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The Iranian Journal of Cardiac Surgery is the official quarterly publication of the Iranian Society of Cardiac Surgeons (ISCS). The editorial board encourages submission of original papers concerned on any aspects of cardiovascular medicine including cardiac surgery, adult and pediatric cardiology, cardiac anesthesia and cardiac intensive care in the form of both basic and clinical research. Submitted articles should neither have been published previously nor be considered for publication elsewhere. Each article will be carefully reviewed by the editorial board. Additional review may be requested from the specialists in the related field. Then the corresponding author will be informed regarding acceptance or rejection of the article.

Papers in the following categories are accepted for publication in the journal;

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Interesting images, accompanied by a brief description, in the field of cardiovascular medicine will also be considered for publication.

Manuscripts should either be submitted in three complete copies, including three sets of figures or in electronic format (recommended). Authors must read and observe carefully the following guidelines before sending their works to the editorial office.

1- Type all manuscripts with double spacing and wide margins on all sides of the paper. Do not use abbreviations throughout the text.

2- Divide the manuscript into the following sections: Title page, Abstract, Keywords, Introduction, Materials and methods, Results, Discussion and conclusion, Acknowledgement, References, Tables, Figures, Legends.

3- Title page must include the title of the article, which should be a descriptive one, the names of all authors and their highest scientific degrees, the institution where the study was performed, and identification of the address, telephone and fax number and E-mail of the corresponding author.

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4- Abstract of original articles should be no more than 200 words and should be structured as follows; Background or Objectives, Methods, Results, Conclusion. Abstract of review articles and case reports should be nonstructured and no more than 200 and 60 words respectively. A maximum of six key words may be added at the end of the abstract.

5- Prepare your manuscript as precise, descriptive, and
conclusive as possible. For this purpose, the Introduction should be brief and set out the aim for which the study has been performed. The Materials and Methods should be sufficiently detailed so that readers can understand precisely what has been done. The Results should be presented clearly with definition of relevant positive and negative findings. The Discussion should relate directly to the study and interpret the results and their relevance as well as indicate the limitations of the study.

6- Reviews of recent developments are welcome. Materials in the Review Article should be informative, presenting the most recent advances and challenges about the subject.

7- Presentation of interesting cases which add new or important information about specific diseases and description of innovative technique of surgery or intervention will be accepted for publication as Case Report and How to do it?, respectively. Articles in these sections should have no more than three authors, 1200 words, three figures or tables and a maximum of eight references.

8- References should be numbered consecutively (in superscript) as they appear in the text. Style and punctuation of references should conform to the Index Medicus format.

9- Tables should be typed double-spaced, each with a number and title above the table and explanatory footnotes. Figures must be submitted in three sets, indicating their numbers, and be suitable for high quality reproduction. Legends to illustrations must be typed double-spaced separately. Figure numbers should correspond to the order in which they appear in the text.

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11- All authors are recommended to online submission of their manuscript to baghaei@rhc.ac.ir. Obviously, the general guidelines of preparing the text are the same, as explained previously. Use Microsoft Office Word program and text font of Times New Roman 12.
The Correlation between the Blood Group A and Coronary Artery Disease


Abstract

Background: In recent years, lots of studies have been conducted in order to determine the correlation between the blood groups and the cardiovascular diseases. Most studies report a correlation between the blood group A and the Coronary Artery Disease. However, no similar studies have been conducted in Fars province; therefore, we decided to investigate the issue in this province.

Methods: This cross-sectional study was performed on 2750 patients with coronary artery disease in Kowsar hospital (one of the biggest hospitals in Shiraz). Using the epidemiologic reports which show the distribution of the blood groups in Fars province, a statistical comparison (Using chi-squared exam) was done in order to determine the role of the blood groups as well as the risk factors in coronary artery disease.

Results: According to our results, we found that the rate of coronary artery disease in individuals with the blood group A was higher than the other blood groups. Regarding the risk factors, however, no significant difference was observed between the blood groups.

Conclusion: A correlation was found between the blood group A and the incidence of coronary artery disease and there was no significant difference between the blood groups, regarding the risk factors.

Key words: ABO blood groups, coronary artery disease, cardiovascular risk factors, Shiraz

Introduction

Coronary artery disease also known as ischemic heart disease is a common cause of death in the adults. It may present a sudden death, but more usually causes angina pectoris, myocardial infarction (heart attack), or heart failure. It can also lead to the disturbance of the heart rhythm. Factors associated with an increased risk of developing the coronary artery disease include diabetes, cigarette smoking, high blood pressure, obesity, and a raised concentration of cholesterol in the blood (1). Compared to other illnesses, ischemic heart disease causes more deaths and disabilities and incurs greater economic costs in our modern world. Ischemic heart disease is the most common, serious, chronic and life-threatening disease in the United States, where more than 12 million people have ischemic heart disease, more than 6 million have angina pectoris, and more than 7 million have a sustained myocardial infarction (2).

Atherosclerosis occurs due to the deposition of Cholesterol into the walls of the arteries. The process starts in childhood with the development of fatty streaks lining the arteries. In adulthood, these changes progress; in a way that they scar...
and calcify in order to form irregular narrowings within the arteries and eventually lead to the blockage of the vessel. The consequence of the narrowing or blockage depends on which vessels are involved. Coronary vessels, for instance, are believed to cause angina and heart attacks (1).

One of the most important research issues in this field is knowing the significance of the role of the risk factors in coronary artery disease; and one of these risk factors is the effect of ABO blood groups (3, 4, 5). Due to the lack of information about the effect of ABO blood groups in coronary artery disease, reports which show the role of ABO blood groups in the breast cancer and the prognosis of this disease (6), and also its effects on the gastrointestinal disorders, which are confirmed in different researches (2, 7, 8, 9), the present study aims to determine the role of ABO blood groups in ischemic heart disease patients in Kowsar hospital of Shiraz.

Materials and methods
This cross-sectional population base study was conducted in Fars Province in 2010. Recouring to Kowsar Hospital of Shiraz, 2750 patients, who had been hospitalized as Isch-emic Heart Disease and had undergone a Coronary Artery Bypass Graft (CABG) operation, were surveyed. In data form of each patient, age, sex, and risk factors of ischemic heart disease including Hypertension(HTN), Diabetes Mellitus (DM), Smoking, and Hyperlipidemia (HLP) were noted (Here, there is a model of this form. Figure1).

Since the items of family history and myocardial infarction were not completed in a large number of cases, these two risk factors were excluded from the study. Also, the ABO blood groups were derived and noted from the patients’ documents. The data about the prevalence of the ABO blood groups in Shiraz was obtained by referring to Blood Transfusion Organization and using its data in this field. These data were only about individuals who had referred to Blood Transfusion Organization in 2010, and the repeated cases were omitted. Eventually, the prevalence of the ABO blood groups was determined in 147619 donors (8572 females and 139074 males). Recouring to a statistical consultant, the prevalence of the blood groups in ischemic heart disease patients and people of Shiraz was assessed and the data were statistically analyzed. Regarding the risk factors, the blood groups were compared in ischemic heart disease patients through chi-square test.

