Volume 16 Jul-Dec 2008 Number (3-4)

Submit Manuscripts: Editorial office
330 El Sudan Street, Embaba , Egypt
Email : jegyptscts@gmail.com
Tel. 3303 8054 - Mob. 0102327650

EDITORIAL BOARD

Journal of The Egyptian Society of Cardio-Thoracic Surgery

Volume 16 Jul-Dec 2008 Number3,4 ISSN 1110-578X

CONTENTS

Journal of The Egyptian Society of Cardio-Thoracic Surgery

Volume 16 Jul-Dec 2008 Number 3,4 ISSN 1110-578X

Guidelines for Authors

Journal of The Egyptian Society of Cardio-Thoracic Surgery
(J. Egypt. Soc. Cardiothorac. Surg.)

Editorial Office
Please address all correspondence to:
Yasser M W Hegazy MD,FRCS, Editor in Chief
Journal of the Egyptian Society of
Cardio-thoracic Surgery
330 El-Sudan St., Imbaba, Cairo, Egypt.
Telephone: (+201)06045640
Fax: (+202) 303 8054
E-Mail: hegazyyasser@gmail.com

The Journal of the Egyptian Society of Cardio-Thoracic Surgery [ISSN 1110-578 X] is the official publication of the Egyptian Society of Cardio-thoracic Surgery. The journal is published every three months .

General Instructions

Every submission must include:
Cover letter, indicating the category of article , the Complete manuscript, including title page, abstract, text, tables, acknowledgments ,references and illustrations .

Required Disclosures;

A. Conditions for Publication Form which includes disclosures regarding freedom of investigation and conflicts of interest, signed by all authors. In single Author publication an additional Senior Consultant Signature is required.
B. Written permission from the publisher (copyright holder) is required to reproduce any previously published table(s), illustration(s) or photograph(s) in both print and electronic media.
C. Written permission from unmasked patients appearing in photographs is also required.

Revised_Manuscripts:
Revised manuscripts must be submitted in
three parts as Microsoft word-processing files : (1) cover letter with responses to reviewers' comments (2) revised, marked manuscript showing additions and deletions; (3) revised, unmarked manuscript.

General Information
Three copies of the Manuscripts should be sent preferably prepared in Microsoft Word , typed double-spaced throughout (including title page, abstract, text, references, tables and legends) with one (1) inch (2.5 cm) margins all around. Place Author name and page number in the upper right corner of each page.
Manuscripts written in 12 point Arial or Times New Roman fonts are preferred (Note: Do not submit your manuscript in PDF format it causes problems in processing your submission.)
Arrange manuscript as follows: (1) title page, (2) abstract, (3) text, (4) acknowledgments, (5) disclosures if required, (6) references, (7) tables and (8) legends. Number pages consecutively, beginning with the title page as page 1 and ending with the legend page.
If your manuscript contains illustrations, in addition to submitting them online, you must send two sets of original illustrations to the editorial office labeled with manuscript number, first author, and figure number on back.
Tables and figures should be provided separate from the text while there position in the text should be marked on the manuscript.

Word Limits by Category of Manuscript

Original articles should not exceed 4500 words including title page, abstract of 150-200 words, text, figure legends and references. The combined total of illustrations and tables should not exceed 10 and the number of references should not exceed 40.

Case reports and **"The way I do it"** articles are limited to a total of 1500 words including title page, abstract, text, references and figure legends. For each illustration subtract 100 words and for each table subtract 300 words from the word limit. References are limited to eight. A "how to do it" article should be a description of a useful surgical technique and contain descriptive, illustrative material.

Images in cardiothoracic surgery are limited to 350 words including title and text and to two, possibly three figures. The entire contribution must fit on one printed page .

Review articles are limited to 6500 words including title page, abstract, text, figure legends and all references. The total number of references should not exceed 80. Subtract 100

words for each illustration and 300 words for each table.

Our surgical heritage articles are limited to 2500 words including title page, abstract, text, figure legends and references. Subtract 100 words for each illustration and 300 words for each table.

Correspondence (Letters to the Editor) and commentaries are limited to 500 words. Subtract 100 words for each illustration and 300 words for each table.

Editorials are limited to 2500 words including references. Subtract 100 words for each illustration and 300 words for each table.

Manuscript Preparation

Title Page (first page)

The title is limited to 100 characters and spaces for original manuscripts and to 80 characters and spaces for all other categories of manuscripts. The title may not contain acronyms or abbreviations. All submissions, must have a title.

Running Head. Supply a short title of 40 characters and spaces.

Authors. List all authors by first name, all initials, family name and highest academic degree using "MD, PhD" for holders of both degrees (if more then 7 Authors justifie).

Institution and Affiliations. List the name and full address of all institutions where the work was done. List departmental affiliations of each author affiliated with that institution after each institutional address.

Meeting Presentation. If the paper has been or is to be presented at the annual meeting of The Society, provide the name, location and dates of the meeting.

Keywords. Provide up to 5 keywords selected from the appended list to describe the manuscript. Do not use any keywords that are not on the list.

Word Count. Provide the electronic total word count of the entire manuscript including title page, abstract,text,figure legends and entire reference list.

C**orresponding Author.** Provide the name, exact postal address with postal code, telephone number, fax number and e-mail address of the author to whom communications, proofs and requests for reprints should be sent.

Abstract Page (Second page)

Original articles
Provide a structured Abstract, no longer than 250 words, divided into four sections: Background or Objective, Methods, Results, Conclusions. Avoid abbreviations and acronyms. Indicate the abstract word count below the abstract.

Case reports, "the way i do it" articles, review articles and our surgical heritage articles. Provide an unstructured abstract of 100 words.

Images, correspondence, commentaries, editorials and updates. No abstract is required.

Text
Text should be organized as follows: Introduction, Material (or Patients) and Methods, Results, and Comment.Cite references,illustrations and tables in numeric order by order of mention in the text.

Avoid abbreviations. Consult the American Medical Association Manual of Style, 9th edition, for recommended abbreviations. Define abbreviations at first appearance in the text. If 8 or more abbreviations or acronyms are used, provide a separate table of abbreviations and acronyms.

Measurements and weights should be given in standard metric units.Statistical nomenclature and data analysis. Follow the "Guidelines for Data Reporting and Nomenclature" published in The Annals of Thoracic Surgery (1988;46:260-1). Footnotes. Type footnotes at the bottom of the manuscript page on which they are cited. Suppliers of drugs, equipment and other brand mentioned in the article within parentheses , giving company name, city and country .

Acknowledgments
Grants, financial support and technical or other assistance must be acknowledged at the end of the text before the references.

References
Identify references in the text using Arabic numerals in brackets on the line.
Type references double-spaced after text or acknowledgments beginning on a separate sheet. Number consecutively in the order in which they appear in the text. Journal references should provide inclusive page numbers; book references should cite specific page numbers. Journal abbreviations should conform to those used in Index Medicus. follow the formats outlined below:

Journal Article
Jones DR, Stiles BM, Denlinger CE, Antie P . Pulmonary segmentectomy: results and complications. Ann Thorac Surg 2000;76:343-9.(List all authors if 6 or fewer; otherwise list first 3 and add "et al.")

Chapter in Book
12. Vinten-Johansen J, Zhao Z-Q, Guyton RA. Cardiac surgical physiology. In: Cohn LH, Edmunds LH Jr, eds. Cardiac Surgery in the Adult. 2nd ed. New York, NY: McGraw-Hill; 2003:53-84.

Internet Address
3. 1996 NRC Guide for the Care and Use of Laboratory Animals. Available at: http://www.nap.edu/readingroom/books/labrats/contents.html. Accessed October 20, 2003.

Tables :
Tables should be typewritten double-spaced on separate sheets (one to each page). Do not use vertical lines. Each table should be numbered (Arabic) and have a title above. Legends and explanatory notes should be placed below the table. Abbreviations used in the table follow the legend in alphabetic order. Lower case letter superscripts beginning with "a" and following in alphabetic order are used for notations of within-group and between-group statistical probabilities.

FigureLegends :
Figure Legends should be numbered (Arabic) and typed double-spaced in order of appearance beginning on a separate sheet. Identify (in alphabetical order) all abbreviations appearing in the illustrations at the end of each legend. Cite the source of previously published material in the legend and indicate permission has been obtained. Proof of permission must be surface mailed or faxed to the editor .

Illustrations :
You must send two sets of original illustrations to the editorial office labeled with manuscript number, first author, and figure number on back.

Images or figures are submitted online as one or more separate files that may contain one or more images. Within each file containing images, use the figure number (eg, Figure 1A) as the image filename. The system accepts Powerpoint (.ppt) files Most illustrations will be reproduced at a width of one column (8.25 cm; 3 1/4 inches). Black, white and widely crosshatched bars are preferable; do not use stippling, gray fill or thin lines.

Instructions :
Identify print proofs of figures on the back with figure number and name of the first author; when necessary, indicate the top with an up arrow
For figures submitted in electronic format, all images should be at least 5 inches wide. Graphics software such as Photoshop and Illustrator, should be used to create art.
Color images need to be at least 300 dpi.
Gray scale images should be at least 300 dpi .
Line art should be at least 1200 DPI .

Cover letter :
Include with the manuscript a cover letter that provides 1) the category of manuscript (e.g., original research, Brief Communication, Letter to the Editor); 2) statement that the material has not been previously published or submitted elsewhere for publication; 3) information about any personal conflicts of interest of any of the authors; and 4) names of sources of outside support for research, including funding, equipment, and drugs .You may also submit the name of one reviewer of your choice. You should include that individual's mailing address, telephone, fax and e-mail address.
Editorial Policies
Scientific Responsibility Statement
Before publication of an accepted manuscript, each author is required to certify by signing the Conditions for Publication Form that he or she has participated sufficiently in the work and approved the final version of the manuscript to be published.
Exclusive Publication Statement
Each author must certify that none of the material in this manuscript has been published previously in either print or electronic form, and that none of this material is currently under consideration for publication elsewhere. This includes symposia and preliminary publications of any kind except an abstract of 400 words or fewer.

Conflict of Interest :
Authors should disclose any conflict of interests. Authors who have a financial relationship with one or more companies whose products are featured in an article will disclose the existence of this relationship in a box at the bottom of the first page of the published article.

Consultant Statistician and Statistical Methods :
All manuscripts with statistical analysis are required to undergo biostatistical review .The most appropriate way is to involve a biostatistician consultant or coauthor from the investigators' home institution . Manuscripts may undergo further biostatistical review by the Journal after submission. Additional information on statistical methods can be found in "Uniform Requirements for Manuscripts Submitted to Biomedical Journals"(www.acponline.org/journals/resource/unifreqr.htm).

Copyright :
Authors of articles submitted to The J. Egypt. Soc. Cardiothorac. Surg. must transfer copyright to The Egyptian Society of Cardio-Thoracic Surgery by signing the "Conditions for Publication Form." This transfer becomes binding upon acceptance of the article for publication. No part of the published material may be reproduced elsewhere without written permission.
Date of Receipt: The "received for publication" date is the date when the editorial office receives the manuscript, the cover letter, and the Copyright Transfer and Author Declaration Statement, signed by all authors.
For Date of acceptance : letter is provided from the editor.

Checklist

A] Cover Letter

□ Letter to the Editor
□ Manuscript category designation .
□ Single-journal submission affirmation .
□ Conflict of interest statement (if appropriate).
□ Sources of outside funding.
□ Signed Statistical Collaboration .

B] Complete Manuscript

□ Title page .
□ Title of article
□ Full name(s), academic degrees, and affiliation(s) of authors.
□ Corresponding author .
□ Telephones, fax, and e-mail address
□ Abstract (250 words; double-spaced) .
□ Ultramini-abstract (50 words) .
□ Text (double-spaced).
□ References (double-spaced; separate pages).
□ Tables (double-spaced; separate pages).
□ Figures (separate files; on hardcopy; properly identified),
□ Figure legends (double-spaced; separate pages) .
□ Word count.

C] Required Disclosures

□ Conditions for Publication Form signed by all authors. Which transfers copyright to The Egyptian Society of Cardio-Thoracic Surgery
□ Written permission from the publisher to reproduce any previously published material .
□ Written permission from unmasked patients .

Conditions for Publication Form

This form MUST be completed, signed by ALL authors, and returned to the Editorial Office before your manuscript can be accepted for publication.

Scientific Responsibility Statement:

Each author must sign this form to certify that he or she has participated sufficiently in the work to take responsibility for a meaningful share of the content of the manuscript, and that this participation included: (a) conception or design of the experiment(s), or collection and analysis or interpretation of data; (b) drafting the manuscript or revising its intellectual content; and (c) approval of the final version of the manuscript to be published. In addition, each author must indicate whether or not he or she has had full freedom of investigation; defined as freedom from outside interests in controlling the design of the study, collection, analysis, and interpretation of data, and having freedom to full disclose all results.

Exclusive Publication Statement:

Each author must sign this form to certify that none of the material in this manuscript has been published previously in either print or electronic form, and that none of this material is currently under consideration for publication elsewhere. This includes symposia, transactions, books, articles published by invitation and preliminary publications of any kind except an abstract of 400 words or fewer.

Copyright Transfer Agreement:

Each author must sign this form to certify that, if the manuscript is accepted for publication in the Journal of the Egyptian Society of Cardio-Thoracic Surgery (JESCTS), copyright (including the right to obtain copyright registration, whether separately or as part of a journal issue .) in and to the above article transfers throughout the world and for the full term and all extensions and renewals thereof to: THE EGYPTIAN SOCIETY OF CARDIO-THORACIC SURGERY

This transfer includes the right to adapt the article for use in conjunction with computer systems and programs, including reproductions or publication and incorporation in retrieval systems.

Rights of authors:

The ESCTS hereby licenses the following rights back to the author(s):

A. Patent and trademark rights to any process or procedure described in the article.

B. The right to photocopy or make single electronic copies of the article for their own personal use, including for their own classroom use, or for the personal use of colleagues, provided the copies are not offered for sale .

C. The right, subsequent to publication, to use the article or any part thereof free of charge in a printed compilation of works of their own, such as collected writings or lecture notes.

Note:

All copies, paper or electronic, or other use of the information must include an indication of The ESCTS copyright and a full citation of the journal source.

Authorship:

If copyright is held by the employer, the employer or an authorized representative of the employer must sign in addition to the author(s).

Warranties:

The author(s) warrant that the article is the author's original work and has not been published before. The author(s) warrant that the article does not infringe on the rights of others. If excerpts from copyrighted works are included, the author(s) has (have) obtained written permission from the copyright owners and will credit the sources in the article.

Preprints:

The author(s) warrant(s) that if a prior version of this work (normally a preprint) has been posted to an electronic server, such version was accessible to only a small group of individuals and the author(s) will cause its prompt removal from such server.

Conflict of Interest Disclosure Statements:

Each author must indicate below that either (a) no financial conflict of interest exists with any commercial entity whose products are described, reviewed, evaluated or compared in the manuscript, except for that disclosed under "Acknowledgements" or (b) a potential conflict of interest exists with one or more commercial entities whose products are described, reviewed, evaluated or compared in the manuscript through the existence of one or more of the following relationships: the author is a full or part-time employee of a company; has an existing or optional equity interest in a company; owns or partly owns patents licensed to a company; has an ongoing retainer relationship (consultantship, speaker, etc.) with a company for which he/she receives financial remuneration; or has received financial compensation for this publication. If Yes is checked, a box on the first page of the published article will read: ?Dr. X discloses that he/she has a financial relationship with company Y.?

Author: ____

Manuscript Title: ____

I agree with the preceding conditions and provide the appropriate signatures and information below accordingly:

Author's Name:____
Signature:_______________________________ **Date:**______________________
Author's employer's signature, if appropriate: _____________________________
Conflict of interest: Yes ___ No ___ If yes, with which entity: ________________
Did you have freedom of investigation in all aspects of this work?: Yes ___ No ___

Author's Name:____
Signature:_______________________________ **Date:**______________________
Author's employer's signature, if appropriate: _____________________________
Conflict of interest: Yes ___ No ___ If yes, with which entity: ________________
Did you have freedom of investigation in all aspects of this work?: Yes ___ No ___

Author's Name:____
Signature:_______________________________ **Date:**______________________
Author's employer's signature, if appropriate: _____________________________
Conflict of interest: Yes ___ No ___ If yes, with which entity: ________________
Did you have freedom of investigation in all aspects of this work?: Yes ___ No ___

Author's Name:____
Signature:_______________________________ **Date:**______________________
Author's employer's signature, if appropriate: _____________________________
Conflict of interest: Yes ___ No ___ If yes, with which entity: ________________
Did you have freedom of investigation in all aspects of this work?: Yes ___ No ___

Author's Name:____
Signature:_______________________________ **Date:**______________________
Author's employer's signature, if appropriate: _____________________________
Conflict of interest: Yes ___ No ___ If yes, with which entity: ________________
Did you have freedom of investigation in all aspects of this work?: Yes ___ No ___

Author's Name:____
Signature:_______________________________ **Date:**______________________
Author's employer's signature, if appropriate: _____________________________
Conflict of interest: Yes ___ No ___ If yes, with which entity: ________________
Did you have freedom of investigation in all aspects of this work?: Yes ___ No ___

Author's Name:____
Signature:_______________________________ **Date:**______________________
Author's employer's signature, if appropriate: _____________________________
Conflict of interest: Yes ___ No ___ If yes, with which entity: ________________
Did you have freedom of investigation in all aspects of this work?: Yes ___ No ___

If there are additional authors on the article, please photocopy this form and attach additional sheets as need be with appropriate information and signatures affixed .

Guidelines for Reviewers

Purpose of Peer Review

One is to evaluate objectively the science of the submitted paper and the other is to provide a constructive critique indicating how the paper could be or could have been improved by the authors. Reviewers should avoid unpleasant comments.

Acceptance of a Manuscript for Review

Reviewers should accept assignments to review manuscripts that are within their sphere of expertise, which they plan to review within the 21 day deadline. Reviewers should decline assignments for which a conflict exists between the reviewer and authors or between the reviewer and commercial products that are integral to the content of the article.

Category of the Manuscript

The broad categories of papers for which peer review is undertaken are original scientific articles; new technology papers; case reports, the way i do it articles , images; and review articles. The editor and/or associate editors review correspondence, invited commentaries, editorials, surgical heritage , ethical and statistical papers.

General Requirements for Publication

The paper should conform to the format and restrictions for the category to which it belongs and be written in good, readable English. The paper should address an important or interesting subject and provide new and original information. Illustrative material should be well chosen and of good quality.

Original Scientific Article

The reviewer should assess the articles' interest to readers; strengths and weaknesses; originality; clarity of text, tables, illustrations and figure legends; presentation; analysis of results; credibility of results; importance of the findings; depth of scholarship and relationship of the results to the existing literature Ethical issues, such as prior publication of all or part of the data; plagiarism; transgression of human or animal rights; or dishonesty should be noted, if detected.

The following topics are offered to help guide the reviewer's assessment of an original scientific article.

- 'Title' should reflect the content of the article and be concise and clear
- 'Abstract' should indicate the purpose of the study, subjects and methods used, most important results and the main conclusions supported by results.
- 'Introduction' should indicate the rationale and focus of the study and state the purpose or hypothesis.
- 'Methods' should present the design of the study, fully describe the number and subjects and exclusion and inclusion criteria; whether subjects were enrolled consecutively; methods used to gather data, including follow-up data; methods by which control and experimental groups were assembled; the primary outcome variable; secondary outcome variables; how outcome measurements were made and validated; the statistical design of the study; and the statistical methods used to analyze the study.
- 'Results' should concisely present the most important findings in text . Data should be reported as means or medians with appropriate indicators of variance and exact p values in tables and text. Figures should be well selected to highlight important findings . Survival and event curves should indicate specified confidence limits or subjects at risk. Regression diagrams should include the regression equations, regression coefficient and exact p value in the figure legend. Figure legends should adequately and clearly describe the important information illustrated.
- 'Comment' should not repeat results, but should point out the significance and conclusions of the new data, integrate the authors' new data with that in the prior literature, draw inferences and conclusions regarding the question or purpose addressed by the study and point out the limitations of the study. The 'Comment' section should not be a review of the literature.
- References should be properly cited, reasonably current, accurateand in proper format.

New Technology

Articles describing new technology are necessarily descriptive and do not pose or test a hypothesis. These articles evaluate new devices, systems, monitors, implantable material and similar technology designed for improving patient care and outcomes. The reviewer is asked to evaluate the efficacy, safety and indications of the new technology .

The reviewer needs to inspect the 'Disclosure statement' after the text, before References. This statement should disclose the source of funds used for the evaluation study and whether or not the product was purchased, borrowed or donated by the manufacturer or inventor. Conflicts of interest statements for authors are managed by the editorial staff.

Case Reports, The Way I Do It, Images

Case reports describe interesting presentations of disease and innovative management of the patient's or patients' problem. How to Do It articles emphasize innovations in the operative management of technical challenges and new ways of doing things. Images, which must fit on one printed page, are graphics of interesting presentations of disease within the chest.

Reviewers should evaluate the clarity and completeness of the case or procedure descriptions and the selection and quality of the illustrative material. Reviewers should also note whether or not the paper adheres to the format restrictions enumerated in "Information for Authors". The reference list should be se-

lective rather than inclusive.

Review Article

Reviewers should assess the importance of the subject matter, need for the review and probable interest to readers. Reviews of very rare and unusual diseases are discouraged . Reviewers should note if authors have respected the format and restrictions of this category as stated in "Information for Authors".

The 'Introduction' should provide the rationale for reviewing the subject matter and provide the outlines of what is included and not included in the review. In the 'Methods' section reviewers should assess the methods used to search for articles, including search words and databases probed. The body of the review should be well organized with well chosen topical headings arranged in logical order. Within each topical heading the material should be presented in an integrated, comprehensive, objective manner. Statements should be referenced accurately. Reviewers should look for a "summing up" of the topical content .

The review should provide a general overview of the subject matter assessing progress, pointing out deficiencies in present management and indicating opportunities and directions of future work. The reviewer should also assess the selection of references .

Footnote

The reviewer remains anonymous . The reviewer should direct his or her critique to the authors in the style and format that suits them best. The recommendation to the editor is made separately with or without additio

Events of Interest

The 16th Annual Conference of the Egyptian Society of Cardiothoracic Surgery Cairo - Egypt (AL Azhar University)

Timing : ..... **8-10 April 2009**
Location: ..... **Cairo J.W Marriot**
Email : ..... jegyptscts**@gmail.com**

■ Cardiovascular Resrarch Technologies (CRT) 2009c Master Classes 2008: Minimally Invasive Cardiac Surgery: Mitral Valve and A trial Fibrillation-Gree-Washington, DC-March 4-6,2009

For more information on this meeting, contact the Cardiovascular Research Institute at Washington Hospital Center,110 Irving S NW ,suite 6-d,Washington,DC 200010;telephone: (202) 877-8574;email: crtmeeting@gmail.com;website: www.crtonline.org.

■ 16th Annual Echocardiographic Workshop on 2-D and Doppler Echocardiographiy at Vail-Vial,Colorado-March 8-12,2009

For more information on this meeting, contact Shery1 Dohramann,Mayo Clinic ,200 first St ,SW/ GO6138SW,Rochester,MN 55905;telephone: (507) 266-6703;fax: (507) 2667403;website:www.asecho. org.720-2263; e-mail: mgherardi@promedicacme.com; website: www.promedicacme.com.

■ Houston Arotic Symposium:The Second in The Series-Houston ,Texas-March 26-28,2009.

For more information on this meeting, contact Michelle Gherardi,Sym StSuite 203,Carlsbad, CA 92008;telephone: (760) 7202263;fax: (760) 720-624-7,200963e-mail: mgherardi@promedicacme.com;website: www.promedicacme.com.

■ 58th Annual Scentific Session: American College of Cardiology Annual Meeting Orlando, Florida- March 29-31,2009.

For more information on this meet¬ing, contact American College of Cardiology,Heart House, 2400 N Street NW, Washington,DC 20037;telephone: (202) 375-6000;fax: (202) 375-7000;website: www.acc.org.

■ 31st Anuual Charing Cross International Symposium London, United Kingdom April 4-7,2009.

For more information on this meeting, contact Chris Timmins,BIBA Medical Ltd, 44 Burlington Rd London SW6 4NX, UK; telephone: +44 (0) 2077368788; fax:+44(0) 2077368283; e-mail: info@ cxsymposium.com; website: www.cxsymposium.com.

■ 6th Vienna Interdisciplinary Symposium on Aortic Repair (VISAR)-Vienna,Austria-April 22-24,2009.

For more information on this meeting, contact Congress Secretariat,E&E PCO, Nobilegass 23-25, 1150 ; telephone: 01296 733823; fax: 01296 733823; e-mail: lrassocia tes@lyc os .co.uk.

■ International Meeting on Aortic Aneurysms Liege,Belgium September 19-20, 2008

For more information on this meet¬ing, contact Department of Car¬diovascular and Thoracic Surgery, Genevieve Peters, Catherine Amor-mino, CHU Liege-2000 Liege, Bel¬gium; telephone: 3243667163; fax: 3243667164; e-mail: aneurysms. congress@chu.ulg.ac.be; website: www.chuliege-imaa.be

■ International Meeting on Aortic Aneurysms: New Insights Into an Old Problem-Liege, Belgium—September 19-20, 2008

For more information on this meet¬ing, contact Department of Cardio¬vascular and Thoracic Surgery, Ge¬nevieve Peters, CHU Liege-4000, Belgium; telephoneVienna, Austria; telephone: 43-1-867-4944; e-mail: office@ee[pco.com; website: www.ee-pco.com and www.visar.at.

■ 29th Annual Meeting and Scientific Sessions:International Society for Herat and Lung Transplantation-Paris,France - April 22-25,2009.

For more information on this meeting, contact 14673 MidwayRd, Suite 200,Addison, TX 75001;Telephonen: (972) 490-9495; fax: (972) 490-9499; email: ishlt@ishlt.org; website: www.ishlt.org.

■ 129th Annual Meeting of the American Surgical Association Indian

Wells,California-April 23-25,2009
For more information on this meeting, contact American Surgical Association, 900 Cummings Center,Suite 221-u,Beverly,MA 01915;telephone:(978) 927-8330; fax: (978) 524-8890 ; e-mail: asa@prri.comwebsite: www.americansurgical.info

■ 27th Annual Convention of the Society for Vascular Nursing -Denver, Colorado-April 29-May 2,2009.
For more information on this meeting, contact the society for Vascular Nursing ,203 Washington St , PMB 311, Salem, MA 01970;telephone: (888) 536-4786; fax: (978) 744-5029;email: svn@administrator.com; website: www.svnnet.org

■ Echo Fiesta-san Antonio, Texas-May 7-9,2009.
For more information on this meet¬ing, contact website: www.facs.org/ index.html.

■ 21st Century Treatment of Heart Failure: Synchronizing Surgical and Medical Therapies for Better Outcomes-Cleveland, Ohio—October 16-18, 2008
For more information on this meeting, contact Deborah Feils ,Mayo Cardiovascular CME 200 first St SW , Gonda 6-138, Rochester, MN 55905; telephone: (800) 283-6296; fax: (507) 538-0146; email: cvcme@mayo.edu; website: www.asecho.org.

■ 89th Annual Meeting of the American Association for Thoracic Surgery-Boston, Massachusetts-May 9-13,2009.
For more information on this meeting, contact American Association for Thoracic Surgery, 900 Cummings Center, Suite 221-U , Beverly, MA 01915; telephone: (978) 927-8330; fax: (978) 524-8890; email: aats@prri.com; website: www.aats.org.

■ 5th International Conference on Pediatric Mechanil Circulatory Support Systems & Pedatric cardiopulmonary Perfusion-Dallas, Texas-May 27-30,2009 .
For more information on this meeting, contact Julie A. Graham, Penn State CHILD Research,Penn State College of Medicine, 500. University Dr ,MC H085, Hershey, BA 17033; telephone: (717) 531-0003 ext. 285444; fax: (717) 531-0214; email: pedsabstracts@hmc.pcu.edu; website: www.hmc.psu.edu/childrens/pedscpb.

■ 5th Annual Conference of The American Society for Artificial Internal Organs (ASAIO)-Dallas , texas- May 28-30,2009.
For more information on this meeting, contact ASAIO, Inc,980 N Federal Hwy,Suite 212,Poca Raton,FL 33432; telephone: (561) 391-8589; fax: (561) 368-9153; email: info@ Heart Institute, telephone: (252) 754-2629; fax: (252) 754-8353; e-mail: info@asaio.com; website: www.asaio.com.