Result
Among 2722 patients of coronary artery disease, 1878 (69%) were males and 844(31%) were females. Moreover, the ratio of female to male was 1 to 2.22. The distribution of the patients in different blood groups and the distribution of the people of Shiraz in different blood groups are presented in table1. The table shows that in Shiraz, the blood group O is more prevalent than the others (41.12%). The next blood group is A (28.11%) followed by the blood group B (24.39%), and the last one being AB (6.37%). This assortment (O>A>B>AB) maintains in the patients with coronary artery disease, too. In order to investigate the role of the blood groups in coronary artery disease, we should compare the percentage of each blood group in the Shiraz society with the patients of coronary artery disease. The results of the comparison reveal that, only in the blood group A, the percentage of the coronary artery disease patients is more than that of the people of Shiraz (2.29%). Regarding the other blood groups, however, this comparison is vice versa. (table1)

Table 1(percentage of blood groups)

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>O</th>
<th>AB</th>
</tr>
</thead>
<tbody>
<tr>
<td>28.11</td>
<td>24.39</td>
<td>41.12</td>
<td>6.37</td>
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<tr>
<td>30.4</td>
<td>23.3</td>
<td>40.9</td>
<td>5.4</td>
</tr>
</tbody>
</table>

The distribution of the observed patients, based on different blood groups classified by the risk factors of coronary artery disease, is presented in table2. Regarding the risk factors, the results of the Chi-square test revealed no significant difference among the blood groups (p>0.05) (table2).

Table 2(comparison of risk factors between the blood groups)

<table>
<thead>
<tr>
<th>A</th>
<th>No.</th>
<th>%</th>
<th>B</th>
<th>No.</th>
<th>%</th>
<th>O</th>
<th>No.</th>
<th>%</th>
<th>AB</th>
<th>No.</th>
<th>%</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
<td></td>
<td>No.</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Hypertension</td>
<td>424</td>
<td>50.8</td>
<td>310</td>
<td>48.4</td>
<td>589</td>
<td>52.3</td>
<td>78</td>
<td>52.3</td>
<td>0.444</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Hyperlipidemia</td>
<td>366</td>
<td>43.8</td>
<td>262</td>
<td>40.9</td>
<td>504</td>
<td>44</td>
<td>67</td>
<td>45</td>
<td>0.443</td>
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<td></td>
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<tr>
<td>Diabetes mellitus</td>
<td>281</td>
<td>33.7</td>
<td>193</td>
<td>30.1</td>
<td>354</td>
<td>31.4</td>
<td>43</td>
<td>28.9</td>
<td>0.422</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoking</td>
<td>287</td>
<td>34.4</td>
<td>213</td>
<td>33.2</td>
<td>378</td>
<td>33.6</td>
<td>52</td>
<td>34.9</td>
<td>0.956</td>
<td></td>
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</tbody>
</table>

Discussion and Conclusion
The present study showed that although no significant difference was found in the risk factors among the blood groups, the prevalence of ischemic heart disease in the blood group A was more than the other blood groups. This shows the probable role of this blood group in the incidence of ischemic heart disease. The relationship between the blood
group and ischemic heart disease has been investigated in different studies and has been confirmed in some of them: In a prospective study, which was conducted on 7662 males with known ABO blood group in 24 British towns, the blood group A was revealed to be related to the incidence of ischemic heart disease in individual subjects (10).

In a study on the interplay of genetic and environmental factors in the development of ischemic heart disease, blood grouping was carried out on 792 patients attending pro-thrombin clinics throughout the Cape Peninsula. In comparison to the controls there was an excessive proportion of groups A and B as well as a deficiency of the group O in the patients (11).

In a cohort study in Pakistan, 327 none-obese males and females were investigated. It was shown that blood group A is associated with substantially increased risk for coronary artery disease (5).

A study of 404 patients, who had attended the public clinic in Sulaimani for different reasons, it was shown that the patients with the blood group A had a significant elevation in their serum cholesterol as compared to other blood groups (12).

Moreover a cross sectional research was carried out on 1000 patients with ischemic heart disease in Tehran. This study, in which the patients’ blood groups as well as their risk factors were determined, revealed that the blood group A was related to the incidence of ischemic heart disease (13).

In the same line, a study of 13175 patients, which was conducted in Germany in 1981, showed that the blood group A was more prevalent in ischemic heart disease patients (14). But the question is that how the blood groups can affect the incidence as well as the prognosis of Ischemic heart disease and other diseases. It is suggested that more researches be performed on this issue in order to confirm this relationship. By doing so, lots of things can be done in order to decrease the incidence of ischemic heart disease in special blood groups.

**Acknowledgment**

The authors gratefully acknowledge the Kowsar hospital of Shiraz, the blood transfusion organization for their help. Research improvement center of Shiraz University of medical science and MS. Afsaneh Keivanshekouh are also appreciated for improving the use of English in the manuscript.

**References**


**Figure 1**
Sex Difference in Mid-Term Patency of Arterial and Venous Grafts after Coronary Artery Bypass Graft Surgery in Asymptomatic Patients

Ali Sadeghpour MD1, Alireza Jalali MD2, Rasoul Azarfarin MD3, Ghasem Faghihazadeh Ganji MD4, Somayeh Zavareian DDS5, Ali Amirahmadi MD6

Abstract

Background: The aim of this study was to compare the sex difference in patency rates of left internal thoracic artery (LITA), radial artery (RA), and saphenous vein (SV) grafts in asymptomatic patients after coronary artery bypass graft surgery (CABG) after 2-5 years follow up period.

Method: We assessed thirty patients with three-vessel coronary artery disease including 104 LITA, RA, and SV grafts concomitantly used for isolated elective CABG surgery. The primary end point was rates of graft patency in both men and women. After 2-5 years follow-up, graft patency was assessed by 128-slice, dual-source CT coronary angiography.

Result: There were 21 men and 9 women in this study. A total of 104 grafts, including 30 LITA, 44 SV, and 30 RA grafts, were studied. Total graft patency rate was 84/104 (80.8%). Graft patency rate in men was 64/78 (82.1%) and in women was 20/26 (76.9%; p=0.774). LITA graft patency rates were 20/21(95.2%) in men and 8/9 (88.9%) in women (p=1.000). Patency rates in RA were 21/22 (95.5%) and 4/8 (50%; p=0.016), and patency in SV were 22/34 (64.7%) in men and 9/10 (90%) in women (p=0.251), respectively.

Conclusion: This study revealed that in asymptomatic patients who underwent CABG surgery 2-5 years ago there is a statistically significant lower RA patency rate in women compared with men. We didn’t find any difference in LITA or SV grafts patency rates between men and women in mid-term follow up.

Keywords: Coronary Artery Bypass Graft; Radial artery; Saphenous vein; Graft patency; CT angiography

Introduction

There are a lot of reports on the influence of gender on coronary artery bypass graft (CABG) surgery outcomes (1-5). Some evidence has previously shown that women are at higher risk of postoperative complications than men, particularly in the perioperative period (1, 2). Various explanations exist for this difference. Poorer clinical outcome in women versus men after CABG may be to some extent related to higher exposure to risk factors in women (2). Some studies showed women who underwent CABG, compared with men who were older (3), have higher rates of comorbid conditions, smaller coronary arteries, more acute and unstable presentation, and less frequent usage of the in-
ternal thoracic artery (ITA) (2, 3). However, one of major determinants of worse outcome after CABG is mid-term and long-term graft patency. Generally arterial conduits have higher patency rate than saphenous vein (SV) grafts (6). Several clinical reports support the lower LITA, radial artery (RA) and SV graft patency rates in the women compared with men (7-9).

Most previous studies conducted on comparing graft patency rates between both sex were performed on symptomatic patients (10, 11) using invasive diagnostic modalities such as coronary angiography. In this study we sought to compare women and men regarding mid-term (2-5 years) patency rates in all conduit grafts following CABG surgery in asymptomatic patients using a noninvasive diagnostic tool, CT coronary angiography.

Methods

After the approval of the study protocol by the institutional Ethics Committee, and obtaining written informed consent from all the patients, the study was conducted. We enrolled 30 asymptomatic adult patients who had previously undergone CABG by a single surgeon between 2 and 5 years previously. All the patients had three-vessel coronary artery disease and underwent CABG surgery using the LITA, RA, and SV graft conduits. There were a total of 104 RA, LITA, and SV grafts. At 53.5 (24-97) months follow-up, graft patency was assessed via 128-slice, dual-source CT coronary angiography.

The patients’ background and clinical parameters, including left ventricular ejection fraction (LVEF) and cardiovascular risk factors (cigarette smoking, hypertension, hyperlipidemia, and positive family history of coronary artery disease) were recorded. All the surgical operations were performed by a single surgeon (the first author) 2-5 years previously. The standard surgical methods were used for the RA and SV harvest and dissection of the LITA (12, 13). Harvest of the RA was made from the antecubital fossa to the wrist in the non-dominant arm, and the SV harvest was done in the usual method.

All data were collected and analyzed using the statistical package SPSS ver. 18.0 for Windows. The continuous variables are presented as mean ± SD (standard deviation), and the categorical variables are summarized by raw numbers and percentages. The continuous variables were compared between women and men using the independent samples t-test. The categorical variables were, on the other hand, compared in both sex using the chi-square test (with continuity correction) or the Fisher exact test, as required. A p value ≤ 0.05 was considered statistically significant.

Results

From the 30 patients enrolled into the study, a total of 104 grafts, comprising 30 (28.8%) LITA, 44 (42.4%) SV, and 30 (28.8%) RA grafts, were evaluated. Background and clinical characteristic of patients according to sex distribution were summarized in Table 1. Severity of target vessel stenosis in pre-operative angiography and number of risk factors in men and women were demonstrated in Table 2. As shown in Tables 1 and 2, men and women were comparative to each other except lower mean LVEF in men and higher number of cardiovascular risk factors in women.

Cumulative graft patency rates were 28/30 (93.3%) in the LITA, 25/30 (88.3%) in the RA, and 31/44 (70.5%) in the SV grafts, respectively. Among these grafts, 78 (75%) were used in the men and 26 (25%) were used in the women. The average age of the patients was 59.15 years (48-83 years). The average follow-up period (from CABG to restudy by CT-angiography) was 4.46 years (2-8).

Total graft patency rate was 84/104 (80.8%). Graft patency rate in men was 64/78 (82.1%) and women 20/26 (76.9%; p=0.774). LITA graft patency rates were 20/21(95.2%) in men and 8/9 (88.9%) in women (p=1.000). The patency rate of the RA graft was lower in the females [4/8 (50%)] than in the males [21/22 (95.5%)], (p = 0.016). and patency in SV were 22/34 (64.7%) in men and 9/10 (90%) in women (p=0.251), respectively.

Discussion

Unlike previous investigations, which studied the RA and SV graft patency rates in symptomatic patients using angiography (6, 10, 11) the present study compared the mid-term results of the RA and SV patency in asymptomatic patients by using a noninvasive diagnostic tool, namely CT angiography. This study revealed that in the asymptomatic patients, the RA grafts had an acceptable patency rate at 2-5 years’ follow-up.

Long term outcomes of CABG surgery are influenced by the complex interaction of patient-related and procedure-related factors. Main patient-related factors include distribution of the CAD, the extent and severity of coronary ath-
erosclerosis, age, gender, overall health status, severity of atherosclerotic changes, severity of co-existing morbidities and occurrence of operative complications and patency of aorto-coronary graft conduits (14).

Tan and colleagues reported comparable results in women and men in one-year occlusion rates of vein and LITA grafts (2). However, Hartman and Coelho showed the significantly lower patency rates in conduits grafts in women compared with men (9, 11). Mannacio et al. reported older women have lower conduit patency rate compared with men after CABG operation. This finding in part may be due to impaired expression of messenger RNA for eNOS and decreased eNOS levels in internal thoracic artery endothelial cells from women after menopause undergoing CABG (4). So, Bartens et al. found that the tendency of RA graft failure in diabetics and the higher patency associated with angiotensin inhibition might both associate to endothelial modulation of the muscular tone of the graft (5). Hiramoto et al. showed that women undergoing lower extremity bypass (LEB) for severe peripheral artery disease have a different inflammatory response compared with men. Increased baseline levels of CRP and fibrinogen are associated with lower vein graft patency in women but not in men. These findings indicate an important correlation between gender and inflammatory response in the healing response of vein grafts for LEB (15).

We noticed a statistically significant difference in the RA grafts when comparing both sexes, with a lower RA graft patency rate in the women. The same result was observed by Lawton (7), Schwann (8), and Hartman (9) because of the smaller size of the RA in women. Also, Desai and coworkers demonstrated patients who undergoing CABG benefit from RA-coronary artery bypass conduits compared with SV conduits, and this effect is especially strong in women (16). In other study Khot et al. reported in symptomatic patients after CABG, radial artery grafts have lower patency rates than left internal mammary artery and saphenous vein grafts. The researcher suggested selective use of the radial artery, particularly in women (17).