■ The International Society for Minimally Invasive Cardiothoracic surgery (ISMICS) 2009 Annual Scientific Meeting-San Francisco, California-June 3-6,2009.
For more information on this meeting, contact ISMICS,900 Cummings Center , Suite 221-U , Beverly,MA 01915; telephone: (978) 927-8330; fax: (978) 524-0498; email: ismics@prri.com; website: www.ismics.org.

■ 35th Annual Meeting of The Western Thoracic Surgical Association -Banff, AB , Canda -June 24-27,2009.
For more information on this meeting,contact Western Thoracic Surgical Association , 900 Cummings Center, suite 221 - U ,Beverly,MA 01915; telephone: (978) 927-8330; fax: (978) 524-8890; email: wtsa@prri.com; website: www.westernthoracic.org.

■ 23rd Annual Meeting of The European Association for Cardiothoracic Surgical - Vienna,Austria-October 17-21,2009.
For more information on this meeting, contact EACTS Exetcutive Secretariat,3 Park St, Windsor,Berkshire SL4 1LU,UK;telephone: +44-1753-832166; fax: +44 1753 620407; email: info@ eacts.co.uk; website: www.eacts.org.

■ 56th Southern Thoracic Surgical Association Annual Meeting-Marco Island , Florida-November 4-7,2009.
For more information on this meeting contact Southern Thoracic Surgical Association, 633 N Saint Clair St, Suite 2320,Chicago, IL 60611; telephone: (312) 202-5800; fax: (312) 202-5801; emil: mail@stsa.org; website: www.stsa.org.

■ 5th International Meeting of The Onassis Cardiac Surgery Center: Current Trends in Cardiac Surgery and Cardiology-Athens ,Greece-November 12-14,2009.
For more information on this meeting, contact Triaena Tours & Congress,206 Sygrou Ave, 176 72 Kallithea,Greece; telephone: +30 210 7499353; fax: +30 210 7705752 ; email: lianae@triaenatours.gr; website: www.ocsc2009.com.

■ International Joint Meeting on Thoracic Surgery- Barcelona Spain-November 25-27,2009.
For more information on this meeting, contact Oriol Seto,Acto Serveis, C/Bonaire,7,08301 Mataro,Barcelona,Spain;telephone: 34-937-552-382;fax: 34-937-552-383;email: thoracic.surgery@actoserveis.com;website: www.thoracicsurgery2009.org.

Editorial

Al Azhar University is honored to organize the 16th conference of the Egyptian Society of Cardiothoracic Surgery. The conference will be held at JW Marriott from 8 till 10 April 2009. The conference is considered as a platform whereby participants from different countries meet and exchange their expertise. Top notch presenters will contribute with their latest researches , discussion and knowledge .

On behalf of the organizing committee of the conference and members of the board of the Egyptian Society of Cardio-Thoracic Surgery, I would like to express our utmost pleasure to welcome you all and wish you an enjoyable and pleasant stay .

The goal of this meeting is, to show to each of us that though our field is evolving rapidly, cardiac surgery is here to remain. It is our duty to keep up to these changes and also probably to initiate further ones to our advantage by innovation, improving quality of care and better communication with the public.

One of our sponsored sessions will be devoted to the cardiac field and will concentrate on multi-disciplinarity and data reporting for quality outcomes. The second will be thoracic.

We look forward to your effective and valuable participation

Finally, I could not have had a greater honor than the opportunity to serve as President of the forthcoming meeting. Thank you for your help and support.

President Of The Conference

Prof. Mohamed Ezz Eldin Abdel Raouf

Statistics

CLINICALLY USEFUL MEASURES OF TRIAL OUTCOMES (PART ONE)

Ahmed A. Hassouna, MD.

The clinical effect of studies such as clinical trials, systemic reviews or meta-analysis are usually presented with multiple meaningful ways; including Odds ratio, likelihood ratio, relative risk, risk reduction (or increase) and number needed to treat (or to harm), etc… The term "risk" is used to express the frequency (the probability) of a given outcome or event. As an example, the risk (the probability) of stroke decreases when hypertensive patients receive adequate therapy. Numerically, a probability (the risk) can vary from 0.0 or 0% (meaning that the event –i.e. stroke- will never happen) to 1.0 or 100% (meaning that the event will always happen [(1)].

Relative risk (RR), Relative risk reduction (RRR) and Relative risk increase (RRI):

Table 1 shows the results of 1 year follow up for the risk of sudden death, in a total of 800 patients with aortic valve stenosis (AS). Patients were divided into 4 equal groups according to the severity of the disease (moderate or severe) and to the method of treatment (medical follow-up or aortic valve replacement). In patient with severe AS, the probability of sudden death has dropped from 10% in the medically treated group to only 1% in the surgery group. In patients with moderate AS, the risk of sudden death was initially as low as 1% and dropped to only 0.5% in the surgery group. Although the outcome in each category is clear, yet we are more interested in the comparative results, that is, the outcome in one group relative to the outcome in the other group. One index to compare outcomes is the relative risk (RR), that is, the risk in one group relative to (divided by) that in the control group. In our example, the RR of surgery in patients with moderate AS = 0.005/0.01 = 0.50 and in patients with severe AS =0.01/0.1 = 0.10. This means that after surgery, the probability of sudden death drops to half (50%) of its original value in patients with moderate AS and to as low as 10% of its preoperative value in patients with severe AS. The comparison can also be expressed in terms of the relative risk reduction (RRR), which is the ratio between the decrease in risk in the treatment group (0.01-0.005) and (divided by) the risk in the control group (0.01); or is simply 1- RR = 50% for patients with moderate aortic stenosis and 90% for patients with severe aortic stenosis. This means that the risk has been reduced by 50% in the former and by 90% in the latter group of patients.

Address reprint request to Dr A. Hassouna . Department of Cardio-thoracic Surgery , Ain Shams University , Cairo , Egypt E-mail: ahmedhassouna@hotmail.com

Codex :04/ect/05 /0812

Aortic stenosis (800 patients)	Event (n, %)		RR	RRR
	Surgery group	Medical group		
Moderate (400 patients)	1/200 (0.005)	2/200 (0.01)	0.50	0.50
severe (400 patients)	2/200 (0.01)	20/200 (0.10)	0.10	0.90

Table 1: Risk of sudden death calculated over 1 year period for 800 patients with either moderate or severe aortic stenosis, who were either medically or surgically treated.

Values are presented as numbers (%), RR= relative risk, RRR = relative risk reduction.

In general, if Pc is the probability of the event in the control group and Pt is the probability in the treatment group, the RR = Pt/Pc; with beneficial treatments giving relative risks below one. As RRR = 1-(Pt/Pc), a RRR of zero indicates no benefit or harm associated with the active treatment, whereas a RRR of 1 could indicate a "cure" (2). It is worth to say that although both: RR and RRR are usually used in the context of preventing an adverse event; they can also be used to describe a favorable outcome that we intend to increase by treatment. In such a case, a beneficial treatment will give a RR >1 and it becomes more logic to use the term "relative risk increase" (RRI) instead of the term "relative risk reduction" (RRR).

Hypertension (6000 patients)	Event (n, %)		RR	RRR
	Treatment group	Control group		
mild (3000 patients)	12/1500 (0.008)	15/1500 (0.01)	0.80	0.20
moderate (3000 patients)	144/1500 (0.096)	180/1500 (0.12)	0.80	0.20

Table 2: Neurological events calculated over 5 years period for 6000 patients with either mild or moderate hypertension, receiving either placebo or active treatment

Values are presented as numbers (%), RR= relative risk, RRR = relative risk reduction.

Sometimes the benefit of a specific treatment -as expressed by the RR or RRR- remains roughly constant over a range of patient populations at varying baseline risk (Pc). Table 2 is an example of such a case, where despite that Pc and Pt greatly differ between both groups of hypertensive patients (e.g. Pc is only 1% in the mild group and 12% in the moderate hypertension group); the risks of neurological events decrease by very comparable rates in both groups. The net result is that the RR (and of course its follower the RRR) are very close in both groups. In such a case, RR or RRR can become an attractive single estimate of treatment effect for a broad class of patients with mild as well with moderate hypertension.

This last example is not, of course, the rule as shown in Table 1; where patients with different severity of the disease show different relative risks in response to treatment. This is one drawback of those relative indices. Another drawback is that although they clarify the comparison itself, yet none shows exactly what is the weight of this 50% or that 10% risk reduction on the absolute scale? In patients with moderate AS, this 50% RRR was achieved by operating upon 200 patients. After this expensive and tiresome mission, the actual weight of this 50% decrease was only 1patient less in the surgery group, who will not suffer from sudden death. Although 1 life is always precious, yet it remains small on the absolute scale; especially in the eyes of some decision makers. The modesty of the number (1 patient) compared to the

large 50 % figure of risk reduction is of course due to very small original risk (i.e. Pc) of only 1%). One have to notice that if the original risk was as high as 90% and the risk after surgery (Pt) dropped to 45%, the RR would be the same 50% (0.45/0.90 = 0.50). A similar 50% RRR will equally achieved with totally different Pc and Pt percentages, e.g. 10% and 5%; respectively, etc… The clinical implications of these changes clearly differ from one another enormously and depend on the specific disease and intervention and, points to the importance of the other type of indices on the absolute scale such as the absolute risk reduction and the number needed to treat however, this will be the subject of another coming topic of this series.

References

1. *Using Numerical Results from Systematic Reviews in Clinical Practice. McQuay, RA and Moore, HJ. 1997, Ann Intern Med, Vol. 126, pp. 712-20.*
2. *The number needed to treat: a clinically useful measure of treatment effect. Sackett, RJ and Cook, DL. 1995, Vol. 310, pp. 452-4.*

ENDOSCOPIC VERSUS OPEN AND BRIDGING TECHNIQUES FOR SAPHENOUS VEIN HARVESTING: A PROSPECTIVE COMPARATIVE STUDY

El-Domiaty HA MD* ,
Moubarak AM MD,**
Mansy MM MD *.**

Background: **Coronary artery bypass grafting is now one of the most commonly performed cardiac operations. This surgery requires various conduits, with the saphenous vein remaining a conduit of choice next to the left internal mammary artery. The aim of this study is to compare between the different techniques used for saphenous vein harvesting.**

Methods: **The study comprised 240 patients, submitted for first time coronary bypass surgery. The patients were distributed among three groups according to the technique used for harvesting of the great saphenous vein. Group (A) included 100 patients, with long continuous incision technique. Group (B) included 75 patients with small interrupted multiple incisions technique (bridging technique) and Group (C) included 65 patients with endoscopic vein harvest technique. Analysis of preoperative, operative variables and the postoperative prognosis as regard the hospital stay and the postoperative vein site related pain and complications with a follow up of the patients for 6 months postoperatively.**

Results: **The overall mortality rate was 1.7% with no significant differences between the three patient groups. The three patients groups were matched as regarded patient age, sex, and preoperative co-morbid diseases. The total operative time was longer in group C than the other two groups (A and B) but this difference not reached significant value. The vein harvesting time in group C was highly significant longer than, group A and group B (91±28 versus 35±14 and 61±14 minutes respectively. P-value < 0.01). Also the vein preparation time in group (C) was significant longer than group A and B (26 ± 5 min. versus 6 ± 3 min. and 20 ± 5 min. respectively. P-value < 0.05). However, leg closure time was significant shorter in group (C) than in group (A) and group (B) (12 ± 15 minutes versus 62 ± 28 and 44 ± 22 minutes respectively, P-value < 0.05). The incision length was highly significantly shorter in group (C) than in group A and group B (7±2.4 cm versus 81±8 and 31±11 cm respectively, P-value < 0.01). Wound complications were highly significantly less in group C than group A and group B (12.5% versus 24.5% and 21.6% respectively, P-value was < 0.01). Postoperative vein site related pain score was significantly low in group C and B than in group A in the first two postoperative weeks, but no significant differences between the three patient groups after 2 weeks forever.**

Conclusion: **Endoscopic vein harvest is safe and effective technique, and associated with shorter hospital stay and fewer complications than open harvest technique and bridging techniques. Endoscopic vein harvested, should be considered a good choice for vein harvest especially in patients with high risk for postoperative vein site complications.**

Accepted for publication Jun,2008
Address reprint request to : El-Domiaty Department, Cardiothoracic Surgery - Suez Canal university, Egypt.
Email : jegyptscts@gmail.com
Codex : 04/cord/77/0806
* Suez Canal university
** Dar Al-Fouad hospital in Egypt
*** Saad specialist hospital in Saudi Arabia

Although arterial grafts are widely used due to the advantage of long-term patency in coronary bypass surgery, greater saphenous vein is still commonly used in patients, who require multiple grafts (1).

The great saphenous vein has traditionally been harvested by use of an open surgical technique in which the vein is exposed via a long continuous incision or multiple interrupted incisions from the groin to the ankle, a procedure which is not free of many wound complications [1,2] and significant post operative pain is a frequent observation after coronary artery bypass graft surgery so that many patients complain more about their leg wound than they do about their median sternotomy[3].

With the advent of endoscopic vein harvesting in 1994, and because of advances in surgical instrumentation and video technology, endoscopic saphenous vein harvesting has become a promising alternative to open saphenous vein harvesting for coronary artery bypass grafting and has been advocated in an effort to minimize such wound related problems(2,4).

The aim of this study is to evaluate the technique of endoscopic vein harvest and comparing this technique with traditional (open) technique and interrupted (bridging) technique for saphenous vein harvesting.

Method

This study was conducted during a period of 3 years from March 2005 to March 2008, in the departments of cardiac surgery in Suez Canal University hospital, Dar Al-Fouad hospital in Egypt and Saad Specialist hospital in Saudia Arabia.

Included in the study, all patients with reversible ischemia, admitted for first time coronary artery bypass surgery with multi-vessels disease and excluded from the study, all patients with single or double bypass grafting, emergency surgery, prior bilateral greater saphenous vein stripping, major saphenous vein varices which precluded use of the vein, exclusive arterial revascularization, redo-surgery, and patients with associated other cardiac lesion required surgical correction.

Total of 240 patients fulfilled the criteria for the study. The overall age was ranged between 36 and 78 years (mean age 57±12 years), with a female sex accounted for 33.7% of patients. The patients were classified into three groups according to the technique used for the harvesting of the great saphenous vein.

Group (A): Include 100 patients in whom the saphenous vein was harvested by long continuous incision technique from ankle to groin (the traditional technique).

Group (B): Include 75 patients in whom the saphenous vein was harvested by small interrupted multiple incisions technique (the bridging technique).

Group (C): Include 65 patients in whom the saphenous vein was harvested by the endoscopic vein harvest technique (Endoscopic technique).

Preoperative assessment of all patient, includes, clinical examination, chest X-ray postero-anterior and lateral films, echocardiography and coronary angiography. Laboratory evaluation was done for all patients and assessment of the associated risk factors as obesity (body mass index >30 in males and > 32 in females), smoking, hypertension, anemia, hypoprotenemia, elevated cholesterol, diabetes mellitus, coexistent vascular diseases, renal failure, chronic obstructive pulmonary disease COPD, and history of corticosteroid medication.)

Operative details

The anesthetic management and operative techniques were similar among the anesthetists and the surgeons participating in the study.

Under general anesthesia, the patient's legs, chest, and abdomen were prepared and draped in standard fashion. The lower limbs were positioned in a "frog leg" position with towel stacks under the knees. In patients undergoing open vein harvest or bridging technique, the chest and leg procedures were performed simultaneously, whereas in endoscopic vein harvest was started on the right leg 20 to 30 minutes before the chest team began.

Long continuous incision technique (the traditional technique, Group A): The incision was commenced just above the medial malleolus. The vein was identified and cleared of all adventitia and connective tissue using sharp and blunt dissection. The skin was incised over the whole length of the vein to the required length and careful dissection was used to isolate the vein in situ, with attention given to avoid unnecessary trauma to the vein or its tributaries. Side branches were ligated with 3/0 silk ligatures on the vein side and metal clips on the patient side. The leg wound was closed in layers and a full-length pressure dressing was applied.

Small interrupted incisions technique (the bridging technique, Group B): The incision was commenced just above the medial malleolus and vein was identified and cleared and by the use of special retractors and through

multiple small interrupted incisions, the vein was followed until the required length was harvested. All tributaries were divided between two metal clips. After hemostasis, the incisions were closed in usual manner and a pressure dressing was then applied to the leg.

Minimally invasive technique (the endoscopic technique, Group C): We used the VASOVIEW 6 endoscopic system marketed by GIUDANT (Giudant Corporation Santa Clara, CA, USA). The greater saphenous vein was identified through a 2 cm longitudinal incision two finger breadth below the crease of the knee. The vein was identified and encircled with vessel loop, with the use of army navy retractor 2 cm of the vein above and below were dissected and their tributaries were clipped and divided.

Then a dissection cannula and the endoscope were introduced into the subcutaneous tissue directed upward in the thigh with Insufflating CO2 to enhance exposure.

The vein is mobilized circumferentially, and side branches are coagulated using bipolar endoscopic cautery scissors.

Whenever bipolar cautery is applied, a distance of at least 2 mm between the scissors and the vein using the C- arm retractor should be kept in order to avoid thermal damage. Proximal control of the greater saphenous vein is accomplished with direct double silk ligature through a separate 2 cm incisions at the groin.

When more length of the vein was required the cannula and the endoscope was directed downward toward the leg and the desired length of the vein was harvested up to the level of medial malleoulus. Distal control of the vein was done through separate 2 cm incision.

The vein was withdrawn from the subcutaneous tunnel. Then three wounds were closed in a standard fashion and a full length pressure bandage was applied.

All patients were approached through median sternotomy with dissection of internal mammary artery pedicle from the subclavein vein down to the bifurcation of the mammary artery.

Standard normothermic cardiopulmonary bypass was established in all patients utilizing aortic and single venous cannulation.

Myocardial protection was achieved by warm blood potassium cardioplegia infused in the aortic root by perfusionest with loading dose of 20 milliequevelant potassium chloride and maintenance dose of 10 milliequevelant potassium chloride every 20 minutes.

All our patients had multi-vessels coronary disease. The left internal mammary artery was utilized in all patients as the conduit of choice to the left anterior descending coronary artery, and the saphenous vein grafts were used as conduit for other coronary arteries.

Operative data were collected as regarding total operative time, cardiopulmonary bypass time, aortic clamping time, vein harvesting time, number of vein grafts, length of vein harvested, length of skin incision, and time of leg wound closure.

All survivors were evaluated in ICU and during their hospital stay for the severity of pain related to the lower limb wound daily, utilizing numerical scale from 0 to 10 (The answer was given orally and written on a scale, with 10 being described as an excruciating pain, and 0 as no pain at all ever experienced throughout the day), and the presence of wound complications as regard lower limb erythema, edema, echomosis, hematoma, cellulitis wound discharge, and wound dehiscence.

After hospital discharge all patients were followed in outpatient clinic with weekly visit during the first month and monthly visit after that, evaluating the general condition of the patients with specific evaluation for lower limb wound healing process and the presence of leg pain or discomfort or other complications related to the vein harvesting site.

Statistical analysis

Data are presented as mean values with standard deviations. Analysis of variance and independent t tests were used for group comparisons of continuous variables. Fisher's exact test and chi-square analysis were performed to compare categorical data. P-value considered significant if <0.05, highly significant if <0.01, and non significant if >0.05.

Stepwise multivariate logistic regression was performed to assess the influence of preoperative variables as independent risk factors for postoperative vein site complications. Data were analyzed using SPSS version 16 statistical software (SPSS, Inc., Chicago, IL, USA).

Results

The total hospital mortality in our patients was 1.7% (4 patients), out of them two patients in group A (2%), one patient in group B (1.3%) and one patients in group C (1.5%). The cause of death was postoperative low cardiac output and all death occurs within the first 48 hours postoperative. All were excluded from further analysis, leaving 98 patients in group A, 74 in group B and 64 in group C.

No significant differences between the three patients groups, as regarded patient age and sex distribution. In Group (A), the mean age was 58±10years, (69.4% males and 30.6% female). In Group (B), the mean age was 57±9 years (63.5% males and 36.5% females). In Group (C), the mean age was 55±11 (64.1% males and 35.9% females). Demographic data were comparable between the three patient groups with no significant differences, as regarded the preoperative non-cardiac risk factors Table (1).

Patient demographic data and risk factors.

Variables	Group A		Group B		Group C		P value
	N	%	N	%	N	%	
Angina Class							
II	19	19	12	16	12	18.5	
III	39	39	30	40	25	38.5	>0.05
IV	51	51	33	44	28	43.1	
Smoking	52	52	40	53.3	31	47.7	>0.05
Hypertension	88	88	64	85.3	54	83.1	>0.05
High cholesterol	49	49	41	54.7	33	50.1	>0.05
Obesity	20	20	11	14.7	15	23.1	>0.05
DM	31	31	21	28	17	26.2	>0.05
CVD	8	8	7	9.3	6	9.2	>0.05
Renal failure	8	8	5	6.7	5	7.7	>0.05

Table (1): DM= Diabetes mellitus, CVD= Cerebrovascular disease.

Comparison between the three patient groups revealed non significant differences as regard the total operative time, cardiopulmonary bypass time, aortic clamping time, the length of vein harvested, and the number of grafts constructed. However, vein harvesting time was highly significantly longer in group (C) than the other two groups (91 ± 28 min versus 35 ± 14 minutes in group A and 61 ± 14 minutes in group B, P<0.01). Also, vein preparation time was significantly longer in group C than the other two patient groups (26 ± 5 minutes versus 6 ± 3 minutes in group A and 20 ± 5 minutes in group B, P <0.05).

The length of skin incision was highly significantly short in group C (7 ± 2.4 cm) than group A (81 ± 8 cm) and group B (31 ±11cm), P-value <0.01. Also, the wound closure time were highly significantly short in group C (12 ± 15 minutes) than group A (62 ± 28 minutes) and group B (44 ± 22 minutes), P-value <0.01. (Table 2).

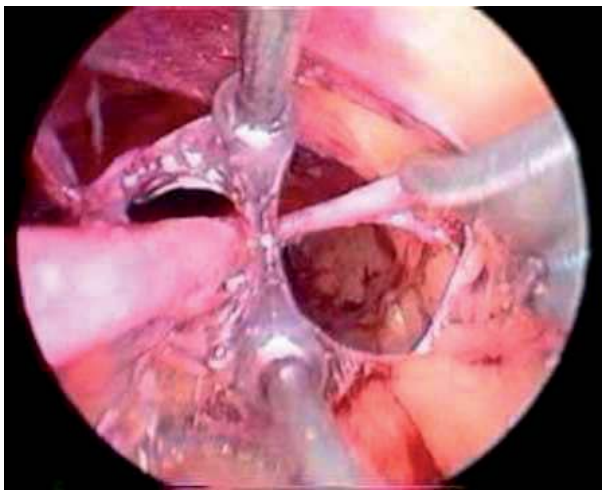
Intra-operative details.

	Group A (N=125)	Group B (N=75)	Group C (N=40)	P value
Total OR time	250 ± 60	270 ± 64	310 ± 75	NS
Total CPB time	86 ± 22	80 ± 16	77 ± 15	NS
Vein harvest time	35 ± 14*	61 ± 14*	91±28*	<0.01
Vein preparation Time	6 ± 3*	20 ± 5*	26 ± 5*	0.05
Skin closure time	62 ± 28*	44 ± 22*	12 ± 15*	0.05
Total vein length	32 ± 12	30 ± 10	24 ± 8	NS
skin incisions length	81 ± 8*	31 ± 11*	7±2.4*	0.01
Number of vein grafts	3.4 ± 0.8	3.2 ± 0.6	2.9 ± 1.2	NS

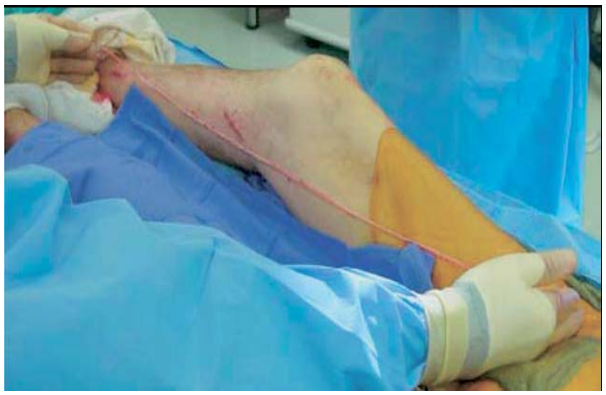
Table (2):OR= operative room, CPB= Cardiopulmonary bypass)

Complications	Group A		Group B		Group C		P value
	N	%	N	%	N	%	
Erythema	5	5.1	3	4.1	2	3.1	> 0.05
Edema	12	12.2	8	10.8	6	9.4	>0.05
Hematoma	4	4.1	2	2.7	3	4.7	>0.05
Drainage	16	16.3	8	10.8	1	1.6	<0.01
Echemosis	2	2.0	2	2.7	8	12.5	<0.01
Dehiscence	8	8.2	4	5.4	0	0	<0.01
Cellulitis	4	4.1	2	2.7	0	0	<0.01
Bacterial growth	10	10.2	4	5.4	0	0	<0.01
Readmission	6	6.1	2	2.7	0	0	<0.01
Number of patients	24	24.5	16	21.6	8	12.5	<0.01
Number of complications	67		35		20		<0.05

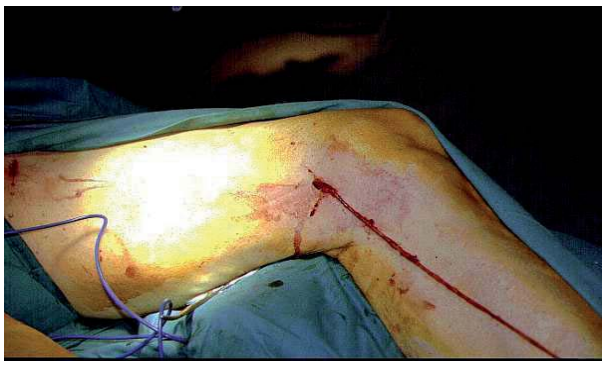
Table (3): Postoperative vein site complications.



Picture (1): Endoscopic view with C-arm keep distance between the vein and the end diathermy to avoid thermal injury of the vein



Picture (2): Endoscopic vein harvesting from the whole lower limb, length sufficient for four grafts).



Picture (3): Endoscopic vein harvest from the thigh, length sufficient for two grafts.

Three patients (4.7%) in the endoscopic technique (group C) and five patients (6.8%) in the interrupted technique (group B) were converted to an open technique (group A). These patients remained in its original group due to the intention-to-treat principle as described above under statistical analysis. The reason for conversion in the endoscopic group was mainly small vein size and excess number of the vein tributaries. However, in interrupted technique group the cause of conversion was excessive subcutaneous fat and deep vein position, which made completion of interrupted technique time consuming. In follow-up, none of these patients developed complications associated with their leg incisions.

Follow up of the lower limb wound healing revealed significantly more wound drainage in the open technique (group A) and the interrupted technique (group B) compared with the endoscopic technique (group C) (16.3% in group A and 10.8% in group B versus 1.6% in group C, P<0.05). However, there were significantly more ecchymoses in the endoscopic technique (group C) 12.5%, than the open technique (group A) 2.0% and the interrupted technique (group B) 2.7%, P<0.05.

Wound dehiscence, was reported in 8 patients (8.2%) in the open technique (group A) and in 4 patients (5.4%) in the interrupted technique (group B) while it was (0.00%) in the endoscopic technique (group C), P value <0.01. Two patients in group A (2.1%) and one patient in group B(1.4%), required prolongation of hospital stay for leg wounds dressing changes and intravenous antibiotics. One patient in group A (1.1%) requires operative revision of the wound. Bacterial examination from wound discharge revealed bacterial growth in 10 patients in group A (10.2%), and 4 patients in group B (5.4%), while no bacterial growth was reported in group C patients. Six patients within group A (6.1%) and two patients within group B (2.7%) were re-admitted to the hospital after discharge and treated with wound dressing and oral antibiotics, while no patient in group C required readmission for wound complications.

During follow up in the outpatient clinic, there were 29 patients (29.6%) in the group (A), 21 patients (28.4%) in the group (B) and 4 patients (6.2%) in the group (C) required more frequent follow-up evaluation specifically for suspected complications associated with their leg incision (p<0.01). Not all complaints required interventions; however, all sought additional medical advice from a member of our service or from their primary care provider.

Although the lower limb pain score was low in the first two postoperative days with no significant differences between the three patient groups. But from the

third postoperative day to the hospital discharge patients within group (A) exhibit significantly more pain than the group B and C (4.6±2.2 versus 1.9±0.8 and 0.9±0.6 respectively, P<0.05), Table (4). Follow up of lower limb pain at 2 weeks and up to 6 months postoperative revealed low pain score in the three patient groups with no significant differences (1.8±0.7, 1.1±0.1, and 0.5±0.6 respectively, p>0.05). However, most of patients within group A complain of discomfort from their leg wounds especially when bending the knee.

Time	Group A	Group B	Group C	P-value
1st day	2.4±1.2	2.6±1.1	1.8±1.6	>0.05
2nd day	2.8±1.9	2.3±1.9	1.9±1.1	>0.05
3rd day to HD	4.6±2.2	1.9±0.8	0.9±0.6	<0.05
2 week	1.8±0.7	1.1±0.8	0.5±0.6	>0.05
4 week	1.2±0.2	0.8±0.3	0.4±0.7	>0.05
2 to 6 months	No pain	No pain	No pain	0

Table (4): post-operative leg pain score.

The mean length of hospital stay for all patients was 7.4 ± 6.7 days. For the open technique (group A) the mean stay was 7.6 ± 6.4 days and for the interrupted technique group (B) the mean stay was 7.1 ± 6.5, compared with 5.1 ± 6.0 days for the endoscopic technique (group C) patients which statistically non-significant.

Correlation study between the preoperative variables and the postoperative wound complications in all our patients, revealed that the predictors of postoperative vein site wound complications were diabetes mellitus (OR 0.31, 95% CI 0.23–0.43; p < 0.01), hypo-protenemia (OR 0.29, 95% CI 0.12–0.70; p =<0.01), and obesity (OR 0.26, 95% CI 0.12–0.55; p < 0.01).

Discussion

Modern management of CABG surgery patients emphasizes an early return to normal activities. In this regard early mobilization after surgery plays an important part in the process of recovery. In turn, any reduction in morbidity from the saphenous vein harvest procedure will promote early mobilization and speed rehabilitation (3,5).

Conventional saphenous vein harvesting has been performed for decades in association with aortocoronary bypass grafting, compounding the pain and morbidity of the chest procedure (1,6). Complications with open saphenous vein harvest have been reported in the range of 19% to 34% in most of literatures (3,5,7).

When minimally invasive alternatives for vein harvest appeared in the early 1990s, surgeons were eager to determine whether an endoscopic approach could deliver the anticipated benefits of fewer complications (8).

In this study we compare the technique of endoscopic vein harvest with the other two techniques commonly utilized in our centers for vein harvesting, the traditional open long skin incision technique and the bridging technique through interrupted small incisions.

In our study it is evident that, harvesting of saphenous vein with endoscopic technique was time consuming in comparison with both long continous incision and interrupted incision techniques. Also the resulted vein required prolonged time for preparation than the other two techniques, in term of vein repair stitches or clipping or ligation of the tributaries. However, this prolongation in duration of vein harvesting and preparation with endoscopic technique was decreased gradually late in the study with rising of the learning curve, but still significantly longer than the other two groups.

All published literatures (4,6,9,10,11) reported prolonged time in endoscopic vein harvesting technique than traditional open vein harvest and the time reported for endoscopic vein harvest range from 60 to 120 minutes (4,12,13). This wide range of the time required for endoscopic vein harvest apparently resulted from the difference in experience between centers and different patients' population.

In the other hand, we and others (4,9,12,14) reported that, wound closure and hemostasis in endoscopic vein harvesting was very short in comparison with the other two techniques. The total operative time in our study was longer in endoscopic than the other two groups but not reaching statistical significant value. The same observation reported by Bonde et al (5), Yan et al (12) and Aziz et al (8), all reported statistically non significant differences between endoscopic vein harvesting and other techniques.

However, both Puskas et al(6) and Crouch et al(10) reported significant long operative time with endoscopic vein harvesting than with other technique of vein harvesting. But in the previous two studies the cross clamp time and cardiopulmonary bypass times were prolonged in endoscopic vein group than the other group of their patients for unmentioned reason and this may lead cumulative evidence that the total operative time was prolonged with endoscopic vein harvest.

In our study we reported conversion rate from endoscopic vein to open technique of 4.7 %. Yan et al (12), reported conversion rate of 3 % with endoscopic vein harvest and, Mandiye et al (13) reported conversion rate of 12.5% in their patients. The reason for conversion in our group of patients and other studies was due to superficial vein position with excessive vein tributaries and small size of the vein. It seem that the rate of conversion from endoscopic technique to open technique related mainly to experience of the operator. However, there is agreement that superfacial position of saphenous vein is considered the main cause of conversion of the endoscopic technique to other technique(12,13).

The rate of conversion from interrupted technique to traditional open technique in our patients was 6.8%. However, Mahmood et al (15) reported no conversion from interrupted technique to traditional open technique in their patients. But they utilize Mayo clinic ring with vein stripper in the interrupted technique, which facilitate localization of vein tributaries, and this may be the reason for the difference between studies as all cases of conversion in our study were due to excessive subcutaneous fat and deep vein location with difficulty in localization of vein tributaries.

In our study, patients within group (C) endoscopic technique experienced significantly fewer wound complications (20 complications reported in 12.5% of patients). However, in group (A) traditional open technique (67 complications reported in 24.5% of patients), and in group (B) the interrupted technique (35 complications reported in 21.6% of the patients). These results concur with the results of published literatures (9,12,13,14) where the reported incidence of complications with endoscopic techniques ranges between 3.5 and 9% and with the open harvesting technique range between 22 and 34%.

Postoperative pain related to vein harvest site was significantly lower in both endoscopic and interrupted technique than with continuous incision technique during hospital stay especially with ambulation. This difference was declined by time to become insignificant after the second postoperative week forever. However, patients with long continuous incision were still complaining of discomfort with bending the leg.

Controversy in the literature about the postoperative pain, some (12,13,14) agree with our results and reported significant difference between the endoscopic vein technique and the traditional open technique. However, Hayward et al(4) denied any differences in severity of post operative pain between the two techniques. This difference may be due to different patients' population especially as regard pain threshold or associated disease as diabetes and peripheral vascular disease.

Correlation study between the preoperative variables and the postoperative wound complications in all our patients, revealed that the predictors of postoperative wound complications in our patients were diabetes mellitus (OR 0.31, 95% CI 0.23–0.43; $p < .0001$), hypoprotenemia (OR 0.29, 95% CI 0.12–0.70; $p = .007$), and obesity (OR 0.26, 95% CI 0.12–0.55; $p < .0001$). Also, the same finding reported by Utley et al (7) whose reported that diabetes mellitus and obesity were predictors of leg wound complications after saphenous vein harvesting.

The mean length of hospital stay for patients within group (C) was (5.1±6.0 days), which was shorter but not statistically different from patients within group (A) and group (B) 7.6±6.4 and 7.1±6.5 days respectively, $P>0.05$. Allen et al (2) observed one day earlier discharge, in endoscopic vein harvest than traditional technique but in their analysis this variable was statistically significant. Other studies have not found significant differences in the length of hospital stay between different techniques (4,10,12,13).

Cost may be an important consideration when choosing an endoscopic approach to harvesting the saphenous vein. The endoscopic technique increase the coast of surgery due to utilization of the disposable equipment required, also the use of the non-disposable equipment (monitor, camera, light source, and CO2 insufflators). However, overall more coast of the endoscopic technique in comparison with the improvement of wound healing and the reduction in the additional treatments and the requirement for more hospitalization may counterbalance the added cost of the equipment.

Limitations of the study

In our study there was no histological examination of the harvested veins to evaluate the degree of trauma to the vein wall. Also, no angiographic follow up for the patients to determine the patency rate of the vein grafts. This mainly due to the early experience with endoscopic vein harvest and both elements were not scheduled in our study from the beginning of the study.

However, Kianii et al 2002(14), reported no significant histological differences between the conventional

and endoscopically harvested saphenous veins in their double blinded histological assessment of harvested vein by both techniques.

Also, Yan et al (12) evaluated their patients with angiographic assessment for vein patency 6 months postoperative and reported no significant differences between patency rate between endoscopic and traditional open techniques, the overall occlusion rates at 6 months were 21.7% for endoscopic vein harvest and 17.6% for open vein harvest. Additionally, there was evidence of significant disease (>50% stenosis) in 10.2% and 12.4% of endoscopic vein harvest and open vein harvest grafts, respectively.

Conclusion

Endoscopic vein harvest is safe and effective technique, and associated with shorter hospital stay and fewer complications than open harvest technique and bridging technique. Endoscopic vein harvested, should be considered a good choice for vein harvest especially in patients with high risk for postoperative vein site complications.

References

1. Goldsborough MA, Miller MH, Gibson J, et al. Prevalence of leg wound complications after coronary artery bypass grafting: Determination of risk factors. Am J Crit Care 1999; 8:149.
2. Allen KB, Griffith GL, Heimansohn DA. et al. Endoscopic versus traditional saphenous vein harvesting: a prospective randomized trial. Ann Thorac Surg. 1998; 66:26–32.
3. Kan CD, Luo CY and Tang YJ. Endoscopic saphenous vein harvest decreases leg wound complication in coronary artery bypass grafting patients. J Card Surg. 1999; 14:157–162.
4. Hayward T, Hey L, Newman L et al. Endoscopic versus open saphenous vein harvest: the effect on postoperative outcomes. Ann Thorac Surg. 1999; 68:2107–2111.
5. Bonde P, Graham A and Mac Gowan SW: Endoscopic vein harvest: Advantages and limitations. Ann Thorac Surg 2005; 77:2076.
6. Puskas JD, Wright CE, Miller PK, et al. A randomized trial of endoscopic versus open saphenous vein harvest in coronary bypass surgery. Ann Thorac Surg 1999; 68:1509-12.
7. Utley JR, Thomason ME, Wallace DJ. et al. Preoperative correlates of impaired wound healing after saphenous vein excision. J Thorac Cardiovasc Surg. 1989; 98:147–149.
8. Aziz O, Athanasiou O and Darzi A. Minimally invasive conduit harvesting: A systematic review. Eur J Cardiothorac Surg 2006; 29:324.
9. Carrizo GJ, Livesay JJ and Luy L. Endoscopic harvesting of the greater saphenous vein for aortocoronary bypass grafting. Tex Heart Inst J. 1999; 26:120–123.
10. Crouch JD, O'Hair DP, Keuler JP, et al. Open versus endoscopic saphenous vein harvesting: Wound complications and vein quality. Ann Thorac Surg 1999; 68:1513.
11. Bitondo JM, Daggett WM, Torchiana DF, et al. Endoscopic versus open saphenous vein harvest: A Comparison of Postoperative Wound Complications. Ann Thorac Surg 2002; 73:523-528.
12. Yun KL, Xing YW, Aharonian V, et al. Randomized trial of endoscopic versus open vein harvest for coronary artery bypass grafting: Six-month patency rates. J Thorac Cardiovasc Surg. 2005; 129:488-490.
13. Mandiye SS, Yadav A, Pathak S, et al. Extended length" endoscopic harvest of the great saphenous vein for coronary artery bypass grafting. Ind J Thorac Cardiovasc Surg, 2007; 23: 125-127.
14. Kianii B, Moon BC, Massel D, et al. Prospective randomized trial of endoscopic versus conventional harvesting of the saphenous vein in coronary artery bypass surgery. J Thorac Cardiovasc Surg 2002; 123:204-12.
15. Mahmood Z, Al Benna S, Nkere U and Murday A. Decreased morbidity following long saphenous vein harvesting using a minimally invasive technique: a randomised controlled trial comparing two techniques for long saphenous vein harvest. J Thorac Cardiovasc Surg.2006; 115:110.118.

IS THE USE OF BILATERAL SKELETONIZED INTERNAL MAMMARY ARTERY FOR REVASCULARIZATION IN CABG A SAFE TECHNIQUE?

Saeed M. Elassy, M.D.

Background: **The indisputable survival benefit of grafting one internal thoracic artery (ITA) on the left anterior descending coronary artery is because of its superior long-term patency. The superior performance of this conduit led to an increase in the use of (BITA) in an attempt to avoid late Saphenous graft closure and improve event-free survival. Skeletonization of the internal mammary artery increases the ability to use it for complete revascularization.**

Methods: **We retrospectively evaluated the impact of the routine use of double skeletonized internal mammary artery in 222 patients who underwent coronary artery bypass grafting between December 2003 and October 2005. Their mean age was 53.53 ± 7.391 (37 to 70 years), 208 (93.7%) were men, and 14 (6.3%) women. 98 (44.1 %) were diabetic. The average number of grafts was 3.05 per patient (2 to 5 grafts).**

Results: **Operative mortality was 2.7 % (n = 6) causes were perioperative infarction, multiorgan failure and septicemia and renal failure. Sternal wound infection occurred in 2 patients (0.9 %) and superficial wound infection in 6 patients (2.7 %). Emergency operation, left ventricular dysfunction (ejection fraction less than 35%) and old myocardial infarction were found significant predictors of early mortality (30 days). Chronic obstructive pulmonary disease was found to be the only independent predictor of deep infection. Diabetes was not found to be an independent predictor of infection. Postoperative follow-up (1 to 24 months) was available in 162 patients (75.7 %). 91.9 % of the surviving and followed patients are well and free of angina.**

Conclusions: **Routine use of bilateral skeletonized internal mammary artery is a safe technique for myocardial revascularization even in diabetic patients.**

Left internal mammary artery (LIMA) grafting to the left anterior descending (LAD) artery was demonstrated to be the most important determinant of survival and of minimizing late cardiac events in any patient undergoing coronary artery bypass grafting (1). This indisputable survival benefit of grafting one internal thoracic artery (ITA) on the left anterior descending coronary artery is because of its superior long-term patency (2). The superior performance of this conduit led to an increase in the use of BITA in an attempt to avoid late saphenous graft closure and improve event-free survival (3). It is controversial whether the use of bilateral internal mammary artery (BIMA) conduits can enhance the quality of the results of myocardial revascularization. Recently, Lytle and associates (4) were able to demonstrate the superiority of BIMA grafting in comparison with single LIMA and saphenous vein grafts in the long term. In terms of event-free survival, however, the benefit of BIMA grafts, if any, could appear also in the first decade.

Accepted for publication Jun,2008

Address reprint request to : Dr Saeed M. Elassy, M.D.

Departement of cardiothoracic surgery

Ain Shams university.

Email : smrassy@gmail.com

Codex : o4 / cord / 78 / 0806

Internal thoracic artery grafting is particularly important for patients with diabetes because survival is significantly higher in patients with diabetes after CABG compared with percutaneous transluminal angioplasty. Furthermore, the higher survival in the patients with diabetes after CABG was limited to patients who received ITA grafts. Patients with diabetes represent a subgroup of those who could potentially derive the greatest benefit from bilateral ITA grafting. (5)

In most centers, the IMA is isolated from the chest wall as a pedicle, together with the vein, muscle, fat, and accompanying endothoracic fascia (6). Harvesting is relatively quick, however, cauterization damages the blood supply to the sternum, which in turn impedes sternal healing and exposes the sternum to the risks of early dehiscence and infection. Skeletonized IMA dissection leaves the vein, muscle, and accompanying tissue in place. The advantage is that the dissected artery is particularly long, its spontaneous blood flow is greater than that in a pedicled IMA (7), and allowing the use of both IMAs as grafts to all necessary coronary vessels.

Another advantage of using skeletonized IMA is the preservation of collateral blood supply to the sternum, enabling more rapid healing and decreasing the risk of infection (8). Finally, by dissecting the IMA as a skeletonized vessel, a significant decrease of the incidence of postoperative pulmonary dysfunction can be achieved. (9)

This paper is aimed to analyze the effects of use of bilateral skeletonized (IMA) on early clinical outcome especially in diabetic patients.

Patients and Methods

The protocol was approved by our local institutional review board. Clinical variables were prospectively entered into Nasser Institute computerized data base and used for this retrospective analysis. All variables were defined according to the STS database description.

Between December 2003 and October 2005, 222 patients underwent CABG in Nasser institute for multivessel disease using bilateral internal mammary artery.

All patients were below 70 years, the minimum age was 37 and the maximum was 69 the mean age was 53.53 ± 7.391. 208 patients (93.7 %) were males and 14 (6.3 %) were females.

98 patients (44.1 %) were diabetics, 2 patients (0.9 %) were on diet control, 27 % of patients were on oral therapy and 16.2 % were on insulin therapy. Table (1) shows the demographic data of the patients and preoperative data.

Patient demographics	No. (222)	%
Sex		
Male	208	93.7
Female	14	6.3
Age (y)		
Mean	53.53±7.391	
Range	37-69	
Hypercholesterolemia	144	64.9
COPD	4	1.8
Smoker	136	61.3
Renal impairment	11	4.9
Diabetes		
Diet controlled	2	0.9
Insulin	36	16.2
Oral therapy	60	27.0
Total	98	44.1
Hypertension	168	75.6
Previous Q wave infarction	36	16.2
Ejection fraction ≤ 35	30	13.5
Previous CABG	6	2.7
Emergency	10	4.5

Table (1) Showing patients demographics and preoperative data

Surgery

All operations were performed using a skeletonized technique for ITA harvesting. The electrocautry is set to low energy and the endothoracic fascia is incised just at the mammary artery itself excluding the veins. The branches are controlled proximally with metal clips and cauterized distally. This technique is used till the whole length of the mammary artery is dissected, then heparin is given and the mammary artery is clipped distally and divided just after the distal terminal branches. A 1 cm longitudinal incision is made in the distal end of the mammary artery and cannulated with a 22 fr canula. A mix solution of papaverine, nitroglycerine and Isopten is injected into the mammary artery to dilate it and prevent early spasm.

20 operations (9%) were done without cardiopulmonary bypass using off pump techniques. Hypothermic cardiopulmonary bypass was used in the rest of cases and myocardial protection was achieved by intermittent antegrade cold blood cardioplegia.

The sternum was closed with bilateral bonechek technique and 4 to 5 stainless-steel wires in interrupted figure of eight fashion, continuous vicryl musculofas-

cial sutures, and vicryl absorbable continuous dermal suture.

After surgery all patients had blood glucose determination at 2-hour intervals and continuously adapted insulin infusion to a blood glucose target level of 150 to 200 mg/dL until postoperative day one. Thereafter, either subcutaneous insulin or the oral hypoglycemic agents were resumed in diabetic patients.

As for all coronary revascularization, the infection prophylaxis was carried out by a third generation cephalosporins at induction of aneathesia, iv postoperatively for 5 days. An additional dose of vancomycine was given on bypass.

Statistical analysis:

Normally distributed continuous variables are represented as mean ± standard deviation (SD) or as the percentage of the sample. The x-test and Fisher's exact test were used to determine differences in patient characteristics by univariate analysis. Multivariate logistic regression was used to detect independent risk factors for hospital mortality and postoperative morbidity. A p value < 0.05 was considered significant for all tests. All analysis were performed by SPSS software (SPSS Inc,Chicago,IL}.

Results

Cardiopulmonary bypass times were 89.99 ± 27.7 mins in diabetic patients and 82 ± 25 mins in nondiabetic patients (p = NS). Cross – clamp times were 61 ± 19 mn and 60 ± 19 mn in the diabetic and nondiabetic patients, respectively (p = NS). The number of the grafts per patient was from 2 to 5 mean 3.05 ± 0.724 in diabetic and 3.05 ± 0.685, with no statistically significant difference between the two groups. Tables (2&3).

	Diabetics	Non-diabetics	P value
Off-pump procedures	9	11	ns
Mean number of grafts	3.05±0.724	3.05±0.685	ns
Mean CBP time (mns)	89.9±27.7	82±25	ns
Mean A cross-clamp time (mns)	61±19	60±19	ns

Table (2) showing operative data.

No. 0f grafts	frequency	percent
2	46	20.7
3	124	55.9
4	42	18.9
5	6	2.7

Table (3) showing the number of grafts and percentage.

RIMA was used exclusively to revascularize the Rt coronary or its branches and used as a free graft in 50 patients (22.5 %) because the RIMA was short. The proximal end was anastomosed end to side to insitu LIMA or radial artery after aortic cross clamp removal. Radial artery was used in 150 pts (67.6 %) and Saphenous venous grafts was used in 57 patients (25.7%). Complete arterial revascularization was possible in 74.3 %.

Postoperative morbidity included 2 patients (0.9 %) with perioperative myocardial infarction and 8 patients (3.6 %) who suffered temporary neurologic deficiency in the form of confusion, delayed recovery or behavioral changes. All these patients have recovered completely. 8 (3.6 %) patients developed arrythmias that recovered with medical treatment, 4 (1.8%) patients developed ventricular fibrillation that required cardioversion.

8 patients (3.6%) sustained sternal wound infection, 6 of them where superficial and 2 have progressed to mediasnitis and mediastinal dehiscence requiring sternal rewiring. 14 patients (6.3%) suffered from postoperative bleeding that required reopening of the chest. 86.5% of the patients are free of any postoperative complication. Chronic obstructive pulmonary disease was found to be the only independent predictor of deep infection. Diabetes was not found to be an independent predictor of infection.

Postoperative complication	No.	%
Arrhythmia	12	5.4
Myocardial infarction	4	1.8
Renal impairment requiring dialysis	4	1.8
Neurological deficit	8	3.6
Superficial Wound infection	6	2.7
Mediastinitis	2	0.9
Reoperation for bleeding	14	6.3
IABP	4	1.8

Table (4) showing postoperative complications.

The overall mortality was 6 patients 2.7%. Causes of death included 2 patients died due to acute MI, one patient with multiorgan failure, one patient with septicemia and one patient with renal failure.

Emergency operation, left ventricular dysfunction (ejection fraction less than 35%) and old myocardial infarction were found significant predictors of early mortality (30 days). Bypass time and cross-clamping time were not significant predictors of early mortality.

Follow-up was available in 162 of the 214 surviving patients (75.7 %) up to 25 months postoperatively. There were 3 late deaths, two of which were due to unrelated causes to the operation. Two patients had late myocar-

dial infarction and there were 3 new cases of congestive heart failure. Five patients reported return of the angina. In the last follow up, 149 (91.97 %) of the followed up surviving patients are well and free of angina.

Discussion

This report summarizes our experience with the early routine use of bilateral skeletonized IMAs. The current conventional and most commonly used operative procedure for CABG includes one IMA together with one or more SVG (7). Vein graft atherosclerosis, however, continues to be the major cause of late failure of CABG. Consequently, techniques were sought for complete arterial myocardial revascularization using both internal mammary arteries (26, 28). Most of the reported series on bilateral IMA grafting are based on selected patient populations such as young and nondiabetic individuals collected over the course of several years (5,6,11,12). Unlike those studies, our reported operative procedure was performed in almost all patients undergoing CABG and included patients with decreased myocardial function, emergency cases (after stabilization if possible) and those who had sustained a recent myocardial infarction. Our intention in performing this type of operation was to minimize the potential for recurrence of angina and all other untoward events associated with SVG failure, and to decrease morbidity associated with leg wound infection, edema, and pain in the leg harvesting site.

The use of skeletonized ITAs allows the use of both ITAs as grafts to practically all coronary vessels requiring surgical revascularization, due to extended length thus obtaining complete arterial revascularization (13). The pedicled right internal thoracic artery (RITA) is less useful than the left internal thoracic artery (LITA), as it will not always reach the right coronary artery branches without tension, leading to its use predominantly as a free graft with a lower patency rate when attached to the ascending aorta (14,26). Skeletonization has the advantage of extra length which permits direct grafting to Rt coronary artery (77.5 % in our series) or composite arterial grafting, connecting the skeletonized free RITA end-to-side to the skeletonized LITA (22.5 % in our series).

The only contraindication for the use of arterial grafts during the study period was hemodynamic instability and decreased blood pressure (requiring rapid connection to cardiopulmonary bypass) in emergency operations.

The ITA hypoperfusion syndrome is a rare but life-threatening perioperative clinical syndrome manifested by low cardiac output, left ventricular failure, and cardiac arrest due to disproportion between ITA flow and myocardial demand, an anastomosis with a larger diameter and decrease in graft vascular resistance secondary to skeletonization are factors that may prevent this syndrome. (7,15). Skeletonization has been shown to be associated with a lower prevalence of low cardiac output syndrome and intraaortic balloon use than the use of pedicled graft (16) and this fact may explain the low incidence of IABP usage in our series (1.8 %).

Peterson and colleagues (16) also showed that patients who received skeletonized grafts had lower red blood cell transfusion requirements. This is attributed to the meticulous dissection and hemostasis that is necessary during skeletonization. Their study also revealed that patients who received skeletonized grafts had shorter ventilation times, shorter intensive care unit stays, and shorter hospital stays than patients who received pedicled grafts. They also found that skeletonization decreased postoperative chest wall pain. These finding could not be assessed in our series since we did not compare with pedicled grafts but clinical observation comply with their results. Another potential benefit of Skeletonization is it allows visual inspection of the vessel to identify any injury, which if unnoticed may jeopardize the long-term outcome (5).

The immediate operative results and predictors of early mortality are comparable to those described in operations in which one IMA was used. This is true not only for operative mortality, perioperative myocardial infarction, and stroke, but also for rates of sternal infection and dehiscence (17). Our results in this area are also satisfactory in the groups of patients with an elevated risk of these complications, such as elderly patients and diabetics.

A growing number of diabetic patients who suffer from multivessel coronary artery disease have recently been referred for operation due to unfavorable results of percutaneous transluminal coronary angioplasty (18). In the recently reported Bypass Angioplasty Revascularization Investigation (BARI) study, the better average of 5.4-year survival of diabetic patients who underwent CABG was attributable to reduced cardiac mortality (5.8% versus 20.6% with PTCA; p 5 0.0003) (19). The better survival for CABG patients was limited to those who received at least one IMA graft, this emphasize the particular importance of BITA in diabetic patients.

Three major studies (19, 20, 21) have identified the use of bilateral ITAs as a significant risk factor for sternal dehiscence and mediastinal wound infection. Because each hemi-sternum loses 90% of its blood supply upon mobilization of the corresponding ITA, this is well documented by Carrier and associates who performed sternal bone tomography at 1week and 4 weeks after median sternotomy in 67 patients. However, skeletonization of ITA conduits results in less reduction of sternal

blood flow. Substantial collateral blood flow to the sternum can be maintained in the absence of the ITA, provided the sternal-anterior intercostals trunk is left intact. Skeletonization of the ITA often results in preservation of this common trunk, particularly if meticulous dissection is performed (23).

Peterson and colleagues (16) confirmed an unacceptably high prevalence of deep sternal wound infection in patients with diabetes (11.1%) receiving pedicled bilateral ITA grafts. They concluded that skeletonization allows safe application of bilateral ITA grafting in patients with diabetes, a finding that has been demonstrated by others (11,24, 25).

Analysis of sternal infection in this cohort revealed that the only independent predictor of sternal wound infection was chronic obstructive pulmonary disease. The increased respiratory mechanical forces produced in these patients in the first few postoperative days are blamed for sternal dehiscence.

Skeletonization may have some limitations as it is technically more demanding and time consuming than pedicled ITA harvesting. Another potential drawback of skeletonization is that it is a relatively new surgical technique; therefore there is no current data on long-term patency rates. However, it is unlikely that long-term patency rates will be worse than for pedicled ITA grafts.

In summary, Skeletonization of internal thoracic arteries with its proven advantages of decreased incidence of sternal wound infection, greater length, and multiple arterial anastomoses appears to be an attractive technique for myocardial revascularization and allowing the use of both IMAs. In an era of evidence based medicine, there is no denying the fact that multi institutional, randomized controlled trials comparing the skeletonized and pedicled ITA techniques with respect to long-term patency must be conducted to conclusively prove the true superiority of the skeletonization technique.