**Conclusions**

In this study we found that after mid-term (2-5 years) follow-up period, in asymptomatic patients who previously underwent CABG, women have lower patency rates in RA but not in LITA or SV grafts. Furthermore, the RA graft function was poor in the patients with multiple CAD risk factors as well as in those with moderate target vessel stenosis.

**Limitations**

Owing to economic constraints, we were able to perform

| Table 1. Background and clinical characteristic of patients according to sex distribution. |
|---------------------------------|-----------------|-----------------|---|
|                                | **Male** n=78   | **Female** n=26 | **p** |
| Age (year)                     | 59.9±7.7        | 56.9±4.6        | 0.065 |
| Age>70 years                    | 8 (10.3%)       | 0 (0%)          | 0.202 |
| Diabetes Mellitus              | 13 (16.7%)      | 5 (19.2%)       | 0.090 |
| Hypertension                   | 15 (19.2%)      | 7 (26.9%)       | 0.307 |
| Hyperlipidemia                 | 23 (29.4%)      | 11 (42.3%)      | 0.932 |
| LVEF* (%)                      | 45.0±7.4        | 50.0±4.2        | 0.002 |
| LVEF<30%                       | 7 (9.0%)        | 0 (0%)          | 0.259 |
| Underling dis.                 | 3 (3.8%)        | 0 (0%)          | 0.735 |
| Target vessel run off          | 75 (96.2%)      | 26 (100%)       | 0.735 |
| Follow up period (month)       | 54.4±17.7       | 50.7±27.4       | 0.430 |
| Graft patency rate             | 64 (82.1%)      | 20 (76.9%)      | 0.774 |

*LVEF = Left ventricular ejection fraction*
the costly modality of CT angiography only on 30 patients free of charge. It seems that some of the statistically non-significant results such as that SV graft patency rates between men and women might be related to this limited sample size. This study was funded by Rajaie Cardiovascular, Medical and Research Center, Iran University of Medical Sciences, Tehran, Iran.

Table 2. Severity of target vessel stenosis in pre-operative angiography and number of risk factors in men and women.

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>n = 78</td>
<td>n = 26</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Target vessel stenosis*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mild Moderate</td>
<td>0 (0%)</td>
<td>1 (3.8%)</td>
</tr>
<tr>
<td>Severe</td>
<td>6 (7.7%)</td>
<td>4 (15.4%)</td>
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<td></td>
<td>72 (92.3%)</td>
<td>21 (80.8%)</td>
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<td></td>
<td>26 (33.3%)</td>
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</tr>
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<td>34 (43.6%)</td>
<td>0 (0%)</td>
</tr>
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<td></td>
<td>18 (23.1%)</td>
<td>23 (88.5%)</td>
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<tr>
<td>No. of risk factors**</td>
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</table>

*p = 0.106
**p < 0.001

References

Visceral Fat ABCG1, ABCG5 and Visfatin Gene Expression in Response to a Treadmill Running Program with or without a Liquid Pistachio-atlantica (Bene) Extraction in Female Rats

Abbass Ghanbari-Niaki¹, Navabeh Zare-Kookandeh¹, Hamid Deldar ², Asghar Zare-Kookandeh¹, Ramin Baghaei-Tehrani³
Corresponding authors: Abbass Ghanbari-niaki- Navabeh Zare-kookandeh

Abstract
ATP-binding cassette (ABC) transporters including ABCG1 and ABCG5, use the energy of ATP hydrolysis to translocate a wide variety of substrates across biological membranes. Visfatin, a novel adipokine, was revealed to be associated with obesity and to have insulin mimetic effect that is highly expressed in visceral adipose tissue. The aim of this study was to determine the visceral fat ABCG1, ABCG5 and visfatin relative gene expression.

Twenty wistar rats (6-8 weeks old and 125-135 g weight) were used. Animals were randomly assigned into saline-control (SC), saline-training (ST), and Bene-control (BC), and Bene-training (BT). Training groups was given exercise on a motor-driven treadmill at 25 m/min (0% grade) for 60 min/day and 5 days/week for eight weeks. Subjects were fed oral, with Bene extraction and saline for four weeks. ABCG1, ABCG5 and visfatin relative genes expression was detected by Real-time PCR method. Results demonstrated that Bene extraction significantly reduces ABCG1 and ABCG5 relative gene expression and increase visfatin relative gene expression in visceral fat. Exercise training significantly reduces visfatin relative gene expression and increases ABCG1 and ABCG5 relative gene expression in visceral fat.

Keywords: ABCG1; ABCG5; visfatin; female rats; Treadmill exercise; Pistachia atlantica
List of abbreviations: Pistachia atlantica (Bene); saline-control (SC); Bene-control (BC); saline-training (ST); Bene-training (BT)

Introduction
Coronary artery disease (CAD) is one of the major causes of death in most societies that is associated with the concentration of total cholesterol (TC), low density lipoprotein cholesterol (LDL-C) and high-density lipoprotein cholesterol (HDL-C lower) (1). Formation of HDL and its rearrangement process is complex and requires a variety of factors, such as lecithin cholesterol transferase (LCAT), cholesterol ester transport protein (CETP), phosphoinositide lipid carrier protein (PLTP), and ATP-binding cassette (ABC) transporters including ABCG1 and ABCG5 (2,3). ATP-binding cassette (ABC) transporters mediate the translocation of a wide variety of substrates such as ions, sugars, amino acids, vitamins, lipids, antibiotics and drugs to larger molecules (4). ABCG1 is the first member of the ABCG subfamily. The protein is expressed in many cell types (including macrophages, endothelial and epithelial cells, T and B cells, type II cells, astrocytes and neurons) and in numerous tissues including the brain, eye, kidney, spleen, lung, liver, and intestine (5-7). ABCG5 and ABCG8 are half-transporters that form heterodimers to become functional (8-10). Both proteins are expressed at a high level in the liver and intestine.

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and at lower levels in the colon (11-15). In the intestine, ABCG5/G8 secrete absorbed plant sterols back into the intestinal lumen, while on the bile canaliculus ABCG5/G8 mediate biliary plant sterol as well as cholesterol secretion into bile (16, 17).

In recent years, many researches have been done on the ABC family. One of these researches was carried out by Ghanbari-Niaki et al and investigated the effect of 6 weeks’ endurance exercise on ABCA1 gene expression in rats. They reported that ABCA1 gene expression increases in rats’ liver and that the plasma levels of high density lipoprotein-cholesterol (HDL-C), Pre-β HDL and lecithin cholesterol acyltransferase (LCAT), significantly increased (18). Khabazian et al showed that 12 weeks of aerobic exercise, increased mRNA expressions of ABCA1 gene expression in rat’s small intestine (19). Also Zare-Kookandeh et al investigated that 8 weeks of endurance exercise, increased ABCG1 gene expression in small intestine and kidney tissue of rats (20).