References

1. Califiore A, Vitolla G, Iaco A, et al. Bilateral Internal mammary artery grafting: Midterm results of pedicled versus skeletonized conduits. Ann Thorac Surg 1999;67:1637-42
2. Loop FD, Lytle BW, Cosgrove DM, et al. Influence of the internal mammary artery graft on 10 year survival and other cardiac events N Engl J Med 1986;314:1-6
3. Pick A.W., Orszulak T.A., Anderson B.J., et al. Single versus bilateral internal mammary artery grafts: 10-year outcome analysis. Ann Thorac Surg 1997;64:599-605
4. Lytle BW, Blackstone EH, Loop FD, et al. Two internal thoracic arteries are better than one. Presented at AATS Meeting, J Thorac cardiovasc 1999;117:855-72.
5. Raja S, Dreyfus G. Internal thoracic artery skeletonise or not to skeletonize?. Ann thorac surg 2005;79:1805-11.
6. Tector A.J., Kress D.C., Downey F.X., et al. Complete revascularization with internal thoracic artery grafts. Semin Thorac Cardiovasc Surg 1996;8:29-41.
7. Choi J.B., Lee S.Y. Skeletonized and pedicled internal thoracic artery grafts: effects on free flow during bypass.. Ann Thorac Surg 1996;61:909-913.
8. Parish M.A., Asai T., Grossi E.A., et al. The effects of different techniques of internal mammary artery harvesting on sternal blood flow. J Thorac Cardiovasc Surg 1992;104:1303-1307
9. Matsumoto M., Konishi Y., Miwa S., et al. Effect of different methods of internal thoracic artery harvest on pulmonary function. Ann Thorac Surg 1997;63:653-655.
10. Gurevitch J, Paz Y, Shapira I, et al. Routine use of bilateral skeletonized internal mammary arteries for myocardial revascularization. Ann thorac surg 1999;68:406-12.
11. Bical O, Braunberger E, Fischer M, et al. Bilateral skeletonized mammary artery grafting: experience with 560 consecutive patients. Eur J Cardiothorac Surg 1996;10:971–5.
12. Sergeant P, Flameng W, Suy R. The sequential internal mammary artery graft. Long term results of a consecutive series of 364 patients. J Cardiovasc Surg (Torino) 1988;29:596–600.
13. Pevni D, Mohr R, Lev-Ran O, et al. Technical aspects of composite arterial grafting with double skeletonized internal thoracic arteries. Chest 2003;123:1348 –54.
14. Tatoulis J, Buxton B, Fuller J. Results of 1,454 free right internal thoracic artery-to-coronary artery grafts. Ann Thorac Surg 1997;64:1263– 8.
15. Takami Y, Ina H. Effects of skeletonization on intraoperative flow and anastomosis diameter of internal thoracic arteries in coronary artery bypass grafting. Ann Thorac Surg 2002;73:1441–5.
16. Peterson MD, Borger MA, Rao V, et al. Skeletonization of bilateral internal thoracic artery grafts lowers the risk of sternal infection in patients with diabetes. J Thorac Cardiovasc Surg 2003;126:1314 –9.
17. Athanasiou T, Crossman MC, Asimakopoulos G et al. Should the internal mammary artery be skeletonized. Ann thorac surg 2004;77:2238-46.
18. Weintraub WS, Stein B, Kosinski A, et al. Outcome of coronary bypass surgery versus coronary angioplasty in diabetic patients with multivessel coronary artery disease. J Am Coll Cardiol 1998; 31:10–9.
19. Influence of diabetes on 5-year mortality and morbidity in a randomized trial comparing CABG and PTCA in patients with multivessel disease: the Bypass Angioplasty Revascularization Investigation (BARI). Circulation 1997; 96:1761–9.
20. Cosgrove DM, Lytle BW, Loop FD, et al. Does bilateral internal mammary artery grafting increase surgical risk?. J Thorac Cardiovasc Surg 1988; 95:850–6.
21. Kouchoukos NT, Wareing TH, Murphy SF, et al. Risks of bilateral internal mammary artery bypass grafting. Ann Thorac Surg 1990;49: 210 –9.
22. Carrier M, Gregoire J, Tronc F, et al. Effect of internal mammary artery dissection on sterna vascularization. Ann

Thorac Surg 1992; 53:115–9.
23. Cohen AJ, Lockman J, Lorberboym M, et al. Assessment of sternal vascularity with single photon emission computed tomography after harvesting of the internal thoracic artery. J Thorac Cardiovasc Surg 1999;118:496 –502.
24. Matsa M, Paz Y, Gurevitch J, et al. Bilateral skeletonized internal thoracic artery grafts in patients with diabetes mellitus. J Thorac Cardiovasc Surg 2001; 121:668 –74.
25. Kramer A, Mastsa M, Paz Y, et al. Bilateral skeletonized internal thoracic artery grafting in 303 patients seventy years and older. J Thorac Cardiovasc Surg 2000; 120:290 –7.
26. Lytle B, Blackstone E, Sabik J et al. The effect of bilateral internal thoracic artery grafting on survival during 20 years postoperative years. Ann Thorac surg 2004; 78: 2005-2014.
27. Ascione R, Underwood m, Lioyd C et al. Clinical and angiographic outcome of different surgical strategies of bilateral internal mammary artery grafting. Ann thorac surg 2001; 72:959-965.
28. Berreklouw E, Schonberger J, Ercan H et al. Does it make sense to use two internal thoracic arteries?. Ann Thorac Surg 1995;59:1456-1463.

INFLUENCE OF PLEURAL INTEGRITY DURING INTERNAL THORACIC ARTERY HARVEST ON THE EARLY CLINICAL OUTCOME AND PULMONARY FUNCTION AFTER CORONARY ARTERY BYPASS GRAFTING SURGERY.

Mohamed Essa MD*,
Abeer H. El-Sawy MD **,
Abeer El-Nakera MD*.

Objective: **The influence of pleural integrity during internal thoracic artery (ITA) harvesting on the early clinical outcome and pulmonary function after coronary artery bypass grafting (CABG) surgery is still debated. This study compares effects of ITA harvesting with intact pleura versus pleurotomy on the early clinical outcome and pulmonary function after CABG.**

Methods: **In this prospective randomized study, 88 patients were allocated into two groups according to the technique ITA harvesting during off-pump CABG. In Group I (n=42), ITA was prepared keeping the pleura intact and in Group II (n=46), pleura was opened. Both groups were compared in terms of postoperative clinical outcome and pulmonary function.**

Results: **Postoperative blood loss and blood transfusion were significantly higher in Group II compared to Group I ($p<0.05$). The duration of mechanical ventilation was significantly longer in Group II than Group I ($p<0.05$). The occurrence of postoperative pleural effusion and atelectasis were significantly higher in Group II than Group I ($p<0.05$). Moreover, postoperative thoracentesis was done only in Group II and was statistically significant ($p<0.05$). Chest pain score evaluation was significantly higher in group II patients at 12 hours after awakening ($p<0.05$). Hospital stay was significantly longer in group II patients than Group I patients ($p<0.05$). Analysis of spirometric and arterial blood gases data showed that the magnitude of postoperative reductions in FVC and FEV1 and PaO2 were significantly pronounced in Group II than Group I patients ($p<0.05$). Also, the increase in intrapulmonary shunts at 24 hours after extubation was significantly pronounced in Group II than Group I patients ($p<0.01$).**

Conclusion: **According to our results, preserving pleural integrity has beneficial effects on the early clinical outcome and pulmonary function after CABG surgery.**

Accepted for publication Dec,2008
Address reprint request to : Dr. Mohamed Essa Department of cardiothoracic surgery - Zagazig University- Egypt
Email : messacts1@gmail.com
Codex : 04 / cord /79 / 0812
* Department of cardiothoracic surgery- Zagazig University - Egypt .
** Department of Anesthesia-Zagazig University - Egypt .

The internal thoracic artery (ITA) is the conduit of choice in coronary artery bypass grafting (CABG) surgery because of superior long-term graft patency, reduced cardiac events, and enhanced short- and long-term survival [1,2]. In the current surgical era, routine ITA use have emerged various harvesting techniques of this invaluable arterial graft [3-5].

Altered pulmonary function is a frequently found complication after CABG surgery. Evidences suggest that ITA harvesting is associated with a greater decrease in postoperative pulmonary function, therefore increasing the risk of pleuro-pulmonary complications [6-9]. This has largely been attributed to pleurotomy [9, 10]. Yet, the role of pleural opening is still debated and the effects of pleural integrity on the early clinical outcome and respiratory func-

tion are still not absolutely clear [9, 11-12].

The aim of this prospective study was to evaluate the influence of pleural integrity during ITA harvesting on the early clinical outcome and pulmonary function of patients undergoing CABG surgery, by comparing postoperative clinical outcome and pulmonary function of patients with intact pleura versus patients with pleurotomy.

Methods

In this prospective, randomized study, we enrolled 88 consecutive patients who undergoing elective first-time off-pump CABG, where the ITA graft was used, between the periods of January 2005 to May 2008 in department of cardiothoracic surgery, Zagazig University Hospital. We select off-pump CABG technique to eliminate the harmful effects of the systemic inflammatory response syndrome and pulmonary injury associated with cardiopulmonary bypass (CPB) which could affect the results of this study.

Patients undergoing emergency surgery, previous cardiac operations, with abnormal pulmonary functions, coagulation disorders, with a left ventricular ejection fraction of less than 50%, diabetes mellitus, obesity, renal insufficiency, left main disease, age over 70 years and skeletal disorders were not included in this study. Also, cases with intraoperative conversion, intraoperative or early postoperative mortality or with perioperative myocardial infarction were not enrolled. These exclusion criteria's were done to have almost matched patients in this study and also to don't affect the results of this study.

Patients were randomized and allocated into two groups according to techniques of ITA harvesting after obtaining written informed consents. Two different techniques of ITA harvesting were performed: in Group I (n=42 patients), the pleural space was left intact by extrapleural takedown (intact pleura group) and in Group II (n=46 patients), complete opening of the pleural space was performed routinely (pleurotomy group).

Anesthesia and monitoring

A standard anesthetic regimen and standard monitoring including electrocardiogram (ECG), invasive arterial blood pressure, central venous pressure (CVP), pulse oximetry, capnography, pharyngeal temperature and urinary output were used in all cases. Pulmonary artery catheterization with Swan-Ganz catheter was performed for blood gases work-up. Intermittent arterial blood samples were taken for measurements of arterial blood gases, haematocrit, electrolytes and glucose.

The patients were premedicated with midazolam IV (0.05 mg/kg) after insertion of venous canulae. Prophylactic broad spectrum antibiotic was given intravenous. After venous and arterial canulations, all patients were preoxygenated with 100% O2 for at least 3 minutes. Anesthesia was induced with thiopental 2.5% (sleep dose), fentanyl (5-10 μg/kg), and pancuronium bromide (0.1 mg/kg). Endotracheal intubation was done after 3 minutes. Anesthesia was maintained with supplemental isoflurane (1-2%), propofol (2-5 mg/kg/hr), and fentanyl (1-3 μg/kg/hr).

Intraoperative muscle relaxation was maintained with supplements of pancuronium bromide as necessary. Blood pressure was continually optimized during the procedure. Hypertension was treated with isoflurane, fentanyl boluses, and nitroglycerin infusion. Conversely, hypotensive episodes were treated by repositioning the heart, intravenous fluids and norepinephrine as required.

After harvesting of conduits, heparin was injected in a dose of 2 mg/kg. Activated clotting time was measured initially and then every 30 minutes; it was maintained for more than 300 seconds. Protamine sulfate was used in 1:1 ratio to reverse the heparin effect after the procedure.

Surgical techniques

Following midline sternotomy, left ITA dissection was completed before heparinization, in both groups. For exposing and harvesting the ITA, a mammary retractor was used. Electrocautery was used for dissection and hemoclips were used for side branch occlusions. Saphenous veins were harvested simultaneously.

The left ITA was harvested by standard technique as a pedicle with adjacent veins, fascia, and pleura attached. In the intact pleura group (Group I), mediastinal pleura was dissected smoothly from the endothoracic fascia and extreme attention had to be taken to prevent pleural injury. ITA was mobilized through its bed anterior to the phrenic nerve into the pericardial cavity. So, it lies median and posterior to the lung and the ventilation does not cause any pressure on the artery. In the pleurotomy group (Group II), a tunnel was created into the pericardium above the phrenic nerve and ITA was crossed through this tunnel into the pericardial space.

Distal anastomoses were always constructed before proximal anastomoses. In most cases, the left anterior descending coronary artery was the first coronary artery to be grafted. The right coronary artery was always the second artery to be grafted. The vessels on the lateral and posterior wall were usually grafted last. However, the sequence of grafting was individualized for a particular patient, depending on the severity of the lesions in

different coronary arteries and patient's hemodynamics.

Deep retracting sutures, the placement of a warm moist laparotomy sponge in the posterolateral aspect of the pericardial sac, Trendelenburg position, and right tilt were used to facilitate exposure of the lateral and posterior vessels of the heart. Octopus tissue suction stabilizer (Medtronic, Inc., Minneapolis, MN, USA) was used to stabilize the myocardium. During the construction of all anastomosis, target vessel hemostasis was obtained with proximal and distal silicone rubber (Silastic; Dow Corning, Midland, Mich) vessel loops as coronary snares and intracoronary shunts (Anastafloa, Research Medical, Midvale, UT, USA) were used for most of the anastomosis. The anastomoses were constructed with a single running stitch of 7-0 polypropylene (ProleneTM, Johnson & Johnson, New Brunswick, NJ, USA) and visualization was improved with use of a continuous air/saline blower.

Proximal anastomosis was performed with partial clamping of the ascending aorta using standard techniques. The proximal anastomosis was performed using a single running stitch of 6-0 Prolene suture.

Postoperative Management

In the intensive care unit (ICU), the patient ventilation management protocol included: 1) synchronized intermittent mandatory ventilation (SIMV) at 12-14 breaths/min, 2) a tidal volume of 10 ml/kg of body weight, 3) a pressure support of 10-20 cm H2O, 4) a positive end expiratory pressure (PEEP) of 3-5 cm H2O, and, 5) an inspiratory/expiratory ratio of 1:2.

Arterial blood gas (ABG) analysis data were recorded hourly on mechanical ventilation and before extubation. Extubation was performed when the patient was normothermic, haemodynamically stable, no bleeding, alert, with good blood gas analysis data and capable of maintaining self-ventilation.

Chest X-ray examination was performed daily during the stay in ICU and on the day of discharge for the evaluation of the pleural effusion and atelectasis. On the second postoperative day, central and arterial lines and the urinary catheter were removed, and the patients were mobilized. The chest drains were routinely removed on the second postoperative day except in patients with pleural drainage more than 50 ml/day. All patients received the same analgesic protocol (oral non-steroidal anti-inflammatory drugs) during the first 5 postoperative days. Physiotherapy was given daily until discharge. The pain score was evaluated routinely by self-reporting, using a scale of 1-5: 1, no pain; 2, mild pain; 3, moderate pain; 4, severe pain; 5, extremely severe pain.

Pulmonary Function Assessment

A spirometric analysis with assessment of pulmonary function was done for all patients. The pulmonary function indicators of vital capacity (VC), forced vital capacity (FVC) and forced expiratory volume in one second (FEV1) were evaluated and compared between the two groups on the day before the operation as the initial measurement and repeated on a week after the operation as the postoperative measurement, supposing patients became fully mobilized, and their hemodynamic parameters stabilized and pain resolved.

ABG (partial pressure of arterial oxygen [PaO2], partial pressure of arterial carbon dioxide [PaCO2] and oxygen [O2] saturation) were recorded immediately before operation in the operating theatre before the induction of anesthesia as the initial measurement, and at 24 hours after extubation as the postoperative measurement.

The intrapulmonary shunt was calculated by the simplified equation [Qs/Qt = (CcO2-CaO2) / (CcO2-CvO2)] (Qs: venous admixture, Qt: total cardiac output, CcO2: oxygen content of ideal pulmonary end-capillary blood, CaO2: arterial oxygen content, CvO2: mixed venous oxygen content) at the beginning of the operation before the sternotomy as the initial measurement and at one hour and 24 hours after extubation as the postoperative measurements.

Statistical Analysis

Data are expressed as a mean value ± standard deviation (means ± SD) and as percentages (%). Normally distributed continuous variables were compared between the groups using the unpaired Student's t test, and abnormally distributed variables were compared using Mann-Whitney U test. Chi-square test ($\chi 2$) and Fischer exact test were used for comparison of ordinal and nominal data. Paired Student's t test was used for intragroup comparison. ANOVA test was performed to compare magnitude of changes in continuous variables before and after operation between groups. Statistical significance was defined as a p value of less than 0.05 ($p<0.05$). Statistical analyses were performed with SPSS for Windows, version 11.5 statistical package (SPSS, Inc, Chicago, Ill, USA).

Results

Preoperative and intraoperative patient characteristics are summarized in Table 1. There were no statistical difference found between the two groups in terms of age, gender, body mass index (BMI), preoperative cardiac status, preoperative pulmonary function, operative time and number of grafts per patient (p=NS).

Postoperative early clinical outcome are shown in Table 2. Postoperative blood loss (within 24 hours after the operation) was significantly higher in Group II than in Group I patients (954±265 ml vs. 645±169 ml; p <0.05). Meanwhile, there was significant difference in the need of blood transfusion postoperatively between the two groups, which tend to be more in Group II (p <0.05). However, re-exploration for bleeding was necessary in one patient in Group I and in three patients in Group II, which was statistically non-significant between the two groups (p=NS).

All patients were extubated within the first 24 hours, except one patient in Group I and two patients in Group II needed prolonged mechanical ventilation (> 24hours) , which was statistically non-significant between the two groups (p=NS). However, the duration of mechanical ventilation was significantly longer in Group II than Group I (6.1±2.6 h vs. 4.6±1.3 h, p<0.05) (Table 2).

Postoperative cough and sputum were occurred more significantly in Group II than in Group I patients (p<0.01). Postoperative clinical and radiological evaluation of the chest showed that the occurrence of postoperative pleural effusion and atelectasis were significantly higher in Group II than Group I (p<0.05). Moreover, postoperative thoracentesis was done only in Group II patients and was statistically significant (p<0.05) (Table 2).

The chest pain score evaluation was significantly higher in Group II patients at 12 hours after awakening (p<0.05) and becoming non-significant after the chest tubes were removed (p=NS). There was no significant difference in the duration of ICU stay between both groups (p=NS), however, the duration of hospital stay was significantly longer in Group II than Group I (p<0.05) (Table 2).

Preoperative, postoperative and the magnitude of postoperative changes of pulmonary Function and ABG in both groups are shown in Table 3. Analysis of spirometric and ABG data showed that changes in VC in both groups after operation did not differ significantly (p=NS). However, the magnitude of postoperative reductions in FVC (0.19±0.15 vs. 0.28±0.14, p<0.05) and FEV1 (0.16±0.17 vs. 0.27±0.13, p<0.05) were significantly pronounced in patients of Group II as compared with patients of Group I. Similarly, the mean difference of changes in PaO2 after operation were significantly different in Group I and Group II (-0.1±0.1 mmHg vs. 0.13±0.3 mmHg, p<0.05), with trend to increase in Group I and decrease in Group II after operation. Also, the mean difference of changes in PaCO2 after operation were significantly higher in Group II than Group I (0.1±0.01mmHg vs. 1.15±0.2 mmHg, p<0.05) (Table 3).

Measurement of the intrapulmonary shunt (Qs/Qt) immediately before and one hour after extubation did not differ significantly between the two groups (p=NS), however, Qs/Qt ratio at 24 hours after extubation was significantly higher in Group II as compared with Group I (p<0.01). The intragroup analysis of Qs/Qt ratio dynamics showed significant differences (p<0.05) between pre-operative and 24 hours after extubation values in Group I, while Group II Qs/Qt values significantly increased at one hour after extubation (p<0.05) and with further raise at 24 hours after extubation as compared with pre-operative values (p<0.01) (Table 4).

Discussion

ITA has long been established as the graft of choice for CABG surgery. Superior long-term graft patency leads to improved survival, better quality of life, and lower incidence of cardiac events compared with vein grafts [1, 2]. In the current surgical era, routine ITA use have emerged several various harvesting techniques for this invaluable arterial graft. However, there is still no consensus on the ITA harvest technique [3-5].

Despite evidences suggests that ITA harvesting during CABG is associated with greater decrease in postoperative pulmonary function, increased incidence of pulmonary complications, postoperative bleeding and pain, which has been largely attributed to pleurotomy [6-9, 10], the role of pleural integrity is still debated and controversy with conflicting opinions exists about the effect of pleural integrity on early clinical outcome and pulmonary function after CABG surgery [9, 11-13].

Surgeons prefer to open the pleural cavity during the ITA harvesting for better exposure of this arterial conduit and in order to allow the placement of the ITA medial to the upper lobe avoiding any undue tension on the mammary pedicle and graft stretching following sternal closure at completion of surgery [7]. Pleurotomy is also helpful in the immediate postoperative period, as excess bleeding is immediately apparent through the pleural drain and it also prevents any tomponade effect [14].

On the other hand, the technique of extrapleural ITA harvesting in which the pleura is kept intact as described by Noera et al. [15] has emerged as an alternative technique for ITA harvesting. Preserved pleural integrity could prevent lung injury and contact of the thorax with blood during the operation, and thereby decrease the incidence of pleural effusion, atelectasis and bleeding during the postoperative period. However, there is concern that closed pleura might inflict increased tension on the

graft by forcing it against the sternum [7]. Another major problem with use of the ITA when pleural integrity is preserved is that the inflated lung can exert enough tension on the ITA to dislocate it, which can cause injury in case of repeat CABG [9]. Furthermore, if an extrapleural ITA harvesting is done, there is always a risk of injuring the pleura which may not be apparent at the time, but in the postoperative period on the ventilatory support, it will present as a full blown pneumothorax, compromising the patient safety [14].

When pleura is opened, more extensive dissection of surrounding tissues will be performed during the ITA harvest and thus leading to increased blood oozing from the thorax wall and blood loss. On the other hand, significant reduction of bleeding in the patient with intact pleura might be considered due to the hematoma in the mediastinum [9, 16]. Former studies proved that bleeding and transfusion requirements are decreased when ITA is harvested with intact pleural integrity [9, 16-18]. Our study supports these findings since there were significant decreases in the amount of postoperative bleeding and the need for blood transfusion in the intact pleura group as compared with pleurotomy group. Contrary, Lim's group study [19] did not show any difference of blood loss between pleurotomy group and intact pleura group.

Totaro and coworkers [20] found that the duration of mechanical ventilation was the same, while, Goksin and colleagues [16] and Bonacchi and colleagues [17] found that the duration of mechanical ventilation was signifi-

Variables	Group I (intact pleura group) (n = 42)			Group II (pleurotomy group) (n = 46)		
	Preop.	Postop.	Mean difference	Preop.	Postop.	Mean difference
VC (L)	3.3±0.9	2.7±0.6	0.19±0.18	3.29±0.8	2.4±0.7	0.27±0.15
FVC (L)	3.6±0.7	3.2±0.8	0.19±0.15	3.7±0.5	2.9±0.7	0.28±0.14 b*
FEV1(L)	2.8±0.6	2.3±0.4a*	0.16±0.17	2.9±0.5	1.9±0.6	0.27±0.13 b*
PaO2 (mmHg)	85±9	86±10	(-)0.1±0.1	86±8	84±12	0.13±0.3 b*
PaCO2 (mmHg)	34±5	34.8±4.8	0.1±0.01	33±4	37.5±4.6	1.15±0.2 b*
O2 saturation (%)	98.5±3.6	97.1±1.9	1.06±1.1	99.0±3.1	97.02±1.2	1.12±1.4

Table 3. Comparison of preoperative and postoperative changes of pulmonary function and arterial blood gases data.
VC, vital capacity; FVC, forced vital capacity; FEV1, forced expiratory volume in 1 second; PaO2, partial pressure of arterial oxygen; PaCO2, partial pressure of arterial carbon dioxide; O2, oxygen.
a= group I postoperative versus group II postoperative. b= group I Mean difference versus group II Mean difference.
* = P<0.05

cantly greater in the opened pleura group. In this study, we observed that the duration of postoperative mechanical ventilation was significantly greater in the pleurotomy group. The considerably shorter intubation time in patients with intact pleura can be considered as the clinical manifestation of a lower atelectasis incidence.

The respiratory problems in CABG patients are the critical issues influencing patient's early outcome [6]. Evidences suggest that ITA harvesting with pleurotomy during CABG is associated with increasing risk of pleu-

ro-pulmonary complications [6-10, 17-21]. When pleura is opened, more extensive dissection of surrounding tissues will be performed during the ITA harvest and thus leading to increased blood oozing from the thorax wall which will be collected in the pleural space and as a consequence, there will be pressure on the lungs which will facilitate atelectasis [9, 16]. Moreover, pain due to chest tube usually influences patient's respiratory capacity and cough, and this could induce mucus retention thus favoring atelectasis [22].

Many recent studies showed that pleural effusion and atelectasis occurred more frequently in the opened pleura group [8, 9, 19]. Meanwhile, Lyem et al. [18] concluded that preserved pleural integrity could prevent lung injury and thereby decrease the incidence of pleural effusion and atelectasis. The results of this study revealed similar data. In this study, we observed that postoperative pleural effusion and atelectasis were significantly greater in the pleurotomy group in comparison with intact pleura group. Goksin and colleagues [16] and Bonacchi and colleagues [17] determined that the need for thoracentesis was significantly greater in the opened pleura group, which was in agreement with this study.

Wimmer -Greinecker et al. [9] and Oz et al. [13] showed that patients who had opened pleura experienced more pain during the first week of the postoperative period. In this study, the chest pain score evaluation was significantly higher in pleurotomy group at 12 hours after awakening ($p<0.05$) and becoming non-significant after the chest tubes were removed (p=NS). The pleural opening and placement of additional chest tube certainly involves trauma. The drain causes damage to the parietal pleura and intercostal muscles, both very sensitive structures. The friction of the drain between ribs during breathing increases pain due to the ongoing irritation of the intercostal nerves and costal periosteum [9, 13].

In this study, we observed that the duration of hospital stay was significantly greater in the pleurotomy group, while the duration of stay in the intensive care unit was not significantly different between the two groups. This was in agreement with Oz et al. [13], while, on the other hand, Bonacchi and colleagues [17] determined that stay in the intensive care unit was significantly greater in the opened pleura group. Meanwhile, Lyem et al. [18] and Lim's group [19] showed that hospital stay was not significantly different between the two groups.

Evidences of pulmonary function impairment are a frequently found complication in the CABG postoperative period. Several factors can influence pulmonary dysfunction after CABG, including the combined effects of the general anesthesia, sternotomy, ITA harvesting and CPB [22]. It is noted that the employment of the ITA during CABG is associated with greater decrease in postoperative pulmonary function. However, controversy exists about the effect of pleurotomy on postoperative pulmonary function [9-13, 16-23]. Some studies reported that the pleurotomy does not affect postoperative FEV1 and FVC [12, 23]. Meanwhile, many other recent studies demonstrated that loss of pleural integrity during ITA harvesting reduces pulmonary function while maintaining pleural integrity has beneficial effects on pulmonary function [9-11, 13, 16-22]. This study showed significant reduction of the postoperative FEV1 in pleurotomy group than intact pleura group ($p<0.05$). Moreover, the magnitude of postoperative reductions in FVC and FEV1 were significantly pronounced in pleurotomy group as compared with intact pleura group ($p<0.05$).

Recent studies have reported a negative influence of pleurotomy during ITA harvesting on pulmonary oxygenation and gas exchange after CABG [16, 17, 22]. Similarly in this study, the mean difference of changes in PaO2 after operation were significantly different in intact pleura group and pleurotomy group ($p<0.05$), with trend to increase after operation in intact pleura group and decrease in pleurotomy group. Also, the mean difference of changes in PaCO2 after operation were significantly higher in pleurotomy group ($p<0.05$).

Although, Lim et al. [19] confirmed that intrapulmonary shunt was significantly higher in patients with pleurotomy as compared those with intact pleura after cardiac surgery; they could not find any clinical consequence of it. This study showed significantly higher intrapulmonary shunt at 24 hours after extubation in pleurotomy group as compared with intact pleura group ($p<0.01$), which may displays the positive effect of the intact pleura on the respiratory function. When we consider the fact that most of the CABG patients are current or ex-smokers, even a little progress in the respiratory function tests will contribute to their recovery period.

In conclusion, this study showed that preservation of pleural integrity during ITA harvesting decreases postoperative bleeding, pleural effusion, and atelectasis, has beneficial effects on postoperative pulmonary function, and provides notable decrease in duration of hospital stay.

References

1. Loop FD, Lytle BW, Cosgrove DM, Stewart RW, Goormastic M, Williams GW, Golding LA, Gill CC, Taylor PC, Sheldon WC. Influence of the internal mammary artery graft on 10-year survival and other cardiac events. N Engl J Med 1986;314:1±6.