Visfatin is an adipokine identified in 2004 (21), and thus named for the suggestion that it would be predominantly produced and secreted in visceral fat. Visfatin was found to be released predominantly from macrophages rather than from adipocytes in visceral adipose tissue (21). It is now believed that visfatin actions can be endocrine, paracrine, and autocrine as well. These autocrine effects of visfatin may play an important role in regulating insulin sensitivity in the liver (22). Plasma visfatin levels are elevated in patients with type2 diabetes and in obesity (23-25). Physical exercise is a metabolic and neuroendocrine stressor that mobilizes lipids for energy and is a cornerstone treatment for obesity and diabetes (26-28).

Visfatin has insulin-like performance and causes stimulation of glucose uptake in adipose cells and myocytes, Inhibits the release of glucose by the liver and accumulation of triglycerides. Haus et al investigated that 12 weeks’ endurance exercise (intensity 80% HR max, duration: 60 min/session and 5 days a week), Causes weight loss along with the significantly reduction in plasma visfatin levels (29). Also Ghanbari-Niaki et al reported a single exercise session that consisted of a running-based high-intensity sprint test, Causes Plasma visfatin concentrations were significantly increased immediately after exercise and returned to baseline during the recovery period. An increase in plasma insulin was observed immediately after exercise. This response returned to baseline by 45 min and remained at this level at 90 min after the exercise. Similarly, glucose concentrations were significantly increased immediately after exercise and had returned to baseline at 45 and 90 min after exercise (30). However, no research has examined the effect of exercise on ABCG1, ABCG5 and visfatin genes expression in visceral fat. Also knowledge about the effect of Pistacia atlantica on these genes expression is lacking. Pistacia atlantica (Bene) are plants of Anacardiaceae family that is rich in antioxidants and unsaturated fatty acid. It is shown that this plant leaves contain anti-oxidative compounds that reduce the amount of free radicals (31). The total amount of essential oil obtained from Pistacia atlantica is higher than any other species of the genus Pistacia (32). Also Pistacia has anti-inflammatory effect. In this study we investigated visceral fat ABCG1, ABCG5 and visfatin genes expression after 8 weeks of treadmill running program and Bene extraction in wild type female rats.

**Material and methods**

**Plant material**

The ripped fruit samples of Pistachia atlantica (Bene) were collected from the fields of Maibod in the Yazd province of Iran, and were stored at –18 ° C until use. Plant material was identified by herbarium collection in department of physical education and sport science, university of Mazandaran, Baboulsar, Iran.

**Preparation of the extracts**

The extraction was prepared according to the Hamdan. et al (2004) (33). Briefly, the wholeRipped and dried fruit of Pistachia atlantica (Bene) (10g) was coarsely powdered and mixed with 150 ml of tap water and boiled for 45 min and then cooled at room temperature. After cooling, the mixture was filtered twice by using a Watman filter (No. 4 filter). The volume of the filtered solution was increased to 100 ml with tap water so that 1ml was equivalent to 100 mg of starting material. It has to be noted that we did not used distilled water on the basis of herbalist’s recommendation. A fresh extraction was orally given at dose 100 mg/kg (7.5ul/g of body weight) immediately at the end of the training session for six week. The control groups have been treated at same manner and volume.

**Animals**

All experiments involving the animals were conducted...
according to the policy of the Iranian convention for the protection of vertebrate animals used for experimental and other scientific purposes; and the protocol was approved by the Ethics Committee of the Sciences, University of Mazandaran (UMZ) and Babol University of Medical Sciences (BUMS, Mazandaran, Iran. Twenty Wistar female rats (6-8 weeks old125-135 g weight) were acquired from Pasteur’s Institute (Amol, Mazandaran) and maintained in the Central Animal House of Faculty of Physical Education and Sports Science of UMZ. Five rats were housed per cage (46-L volume) with a 12-hour: 12-hour light-dark cycle. Temperature was maintained at 22°C ± 1.4°C. Diets (a pellet form) and water were provided ad libitum. Animals were randomly assigned into control (n = 10) and training (n = 10) groups. Rats were divided further into saline-control (SC), saline-training (ST), and Bene-control (BC), and Bene-training (BT). The control group remained sedentary, whereas the training group underwent a moderate running exercise program.

**Exercise training protocol**

At first, the animals were familiarized with the rat treadmill apparatus, every day and for 4 days [(the 14-lane motorized-driven treadmill was designed by the primary author (UMZ, Baboulsar, Mazandaran, Iran)]. The exercise group was trained for 8 weeks using the same training methods previously described (18, 19). The rats run at 25 m/min for 60 minutes, 5 d/wk. The animals were killed 72 hours after the last exercise session. Food but not water was removed from the rat cages 4 hours before the sacrifices. The estrous cycle was determined in intact female rats by taking vaginal smears each morning by vaginal lavage. Smears were analyzed under a microscope to determine the type of cells present and the stage of the estrous cycle (34). Only female rats showing at least two consecutive 4- or 5-day estrous cycles were used. The established estrous cycle in each female was used to select the day of the experiment, at which time the estrous cycle stage was confirmed by vaginal smear (35).

**Tissue biopsies**

Seventy-two hours after the last training session, rats were anesthetized with intra peritoneal administration of a mixture of ketamine (30–50 mg / kg body weight) and xylazine (3– 5 mg / kg body weight). The visceral fat was excised, cleaned, divided into two pieces, washed in ice-cold saline, and immediately frozen in liquid nitrogen and stored at − 80 °C until RNA extraction.

RNA isolation, cDNA synthesis and Real-time PCR

Total RNA was extracted from 80 to 100 mg of tissue using RNA purification kits (AccuZol, Bioneer, Cat.No: k3090). Complementary DNA (cDNA) was extended from 1µl oligo-(dt)18 primers (0.25 µg per reaction) using cDNA synthesis kit (Accu Power RT PreMix, Bioneer, Cat.No: k2041-B) according to the manufacturer's instructions. Complementary DNA concentration was 1 to 2 ng/25µl reaction. Real-time quantitative PCR was performed using Quanti Fast SYBR Green PCR Kit (Cat. No. 204052; Qia-gen, GmbH, Germany) in using 15 µl reaction containing 0.5µl single-strand cDNA, 7.5µl Master Mix, 1µl of the each forward and reverse primers (5 pmol/µl) and 5µl dH2O. The primers for ABCG1, ABCG5, visfatin and β-actin (as normalizer) were taken from Sporstøl et al, 2007, Yu et al., 2003, Josephs et al., 2007 and Gao &Yuan, 2010, respectively (Table 1) (36-39). Real-time PCR reactions were performed using the Rotor Gene 3000 real time PCR system from Corbett using following program: step1:95 °C for 5 min and step2:40 cycle of 95 °C for 10 sec and 60°C for 30 sec. The last heating step in phase 2 was carried out for generation of a melting curve of the product. The amplicons were melted at the rate of 0.1°C/s to generate the high resolution melting profile.

**Statistical analysis**

The relative levels of mRNA were analyzed by the 2–ΔΔCt method. CT for each sample determined using Rotor-Gene 3000 Software. Briefly, Δ-CT value was calculated by taking the CT of the ABCG1, ABCG5, visfatin and β-actin (as normalizer) were taken from Sporstøl et al, 2007, Yu et al., 2003, Josephs et al., 2007 and Gao &Yuan, 2010, respectively (Table 1) (36-39). Real-time PCR reactions were performed using the Rotor Gene 3000 real time PCR system from Corbett using following program: step1:95 °C for 5 min and step2:40 cycle of 95 °C for 10 sec and 60°C for 30 sec. The last heating step in phase 2 was carried out for generation of a melting curve of the product. The amplicons were melted at the rate of 0.1°C/s to generate the high resolution melting profile.

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The Kolmogorov-Smirnov test was used to determine the normality of distribution, and variables were found to be normally distributed. All results are expressed as means ± SEM. Statistical analysis were performed using a one way analysis of variance. Least significant difference (LSD) post hoc test was used in the event of a significant (P < .05) F ratio. All statistical analysis was performed with SPSS (Version 13; SPSS, Chicago, IL).
Results
ABCG1, ABCG5 and visfatin relative gene expression in visceral fat were determined in female rats. Data analysis revealed a significant difference in visceral fat ABCG1 mRNA relative abundance between groups (F=12.53, P<0.001) (Fig.1). Using a suitable following post hoc test, data were showed that visceral fat relative expression of ABCG1 was higher in ST group when compared with other groups at the end of program (Fig.1). A significant difference was also found in visceral fat relative mRNA expression of ABCG5 at the end of treadmill running program (F=3.75, P<0.034). In this regard, the ABCG5 mRNA relative abundance was lower in Bene treated animals when compared with Bene-Control group (Fig.2). Consider to Fig 3, the visceral fat visfatin, was higher in bene groups when compared with saline groups (F=4.731, P<0.015) (Fig.3).

Discussion
The present investigation revealed a significant effect of treadmill running program with or without a liquid pista-

### Table 1. Oligonucleotide primer sequences and real-time PCR amplification parameter

<table>
<thead>
<tr>
<th>Gene</th>
<th>Forward and reverse primer sequences</th>
<th>Annealing temperature (°C)</th>
<th>Amplicon size (bp)</th>
<th>Gene accession no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABCG1</td>
<td>F:5'-GAAGGGTGCCACAGCTTCTC-3' R:5'-CATGGTCCTGGCCAGTTG-3'</td>
<td>55</td>
<td>339</td>
<td>NM_053502</td>
</tr>
<tr>
<td>ABCG5</td>
<td>F:5'-AGGCTCACGAGGGTACAGAGG-3' R:5'-CCACAGACAGGACACTGATG-3'</td>
<td>60°C</td>
<td>118</td>
<td>AF312714</td>
</tr>
<tr>
<td>Visfatin</td>
<td>F:5'-AGCGGACAGCAAGTACCATA-3' R:5'-AGCAGTCTGTGGCATAGAGG-3'</td>
<td>60°C</td>
<td>101</td>
<td>NM_177928</td>
</tr>
<tr>
<td>β-actin</td>
<td>F:5'-TATCGGAATGAGGGGTCC-3' R:5'-AGCAGTCTGTGGCATAGAGG-3'</td>
<td>55-60°C</td>
<td>145</td>
<td>NM_031144</td>
</tr>
</tbody>
</table>

Figure 1: Real-time PCR of Visceral fat ABCG1 mRNA relative expression in saline- control (SC), saline-training (ST), Bene-control (BC), and Bene-training (BT) female rats. Data expressed as mean ± SEM. Each column is assigned to one group and 5 rats per group. SC vs. ST, (P < 0.001), ST vs. BT, (P < 0.001)

Figure 2: Real-time PCR of Visceral fat ABCG5 mRNA relative expression in saline- control (SC), saline-training (ST), Bene-control (BC), and Bene-training (BT) female rats. Data expressed as mean ± SEM. Each column is assigned to one group and 5 rats per group. BC vs. BT, (P < 0.029)

Figure 3: Real-time PCR of Visceral fat Visfatin mRNA relative expression in saline- control (SC), saline-training (ST), Bene-control (BC), and Bene-training (BT) female rats. Data expressed as mean ± SEM. Each column is assigned to one group and 5 rats per group. SC vs. BC, (P < 0.011)
Khabazian et al. showed that 12 weeks of aerobic exercise significantly increased lipoprotein-cholesterol (HDL-C), Pre-β HDL and lecithin cholesterol acyltransferase (LCAT) in rat's liver. Also the plasma levels of high density lipoproteins increased five days a week, that resulted ABCA1 gene expression increase in trained visceral fat than control groups. Another finding was a higher visfatin relative genes expression in Bene groups when compared with saline groups. mRNA expression of ABCG1 was observed in several tissues including the brain, eye, kidney, spleen, lung, liver, and intestine (6, 7). The expression of ABCG5 gene has been reported in liver and small intestine (15), colon and choroid plexus (11-15). ABCG facilitates the efflux of cholesterol from cells to HDL, rather than to free apoA-I (6, 41, 42). In recent years, several studies were done on ABCA1 transporter. Ghanbari-Niaki et al. investigated the effect of 12 weeks' Aerobic exercise (intensity: 25 m/min, duration: 90 min/session and five days a week), that resulted ABCA1 gene expression increase in rat’s liver. Also the plasma levels of high density lipoprotein-cholesterol (HDL-C), Pre-β HDL and lecithin cholesterol acyltransferase (LCAT) significantly increased (18). Khabazian et al. showed that 12 weeks of aerobic exercise (intensity: 25 m/min, duration: 90 min/session and five days a week, 60 minutes a day, five days a week), increase mRNA expressions of rats’ small intestinal ABCA1 gene expression (19). In human subjects, a low intensity exercise training (walking) for 8 weeks has been shown to increase the levels of ABCA1 and ABCG1 expression in peripheral blood lymphocytes (43). Ghanbari-Niaki et al. (2012) who found that a high dose of aqueous extraction of pistacia atlantica (Bene) extract reduced and increased small intestine and kidney ABCG8 expression, respectively (44). Recently Côté et al. (2012) who studied the effect of atherogenic diet (high fat/high cholesterol) and a progressive exercise training (15-26min/min on 0%-10% slope, 15-60min/day, 5times/week, and for 6 weeks) on liver and small intestine ABCG5 and ABCG8 gene expression (45).