2. Boylan MJ, Lytle BW, Loop FD, Taylor PC, Borsh JA, Goormastic M, Cosgrove DM. Surgical treatment of isolated left anterior descending coronary stenosis. Comparison of left internal mammary artery and venous autograft at 18 to 20 years of follow-up. J Thorac Cardiovasc Surg 1994; 107:657–62.
3. Cosgrove DM, Loop FD. Techniques to maximize mammary artery length. Ann Thorac Surg 1985;40:78–9.
4. Keeley SB. The skeletonized internal mammary artery. Ann Thorac Surg 1987; 44: 324-5.
5. Horii T, Suma H. Semiskeletonization of internal thoracic artery: alternative harvest technique. Ann Thorac Surg 1997; 63: 867-8.
6. Hurlbut D, Myers ML, Lefcoe M, Goldbach M. Pleuropulmonary morbidity: internal thoracic artery versus saphenous vein graft. Ann Thorac Surg 1990;50:959–64.
7. Landymore RW, Howell F. Pulmonary complications following myocardial revascularization with the internal mammary artery graft. Eur J Cardiothorac Surg 1990;4:156–62.
8. Peng MJ, Vargas FS, Cukier A, Terra-Filho M, Teixeira LR, Light RW. Postoperative pleural changes after coronary revascularization. Comparison between saphenous vein and internal mammary artery grafting. Chest 1992;101:327–30.
9. Wimmer-Greinecker G, Yosseef-Hakimi M, Rinne T, Buhl R, Matheis G, Martens S, Westphal K, Moritz A. Effect of internal thoracic artery preparation on blood loss, lung function, and pain. Ann Thorac Surg 1999;67:1078–82.
10. Burgess GE, Cooper JR, Marino RJ, Peuler MJ, Mills NL, Ochsner JL. Pulmonary effect of pleurotomy during and after coronary artery bypass with internal mammary artery versus saphenous vein grafts. J Thorac Cardiovasc Surg 1978;76: 230–4.
11. Rolla G, Fogliati P, Bucca C, Brussino L, Di Rosa E, Di Summa M, Comoglio C, Malara D, Ottino GM. Effect of pleurotomy on pulmonary function after coronary artery bypass grafting with internal mammary artery. Respir Med 1994;88(6):417–420.
12. Tomita S, Sakata R, Umebayasi Y, Miyata A, Terai H, Ueyama K, Uezu T. Study of pulmonary function after CABG with pleurotomy. Jpn J Thoracic Surg 1994;47(7):528–532
13. Oz BS, Iyem H, Akay HT, V Yildirim,C Bolcal,K Karabacak ,U Demirkilic,H Tatar. Preservation of pleural integrity during coronary artery bypass surgery affects respiratory functions and postoperative pain: a prospective study. Can Respir J 2006;13:145–9.
14. Wheatcroft M, Shrivastava V, Nyawo B, Rostron A, Dunning J. Does pleurotomy during internal mammary artery harvest increase post-operative pulmonary complications? Interactive Cardiovasc Thorac Surg 2005;4:143– 6.
15. Noera G, Pensa PM, Guelfi P, Biagi B, Lodi R, Carbone C. Extrapleural takedown of the internal mammary artery as a pedicle. Ann Thorac Surg 1991;52(6):1292–1294.
16. Goksin I, Baltalarli A, Sacar M, Sungurtekin H, Ozcan V, Gurses E, Kaya S, Evrengul H. Preservation of pleural integrity in patients undergoing coronary artery bypass grafting: effect on postoperative bleeding and respiratory function. Acta Cardiol 2006;61:89 –94.
17. Bonnacchi M, Prifti E, Giunti G, Salica A, Frati G, Sani G. Respiratory dysfunction after coronary artery bypass grafting and employing bilateral internal mammary arteries: the influence of the intact pleura. Eur J Cardiothorac Surg 2001;19(6):827–833.
18. Iyem H, Islamoglu F, Yagdi T, Sargin M, Berber O, Hamulu A, Buket S, Durmaz I. Effects of pleurotomy on respiratory sequelae after internal mammary artery harvesting. Tex Heart Inst J 2006;33:116 –21.
19. Lim E, Callaghan C, Motalleb-Zadeh R, Wallard M, Misra N, Ali A, Halstead JC, Tsui S. A prospective study on clinical outcome following pleurotomy during cardiac surgery. Thorac Cardiovasc Surg 2002;50(5):287–291.
20. Totaro P, Fucci C, Minzioni G. Preserved pleura space integrity and respiratory dysfunction after coronary surgery. Eur J Cardiothorac Surg 2001;20:1067–70.
21. Ali IM, Lau P, Kinley CE, Sanalla A. Opening the pleura during internal mammary artery harvesting: advantages and disadvantages. Can J Surg 1996;39(1):42–45.
22. Guizilini S, Gomes WJ, Faresin SM, Bolzan DW, Buffolo E, Carvalho AC, De Paola AAV. Influence of pleurotomy on pulmonary function after off-pump coronary artery bypass grafting. Ann Thorac Surg 2007;84:817–22.
23. Matsumoto M, Konishi Y, Miwa S, Minakata K. Effect of different methods of internal thoracic artery harvest on pulmonary function. Ann Thorac Surg 1997;63:653–5.

COMBINATION OF VITAMIN C AND B-BLOCKERS FOR PREVENTION OF ATRIAL FIBRILLATION AFTER SURGICAL MYOCARDIAL REVASCULARIZATION

Ahmad K Darwazah, MD *,
Mohamed Awady, MD **,
Hassan Nagy, MD *,**
Mahmoud Sherif, MD *,**

Background : **The use of B-blockers as a prophylactic agent against the occurrence of atrial fibrillation (AF) has proved it's efficiency. Both inflammation and oxidative stress have been recently involved in pathogenesis of postoperative AF. The aim of our study is to evaluate the efficiency of using oral vitamin C in addition to B-blockers to prevent postoperative AF.**

Methods : **From December 2007 to April 2008, 80 patients undergoing isolated coronary artery bypass surgery were selected and randomly divided into two groups. Group I (n = 40) received 2g of oral vitamin C one day before operation and for 5 days afterwards in addition to B-blockers. Group II (n = 40) as a control group, who received B-blockers only. Patients were monitored for the occurrence of AF from the operation time to the fifth postoperative day.**

Results : **Preoperative patients demography and risk factors for coronary artery disease were similar among both groups. The mean number of grafts performed per patient was 3±0.6 and 2.9±0.6 in group I and II respectively (P = 0.37). Inotropic support was used more in group II 28% Vs 23%, P = 0.61. In hospital mortality was 0%. Combined morbidity (AF, wound infection, renal impairment, bleeding, reoperation ischemic changes and mediastinitis) were higher in group II 45% Vs 28%. The incidence of postoperative AF was higher in the control group than vitamin C group (25% Vs 15%) but the difference did not reach statistical significance (P = 0.088). Vitamin C group had a significantly shorter intensive care unit stay (25±3h Vs 30±12h: P = 0.017), but the mean hospital length of stay was similar among both groups. The duration of the attack of AF was short and transient among patients receiving vitamin C (50% Vs 7%). Subsequently, the number of patients receiving medical management for AF was less in Vitamin C group.**

Conclusions : **Administration of oral vitamin C in combination with B-blockers reduces the incidence and duration of postoperative AF. Our results were not statistically significant when compared to patients receiving B-blockers alone. However, the number of patients who received further management to control AF was less in Vitamin C group.**

Accepted for publication Jun,2008
Address reprint request to : Dr Ahmad K Darwazah
Department of Cardic Surgery1 Menofia University
Email : jegyptscts@gmail.com
Codex : 04 / cord / 80 / 0806
* Department of Cardic Surgery1 Menofia University,
** Banha University , Madina Nasr Hospital ,
*** Anaesthesia2 Ain Shams University

Atrial fibrillation is one of the most common complications after coronary artery bypass surgery. It is associated with higher early and late mortality and morbidity[1]. It's etiology is multi-factorial. Myocardial ischemia, reperfusion injury, excessive catecholamines, electrolyte imbalance and surgical manipulation of the right atrium are all implicated in its development[2,3,4]. Recently, inflammatory mediators which are associated with cardiopulmonary bypass as complement activation, cytokines release and endothelial activation are directly involved in it's pathogenesis[5,6,7].

A wide variety of prophylactic drugs have been used to prevent it's occur-

rence with varying degree of success was obtained. The aim of our study is to evaluate the effect of using vitamin C as an antioxidant in addition to B blockers in reducing the occurrence of postoperative AF.

Methods

This prospective, randomized study was conducted among patients undergoing isolated coronary artery bypass surgery during a period of 10 months from December 2007 – April 2008. All patients receiving B-blockers for at least one week before surgery were included. Those with previous history of atrial fibrillation, associated comorbidities (as renal failure and advanced liver disease), and patients receiving antiarrythmic drugs and digoxin were excluded.

A total of 80 patients were included randomly and divided into two groups: Group I included 40 patients who received vitamin C tablets in addition to B-blockers and Group II included 40 patients who received B-blockers only and were considered as a control group.

Patients in group I (Vitamin C group) received 2 grams of vitamin C tablets (Cevitil, Epico. Egyptian International Pharmaceutical Industrial Company) one day before surgery and continued on 1 gram twice per day for 5 days. Determination of ejection fraction and right atrial size was done by echo-cardiography in all patients.

Surgical and Anaesthetic technique

Anaesthetic technique was standardized for all patients. Anaesthesia was induced by Thiopental sodium (sleeping dose), Succinyl sodium 1 mg/kg, Midazolam 0.1 mg/kg and Pancuronium bormide as needed and maintained by Fentanyl and isoflurane. Conventional cardiopulmonary bypass was performed through median sternotomy in all patients. Standard cannulation of the ascending and right atrium was performed. Myocardium protection was achieved with intermittent cold crystalloid cardioplegia given antegradely through aortic root. Systemic normothermia 37˚C – 36˚C was used among all patients.

Different variables were evaluated preoperatively, operatively and postoperatively among all patients in both groups. The frequency of AF was analysed from operation time to the 5th postoperative day. All patients were monitored in the ICU in the first four days, subsequently they had electrocardiography on the 5th day. Patients were clinically observed. AF was considered positive even in the presence of transient short attacks.

Results

Preoperative patients characteristics of both groups are listed in Table I. The age of patients ranged from 33 to 78 years. The mean age between the two groups was similar. No difference in the number of males both groups was seen. Regarding risk factors for coronary artery disease, the incidence of hyperchoelstermia, diabetes mellitus, carotid artery disease and COPD were similar among both groups. The percentage of patients with hypertension, old myocardial infarction and smoking were higher in group II, but this difference did not reach statistical significance. Patients in both groups, had similar ejection fraction as measured by echocardiography. As well as the number of vessels involved and the prevalence of main stem.

Patient's profiles and preoperative data

Variable	Group I Vitamin C	Group II Control	P value	
Age (year)	57.00±8.24	54.90±7.68	0.242	NS
Males	34(85%)	33(82%)	0.37	NS
Females	6(15%)	7(17%)		
Smoking	20(50%)	28(70.0%)	0.84	NS
Hypertension	56.7%	73.3%	0.35	NS
Diabetes	11(27.5%)	10(25%)	0.61	NS
COPD	2(5%)	2(5%)	0.54	NS
Dyslipidemia	13(32%)	12(30%)	0.31	NS
Myocardial Infarction	56.7%	76.6%	0.57	NS
Carotid Artery Disease	1(2.5%)	1(2.5%)		NS
LA Dimensions	4.13±0.41	4.03±0.15	0.13	NS
Ejection Fraction	53.17±9.69	56.55±6.10	0.11	NS
Left main stem	4(10%)	3 (7.5%)		NS
Single Vessel Disease	0(0%)	0(0%)		NS
Double Vessel Disease	7(18%)	11(28%)		NS
Triple Vessel Disease	26(65%)	23(58%)		NS
Quadriple Vessel Disease	&(18%)	6(15%)		NS

Table (1):COP (ch4onic obstructive pulmonary disease), LA (left atrium) NS: Non-significant (P > 0.05).

Operative data

Variable	Group I Vitamin C	Group II Control	P value	Sign.
Bypass Time(min)	48.07±30.50	58.80±29.67	0.11	NS
Cross-Clamp Time(min)	32.22±21.46	32.97±18.28	0.86	NS
Number of grafts	3.00±0.59	2.87±0.64	0.37	NS
Complete Revascularization	38(95%)	37(93%)	0.23	NS
Use of LIMA	40(100%)	40(100%)		NS
Endarterectomy	2(5%)	1(2.5%)	0.56	NS
IAPB	0	0		
Inotropic Support	11(27.5%)	9(22.5%)	0.61	NS

Table (2):LIMA (Left internal mammary artery), IAPB (Intra Aortic Balloon Pump)

Postoperative dzta

Variable	Group I Vitamin C	Group II Control	P value	Sig.
Oeprative morality	0.10%	0(0%)		
Ventilator Time	10.23±112	9.72±3.27	0.807	NS
ICU Time	24.85±3.82	29.72±12.04	0.017	S
Hospital Stay	6.7±0.51	6.77±0.42	0.47	NS
Permanent Pacemaker	0(0%)	0(0%)		
Post Operative AF	4(10%)	10(25%)	0.0 88	NS
Superficial Wound Infection	2(5%)	2(5%)		NS
Renal Impairment	2(5%)	1(.5%)		NS
Bleeding & exploration	2(5%)	2(5%)		
Mediastinitis	0(0%)	1(2.5%)		NS
Rewiring	1(2.5%)	1(2.5%)		NS
S-T segment Elevation	0(%0%)	1(2.5%)		NS

Table (3):S: significant. ***NS: Non-significant. (P > 0.05).***

There was no difference regarding bypass time and cross clamp time among both groups (Table 2). Spontaneous sinus rhythm was obtained in all patients after removal of aortic clamp.

Completeness of revascularization was slightly more in group I 95% vs 93%, but the difference was not significant (P = 0.23).

Left internal mammary artery was used to graft left anterior descending artery among all patients. The mean number of grafts performed per patient as measured by the mean number of distal anastomosis divided by the mean number of diseased vessel systems was 3±0.6 and 2.9±0.6 in group I and II respectively (P = 0.37).

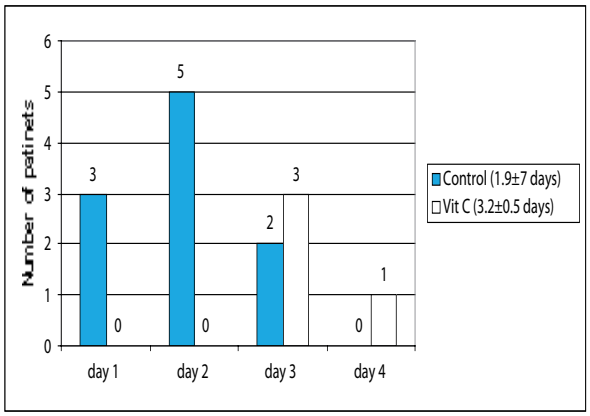


Fig. (1): Onset of postoperative AF

Endartrectomy of LAD was performed among three patients, two of them in group I. None of the patients had IABP either pre or postoperatively. Inotropic support was used in 27.5% and 22.5% in group I and II respectively (P = 0.61).

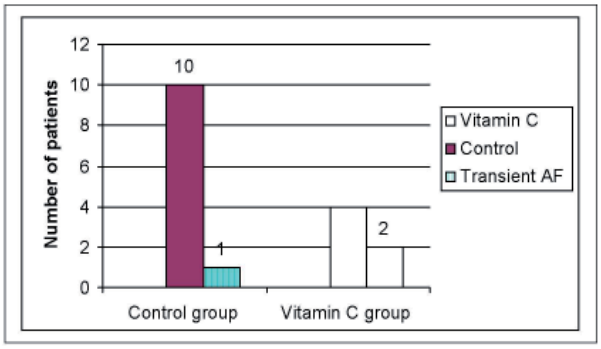


Fig. (2): Number of patients with transient AF Among both groups

All patients in both group survived. Combined incidence of morbidity including AF, wound infection, renal impairment, bleeding, reoperation, ischemic changes and mediastinitis were higher in group II 45% vs 28%, (Table 3).

Similarly, the incidence of postoperative AF was more prevalent in the control group 25% Vs 10%. The difference did

not reach statistical significance. (P = 0.088).

In the current study, the post-operative intensive care unit (ICU) length of stay was significantly higher in the control group (30 ± 12 vs 25 ± 3 hours, P = 0.017. There was no difference regarding total postoperative hospital stay among both groups.

The onset of AF appeared late on the 3rd and 4th postoperative days in the Vitamin C group when compared to the control patients. (Fig. 1). The duration of the attack of AF was transient among 50% of patients who had AF in vitamin C group. These patients had no further management of their AF. On, the contrary only 7% of the control patients had transient AF and the majority had further medical treatment. (Fig. 2).

Discussion

Atrial fibrillation is the most common arrythmia seen after coronary artery bypass surgery[8]. Despite improvement in perioperative management, its occurrence

has not been prevented over the years[9]. It's incidence varies from 10% to 50%[10]. In the majority of cases it is a self limiting problem[11], but it's persistence is associated with high early and late mortality and morbidity[1].

It is commonly associated with elderly male patients with diabetes mellitus, hypertension, chronic obstructive pulmonary disease, chronic renal disease, impaired cardiac function and advanced coronary artery disease[9]. The development of AF is associated with longer hospital stay, hemodynamic deterioration, thromboembolism, renal and neurological complications[12,10].

The exact pathogenesis is still not clear. Re-entry phenomena in the atrial wall are thought to play an important role in it's development[13]. Several mechanisms related to cardiopulmonary bypass have been incriminated. Myocardial ischaemia, and reperfusion injury which are associated with CPB has a direct effect on the atrial myocardium to generate arrythmias. Excessive catecholamines, hemodilution, cardioplegic solution all may cause electrolyte imbalance which help to generate arrythmias[2,4,10,12]. Also surgical manipulation of the right atrium by purse string and cannulation may play a role in its development[2].

Inflammatory mediators which are associated with CPB as complement activation, release of cytokines and endothelial activation[7] may cause hypoxia and electrolyte imbalance by affecting both kidney and respiratory function.

Recent studies[5,6], showed that these inflammatory cytokines can initiate oxygen radicles which in turn create an "oxidant stress". These oxidants have various effects on the myocardium including apoptosis, truncated action potential, abnormalities in sodium, calcium and potassium channel function[14], all potentiate the development of atrial fibrillation[14,15].

A wide variety of prophylactic drugs have been used to reduce the incidence of postoperative AF. B-adrenergic blockers proved to be an effective drug used pre and post operatively. Its mode of action is through affecting sympathetic tone after surgery and reduction of calcium overload[8,11,16].

The use of Amiodarone reduces the incidence of AF as low as 5%[17]. Various studies consider it as the drug of choice[19]. Recent work by Samuels and Colleagues[18], using Amiodarone and early cardioversion found that 98% of their patients had restored their sinus rhythm before they were discharged from hospital.

The use of magnesium showed variable results. In the study by Kohno and coworkers[9] the incidence of AF was significantly reduced after three days use of magnesium. While, Kaplan and colleagues[20] found that infusion of magnesium alone is not sufficient as a prophylactic agent to control postoperative AF.

Similarly, recent work by piper and colleagues[21] found that combined use of potassium, magnesium and aspartate (Inzolen solution) has no significant difference in controlling AF when compared to potassium solution. Based on the effect of inflammatory mediators on generating AF. Vitamin C as an antioxidant was recently used as a prophylactic agent to reduce incidence and to prevent recurrence of AF after electrical cardioversion[5,15,22]. These studies showed that the use of vitamin C, significantly reduces both incidence and recurrence of AF.

In our study, the incidence of postoperative AF among our control group was 25% which is similar to previous studies[5,10,16].

The effect of using vitamin C as a prophylactic agent was clearly seen on reducing the incidence to 15%. Contrary, to previous studies[5,15]. Our reduction in the incidence was not significant, despite the fact that our patients were younger, and had less incidence of diabetes mellitus and their ejection fraction was better. However, we found that our patients had a higher incidence of myocardial infarction, hypertension, smoking,

a larger left atrial dimension and less number of grafts performed when compared to Eslami and colleagues study[5]. It seems that these factors had a direct impact on generating more AF among our vitamin C group of patients.

The onset of post operative AF varies from 24 to 96 hours with a peak incidence on the second to third day[23]. In our study the mean time was 2.3±0.9 which is consistent with the previous studies. Comparing our two groups of patients, we noticed that the onset of AF among vitamin C group appeared later than the control group i.e. on the 3rd and 4th day. Contrary to the observation seen in Eslami study[5], who had an onset of AF on the 2nd and 3rd and none of their patients had AF on the 4th day.

The use of vitamin C not only affects the onset of AF, but also the duration of the attack. Among the four patients who had AF, two of them (50%) had transient short attacks which lasted for few seconds which did not cause any medical inconveniences. These patients received no further management. On the other hand, one patient (7%) in the control group had a transient attack and the majority of the patients received further treatment.

Evaluating our patients among both groups who developed AF, we found that the incidence was more prevalent among male patients who had hypertension, multi-vessel disease and COPD. 79% of our patients were males, 55% had multi-vessel disease and 50% had hypertension. Our observations were similar to previous studies, who found a direct association between these risk factors and the incidence of AF[8,24].

It is well known that age is an independent risk factor for development of AF[8,11,24]. The relationship between age and AF in our study was similar to those reported previously. We found that the mean age of our patients who had AF was significantly higher than those who had a normal rhythm.

From our previous discussion, it seems clear to us that the pathogenesis involved in the development of AF is complex. Multifactors are involved in its generation. It's incidence is influenced by many risk factors as age, gender, diabetes, hypertension and multi-vessel affection. The occurrence of postoperative AF is an inevitable sequence of coronary artery bypass grafting. Prophylactic use of vitamin C does not prevent it's occurrence but reduces it's incidence, and duration of the attack.

References

1- Almassi GH, Schowatter Tl Nicolosi AC, Aggarwal A, et al. Atrial fibrillation after cardiac surgery: a major morbid event? Ann Surg 1997; 226: 501-13.

2- Athanasiou T, Aziz O, Mangoush O, Weerasinghe A, et al. Do Off-pump Techniques Reduce the Incidence of Post-operative Atrial Fibrillation in Elderly patients Undergoing coronary artery Bypass Grafting? Ann Thorac Surg 2004; 77: 1567-74.

3- Funk M, Richard, SB, Desjardins J, Bebon C, Wilcox H. Incidence, timing, symptoms, and risk factors for atrial fibrillation after cardiac surgery. Am J Crit Care 2003; 12: 424-33.

4- Hogue CW Jr, Murphy SF, Schenchtman KB, Davila-Roman VG. Risk factors for early or delayed stroke after cardiac surgery. Circulation 1999; 100: 642-7.

5- Eslami H, Badkoubeh RS, Mousari M, Radmehr H, et al. Oral ascorbic Acid in Combination with beta-Blockers is more effective than Beta-Blockers Alone in the Preventing of Atrial fibrillation after Coronary Bypass grafting. Tex Heart Inst J 2007; 34(3): 268-274.

6- Wilson JM. A day without Orange Juice is Like an invitation to Atrial Fibrillation. Tex Heart Inst J 2007; 34(3): 265-267.

7- Ascione R, Lloyd CT, Underwood NJ, et al. Inflammatory response after coronary revascularization with or without cardiopulmonary bypass. Ann Thorac Surg 2000; 69: 1198-204.

8- Hakala T, Hedman A. Predicting the risk of atrial fibrillation after coronary bypass surgery. Scand Cardiovasc J 2003; 37: 309-15.

9- Kohno H, Koyanagi T, Kasegawa H, Miyazaki M. Three-Day Magnesium Administration Prevents Atrial Fibrillation After Coronary artery Bypass Grafting. Ann Thorc Surg 2005; 79: 117-26.

10- Mathew JP, Parks R, Savino JS, et al. Atrial fibrillation following coronary artery bypass graft surgery: Predictors, outcomes and resource utilization. JAMA 1996; 276: 300-6.

11- Chung HK. Cadiac surgery: postoperative arrhythmias. Crit Care Med 2000; 28 (10 Suppl): N 136-44.

12- Hogue CW Jr, Hyder HL. Atrial fibrillation after cardiac operation: risks, mechanisms and treatment. Ann Thorac Surg 2000; 69: 300-6.

13- Haïssaguerre H, Jaïs P, Shah DC, et al. Spontaneous initiation of atrial fibrillation by ectopic beats originating in the pulmonary veins. N Engl J Med 1998; 339: 659-66.

14- Sautarelli LC, Wassef R, Heinemann SH, Hoshi T. Three methionine residues located within the regulator of conductance for K^+ (RCK) domains confer oxidative sensitivity to large conductance Ca^{2+} activated K^+ channels. J Physiol

2006; 571 (Pt 2) 329-48.
15- Carnes CA, Chung HK, Nakayama J, et al. Ascorbate attenuates atrial pacing induced peroxynitrite formation and electrical remodeling and decreases the incidence of postoperative atrial fibrillation. Circ Res 2001; 89: E32-8.
16- Kalman JM, Munawar M, Howes LG, Louis WJ, et al. Atrial fibrillation after coronary artery bypass grafting is associated with sympathetic activation. Ann Thorac Surg 1995; 60: 1709-15.
17- Katariya K, De Marchena E, Bolooki H. Oral amiodarone reduces incidence of postoperative atrial fibrillation Ann Throac Surg 1999; 68: 1599-603.
18- Samuels LE, Holnes EC, Samuels FL. Selective use of Amiodarone and Early Cardioversion for postoperative atrial Fibrillation. Ann Throac Surg 2005; 79: 113-6.
19- Yagdi T, Nalbantgil S, Ayik F, et al. Amiodarone reduces the incidence of atrial fibrillation after coronary artery bypass grafting. J Thorac Cardiovasc Surg 2003; 125: 1420-5.
20- Kaplan M, Kut MS, Icer UA, Demirtas MM. Intravenous magnesium sulfate prophylaxis for atrial fibrillation after coronary artery bypass surgery. J Thorac Cardiovasc Surg. 2003 Feb; 125(2): 344-52.
21- Piper SN, Kiessling Alt, Suttner SW, Ducke M, et al. Prevention of atrial fibrillation after coronary artery bypass graft surgery using a potassium – magnesium – aspartate solution (Inzolen). Thorac Cardiovasc Surg. 2007 Oct; 55(7): 418-23.
22- Korantzopoulos P, Kolettis TM, Kounfouris E, Dimitroula V, et al. Oral Vitmain C administration reduces early recurrence rates after electrical cardioversion of persisent atrial fibrillation and attenuates associated inflammation. Int J Cardiol 2005; 102: 321-6.
23- Watanabe Y, Dreifus LS. Electrophysiolgoical effects of magnesium and its interaction and potassium. Cardiovasc Res 1972; 6: 79-88.
24- Adams DH, Filsoufi F, Antman EM. Medical management of the patient undergoing cardiac surgery. In: Zipes DP, Libby P, Bonow RO, Braunwald E, editors. Braunwald's heart disease: a textbook of cardiovascular medicine. 7th ed. Philadelphia: Elsevier Saunders; 2005. p.1993-2020.

EARLY OUTCOME OF CORONARY ARTERY SURGERY IN PATIENTS WITH DIABETES MELLITUS: A 3 YEARS EXPERIENCE IN NASSER INSTITUTE.

Saeed Elassy*, M.D.,
Ashraf Elsebaie*, M.D.,
Bassem Ramadan, M.D.,**
Mohamed Abdelfatah*, M.D.,
Hossam Ashoor*, M.D.,
Waleed Ismaeel*, M.D.,
Mohamed Elfeky*, M.D.

Objectives: **We aimed at determining the effect of diabetes mellitus on short-term mortality and morbidity in a cohort of patients with ischemic heart disease undergoing coronary artery bypass surgery (CABG) at our institution.**

Methods: **1200 patients undergoing isolated CABG in a 3-year period; from year 2003-2006; were studied. The patients were randomly selected from the pool of CABG patients of Nasser institute and assigned to two groups, diabetic group and non diabetic group; (Compared to each other . The group with diabetes had a statistically significant younger age, more females, higher weight, higher incidence of renal impairment, congestive heart failure, infarction, NYHA class III and IV dyspnea and more extensive disease (3 and 4 vessel disease).**

Results: **The overall hospital mortality was 4.42 % (n = 53) diabetics: 4.67 % and non-diabetics: 4.16 % (p = 0.07). In univariate analysis, only deep sternal infection and blood requirements being significantly higher in the diabetic patients (p < 0.05). In multivariate analysis, diabetes was not found to be an independent risk factor for in hospital mortality, but predicted the occurrence of mediastinitis. Female sex, peripheral vascular disease, hypertension, renal impairment are intra aortic balloon pump usage were identified as independent predictors of hospital death.**

Conclusions: **Despite worse demographic and clinical characteristics, diabetic patients could be surgically revascularized with low mortality and morbidity, comparable with control patients. Therefore the results from our series show that diabetes is not a risk factor for hospital mortality, however it increases the rate of deep sternal infection.+**

Diabetes mellitus is an established risk factor for the development of coronary artery disease . diabetic patients have traditionally higher morbidity and mortality after CABG than non-diabetic population. A consequence of the evolution of coronary angioplasty is that a higher proportion of patients undergoing CABG today either have extensive coronary artery disease or diabetes mellitus. (1)

In a study reported by Thourani et al., mortality in diabetic patients was significantly higher compared to non-diabetic patients with a direct impact of diabetes on early postoperative outcome (2). More recently, studies have suggested an improved outcome in diabetic patients and have raised questions regarding the potential influence of this disease on early operative results (3, 4). This improvement may be due to several factors as implementation of metabolic control of inflammation and hypercatabolism and advances in operative techniques. (5)

Although coronary artery bypass grafting is well tolerated by diabetic patients, long-term survival continues to be poorer for these patients compared

Accepted for publication Jun, 2008
Address reprint request to : El-Domiaty Department, Cardiothoracic Surgery - Suez Canal university, Egypt.
Email : smrassy@gmail.com
Codex : 04 / cord /81 / 0806
*Department of cardiothoracic surgery, Ain shams university.
** Department of cardiothoracic surgery, Alexandria university

with their nondiabetic counterparts as a result of the underlying pathophysiology of diabetic heart disease. Abnormalities in the vascular endothelium may explain the reduction in survival after cardiovascular events for diabetic patients. There is substantial evidence that endothelium dependent vasodilation is abnormal in both conduit arteries and resistance vessels of diabetic animals and humans (2).

There is a need for continuously evaluating the performance of surgical revascularization in diabetic patients, because diabetes is present in approximately one-quarter of the patients undergoing CABG (1,3,5,6) and its prevalence is steadily increasing (7,8) and over the years, several reports have attested the superiority of CABG over percutaneous coronary intervention for coronary revascularization in diabetic patients (10—12).

The purpose of this study was to investigate short-term outcome in terms of postoperative morbidity and 30-day mortality in diabetic patients undergoing CABG compared to non diabetic patients.

Methods

After obtaining approval of the local institutional review board, we retrospectively analyzed 1200 patients undergoing CABG between January 2003 and December 2006. The patients were randomly selected from the pool of CABG patients of Nasser institute and assigned to two groups, the first is the diabetic group, group I and the second is the non diabetic group or group II. Clinical variables were prospectively entered into Nasser Institute computerized data base and used for this retrospective analysis. According to the STS data base diabetic patient was defined as any patient with a history of diabetes, regardless of duration of disease or need for anti-diabetic agents. Includes an admission or preoperative diagnosis. All other definition of morbidities and mortalities comply with STS data base definitions and Nasser institute data base.

All diabetic patients had blood glucose determination at 2-hour intervals and intravenous insulin infusion was started intraoperatively and continued postoperatively to a target level of 150 to 200 mg/dL until postoperative day one. The intravenous insulin therapy was transitioned to subcutaneous insulin therapy, oral antidiabetic therapy or discontinued altogether after 48 h. As for all coronary revascularization, the infection prophylaxis was carried out by a third generation cephalosporins at induction of aneathesia and iv postoperatively for 5 days. An additional dose of vancomycine was given on bypass.

The incidence of females in the diabetic group was significantly higher (30.67 %) compared to the non diabetic group (12.83 %). The mean age was 54.9 ± 7.658 for non diabetics and 53.37 ± 8.168 in diabetic patients. 58.71 % of the diabetic patients were on insulin therapy, 38.52 % were on oral therapy and 2.63 % were on diet control.

The diabetic group had a statistically significant younger age, more females, higher weight, higher incidence of renal impairment, congestive heart failure, infarction, NYHA class III and IV dyspnea and more extensive disease (3 and 4 vessel disease), also the incidence of cerebrovascular disease was higher in diabetic than non diabetic group. Table (1) & (2) show the demographic distribution and preoperative data in both groups.

Statistical methods

Normally distributed continuous variables are represented as mean standard deviation (SD) or as the percentage of the sample. The x-test and Fisher's exact test were used to determine differences in patient characteristics by univariate analysis. Multivariate logistic regression was performed to assess the influence of diabetes as an independent risk factor for hospital mortality and postoperative morbidity. A p value < 0.05 was considered significant for all tests. All analysis was performed by SPSS software (SPSS Inc., Chicago, IL).

Results

Mean cardiopulmonary bypass times were 106 ± 54 minutes in diabetic patients and 103 ± 54 minutes in nondiabetic patients (p = NS). Cross – clamp times were 64 ± 47 minutes and 63 ± 50 minutes in the diabetic and nondiabetic patients, respectively (p = NS). The number of the grafts per patient was from 2 to 5 mean 2.3 ± 1.2 in diabetics and 2.3±1.1 in non diabetics with no statistically significant difference between the two groups. No statistical difference was also noted between the two groups in the number of the off pump procedures done. Table (3) shows the operative data.

Discussion

The negative impact of diabetes on the outcome of a patient with coronary artery disease (CAD) is well established and related to its atherosclerotic, pro-inflammatory and pro-thrombotic effects (14). Until recently, patients with diabetes and multi-vessel CAD undergoing revascularization were considered high-risk due to increased morbidity and mortality (15).

Most reports indicated that, diabetes is present in approximately one-quarter of the patients undergoing revascularization for coronary artery disease, for which it is considered a risk factor (1,3,5,6), but there has been

	GROUP TYPE	Mean	Std. Deviation	Std. Error Mean	Sig. (2-tailed)
Age at Surgery	Diabetic	53.37	8.168	0.341	0.001
	Non Diabetics	54.91	7.658	0.319	
Hb on admission	Diabetic	13.06	1.292	0.063	0.325
	Non Diabetics	12.98	1.301	0.064	
Creatinine on admission	Diabetic	1.03	0.599	0.029	0.086
	Non Diabetics	1.13	1.017	0.05	
Bilirubin on admission	Diabetic	0.609	0.2772	0.0137	0.125
	Non Diabetics	0.644	0.3707	0.0184	
Ejection Fraction (%)	Diabetic	47	6.411	0.273	0.172
	Non Diabetics	47.5	5.831	0.247	
Height (cm)	Diabetic	167.74	10.138	0.438	0.012
	Non Diabetics	169.26	9.449	0.408	
Weight (kg)	Diabetic	96.46	14.088	0.609	0.001
	Non Diabetics	85.55	12.985	0.56	
BMI	Diabetic	31.4779	15.73599	0.68033	0.0151
	Non Diabetics	30.844	18.86784	0.81497	
BSA	Diabetic	1.9491	0.16443	0.00712	0.621
	Non Diabetics	1.9538	0.14741	0.00637	

Table (1) showing the demographics and preoperative variables in both groups. T test value significant below 0.05.

The overall in-hospital mortality was 4.42 % (n = 53). There was no difference in the mortality rate of the diabetic and nondiabetic groups, (4.67 % and 4.17%, respectively; p = 0.07).

In-hospital morbidity events were comparable in the two groups by univariate analysis, with only mediastinitis and need for blood transfusion showing a significant higher incidence in the diabetic patients, although the overall infective complications were not significant. Renal impairment requiring dialysis approached statistical significance.

With multivariate analysis diabetes had no statistical significance on postoperative morbidity, except in the incidence of mediastinitis. Table (5) & (6) show the post operative data in univariate analysis, table (7) shows the effect of diabetes on morbidity and mortality.

Table (4) shows the analysis of post operative arrhythmias, infection and incidence of low cardiac output. Chart (1) and (2) show the number of blood units transfused and number of days of ventilation with no difference between the two groups.

The presence of diabetes was not found to be an independent predictor of hospital mortality in uni or multivariate analysis

(OR=1.13 CI= (0.62–2.19 P= 0.698).

By contrast, female sex, peripheral vascular disease, hypertension, renal impairment, left ventricular dysfunction (ejection fraction ≤ 35 %), congestive heart failure, intra aortic balloon pump usage and hemodynamic instability were identified as independent predictors of hospital death in univariate analysis,

but in multivariate analysis female sex, peripheral vascular disease, hypertension, renal impairment are intra aortic balloon pump usage were identified as independent predictors of hospital death. Table (8) shows the predictors of mortality and morbidity in univariate and multivariate analysis.

	Diabetics		Non Diabetics		Total		Sig.
	No.	%	No.	%	No.	%	
Sex							
Females	184	30.67	77	12.83	261	21.75	0.001
Males	523	87.17	416	69.33	939	78.25	
Hypertension	573	95.50	546	91.00	1119	93.25	0.002
Hypercholestrolemia	55	9.17	45	7.50	100	8.30	0.835
Renal impairment							
R.dysfunction cr.cl> 200 umol/l	20	3.33	13	2.17	33	2.75	
Chronic renal dialysis	16	2.67	3	0.50	19	1.58	
Functioning renal transplant	6	1.00	0	0.00	6	0.50	
Total	42	7.10	16	2.67	58	4.83	0.001
peripheral vascular disease							
previous DVT	12	2.00	6	1.00	18	1.50	
previous PAD	14	2.33	5	0.83	19	1.58	
Total	26	4.33	11	1.83	37	6.1	0.605
Cerebrovascular							
history of TIAs >6months	15	2.50	2	0.33	17	1.42	
history of stroke > 6months	15	2.50	7	1.17	22	1.83	
stroke < 6 months	7	1.17	0	0.00	7	0.58	
Total	37	6.17	9	1.50	46	3.83	0.002
COBD	21	1.75	30	2.50	51	4.25	0.182
GIT							
liver dysfunction	13	2.17	14	2.33	27	2.25	
history of peptic ulcer	17	2.83	18	3.00	35	2.92	
previous surgery	11	1.83	12	2.00	23	1.92	
other	8	1.33	9	1.50	17	1.42	
Total	49	8.16	53	8.83	102	8.5	0.857
Redo	4	0.67	2	0.33	6	0.50	0.765
Unstable Angina	100	16.67	96	16.00	196	16.33	0.968
Congestive heart Failure							
Old	38	6.33	19	3.17	57	4.75	
Present	7	1.17	3	0.50	10	0.83	
Total	45	7.50	22	3.67	67	5.58	0.039
previous Q wave infarction	185	30.00	155	25.83	340	28.33	0.012
previous PTCA stenting	108	18.00	109	18.17	217	18.08	0.900
Ejection fraction							
≤35	25	4.17	20	3.33	45	3.75	
35-49	105	17.50	97	16.17	202	16.83	
≥ 50	470	78.33	483	80.50	953	79.42	
Total	600	100	600	100	1200	100	0.306
Thrombolysis within 24 hrs	2	0.33	1	0.17	3	0.25	0.101
Extent of disease							
One vessel	78	13.00	77	12.83	155	12.92	
Two vessels	79	13.17	111	18.50	190	15.83	
Three vessels	133	22.17	230	38.33	363	30.25	0.023
Four vessels	310	51.67	182	30.33	492	41.00	
Main	33	5.5	25	4.17	58	48.33	

Table (2) showing the demographics and preoperative variables . P value significant below 0.05. DVT: deep venous thrombosis; PAD: peripheral arterial disease; TIA: transient ischemic attacks; COPD: chronic obstructive pulmonary disease.

	Diabetics (600, 50%)	Non- diabetics (600, 50%)	P-value
Off-pump procedures	9 (1.5)	6 (1)	ns
Mean number of grafts	2.3±1.2	2.3±1.1	ns
Mean cardiopulmonary bypass time	106±54	103±54	ns
Mean aortic cross-clamp time (min)	64±47	63±50	ns

Table (3) Showing operative data in diabetic and non-diabetic patients

Low Cardiac Output							
	No Inotropes	Renal Dopamine	1 Inotrope	2 Inotorpes	3 Inotropes	Maximal dose Inotropic therapy including premacure and levophed	P VALUE
Diabetics No. (%)	113(18.83)	262(43.67)	23(3.83)	182(30.3)	11(1.83)	9(1.5)	0.44
Non diabetics No.(%)	100(16.67)	274(45.67)	26(4.33)	189(31.5)	6(1)	5(0.83)	

Arrhythmias					
	Total	SVT	Cardioversion chemical or electrical	VT/VF requiring cardioversion	Temporary heart block	P VALUE
Diabetics No. (%)	175 (29.67)	120 (20.0)	20 (3.33)	30 (5.00)	5 (0.83)	0.791
Non diabetics No.(%)	168 (28.00)	110 (18.33)	21 (3.50)	31 (5.17)	6 (1.00)	

Infective complications						
	Total	Superficial wound infection	Deep sternal infection	Chest infection	Mediastinitis plorartion	P VALUE
Diabetics No. (%)	89 (14.83)	55	12	10	12	0.0552
Non diabetics No.(%)	70 (11.67)	50	6	8	6	

Table (4) analysis of post operative low cardiac output, types of arrhythmias and overall incidence of infection with no statistical significance detected between the two groups.

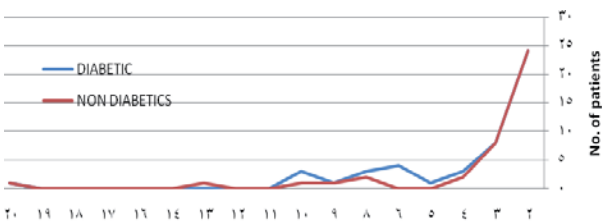


Chart (1) no of patients in each group who remained ventilated more than 24 hrs.

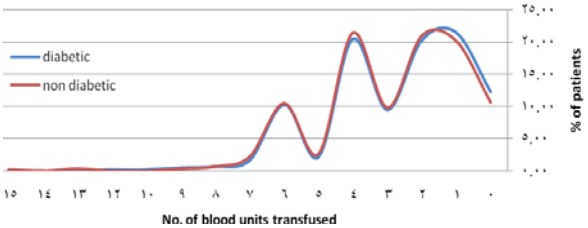


Chart (2) no of blood units transfused per patient in each group.

Postoperative outcome	Diabetics (600)	%	Non-diabetics (600)	%	P-value
Hospital mortality	28	4.67	25.00	4.17	0.07
Postoperative stroke	17	2.83	13.00	2.17	0.33
Rrenal failure dialysis	12	2.00	8.00	1.33	0.05
Mediastinitis & Sternal resuturing	12	2.00	6.00	1.00	0.001
Reexploration for bleeding	172	28.67	141.00	23.50	ns
Blood transfusion needed	535	89.16	512	85.33	0.029

Table (5): Postoperative morbidity and mortality in univariate analysis *(ns1200)*

		Mean	Std. Deviation	Std. Error of Mean	Sig.(2-tailed)
Stay on itu (hours)	Diabetic	46.34	54.147	2.53	0.085
	Non Diabetics	40.88	41.402	1.918	
Hours Ventilated	Diabetic	17.29	32.77	1.531	0.078
	Non diabetics	14.23	18.245	0.842	
Preop Stay (D)	Diabetic	1.69	23.208	0.99	0.628
	Non diabetics	1.02	22.669	0.961	
Post Op Stay (D)	Diabetic	9.03	27.947	1.178	0.624
	Non Diabetics	9.71	17.176	0.723	
Total Hospital Stay (D)	Diabetic	10.75	28.847	1.245	0.957
	Non Diabetics	10.83	18.126	0.776	

Table (6): Postoperative morbidity in univariate analysis*(ns1200)***. d:days***

	OR	95%CI	P-value
Hospital mortality	1.13	(0.62–2.19)	0.698
Deep Sternal infection	3.44	(1.32–6.81) -	0.001
Reoperation for bleeding	1.58	(0.50–1.59)	0.098
Renal failure	1.56	(0.77–4.90)	0.19
Sepsis	1.9	(0.60–2.62)	0.346
Stroke	0.95	(0.71–1.82)	0.76

Table (7) Effect of diabetes on postoperative mortality and morbidities . OR, odds ratio; CI, confidence interval.

Variable	Univariate			Multivariate		
	OR	95% CI	P-value	OR	95% CI	P-value
Female gender	1.6	(0.98–3.00)	0.06	1.81	(0.95–3.09)	0.076
Age ≥ 70 years	0.9	(0.44–1.77)	0.538	0.84	(0.37–1.64)	0.521
Body mass index) 30	1.4	(0.68–2.35)	0.463	1.1	(0.67–2.50)	0.435
Ejection fraction ≤ 35%	2.4	(1.40–4.49)	0.002	2.1	(0.72–2.86)	0.311
Previous M.I.	1.9	(0.89–2.77)	0.117	1.13	0.60–2.11)	0.707
Congestive heart failure	3.01	(1.47–4.72)	0.001	2.35	(0.67–3.74)	0.398
Hemodynamic instability	7.35	(2.13–18.23)	0.001	3.37	(0.69–8.18)	0.173
Intraaortic balloon pump	5.16	(2.36–11.29) -	0.001	4.81	(2.00–11.56)	0.001
Diabetes mellitus	1.59	(0.91–2.76)	0.103	1.12	(0.61–2.06)	0.812
Peripheral vascular disease	3.84	(2.50–6.97)	0.001	2.89	(1.56–5.34)	0.001
Previous stroke	1.72	(0.37–2.91)	0.89	0.98	(0.25–2.17)	0.489
Hypertension	1.86	(1.33–6.34)	0.006	1.29	(1.13–4.65)	0.022
Renal failure	6.67	(3.40–13.06)	0.001	5.71	(2.80–11.67)	0.001
COPD	0.59	(0.14–2.45)	0.467	0.45	(0.10–1.95)	0.288

Table (8): Predictors of hospital mortality in univariate and multivariate analysis
OR, odds ratio; CI, confidence interval; COPD, chronic obstructive pulmonary disease

a steady increase in the incidence. Analysis of the data from the Society of Thoracic Surgeons National Adult Cardiac Database and from the Society of Cardiothoracic Surgeons of Great Britain and Ireland showed an increase in the prevalence of diabetes in patients referred for CABG (21% in 1990 to 33% in 1999, and 18% in 1994 to 23.5% in 2001, respectively) (7,8).

In the present study, we determined the impact of diabetes mellitus on survival after coronary artery bypass grafting. We presented a cohort of nondiabetic and diabetic patients who underwent coronary artery bypass grafting. We compared the same number of diabetic and non diabetic patients referred for CABG. The diabetic patients had a statistically significant younger age, which is consistent with studies demonstrating a more rapidly evolving atherosclerotic progress in diabetic individuals (1). The diabetic patients group had also more females, higher weight, higher incidence of renal impairment, congestive heart failure, infarction, NYHA class III and IV dyspnea and more extensive disease (3 and 4 vessel disease), all factors which are well known for their negative impact on outcome. With the exception of a lower rate of redo procedures, the patients in our series had a similar preoperative risk profile as patients from other reported series. The mean age was lower and the proportion of patients with unstable angina were higher than in most studies. (1,2,3—6,17,18)

Strict metabolic control with insulin infusion after cardiac operation has been followed in our series since it has been demonstrated to reduce the incidence of wound infections in diabetic patients (22),(23). Investigators who have used insulin or GIK for metabolic control in diabetic patients undergoing CABG have presented favorable results (20). In critically ill surgical patients, intensive insulin treatment to achieve strict blood glucose control was found to reduce both morbidity and mortality (21). Furthermore, in diabetic patients with acute myocardial infarction, insulin infusions have been

shown to reduce late mortality (24). The latter study is particularly interesting as it suggests that optimization of metabolic control in the acute phase and during follow-up can enhance long-term survival in diabetic patients. Thus, a sustained strict metabolic control with insulin may prove more important for outcome than intensive insulin treatment during the acute phase in diabetic patients. Considering the impaired long-term survival in diabetic patients after CABG, similar approaches deserve evaluation after cardiac operations.

In the present series, the incidence of morbidity events analyzed were also similar in the two groups by univariate analysis, with only mediastinitis and need for blood transfusion showing a significantly higher incidence in diabetic patients. However, by multivariate analysis, diabetes had only an independent influence on the development of mediastinitis. The studies reported by Filsoufi et al. (4) and Kubal et al. (14) also demonstrated that diabetes had an independent influence on the development of sternal infection.

Post operative cerebrovascular accidents was not significantly higher in diabetic patients, this finding is also in accordance with those of some recent studies (4,14) but against other (1,3). In contrast with studies of Szabo, Rajakaruna and Kubal and their co-workers (1,3,14), we could not identify diabetes as an independent predictor of acute renal failure or prolonged length of stay. Additionally, diabetes was also not associated with increased rate of postoperative myocardial infarction, increased requirement for inotropic or mechanical support, the occurrence of atrial arrhythmia and need for re-exploration for bleeding in our patients in agreement with Fietsam and associates and (25) against Kuan and colleagues (26) .

Our hospital mortality for diabetic patients was (4.67 %), only marginally higher that in non-diabetics (4.17 %) and we could not identify diabetes as an independent predictor of early mortality. It is generally accepted that diabetic individuals subjected to CABG have a higher early mortality, but the influence of diabetes per se on this outcome has been under debate. In the study reported by Thourani et al. (2), the mortality was significantly higher among the diabetic (3.9%) compared to the non-diabetic population (1.6%). The North American Multicenter Registry data of 146,786 patients who underwent CABG surgery in 1997 indicates a 30-day mortality of 3.7% in diabetic patients compared to 2.7% in non-diabetic patients (5). In both studies, and in the studies by Adler (9), Morris (17), and their coworkers, diabetes was found to be an independent predictor of early (in-hospital or 30-day) mortality. However, more recent studies have challenged these findings by reporting more favorable results, crude and adjusted, in diabetic patients undergoing CABG. Szabo et al. (1) , Rajakaruna et al., (3) and Filsoufi et al. (4) reported mortality rates of 2.6%, 2.2% and 2.4%, respectively, in diabetic patients and did not isolate diabetes as an independent predictor of early mortality. In the study reported by Filsoufi et al. (4) , the mortality rate among diabetics decreased significantly, from 3.1% in the period 1998—2002 to 1.0% in 2003— 2005. According to the Society of Cardiothoracic Surgeons of Great Britain and Ireland, in 1997 diabetic patients were twice as likely to die after CABG compared to non-diabetics (5.9% Vs 3.0%), but by 2001 there had been an important reduction in the operative mortality (2.9% Vs 2.2%), practically eliminating diabetes as an additional risk (7) . Cosgrove and associates (19) did not find diabetes to be a predictor of not only hospital mortality but also long-term mortality. Better knowledge of the pathophysiology and improved pre- and perioperative control of the disease may have contributed to this evolution.

Our study has some limitations. It is a retrospective observational study; therefore any conclusions should be limited in their implications. Our database did not provide information to correlate specific types of diabetes, or about blood glucose control on admission. Finally, there is no intermediate or long term follow up.

On conclusion, excellent results following CABG can be expected in diabetic patients with a similar mortality compared to nondiabetic patients. Also, the rate of major postoperative morbidities was also not significantly increased with the exception of mediatinitis, which occurred with a higher rate in diabetic patients. Diabetes should not be considered as a risk factor in the early outcome of patients undergoing CABG.

References

1. Szabo Z, Hakanson E, Svedjeholm R. Early posto perative outcome and medium-term survival in 540 diabetic and 2239 non-diabetic patients undergoing coronary artery bypass grafting. Ann Thorac Surg 2002;74:712— 9.
2. Thourani VH, Weintraub WS, Stein B, et al. Influence of diabetes mellitus on early and late outcome after coronary artery bypass grafting. Ann Thorac Surg 1999;67:1045—52.
3. Rajakaruna C, Rogers CA, Suranimala C, et al. The effect of diabetes mellitus on patients undergoing coronary surgery: a risk-adjusted analysis. J Thorac Cardiovasc Surg 2006;132:8 02—10.
4. Filsoufi F, Rahmanian PB, Castillo JG, et al. Diabetes is not a risk factor for hospital mortality following contemporary coronary artery bypass grafting. Interact Cardiovasc Thorac Surg 2007; 6:753— 8.

5. Carson JL, Scholz PM, Chen AY, et al. Diabetes mellitus increase short -term mortality and morbidity in patients undergoing coronary artery bypass graft surgery. J Am Coll Cardiol 2002;40:418— 23.
6. Flaherty JD, Davidson CJ. Diabetes and coronary revascularization. JAMA 2005;293:1501—8.
7. Keogh B, Kinsman R. Coronary artery bypass surgery. In: Keogh B, Kinsman R, editors. The Society of Cardiothoracic Surgeons of Great Britain and Ireland. National Adult Cardiac Surgical Database Report 2000—2001. Oxfordshire : Dendrite Clinical Systems Ltd; 2002. p. 72—163.
8. Ferguson Jr TB, Hamm ill BG, Peterson ED, et al. A decade of change-risk profiles and outcomes for isolated coronary artery bypass grafting procedures, 1990-1999: a report from the STS National Database Committee and the Duke Clinic al Research Institute. Society of Thoracic Surgeons. Ann Thorac Surg 2002;73:480— 9.
9. Adler DS, Goldman L, O'Neil A, et al. Coronary heart disease. Long-term survival of more than 2,000 patients after coronary artery bypass grafting. Am J Cardiol 1986;58:195–202.
10. Seven- year outcome in the Bypass Angioplasty Revascularization Investigation (BARI) by treatment and diabetic status. J Am Coll Cardiol 2000;35:112 2—9.
11. Abiz aid A, Costa MA, Cent emero M, et al .Arterial Revascularization therapy Study Group. Clinical and economic impact of diabetes mellitus on percutaneous and surgical treatment of multivessel coronary disease patients: insights from the Arterial Revascularization Therapy Study (ARTS) trial. Circulation 2001; 104:533—8.
12. Steinbrook R. Facing the diabetes epidemic — mandatory reporting of glycosylated hemoglobin values in New York City. N Engl J Med 2006; 354:545–548.
13. Kannel WB, McGee DL et al. Diabetes and cardiovascular risk factors: the Framingham study. Circulation 1979;59:8–13.
14. Kubal C., Srinivasan A., Grayson A et al. Effect of Risk-Adjusted Diabetes on Mortality and Morbidity after Coronary Artery Bypass Surgery. Ann. Thorac. Surg., May 2005; 79: 1570 - 1576.
15. Waller BF, Palumbo PJ, Lie JT, et al. Status of the coronary arteries at necropsy in diabetes mellitus with onset after age 30 years. Analysis of 229 diabetic patients with and without clinical evidence of coronary heart disease and comparison to 183 control subjects. Am J Med 1980;69:498–506.
16. Raman M, Nesto RW. Heart disease in diabetes mellitus. Endocrinol Metab Clin North Am 1996;25:425–438.
17. Morris JJ, Smith LR, Jones RH, et al. Influence of diabetes and mammary artery grafting on survival after coronarybypass. Circulation 1991;84(Suppl 3):275– 84.
18. Corbineau H, Lebreton H, Langanay T, et al.. Prospective evaluation of coronary arteries: influence on operative risk in coronary artery surgery. Eur J Cardiothorac Surg 1999;16:429–34.
19. Cosgrove DM, Loop FD, Lytle BW, et al. Determinants of 10-year survival after primary myocardial evascularization. Ann Surg 1985;202:480–90.
20. Weintraub WS, Kosinski A, Culler S. Comparison of outcome after coronary angioplasty and coronary surgery for multivessel coronary artery disease in persons with diabetes. Am Heart J 1999;138:S394–9.
21. Lazar HL, Chipkin S, Philippides G, et al. Glucose-insulin-potassium solutions improve outcomes in diabetics who have coronary artery operations. Ann Thorac Surg 2000;70:145–50.
22. Van den Berghe G, Wouters P, Weekers F, et al. Intensive insulin therapy in critically ill patients. N Engl J Med 2001; 345:1359–67.
23. Zerr KJ, Furnary AP, Grunkemeier GL et al. Glucose control lowers the risk of wound infection in diabetics after open heart operations. Ann Thorac Surg 1997;63:356–61.
24. Malmberg K. Prospective randomised study of intensive insulin treatment on long term survival after acute myocardial infarction in patients with diabetes mellitus. DIGAMI (Diabetes Mellitus, Insulin Glucose Infusion in Acute Myocardial Infarction) Study Group. BMJ 1997;314:1512–5.
25. bFietsam R Jr, Bassett J, Glover JL. Complications of coronary artery surgery in diabetic patients. Am Surg 1991;57:551–7.
26. Kuan P, Bernstein SB, Ellestad MH. Coronary artery bypass surgery morbidity. J Am Coll Cardiol 1994;3:1391–7.