In addition, previous papers have shown that exercise increases the gene expression of G1 and G8 in the liver, small intestine and kidney and Bene extract reduced the expression of these genes (20, 44).

It has been shown that a high-fat diet suppresses ABCA1, ABCG4 and ABCG8 gene expression (46). Previous research showed that pistachios are rich in essential oils (47). Analysis of the Pistacia atlantica var Mutica essential oil by GC-MS method, showed that it is composed of α-pinene (70%), β-pinene (1.94%), 3-carene (0.2%), carveol (2.18%), epoxypinene (2.15%), limonene oxide (9%), myrtenol (5.31%), limonene (0.62%), citral (5.72%), α-phellandrene (0.2%), and β-myrcene (0.3%). The total amount of essential oil obtained was 22% v/w which is higher than any other species of the genus (32). Although we did not work on some of nuclear receptors whose are involved in cholesterol efflux such as peroxisome proliferator-activated receptor (PPAR), liver X receptor (LXR), and farnesoid X receptor (FXR), but It might be also possible that Bene administration reduced ABCG4 expression via these nuclear receptors (45, 48, 49). Physical exercise has been shown to have impact on nuclear receptors. Butcher et al. (2008) reported that LXRa, PPAR α and PPARγ were significantly increased following an 8 weeks of low-intensity exercise program (43).

In the past decade, other finding was a lower visfatin mRNA relative abundance in saline-treated visceral fat of rats when compared with Bene-treated animals. Revollo et al. found that mouse brown adipose tissue, liver, and kidney had the highest levels; mouse heart had intermediate levels; mouse white adipose tissue, lung, spleen, testis, and muscle had low levels; and mouse brain and pancreas had no visfatin protein expression levels (50). Evidence suggests that visfatin is an adipokine that exerts insulin-like action. Visfatin is able to mimic insulin function and lower plasma concentrations of glucose through binding to the insulin receptors (51). Other studies found that the serum concentrations of visfatin increased in diabetic patients, suggesting that visfatin may act as a compensatory factor in glucose metabolism (52).

Visfatin may be involved in improving insulin sensitivity (50). Contrary to previous findings, mRNA levels of visfatin in visceral fat tissue, after correction of BMI, was not associated with indices of insulin resistance (50). In recent year several studies was made on visfatin Lee et al. investigated the effect of 12 weeks’ Aerobic exercise (intensity: 300 - 400 cal energy expenditure, duration: 45
- 50 min/session and four days a week), that resulted visfatin significantly decrease in plasma of adolescents and Obese women (53). Domiche et al. reported that 8 weeks’ Aerobic exercise (intensity 65% - 80% HR max, duration: 20 - 34 min/session and 3 days a week), Causes visfatin significantly decrease in plasma of Middle-aged men and a positive relationship between visfatin and plasma triglyceride levels and body fat were observed (54). Also Haus et al. investigated that 12 weeks’ endurance exercise (intensity 80% HR max, duration: 60 min/session and 5 days a week), Causes Weight loss Along with the significantly reduction in plasma visfatin levels (55).

Data collected by using a GC-MS has shown that our used material had main following compositions; hexadecenoic acid (7.52%), Palmitic acid (28.86%), trans- Oleic acid (49.28%), n-Octadecanoic acid (3.87%). It is possible that the existence of a higher trans oleic acid and Palmitic acid contents were enough to act as a high fat liquid extraction to increase visfatin expression in Bene groups. In pre-adipocytes, visfatin expression decreased by 50% with palmitate and 30% with oleate (56). One existing study has focused on the effects of unsaturated free fatty acids on plasma concentration of adipokine peptide: Cooper et al showed that dietary fatty acid composition significantly reduce plasma PYY concentration and can increases plasma ghrelin concentration that are not significant (57).

In summary, this is the first study demonstrating the effect of exercise training on visceral fat ABCG1, ABCG5 and visfatin genes expression. The present study also clearly shows that treadmill exercise increase ABCG1, ABCG5 and decrease visfatin gene expression. Also bene causes decrease in ABCG1, ABCG5 and increase visfatin gene expression.

References:


Investigation of Pulmonary Valve Replacement Cases after Previous Tetralogy of Fallot repair

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Abstract
Background: The aim of this study was to investigate pulmonary valve replacement cases after previous TF repair.
Methods: This study conducted in Rajaei cardiovascular medical and research center during 2004 -2011. We collected the information including CI (cardiac index) - (left ventricular ejection fraction) LVEF - (left ventricular end systolic volume index) LVESVI - (left ventricular end diastolic volume index) LVEDVI - (right atrial pressure) RA pressure - RVEF (right ventricular ejection fraction) - (right ventricular end systolic volume index) RVESVI - RVEDVI (right ventricular end diastolic volume index) - tricuspid regurgitation grade - Net forward flow and Pulmonary regurgitated fraction
Results: Totally there were 28 cases of PVR. There were 18 and 10 cases of mechanical and biological valves. In comparison between PVR and non PVR cases, the severity of right ventricular dysfunction was higher in PVR cases. The transanular patch was the most commonly used method for repairing TOF, it was used 69.7% and 47.4% in PVR and non PVR cases respectively, and this difference was significant. There were significant improvements in severity of pulmonary stenosis before and after PVR, severe PS were 35.7 and 20% before and after PVR respectively. There were also significant improvements in PAP after PVR (21.3 and 13.5 before and after PVR respectively)
Conclusion: It seems that using transanular patch in repairing TOF is a risk factor for PI which leads to PV. Delay in PVR operation can increase the severity of RV dysfunction and frequency of arrhythmia.

Keywords: transanular patch, PVR, TOF

Introduction
Tetralogy of Fallot (TF) is one of the most common congenital heart disorders which comprise a prevalence of 0.26 to 0.8 per 1000 live births. In recent fifty years, surgical correction for this problem was used achieving the best possible outcomes[1-2]. However, in most patients with this anomaly, pulmonary valve stenosis or insufficiency remains even after correction. The extent of remaining stenosis depends on the primary size of defect, type of surgical operation and also on the right ventricular function[3-5]. In addition, end-systolic and end-diastolic volume of the right ventricle results in considerably reduce right ventricle function with increased susceptibility to cardiarrhythmias[6-7]. Therefore, inpatient with right ventricular dilatation due to significant pulmonary valve insufficiency, pulmonary valve replacing(PVR) is the most effective treatment to restore the right ventricular function and reduc-
ing the length of the QRS complex [8-10]. Despite evidences of PVR benefits in patients with TF, little information about the outcomes of surgical procedures is available. Since RAJAEI Heart Hospital is one of the major referral heart centers, in the current study, we aimed to retrospectively review our experiences about the outcomes of patients who had previous TF repair and then underwent to pulmonary valve replacement.