REPAIR OF ISCHEMIC MITRAL REGURGITATION WITH OR WITHOUT RING ANNULOPLASTY

Mohamed Abdel-aziz Sharawi MD,
Mohamed Shafik MD,
Hassan Abbady MD,
Mohamed Abdel-baset MD,
Zakareya El Mashtory MD.

Introduction: **Surgery for mitral regurgitation of ischemic origin(IMR) is not yet standardized. there is general agreement that the presence of IMR has a negative influence on survival after completed myocardial infarction(MI) ,the necessity of correction of IMR is questioned, and the benefit of mitral valve(MV)repair versus replacement is debated. Mitral regurgitation(MR) was defined as being ischemic in origin as evidenced by clinical data and echocardiographic finding.**

Objective: **ischemic mitral regurgitation (MR) jets can make repair challenging; edge - to - edge (Alfieri) repair augments the repertoire of repair techniques. The aim of this study is to report our results with the edge - to - edge (Alfieri) repair and compare this result with repair by ring annulopasty during coronary artery bypass graft operation.**

Methods: **Between December 2003 and July 2007, 20 patients underwent mitral value repair and coronary artery bypass graft. These patients are classified into two groups according to the type of repair of the mitral value. Group one contain 10 patients which underwent coronary artery by pass graft and mitral value repair using edge - to - edge (Alfieri) repair, the age of these patients ranged from 58-65 years(mean age =57.9 ±5.76). Eight patients were males and two females. The left ventricular ejection fraction ranged from "41-65%" (mean=47.0 ±9.0).Number of grafts ranged from 2-4 grafts. Pre-operative mitral regurgitation was 4+in8 patients and 3+in two patients. The patients were submitted to double orifice repair in a standardized fashion suturing the middle portions of both leaflets. Group two contain 10 patients which underwent coronary artery bypass graft and mitral value repair using ring annuloplasty, the age of these patients ranged from 48-63 years(mean age =54.9 ±5.3). Five patient were males and five were females. The left ventricular ejection fraction ranged from(36-55%,mean= 43.2 ±6.4). Number of grafts ranged from 2-4 grafts. Pre-operative mitral regurgitation was +4 in 7 patients and +3 in 3 patients. These patients were submitted to mitral valve repair by using Carpenter Edward Ring size ''28". Postoperative follow up mitral regurgitation were assessed using trans-thoracic echocardiograms.**

Results: **Hospital mortality occurred in two cases , one case in group I, due to low cardiac output and heart failure 3 years after operation and one case in group II, 2 months after surgical repair unrelated to the type of repair but was related to mediastinitis . Follow up between 2-43 months (mean= 21.9±10.3 months for the 2 groups).In group one mitral stenosis was never observed after correction, immediate post operative echocardiography showed that mitral regurgitation was significantly improved in all patients compared with the pre-operative, but in one patient MR increase to become grade 3/4 after 3 years postoperatively. In group two postoperative echocardiography showed that mitral regur-**

Accepted for publication Jun , 2008

Address reprint request to : Dr MOHAMED ABDEL-AZIZ SHARAWI

Departement of cardiothoracic surgery, Al azharuniversity , egypt

Email : Jegyptscts@gmail.com

Codex : 04 / cord / 82 / 0806

gitation was significantly improved in all Patient from grade 3,4/4 to be grade 1,2/4 postoperatively. ***Conclusion:*** **Correction of ischemic mitral regurgitation through repair either with or without ring annuloplasty provides a good survival rate. Immediate and mid term results of this simple ''edge-to-edge'' ''Alfieri'' repair technique are encouraging and satisfactory . The technique is simple compared with ring annuloplasty and rapidly feasible even when mitral exposure is suboptimal . Alfieri mitral repair can be used in ischemic settings with a low risk of creating mitral stenosis . However in ischemic mitral regurgitation, steadily increasing prevalence of moderately severe regurgitation of edge - to - edge repair suggests that there is still room for further improvement in the management of ischemic MR .**

Surgery for mitral regurgitation of ischemic origin(IMR) is not yet standardized. Whereas there is general agreement that the presence of IMR has a negative influence on survival after completed myocardial infarction(MI) (9-14),the necessity of correction of IMR is questioned(2-20),and the benefit of mitral valve(MV)repair versus replacement is debated(5-11) Mitral regurgitation(MR) was defined as being ischemic in origin as evidenced by clinical data and echocardiographic finding. Mitral leaflets and chordae were normal, and regurgitation was the result of completed myocardial infarction, which is always present in the history of each patient. The posterior papillary muscle(PM) was rarely infracted. In most cases both PMs were normal (function MR) and MR was caused by failure in coaptation of mitral leaflets because of their restricted motion. This could be caused by either global left ventricular (LV) dilatation with posterolateral apical displacement of both PMs or local malfunction of the LV wall adjacent to the posterior PM. The regurgitant jet was often central. However when only the posterior PM was involved, an asymmetric pattern of MV deformation from medial to lateral side of the MV could be present, showing funnel-shaped deformity of medial side and prolapse like deformity on the lateral side. This might develop as a result of preserved or excessive motion of the nontethered lateral side of the anterior leaflet(13). As a consequence, in some cases, the regurgitant jet was double, one central and one lateral " Calafiore et al "(4).

The technique of mitral valve reconstruction were originally developed and systematically applied by Carpentier et al(4) starting in 1970. These techniques are now well-established, with long-term follow-up confirming satisfactory results when applied for properly chosen patient. No need for anticoagulation, avoidance of thromboembolism and preservation chordal function are obvious advantages of mitral valve repair over replacement(5-7-8-10-19).

Since 1991. A simple surgical procedure to correct miral valve prolapse, the edge-to- edge technique, which restores valvular competence by anchoring the free edge of the prolapsing leaflet to the corresponding free edge of the opposing leaflet. Although originally used to correct prolapsing lesions only, the technique has been effectively extended to correction of MR due to restricted leaflet motion secondary to rheumatic or ischemic disease. Although the standared mitral valve repair technique, include leaflet resection, leaflet advancement, chordal shortening and insertion of an annuloplasty ring are usually sufficient, the edge-to-edge technique has been advocated for eliminating residual MR that occurs after complex repair of the regurgitation(15).

METHODS

Patients:Between December 2003 and July 2007, 20 patients with mitral regurgitation and ischemic heart disease were operated on at our institution. In group I which include 10 patients, mitral valve repair using the edge-to-edge technique and bypass grafting to the target vessels according to the lesion in the coronary vessels. The age of these patients ranged from 58-65 years . 8 patients were male and 2 were female. 4 patients were in NYHA functional class II and 6 patients were in NYHA class III. All patients were in sinus rhythm. In group II which include 10 patients . mitral valve repair using Carpentier Edwarde ring annuloplasty and bypass grafting to the target vessels according to the lesion in the coronary vessels. The age of these patients ranged from 48-63 years . Five paients were male and five were female. 2 patients were in NYHA functional class II and 8 patients were in NYHA class III, and all patients were in sinus rhythm.

Etiology of the disease was ischemic in all cases. Mitral regurgitation was graded on a scale of O to 4 based on echocardiography measurement. The miral regurgitation was assessed using preoperative trans-thoracic echocardiography (TTE) and postoperative TTE. Left ventricular ejection fraction (EF) was between 41%-65% in group I preoperatively and was between 36%-55% in group II. Coronary angiographies was carried out in all patients and coexisted coronary artery disease requiring myocardial revascularizatin was done. The number of grafts ranged between 2-4 grafts . Left internal mammary artery was used in patients with EF more than 45%

in both groups, and long saphenous vien graft was used for the rest of patients. Follow up data were acquired using patients chart review and postoperative TTE. Serial TTSs were then performed at hospital discharge,within 3 months and every 6 months after surgery.

Surgical Technique

A conventional midline sternotomy was the approach used for all patients. Cardiopulmonary bypass was instituted with bicaval and aortic cannulation and systemic hypothermia to 30°c. Myocardial protection was achieved by intermitted cold blood cardioplegia in an antegrade fashion. Distal anastomosis was done to the right coronary artery or posterior descending artery and the branches of circumflex artery "Obtuse marginal" arteries. These were done first using long saphenous vien and anastomosis done by polypropylene 7/0 suture. Then the mitral valve was approached through the left atrium, with the incision done in the interatrial groove. An intra operative insepection of the valve was carried out to confirm preoperative echocardiographic findings and to identify any additional lesion. The edg-to-edge

		Group I Allfieri Rep. (n=10)	Group II Ring Rep. (n=10)
1-Age/years	Mean	57.9	54.9
	S.D.	5.76	5.30
Independent (t-test)		t= 1.212	p >0.05 (Insignificant)
2-Sex	Male	8	5
	Female	2	5
χ^2		0.88	P > 0.05 (Insignificant)
3-Diabetes		8	7
χ^2		1.00	P > 0.05 (Insignificant)
4-Smoking		8	5
χ^2		0.88	P > 0.05 (Insignificant)
5-Hypertension		5	6
χ^2		1.00	P > 0.05 (Insignificant)
6-Dyslipidemia		7	8
χ^2		0.88	P > 0.05 (Insignificant)
7-COPD		1	1
χ^2		0.45	P >0.05 (Insignificant)
8- Preoperative LVEF%	Mean	47.0	43.2
	S.D.	9.0	6.4
Independent (t-test)		t= 1.086	p >0.05 (Insignificant)
9-Grade of MR	III/ IV	2	3
	IV/ IV	8	7
χ^2		1.00	P > 0.05 (Insignificant)

Table I : Preoperative demographic data:

repair was performed in correspondence with the site of origin of regurgitant jet, centrally (in case of central jet) or posteromedial(when the regurgitant jet was through posterior commissure). Following the identification of the prolapsing portion of a leaflet, this is resuspended by suturing its free edge to the corresponding edge of the opposing leaflet, usually with a figure of eight stitch using 4/0 polypropylene suture, additional mattress suture reinforced with pericardial pledgets are usually placed in case of thin leafles. When the prolapse is in the middle portion of a leaflet, the correction creates a double orifice valve.

After testing the valve competence, left atrium was closed by 3/0 polypropylene suture. These was done in group I of patients. In group II repair was done by Carpentier-Edwarde ring size 28 in all patients in standared technique. Then the left atrium closed. In all cases, valve competence was evaluated by saline injection in the left ventricle throw the mitral valve. The left anterior descending coronary artery was anastomosed with LAD by using 7/0 polypropylene suture this was done in 8 patients in groupe I and in 6 patients in group II. The LAD was anastomosed with SVG to the rest of patients by the same suture. After that deareation was done and the aortic clamp removed. Proximal anastomosis done in the ascending aorta by using a side-clamp and suture used was polypropylene 6/0 suture,table(2).

Assessment of Repair

Preoperative and postoperative trans-thoracic echocardiography studies are used to assess MR and left ventricular function. Mitral regurgitation was graded as O for no regurgitation 1+ for mild, 2+ for moderate, 3+ for moderately severe, and 4+ for severe regurgitation.

Follow-up

Follow-up information was obtained from all patients from December 2003 to July 2007. The mean period of follow up was.. months. Data were collected either through out-patient visit, including echocardiography examination or the referring physician.

Data Analysis:

Data entry and analysis were done by using SPSS software program (version 12.0).

RESULTS

Mortality

operative death was defined as any death occurring within 30 days of operation or during the initial hospitalization. There was one death in group one, 1 patient died 3years after repair by Alfieri stitch due to low cardiac out put and heart failure, the last echocardiography done to this patient showed increase in the degree of mitral regurgitation from 2+ early postoperatively to be-

		Group I Allfieri Rep. (n=10)	Group II Ring Rep. (n=10)
X-Clamp T/min.	Mean	59.60	73.40
	S.D.	13.13	4.47
Independent (t-test)		t= 3.145	p <0.05(Significant)
Bypass T. /min.	Mean	96.80	101.01
	S.D.	13.60	6.06
Independent (t-test)		t=0.912	p>0.05 (Insignificant)
Distal Anastomosis	2 gr.	4	1
	3 gr.	4	9
	4 gr.	2	0
$\chi 2$		5.723	P > 0.05(Insignificant)

Table II: Operative data:

come 4+ just before deterioration of his condition before dying. In group II one patient died after 2 months due to mediastinitis.

The patient was discharged from the hospital in good general condition and was re-admitted again after 45 days by deep sternal wound infection a great effort was done to control infection including all measure and all these trial are failed, the patient develop low cardiac out put and multisystem failure and died 15 days from admission.

Morbidity

The postoperative course was generally smooth and major complication were rarely encountered. In group one 6 patient with EF between40% and 45% were in need for inotropic support in the form of Adrenaline "dose 100 ugm/kg/min" and vasodilator Tridil" dose 1-2-mg/kgm/min" the other 4 patients with EF above 45% minimal dose of support were required.In group two 5 patient with EF between 35% and 45% need support with the same dose of group one and the other 5 patient with EF between 45% and 55% need minimal support as

			Group I Allfieri Rep. (n=10)	Group II Ring Rep. (n=10)
1-Mechanical Ventilation/hour		Mean	7.9	10.9
		S.D.	1.3	0.99
Independent (t-test)			t= 5.834	p <0.05 (Significant)
2-Inotropic Support	No support		0	0
	Minimal support		4	5
	High support		6	5
	IABP		0	0
	χ^2		0.00	P > 0.05 (Insignificant)
3- Reoperation for Bleeding			1	1
	χ^2		0.56	P > 0.05 (Insignificant)
4- Arrhythmia			2	1
	χ^2		0.37	P > 0.05 (Insignificant)
5- Wound infection		Superficial	1	2
		Deep	0	0
	χ^2		0.37	P > 0.05 (Insignificant)
6- Mortality			1	1
	χ^2		0.56	P > 0.05 (Insignificant)
7-Follow Up/month		Mean	15.5	28.3
		S.D.	6.94	9.34
Independent (t-test)			t= 3.476	p <0.05 (Significant)

Table III : Postoperative data in the two studied groups:

in group I. No need for intra-aortic balloon pump in both group,table(3).

Echocardiographic Data

The degree of correction of MR evident on preoperative echocardiography compared with postoperative echocardiography data was statistically significant. In group I, the degree of MR were 4+ in 8 patients and 3+ in 2 patients, this were improved to become 1+ in 6 patients and 2+ in 4 patients in the immediate postoperative . But latter on echocardiography showed that the degree of MR start to increase to become 3+ in 2 patients. In group II, the degree of MR were 4+ in 7 patients, and 3+ in 3 patients. Immediate and midterm follow up show the MR improved to become 2+ in 2 patients, 1+ in 7 patients and no regurgitation 0+ in one patient. The patient who die 2 month after repair, immediate follow up shows that the MR was 1+ before died. No patient developed mitral stenosis on postoperative follow up echocardiography. The EF improved from 41-65% "mean " preoperatively to become 48-68% "mean " postoperatively in group I. In group II EF improved from 35-53%"mean " to become 43-55% postoperatively at the midterm follow up, table(4).

		Group I Allfieri Rep. (n=10)	Group II Ring Rep. (n=10)
Postoperative EF%	Mean	52.8	49.40
	S.D.	7.65	3.09
Independent (t-test)		t= 1.302	p >0.05 (Insignificant)
Postoperative MR	No Regurge	0	1
	I/ IV	6	7
	II/ IV	4	2
	III/IV	0	0
$\chi 2$		1.47	P > 0.05 (Insignificant)

Table IV : Postoperative Echocardiographic data:

DISCUSSION

Mitral regurgitation that follows completed MI has an incidence of approximately 20%(14), and it is higher in patients with previous inferior MI. In most cases, the mechanism of IMR is related to local LV remodeling, with PM displacement producing apical tethering or tenting of the leaflet (restricted systolic leaflet motion). When global LV dilation occurs, both PMs are displaced posteriorly,laterally and apically. As a consequence, the tethering forces on both leaflets increase, reducing their movement(4). The technique developed and popularized by Carpentier are the basis of the conservative approach to mitral valve repair and are used at our institution. The edge-to-edge technique has been reserved to less than one third of the global population of patients wih severe isolated MR, we selectively applied it when the incompetence was due to unfavorable lesion such as: prolapse of the anterior leaflet, prolapse of the posterior leaflet with calcified posterior annulus, prolapse in the commissural area, and regurgitation secondary to restricted leaflet motion or to endocarditic lesion. Intersetingly, patients with ischemic MR were far more likely to develop 3+ or 4+ MR than those with dilated cardiomyopathy, or as in the series of Alfieri and colleagues and patients with myxometous disease(1).

Calafiore and colleagues found that CABG alone did not avoid early progression of IMR to more severe degrees, whereas MV surgery stabilized the amount of residual MR(4).

Long-term evaluation has proved the results are less satisfactory when rheumatic disease is the cause of mirtral regurgitation(7),or when ischemic heart disease is responsible for the valve dysfunction(16).

The central double-orifice repair is technically simple, but careful evaluation of the mitral valve is always mandatory, and considerable judgment is required in selecting the right site for the approximation of the leaflets

and the appropriate extension of the suture. The surgeon should aim at the complete elimination of the MR, minimizing the reduction of valve area. Inadequate application of the technique may result in residual MR or in mitral stenosis, Alfieri et al.(1)

Fuci et al, have emphasizied that only the ischemic etiology of mitral insufficiency was associated with a significantly higher re-operation rate during follow-up. This finding undoubtedly reflects the complexity of the mechanisms responsible for mitral dysfunction and the progressive nature of the disease(12).

The progression of MR postoperatively could be related to poor durability of the edge-to-edge technique due to high stress of the leaflet repair or progressive annular dilatation.

Correction of anterior leaflet prolapse is more difficult than reconstruction of the posterior leaflet and it has been associated with less favorable outcome when triangular resection or chordal shortening were used . Although satisfactory results have been obtained with chordal transposition(12-18), or artificial chordal replacement (17-18) , both technique are complex and undoubtedly surgical demanding (6).

The edge-to-edge technique appears to be a simple and effective solution for the above mentioned complex situation. We used it for the correction of anterior leaflet prolapse, since it is easier to carry out than other technique and it allow good result(15).

The edge-to-edge technique can be carried out in a short period of time as demonstrated by the duration of cardiopulmonary bypass and aortic cross clamping time study. This is particularly convenient when associated procedures are needed and in patients with poor preoperative condition or with advanced left ventricular dysfunction. Due to its simplicity, the procedure can be reproducible with predictable result even when the exposure of the valve is suboptimal due to small left atrium.

Higher failure rates for the edge-to-edge technique without ring annuloplasty were anticipated on the basis of a recent analysis of a group of 260 patient submitted to the double orifice technique, in which those who received an annuloplasty that a 92% -+ 3.4% freedom from reoperation at 5 year compared with a 70% -+ 15% freedom from reoperation in those who had ringless repair (p=.02) (1).

CONCLUSION

It is evidence that untreated IMR may worsen the outcome in patients who need myocardial revascularization. Moderate-to-severe and severe IMR need to be corrected, inasmuch as today we have appropriate surgical means for this purpose. The present study confirm the favorable results obtained with the central double-orifice technique and also demonstrates the durability of the repair at least up to 4 years of follow-up. The edge-to-edge repair is applicable to lesion of any etiology and it is effective not only when MR is due to leaflet prolapse, but also with other types of valve dysfunction. Eventually, the concept introduced by this type of repair can open the perspective of percutaneous correction of MR. Finally, these data have to be considered as preliminary result, which to be confirmed by a larger number of patients and a significantly longer follow-up.

REFERENCES

1. Alfieri O, Maisano F, DeBonis M, Stefano P, Torracca L, Oppizzi M. The double-orifice technique in mitral valve repair: Asimple solution for complex problems. J Thorac Cardiovasc Surg 2001; 122: 674-81.
2. Arcidi JM Jr, Hebeler RF, Craver JM, et al. Treatment of moderate mitral regurgitation and coronary disease by coronary bypass alone. J Thorac Cardiovasc Surg 1988; 95: 951-9.
3. Carpentier A. (1983) Cardiac valve surgery-the French correction. J Thorac Cardio-vasc Surg 1983; 86: 323-337.
4. Calafiore AM, Mauro M, Gallina S, Giammaro G, Iaco AL, Teodori G, Tavarozzi I. Mitral valve surgery for chronic ischemic mitral regurgitation. Ann Thorac Surg 2004; 77: 1989-97.
5. Cohen LH, Couper GS, Arank SF, Rizzo RJ, Kinchla NM, Collins JJ (1994) : Long-term results of mitral valve reconstruction for regurgitation of the myxomatous mirtral valve. J Thorac Cardiovasc Surg 107: 143-151.
6. David TE, Armstrong S, Sun Z, Daniel L. Late results of mitral valve repair for mitral regurgitation due to degenerative disease. Ann Thorac Surg 1993; 56: 7-14.
7. Deloche A, Jebara V, Relland JYM, Chavaud S, Fabiani JN, Perier P, Dreyfus G, Mihaileanu, Carpentier A, valve repair with Carpentier technique. The second decade. J Thorac Cardiovasc surg 1990; 99: 990-1002.
8. Duran CG, Revuelta JM, Gaite L, Alonso C, Feitas MG, (1988): Stability of mitral reconstruction surgery at 10-12 years for predominantly rheumatic valvular disease. Circulation 78 (Suppl): 191-196.
9. Ellis SG, Whitlow PL, Raymond RE, Schneider JP. Impact of miral regurgitation on long-term survival after percutaneous coronary intervention. Am J Cardiol 2002; 89: 315-8.
10. Galloway AC, Colvin SB, Bauman FG, Esposito R, Vohra R, Harty S, Freedberg R, Kronzon I, Spencer FC (1988) : Long-term results of mitral valve reconstruction with Carpentier techniques in 148 patients with mitral insufficiency. Circulation 78 (suppl) 197-205.
11. Gillinov AM, Cosgrove DM, Blackstone EH et al. Durability of mitral valve repair for degenerative disease. J Thorac Cardiovasc Surg 1998; 116: 734-43.
12. Fucci C, Sandrelli L, Pardini A, Torracca L, Ferrari M, Alfieri O, Improved results with mitral valve repair using

new surgical techniques. Eur J Cardio-Thorac Surg 1995; 9: 621-627.
13. Kwan J, Shiota T, Agler DA, et al. Geometric differences of the mitral apparatus between ischemic and dilated cardiomyopathy with significant mitral regurgitation: real-time three-dimensional echocardiography study. Circulation 2003; 107: 1135-40.
14. Lamas GA, Mitchell GF, Flaker GC, et al. Clinical significance of mitral regurgitation after acute myocardial infarction. Circulation 1997; 96: 827-33.
15. Maisano F, Torracca L, Oppizzi M, Stefano PL, D Addario G, LaCanna G, Zogno M, Alfieri O. The edge-to-edge technique: a simplified method to correct mitral insufficiency. Eur J Cardiothorac Surg 13 (1998) 240-246 .
16. Rankin JS, Freneley MP, Hickey StJ, Lawrence HM, Wechsler AS, Floyd RD, Rene JG, Skelton TN, Califf RM, Lowe JF, Sabiston DC (1988) A clinical comparison of mitral valve repair versus replacement in ischemic mitral regurgitation. J Thorac Cardiovasc Surg 95: 165-177.
17. Sousa Uva M, Dreyfus G, Rescigno G, Al Aile N, Mascagni R, La Marra M, Pouillart F, Pargaonkar S, Palsky E, raffoul R, Scorsin M, Noera G, Lessana A. surgical treatment of asymptomatic and mildly symptomatic mitral regurgitation. J Thorac Cardiovasc Surg 1996; 112: 1240-9.
18. Samedira NG, Selman R, Gosgrove DM, McCarthy PM, Lytle BW, Taylor PC, Apperson-Hansen C, Stewart RW, Loop FD. Repair of anterior leaflet prolapse:chordal transfer is superior to chordal shortening. J Thorac Cardiovasc surg 1996; 112: 287-92.
19. Spencer FC,Colvin SB, Culliford AT, Isom OW (1985) : Experiences with the Carpentier technique for mitral valve reconsruction in 103 patients (1980-1985). J Thorac Cardiovasc Surg 90: 341-350.
20. Tolis JA, Korkolis DP, Kopf GS, Elefteriades JA. Revascularization alone (without mitral valve repair) suffices in patients with advanced ischemic cardiomyopathy, and mild-to-moderate mitral regurgitation. Ann Thorac Surg 2002; 74: 1476-81.

EFFECT OF PROSTHETIC VALVE SIZE ON HAEMODYNAMICS OF ADULTS AFTER MITRAL VALVE REPLACEMENT

Noureldin Noaman Gwely, MD

Background: **Mitral valve surgery does not allow annular enlargement, so the surgeon implants a small size prosthesis obligatory. This study was done to detect the changes which may occur in the haemodynamics of adults after implantation of different mitral prosthetic valve sizes (St. Jude type) and their relation to different body surface areas (BSA) and to the morbidity and mortality rates.**

Methods: **This is a prospective study which consists of 2 groups: group A included 45 patients with MVR by prosthesis ≤ 25 mm and group B included 45 patients with MVR by prosthesis > 25 mm. All patients were assessed clinically and by echocardiography concentrating upon ejection fraction (EF) and the pressure gradient across the mitral valve (PG across MV) as parameters of comparison. All investigations were done preoperatively (preop.), early postoperatively (early postop.) and 6 months postoperatively (6m postop.).**

Results: **There were significant changes within each group as regard all parameters, as regard the changes of the mean NYHA functional class, the changes of the mean EF and the changes of the mean PG across MV ($P < 0.001$). Also, in comparison between both groups, the improvement was more in group B, we found significant changes 6 m postop. as regard the changes in the mean EF, $P < 0.001$ but $P = 0.023$ in early postop., also there were more improvement of the mean PG across MV in group B in the early postop. ($P = 0.031$) which become significant 6m postop. ($P = 0.004$). In correlation between BSA and changes of the mean PG across MV after implantation of different prosthetic sizes, there were high PG across MV with implantation of small prosthetic size in the cases with large BSA > 1.5 m2. The mean PG across MV (mmHg) was 7.92 ± 0.88 and 8.88 ± 1.29 after 6m with size 23 mm in comparison to 4.33 ± 1.07 and 4.22 ± 1.09 with the size 27 mm in the patients having BSA 1.51 – 1.8 and 1.81 – 2.2 m2 respectively. Also, the mean PG across MV (mmHg) was 6.60 ± 1.11 and 7.18 ± 1.11 after 6m with size 25 mm in comparison to 4.60 ± 1.11 and 4.11 ± 1.21 with size 29 mm in the patients having BSA 1.51 – 1.8 and 1.81 – 2.2 m2 respectively. Also, mortalities were 3 cases in group A and only one case in group B and 8 morbidities in group A and only 3 cases in group B and their analysis provided that these cases had a large BSA > 1.8 and small prosthetic valve size indicated that small valve size in large BSA is a risk factor for more morbidity and mortality.**

Conclusion: **We conclude that there is improvement of the haemodynamics of adults after replacement of mitral prosthetic valve especially with valve size > 25 mm. With small size ≤ 25 mm, especially in patients with BSA > 1.5 there is less improvement of haemdynamics with residual PG across the valve which carry high risk of morbidity and mortality.**

Accepted for publication Aug 2008

Address reprint request to Dr Noureldin Noaman . Department of Cardio-thoracic Surgery Mansoura University

E-mail: dr.noureldin_noaman@yahoo.com

Codex :04 / cord /83 /0808

Mitral valve replacement (MVR) for rheumatic mitral valve disease is the treatment of choice and timing of surgery is of crucial importance (1).

MVR carries mostly good results and small prosthetic valve can present a problem when the patients haemodynamic status worsens after surgery (2). Mitral valve surgery does not allow annular enlargement as in aortic position, so implantation of a small prosthetic size may affect the haemodynamic performance of the adult patient (3).

The target of any cardiac surgeon is to implant the proper mitral valve prosthetic size (4), but some surgeons may obligatory implant a small sized mitral valve prosthesis ≤ 25 mm in an adult patient to achieve a proper matching (5). Haemodynamics performance of the patients either their clinical status or their echocardiographic finding will give an idea about the changes that may accompany implantation of small sized mitral valve prosthesis (6).

Aim of this study is to detect the changes which may occur in the haemodynamics of adults after implantation of different mitral prosthetic valve sizes and their relation to different body surface area (BSA) and to detect the safety of implantation of small prosthetic size ≤ 25 mm in adults and their relation to the morbidity and mortality rates.

Methods

This is a prospective study which was done in the Cardiothoracic Surgery Department, Mansoura Faculty of Medicine between January 2005 and December 2007.

Ninety consecutive patients who underwent only MVR were selected, these patients were divided into 2 groups: group A included 45 patients with MVR by prosthesis ≤ 25 mm and group B included 45 patients with MVR by prosthesis > 25 mm.

Inclusion criteria included adult patients > 18 years with double mitral valve lesions (mitral stenosis and regurge "DM") who underwent MVR with St. Jude bileaflet prosthetic valves. Patients with other than these criteria were excluded.

Preoperative preparation

All patients were submitted for careful history taking including the symptomatology, NYHA functional class, clinical examination including body surface area (BSA) and laboratory investigations including full blood picture, ESR, liver and renal function tests and coagulation profile.

Chest x-rays were done for all patients to detect the cardiothoracic ratio, chamber enlargement and pulmonary congestion.

Also ECG was routinely done for all patients to detect any abnormalities especially AF. Careful transthoracic echocardiography (TTE) was done for all patients to confirm the diagnosis, to measure chamber dimension and to assess left ventricular performance especially ejection fraction (EF) and the pressure gradient across the mitral valve (PG across MV) as parameters of comparison.

Operative technique

All patients were operated electively, the heart was approached through a classic median sternotomy in all patients, with aortic and bicaval cannulation and cardiopulmonary bypass as routinely done using hypothermia (28ºC) and blood cardioplagia.

Approach was done through left atriotomy and MVR was done using St. Jude bileaflet valve prosthesis. Suturing of the valves were done using interrupted Tichron 2/0 then closure of the left atriotomy with deairing by left atrial and aortic root venting were done.

Postoperatively

All patients were transported to ICU with mechanical ventilation and inotropic support. All patients had the same examinations and investigation as preoperative before discharge and after 6 months.

Statistical analysis

Data were analyzed using SPSS (Statistical Package for Social Sciences) version 10. Qualitative data were presented as number and percent. Quantitative data were tested for normality by Kolmogrov-Smirnov test. Normally distributed data were presented as mean ± SD. Paired t-test was used for comparison within groups. Student t-test was used to compare between two groups. P value < 0.05 was considered to be statistically significant and P value < 0.001 was considered to be statistically highly significant and P value > 0.05 was considered non significant.

Results

The preoperative patients data of both groups, group A (45 patients) with MVR ≤ 25 mm and group B (45 patients) with MVR > 25 mm are shown in table 1.

Parameter	Group A (45)	Group B (45)	t-test	P value
Age (mean) years	31.84 ± 6.09	30.16 ± 6.15	1.309	0.194 NS
Sex:				
Male	12 (26.7%)	21 (46.7%)		
Female	33 (73.3%)	24 (53.3%)		
BSA (mean) m^2	1.658 ± 0.118	1.667 ± 0.117	0.360	0.720 NS
Symptomatology:				
Recurrent chest infection	13	15		
Hemoptysis	6	8		
Dyspnea	24	23		
Palpitation	16	20		
Fatigue	13	17		
NYHA functional class				
I	0 (0%)	2 (4.44%)		
II	6 (13.33%)	5 (11.11%)		
III	25 (55.56%)	25 (55.56%)		
IV	14 (31.11%)	13 (28.89%)		
Mean	3.18 ± 0.65	3.09 ± 0.76	0.595	0.554 NS
EchocardiographyEF(mean) %	47.42 ± 4.05	50.13 ± 4.89	1.422	0.131 NS
PG across MV (mean) mmHg	14.20 ± 2.56	13.98 ± 2.37	0.427	0.670 NS

Table (1): Preoperative data of the patients.

The intraoperative data are shown in table 2.

Data	Group A (45)	Group B (45)	t-test	P value
Mean aortic cross clamp time (min)	56.13 ± 7.77	58.20 ± 5.84	1.256	0.213 NS
Mean cardiopulmonary bypass time (min)	74.73 ± 7.56	76.44 ± 11.91	0.814	0.418 NS
Valve size (mm):				
23	16 (35.56%)	–		
25	29 (64.44%)	–		
27	–	23 (51.11%)		
29	–	17 (37.78%)		
31	–	5 (11.11%)		

Table (2): Intraoperative data.

Comparison between the changes of preoperative NYHA functional class and the postoperative data are shown in table (3).

	Group A						Group B					
NYHA class	**Preop**		**Early postop**		**6 m postop**		**Preop**		**Early postop**		**6 m postop**	
	No	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**
Class I	-	-	8	19	22	52.4	2	4.4	7	15.9	27	61.4
Class II	6	13.3	23	54.8	16	38.1	5	11.1	26	59.1	14	31.8
Class III	25	55.6	9	21.4	4	9.5	25	55.6	9	20.5	3	6.8
Class IV	14	31.1	2	4.8	-	-	13	28.9	2	4.5	-	-
Total	45	100	42	100	42	100	45	100	44	100	44	100

Table (3): Changes in NYHA functional class.

Data (mean)	Preop	Early postop	T_1	P_1 value	6 m postopop	T_2	P_2 value
NYHA class	3.18±0.65	2.11±0.75	8.046	< 0.001*	1.60±0.65	11.871	< 0.001*
EF (%)	47.42±4.05	54.62±2.75	16.854	< 0.001*	60.73±2.62	21.907	< 0.001*
PG across MV (mmHg)	14.20±2.56	8.40±1.80	14.373	< 0.001*	5.62±1.23	19.979	< 0.001*

Table (4): The changes in group A.T1, P1 difference between preop. and early postop.T2, P2 difference between preop. and 6m postop.* P < 0.001, highly significant (HS).

Data (mean)	Preop	Early postop	T_1	P_1 value	6 m postopop	T_2	P_2 value
NYHA class	3.09±0.76	2.03±0.73	7.095	< 0.001*	1.47±0.63	10.811	< 0.001*
EF (%)	50.13±4.89	56.42±4.39	7.151	< 0.001*	58.71±2.38	9.885	< 0.001*
PG across MV (mmHg)	13.98±2.37	7.24±1.86	12.466	< 0.001*	4.36±1.09	18.271	< 0.001*

Table (5): The changes in group B.T1, P1 difference between preop. and early postop.T2, P2 difference between preop. and 6m postop.* P < 0.001, highly significant (HS).

	Group A (mean ± SD)	Group B (mean ± SD)	T	P value
Preop. NYHA class	3.18±0.65	3.09±0.76	0.595	0.554 NS
Early postop. NYHA class	2.11±0.75	2.03±0.73	0.143	0.886 NS
6 m postop. NYHA class	1.60±0.65	1.47±0.63	0.989	0.325 NS
Preop. EF (%)	47.42±4.05	50.13±4.89	6.030	0.131 NS
Early postop. EF (%)	54.62±2.75	56.42±4.39	2.330	0.023 S
6 m postop. EF (%)	60.73±2.62	58.71±2.38	3.830	< 0.001 HS
Preop. PG across MV (mmHg)	14.20±2.56	13.98±2.37	0.427	0.670 NS
Early postop. PG across MV (mmHg)	8.40±1.80	7.24±1.86	2.187	0.031 S
6 m postop. PG across MV (mmHg)	5.62±1.23	4.36±1.09	2.993	0.004 S

Table (6): Comparison between both groups.NS: non significant differenceS: Significant differenceHS: Highly significant difference.

In the above tables we show significant changes within each group (P value < 0.001) as regard changes in the mean NYHA functional class, the mean EF and the mean PG across MV.

While in comparison between both groups as showed in table (6) we found significant changes toward group B as regard the mean EF 6 months postop. (P < 0.001) but P = 0.023 in early postop. also changes of PG across MV in early postop. P = 0.031 and after 6 m P = 0.004. Also, the improvement was more in group B as regard the mean NYHA functional class, but it was not significant.

In correlation between BSA and the changes of the PG across MV, there was high PG in patients having large BSA > 1.5 with implantation of small prosthetic size. The mean PG across MV (mmHg) was 7.92 ± 0.88 and 8.88 ± 1.29 after 6m with size 23 mm in comparison to 4.33 ± 1.07 and 4.22 ± 1.09 with the size 27 mm in the patients having BSA 1.51 – 1.8 and 1.81 – 2.2 m2 respectively. Also, the mean PG across MV was 6.60 ± 1.11 and 7.18 ± 1.11 after 6m with size 25 mm in comparison to 4.60 ± 1.11 and 4.11 ± 1.21 with size 29 mm in the patients having BSA 1.51 – 1.8 and 1.81 – 2.2 m2 respectively (table 7).

Valve size	BSA (m^2) / Mean PG across MV (mmHg)	1.15 – 1.50	1.51 – 1.80	1.81 – 2.2
23	No of patients	4	6	4
	Preop.	13.60 ± 2.52	14.22 ± 2.11	14.88 ± 2.29
	Early postop	7.18 ± 0.78	8.88 ± 1.22	9.25 ± 2.11
	P_1 value	< 0.001*	< 0.001*	< 0.001*
	6 m Postop	5.99 ± 0.55	7.92 ± 0.88	8.88 ± 1.29
	P_2 value	< 0.001*	< 0.001*	< 0.001*
25	No of patients	12	9	7
	Preop.	13.90 ± 2.22	14.22 ± 1.98	14.90 ± 2.51
	Early postop	6.65 ± 1.21	8.44 ± 1.21	9.50 ± 1.22
	P_1 value	< 0.001*	< 0.001*	< 0.001*
	6 m Postop	5.22 ± 0.71	6.60 ± 1.11	7.18 ± 1.11
	P_2 value	< 0.001*	< 0.001*	< 0.001*
27	No of patients	9	7	6
	Preop.	14.11 ± 1.12	13.89 ± 2.11	14.22 ± 1.22
	Early postop	6.88 ± 1.01	7.21 ± 1.58	7.31 ± 1.90
	P_1 value	< 0.001*	< 0.001*	< 0.001*
	6 m Postop	4.72 ± 1.08	4.33 ± 1.07	4.22 ± 1.09
	P_2 value	< 0.001*	< 0.001*	< 0.001*
29	No of patients	6	8	3
	Preop.	13.12 ± 2.18	14.11 ± 1.89	14.80 ± 2.11
	Early postop	7.01 ± 1.44	7.11 ± 1.65	7.22 ± 1.85
	P_1 value	< 0.001*	< 0.001*	< 0.001*
	6 m Postop	4.50 ± 1.80	4.60 ± 1.11	4.11 ± 1.21
	P_2 value	< 0.001*	< 0.001*	< 0.001*
31	No of patients	2	2	1
	Preop.	14.18 ± 1.85	13.82 ± 1.97	14.50
	Early postop	7.11 ± 0.11	6.89 ± 1.01	7.02
	6 m Postop	4.21 ± 1.05	4.16 ± 1.11	4.21

Table (7): Relation between BSA and changes of mean PG across MV.P1 difference between preop. and early postop.P2 difference between preop. and 6m postop.* P < 0.001, highly significant (HS).

In the above tables we show significant changes within each group (P value < 0.001) as regard changes in the mean NYHA functional class, the mean EF and the mean PG across MV.

While in comparison between both groups as showed in table (6) we found significant changes toward group B as regard the mean EF 6 months postop. (P < 0.001) but P = 0.023 in early postop. also changes of PG across MV in early postop. P = 0.031 and after 6 m P = 0.004. Also, the improvement was more in group B as regard the mean NYHA functional class, but it was not significant.

In correlation between BSA and the changes of the PG across MV, there was high PG in patients having large BSA > 1.5 with implantation of small prosthetic size. The mean PG across MV (mmHg) was 7.92 ± 0.88 and 8.88 ± 1.29 after 6m with size 23 mm in comparison to 4.33 ± 1.07 and 4.22 ± 1.09 with the size 27 mm in the patients having BSA 1.51 – 1.8 and 1.81 – 2.2 m2 respectively. Also, the mean PG across MV was 6.60 ± 1.11 and 7.18 ± 1.11 after 6m with size 25 mm in comparison to 4.60 ± 1.11 and 4.11 ± 1.21 with size 29 mm in the patients having BSA 1.51 – 1.8 and 1.81 – 2.2 m2 respectively (table 7).

Mortalities and morbidities

There are 4 mortalities, 3 in group A due to severe low cardiac output and prolonged ventilation with increasing support and died in ICU after 5 – 7 days and all these cases were with large BSA ≥ 1.8 m2. One case mortality in group B from atriovenricular disruption with uncontrollable bleeding. Morbidities were 11 cases, 8 from group A and 3 from group B as showed in table (8). All morbidity cases were having large BSA and most of them having small valve size. Analysis of these results provided that large BSA with small prosthetic valve size are a high risk factor for morbidity and mortality.

	Case No	Group	BSA (m^2)	Valve size	Cause
Mortality	5	A	1.8	23	Severe low cardiac output (LCOP)
	13	A	1.9	23	Severe LCOP
	34	A	2.1	25	Severe LCOP
	65	B	1.9	27	AV disruption and bleeding
Morbidity	3	A	1.7	23	Prolonged ventilation with LCOP
	7	A	1.9	23	LCOP with support
	15	A	2.2	25	Prolonged ventilation with LCOP
	22	A	2.1	23	Prolonged ventilation with LCOP
	31	A	1.7	23	LCOP, wound infection
	39	A	1.8	25	LCOP, mediastinitis
	41	A	2.1	25	Prolonged ICU stay with support
	44	A	1.9	23	LCOP, Prolonged ventilation
	66	B	2.0	27	LCOP, Prolonged ICU stay
	75	B	2.2	27	LCOP, mediastinitis
	90	B	1.8	27	Prolonged ventilation with support

Table (8): Mortality and morbidity.

Discussion

Rheumatic fever and its consequences are the major cause of valvular heart diseases in the developing world. Mitral valve diseases which are usually caused by rheumatic fever still persist in a large part of the world (7).

In our study, all cases were rheumatic in nature with clear history of rheumatic fever in most of our cases. These finding matched with Gado et al. (8) and Abual-Ela et al. (9) because these papers were done in our community as rheumatic fever is still the most common cause of valvular heart diseases but these features were differ from Dvaid et al. (10), Julien et al. (11) and Rinel et al. (12) in which degenerative and myxmatous causes are more common in west world.

The mean age in our cases was 31.84 ± 6.09 years and 30.16 ± 6.15 years in group A and B respectively. Our results matched with those of Gado et al. (8) and Abd El-Salam (13) in which the mean age was 28 ± 2.1 years and 26.2 ± 18.4 years respectively because their patients had the same etiology and differ from those of Julein et al. (11) and Mingzhou et al. (14) in which the mean age was 62.9 ± 1.1 years and 65 ± 1.2 years respectively due to different etiology in the old ages.

Male to female ratio in our study was about 1 : 2 which matched with Gado et al. (8), Abual-Ela et al. (9), Julien et al. (11) and Mingzhou et al. (14), but differ from Juraj et al. (15) who found that male ratio was about 60% and Carabello (7) who stated that attack of rheumatic fever is roughly equal among both genders but mitral valve disease is 2 – 3 times more common in females.

The patients of mitral valve disease may be entirely asymptomatic in early and mild disease, but with worsening conditions, the symptoms of dyspnea on exertion, orthopnea, pulmonary congestion, haemoptysis, fatigue, palpitation and even HF will occur (15, 16). In our study these symptomatology were variable in degree in all patients, with a mean functional NYHA class of 3.18 ± 0.65 and 3.09 ± 0.76 in group A and B respectively which matched with the study of Juraj et al. (15) in which the mean NYHA functional class was 2.9 ± 0.55. Julien et al. (11) stated that > 80% of their patients were with NYHA class ≥ class III and these results matched with our study in which 86.7% and 84.5% in group A and B

respectively were in NYHA functional class ≥ class III.

Although the ECG and chest radiograph provided support for the diagnosis of mitral valve disease in the past, today echocardiography form the diagnostic mainstay (17). Echocardiography is used to establish the anatomy of the valve, confirm the etiology and calculate the valve area (18, 19, 20), and Doppler interrogation of the valve can establish the pressure gradient across the valve and evaluate left ventricular performance (21, 22).

In our study we do routine chest x-ray and ECG for all cases but echocardiography still remain the cornerstone in confirming the diagnosis and detecting the etiology, left atrial pressure and diameter and left ventricular performance. In our statistical analysis we concentrate on EF and PG across MV as parameters of comparison.

We found preoperatively that the mean PG across MV was 14.20 ± 2.56 mmHg and 13.98 ± 2.37 mmHg in group A and B respectively, this means moderate to severe grade of obstruction of the mitral valve as described by Carabello (7) who stated that PG across MV between 10-15 mmHg means moderate to severe grade of the disease.

In our study, all patients recorded improvement in the NYHA functional class with significant improvement in their life style. These improvement of the mean NYHA class occurred from 3.18 ± 0.65 to 2.11 ± 0.75 early postop. to 1.60 ± 0.65 after 6 month in group A ($P < 0.001$) and from 3.09 ± 0.76 to 2.03 ± 0.73 early postop. to 1.47 ± 0.63 after 6 month in group B ($P < 0.001$). This matched with Juraj et al. (15) which stated that significant change was found in the mean NYHA class from 2.9 ± 0.55 to 2.1 ± 0.41 postop. and on other hand, Julien et al. (11), Abd El-Salam (13) and Rahimtoola (23) stated that there were improvement of NYHA functional class from class III and IV preoperative to class I and II postoperative and this matched with our study as we found that 86.7% and 84.5% of group A and B respectively which were in class ≥ class III became 90.5% and 93.2% in class ≤ class II after 6m postop. in group A and B respectively.

Also in our study there was marked improvement of the mean EF (%) from 47.42 ± 4.05 to 54.62 ± 2.75 early postop. to 60.73 ± 2.62 of the six months postop. in group A ($P < 0.001$) and from 50.13 ± 4.89 to 56.42 ± 4.39 early postop. to 58.71 ± 2.38 after 6 month postop. in group B ($P < 0.001$). These results matched with the studies of Julien et al. (11), Juraj et al. (15) and Rahimtoola (23) who found marked improvement of EF from poor EF (< 40%) to moderate EF (40 – 55%) early postop. to near normal EF (> 55%) after 6 months postop. with better changes in the life activity of their patients.

In our study, significant drop of the mean PG across MV was found from 14.20 ± 2.56 mmHg preop. to 8.40 ± 1.80 mmHg early postop. to 5.62 ± 1.23 mmHg after 6 months postop. in group A ($P < 0.001$) and from 13.98 ± 2.37 mmHg preop. to 7.24 ± 1.86 mmHg early postop. to 4.36 ± 1.09 mmHg at 6m postop. ($P < 0.001$).

This matched with Abd El-Salam (13) who found marked drop of the mean PG from 14.6 ± 4.2 mmHg preop. to 8.5 ± 2.6 mmHg early postop. and Julien et al. (11) who reported mean PG ranged from 2.6 ± 1.0 mmHg to 6.0 ± 2.6 mmHg with mean 3.5 ± 1.7 mmHg within one year postop.

Compared to nature's own heart valve, all artificial valves are stenotic since the native valve size is related to the body surface area (24). Almost all types of valve replacement devices that can be inserted in most patients is less than of normal human valve (25). The effective prosthetic valve area is even further reduced after insertion by tissue growth and endothelialization (26). So, important consideration of the relation between the prosthetic valve size and the patient body size becomes clear and affects the outcome of the MVR operations (27).

In our study, in correlation between BSA of our patients and the changes of the PG across MV, there was a high PG in patients with large BSA > 1.5 when small prosthetic sizes ≤ 25 were implanted. The mean PG across MV (mmHg) was 7.92 ± 0.88 and 8.88 ± 1.29 after 6m with size 23 mm in comparison to 4.33 ± 1.07 and 4.22 ± 1.09 with the size 27 mm in the patients having BSA 1.51 – 1.8 and 1.81 – 2.2 m2 respectively. Also, PG across MV was 6.60 ± 1.11 and 7.18 ± 1.11 after 6m with size 25 mm in comparison to 4.60 ± 1.11 and 4.11 ± 1.21 with size 29 mm in the patients having BSA 1.51 – 1.8 and 1.81 – 2.2 m2 respectively.

These results matched with Julien et al. (11), Abd El-Salam (13) and Yazdanbackhsh et al. (28) which in their studies, residual PG across the mitral valve was observed in patients with large body mass who has small valve size. Julien et al. (11) stated that it must be emphasized that it is not prosthesis size per se that matters but rather its relation to body surface area and that larger prosthesis sizes cannot necessarily be equated with larger affected orifice valve area and BSA (11). So, if the surgeon suspect severe mismatch, he must attempt to implant another type of prosthesis with a larger effective area and these finding need development of better performing mitral prosthesis (14).

In our study, there were 3 mortalities in group A with MVR ≤ 25 mm due to severe low COP in comparison to one mortality in group B with MVR > 25 and also most cases of morbidity were found in group A (8 cases) as compared to 3 cases in group B.

This matched with Abd El-Salam (13) who found more mortalities with valve size 23 in large body mass due to severe LCO with more morbidities in the same group and he proved that small valve size and high body mass are independent risk factors and valve size of > 25mm is safer in most cases of average BSA but smaller sizes of valve prosthesis or bigger BSA than average may carry a higher risk of early morbidity and mortality.

Also Yazdanbakhsh et al. (28) found a strong and independent relation between these relatively small valve and mortality despite the finding of Femandez et al. (25) who found that no correlation between calculated valve area and postoperative complication and that the residual PG across the valve if present did not affect patients overall outcomes. Julien et al. (11), Dumensil and Yoganathor (26), Rahimtoola and Murphy (27) and Yazdanbackhsh et al. (28) proved that there was deleteriorous effect of the narrow prosthetic valves in the early postoperative phase in patient with large body surface area and they concluded that a clear interrelationship existed between prosthetic valve of relatively smaller size (23, 25mm) and postoperative high PG across the valve and postoperative morbidity and mortality either early or late and they urge others to work in their context as it merits further researches which must be directed to the long term results of implantation of small sized mitral valve prosthesis.

Conclusion: we conclude that there is improvement of the haemodynamics of adults after MVR especially by valve size > 25 mm which can be safely implanted in adults. But with implantation of small valve size ≤ 25 mm especially in patients with BSA > 1.5 m2, there is less improvement of haemodynamics with relatively residual high PG across MV and carries high risk of more morbidities and mortalities. So, these small size in large BSA patients must be avoided and we need more further researches for development of better performing mitral prosthesis with more effective orifice area for the large BSA patients and these researches must be directed toward the long term results and prognosis of MVR by small sized prosthesis.

References

1. Mohammed Rafiqu E and Vuyisili TN. Rheumatic and non rheumatic valvular heart disease. Epidemiology, management and prevention in Africa. Circulation; 112: 3584-3591, 2005.
2. Rahimtoola SH. Valve prosthesis-patient mismatch. An update. J Heart Valve Dis; 7: 207-210, 1998.
3. Philipp P and Jean GD. Prosthesis-patient mismatch in the mitral position, old concept, new evidences. J Thorac Cardiovasc Surg; 133: 1405-1408, 2007.
4. Hurte A, Winguemert F, Feijoo J and Medina A. Mitral valve replacement with small sized tilting disc mechanical prosthesis may lead to moderate stenosis. J Cardiovasc Surg (Torino) 41(2): 247-249, 2000.
5. Friedman S, Edwards LH and Cuaso CC. Long term mitral valve replacement in young children. Circulation; 57: 981-986, 1978.
6. Bun-Khanh L, Vincent CH, Paul H, Vincent L and Hery IK. The impact of patient-prosthesis mismatch on late outcomes after mitral valve replacement. J Thorac Cardiovasc Surg; 133: 1464-1473, 2007.
7. Carabello BA. Modern management of mitral stenosis. Circulation; 112: 432-437, 2005.
8. Gado AS, Menaissy YM, Hagras MS and El-Dayan AY. Predictive value of prosthetic mitral valve area index for postoperative outcome after mitral valve replacement. J Egyp Soc Cardio-Thorac Surg; 8(3): 83-90, 2000.
9. Abual-Ela SA, El-Demerdash FM, Fouda AM, Khalaf S and Gwely NEN. Tricuspid valve repair in rheumatic mitral valve diseases. J Egyp Soc Cardio-Thorac Surg; 8(4): 97-104, 2000.
10. David TE, Bum B and Bacchus M. Mitral valve replacement for mitral regurgitation with or without preservation of chordae tendinea. J Thorac Cardiovasc Surg; 88: 718-725, 1984.
11. Julien M, Patrick M, Jean GD, David TE, Francois D, Daniel D and Philippe P. Impact of prosthesis-patient mismatch on survival after mitral valve replacement. Circulation; 115: 1417-1425, 2007.
12. Rinel M, Rubens FD, Masters RG, Tonny KI and Hodge B. Late incidence and predictors of persistent or recurrent heart failure in patients with mitral prosthetic valves. J Thorac Cardiovasc Surg; 128: 278-283, 2004.
13. Abd El-Salam KM. Haemodynamics of adult patient with small mitral valve prosthesis (early results). J Egyp Soc Cardio-Thorac Surg; 10(1): 151-155, 2002.
14. Mingzhou LI, Jean GD, Patrick Matheiw and Philipp P. Impact of valve prosthesis-patient mismatch on pulmonary arterial pressure after MVR. J Am Coll Cardiol; 45: 1034-1040, 2005.
15. Juraj T, Thomas S, Burkhardt S and Marko T. Predictors of the long term outcome after combined aortic and mitral valve surgery. Circulation; 100(2): 48-53, 1999.
16. Runco V, Levin HS, Vahahzaheh H and Booth RW. Basal diastolic murmurs in rheumatic heart disease, intracardiac phonocardiography and cineangiography. Am Heart J; 75: 153-161, 1968.
17. Martin RP, Rakowski H and Kleinman JH. Reliability and reproducibility of two-dimensional echocardiographic measurement of the stenotic mitral valve orifice area. Am J Cardiol; 43: 560-568, 1979.
18. Hatle L, Brubakh A, Tromsdal A and Angelson B. Noninvasive assessment of pressure drop in mitral stenosis by Doppler ultrasound. Br Heart J; 40: 131-140, 1978.
19. Gash AK, Carabello BA, Cepin D and Spann JF. Left ventricular ejection performance and systolic muscle function in patients with mitral stenosis. Circulation; 67: 148-154, 1983.

20. Hildner FJ, Javier RP, Cohen LS, Samet P, Nathan MJ, Yahr WZ and Greenberg JJ. Myocardial dysfunction associated with valvular heart disease. Am J Cardiol; 30: 319-326, 1972.
21. Mohan JC, Khilullol M and Arosa K. Left ventricular internsic contractility in pure rheumatic mitral stenosis. Am J Cardiol; 64: 240-242, 1989.
22. Hatle L, Angelson B and Tromsdal A. Non invasive assessment of atrioventricular pressure-half time by Doppler ultrasound. Circulation; 60: 1096-1104, 1979.
23. Rahimtoola SH. The problem of valve prosthesis-patient mismatch. Circulation; 58: 20-24, 1978.
24. Shiu MF. Mitral valve closure index. Echocardiographic index of severity of mitral stenosis. Br Heart J; 39: 839-843, 1980.
25. Femandez J, Laub GW, Adkins MS, Hoss K and David BS. Early and late phase events after valve replacement with SJ medical prosthesis in 1200 patients. J Thorac Cardiovasc Surg; 107: 394-407, 1996.
26. Dumensil JG and Yoganathor AP. Valve prosthesis haemodynamics and the problem of high transprosthetic pressure gradients. Eur J Cardiothorac Surg; 6(supp): 534-538, 1992.
27. Rahimtoola SH and Murphy E. Valve prosthesis patient mismatch. A long term sequela. Br Heart J; 45: 331-335, 1981.
28. Yazdanbackhsh AO, Van den Brints RB, Deker E and Mol BA. Small valve area index, its influence on early mortality after MVR. Eur J Cardiothoracic Surg; 17: 222-227, 2000.