**Methods and Materials**

**Population Study**

In the current cross-sectional study, we retrospectively reviewed medical records of patients who had previous TF repair and then underwent to pulmonary valve replacement over a 7-year period from 2003-2010. All patients were operated in Rajaie Cardiovascular, Medical and, Research Center, one of the leading referral centers of cardiovascular diseases nationwide.

Corrective surgery was done indifferent ways such as pulmonary Valvotomy, shaving the hypertrophied muscles, obstructive right ventricular outflow patch and transannular patch.

Reviewing the medical records, we collected the demographic data including age, sex, drug history, echocardiographic parameters as LVEF, right ventricular dysfunction, TAPS, pulmonary regurgitation, severe pulmonary valve stenosis, gradient pre-and post-operative. The other data, including clinical symptoms such as shortness of breath, exercise intolerance, palpitations and arrhythmia were extracted from patient records. Other information during catheterization such as RVSP (Right ventricular systolic pressure), RASP (Right atrial systolic pressure), PAP (pulmonary arterial pressure) and PI PHT were taken before and after PVR.

This study was approved in the research center of our institution. Informed consent was exempted by the board due to the retrospective nature of this research.

**Statistical Analysis**

Statistical analysis of the data was performed using SPSS version20. Results for quantitative variables expressed as mean and standard deviation (mean ± SD). Results for qualitatively variables expressed as frequency and relative frequency. Comparisons of qualitative variables were made using Pearson's chi-square or Fisher's exact test when necessary. Quantitative variables comprised using the test or Mann-Whitney U test. P values less than 0.05 were considered statistically significant.

**Results**

**Patients after TF Repair**

Totally, we enrolled 361 patients with TOF who had undergone previous surgical repair of this anomaly. The mean age of the patients at the surgery was 5.86 ± 6.09 years (rang: 1-39). 58.9% of patients were male. Surgical technique was transannular patch in 177 patients (49%), Pulmonary Valvotomy in 14 patients (3.9%), left pulmonary artery (LPA) patch in 16 patients (4.4%), right pulmonary artery (RPA) patch in 3 patients (0.8%) and RVOT shaving in 219 patients (60.7%). The initial symptoms of patients are shown in table 1. The concomitant cardiac

<table>
<thead>
<tr>
<th>Initial Symptoms</th>
<th>None PVR group</th>
<th>PVR group</th>
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<tbody>
<tr>
<td>Clubbing</td>
<td>44.1% 147</td>
<td>46.4% 13</td>
</tr>
<tr>
<td>Cyanosis</td>
<td>68.8% 229</td>
<td>60.7% 17</td>
</tr>
<tr>
<td>Dyspnea</td>
<td>0.9% 3</td>
<td>21.4% 6</td>
</tr>
<tr>
<td>Palpitation</td>
<td>0.0% 0</td>
<td>7.1% 2</td>
</tr>
<tr>
<td>Arrhythmia</td>
<td>3.3% 11</td>
<td>14.3% 4</td>
</tr>
<tr>
<td>Free of symptoms</td>
<td>22.2% 74</td>
<td>10.7% 3</td>
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<table>
<thead>
<tr>
<th>Pvalue</th>
<th>Percentage</th>
<th>Frequency</th>
<th>Percentage</th>
<th>Frequency</th>
<th>Initial Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.81</td>
<td>44.1%</td>
<td>147</td>
<td>46.4%</td>
<td>13</td>
<td>Clubbing</td>
</tr>
<tr>
<td>0.38</td>
<td>68.8%</td>
<td>229</td>
<td>60.7%</td>
<td>17</td>
<td>Cyanosis</td>
</tr>
<tr>
<td>P&lt;0.00</td>
<td>0.9%</td>
<td>3</td>
<td>21.4%</td>
<td>6</td>
<td>Dyspnea</td>
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<tr>
<td>P&lt;0.00</td>
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<td>0</td>
<td>7.1%</td>
<td>2</td>
<td>Palpitation</td>
</tr>
<tr>
<td>P&lt;0.00</td>
<td>3.3%</td>
<td>11</td>
<td>14.3%</td>
<td>4</td>
<td>Arrhythmia</td>
</tr>
<tr>
<td>0.15</td>
<td>22.2%</td>
<td>74</td>
<td>10.7%</td>
<td>3</td>
<td>Free of symptoms</td>
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</table>
Table 2 - The concomitant cardiac anomalies and other repairs

<table>
<thead>
<tr>
<th>Contaminant Anomalies and repairs</th>
<th>PVR group</th>
<th>None PVR group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coronary Anomaly</td>
<td>1</td>
<td>3.6%</td>
</tr>
<tr>
<td>Tricuspid repair</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Mitral valve repair</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Stenosis of right and left pulmonary arteries</td>
<td>7</td>
<td>0.0%</td>
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<tr>
<td>Previous shunt</td>
<td>3</td>
<td>10.7%</td>
</tr>
<tr>
<td>TAPSE</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Pulmonary valve comiseroatmy</td>
<td>3</td>
<td>10.7%</td>
</tr>
<tr>
<td>Pulmonary valve stenosis</td>
<td>1</td>
<td>3.6%</td>
</tr>
<tr>
<td>Oval orifice repair</td>
<td>13</td>
<td>46.4%</td>
</tr>
<tr>
<td>Interatrial orifice repair</td>
<td>2</td>
<td>7.1%</td>
</tr>
<tr>
<td>Tricuspid valve insufficienc</td>
<td>1</td>
<td>3.6%</td>
</tr>
</tbody>
</table>

Regarding the surgical technique, Transanular patch was more used in patients with PVR (9.67% vs. 4.47%). Other techniques performed similarly in both groups of patients. Some initial clinical symptoms, such as dyspnea (P-value < 0.00), palpitations (P-value < 0.00), and arrhythmias (P-value < 0.00) more observed in patients in PVR group. In the terms of right ventricular function, the moderate and severe dysfunction was significantly higher in PVR candidates. The severity of PI was higher in patients with PVR and the severity of PS had a significant difference between two groups. In the other side, LVEF was significantly lower in PVR group (P-value = ?). The evaluation of PIPHT index, the index of mean PI and PS showed no significant difference between two groups.

The values for the index of preoperative and postoperative valvular PS were similar between the two groups. Cardiac volume indices before PVR are shown in table 3.

Comparison of Cardiac Volume Indices before and after PVR

The severity of PI and PS after PVR significantly improved. TAPSE index showed a significant decrease in PVR group. Systolic and diastolic values of RVSP indices significantly decreased after surgery. The mean value for PAP was significantly improved after PVR. Significant changes in other parameters were not observed. Comparison of cardiac volume indices before and after PVR is shown in table 3. Before the surgery 21.3% of patients were free of symptoms that increased to 51.2% after surgery.

Discussion

It has been revealed that PVR, in patients who had previous TF repair, reduces RV volume overload resulting in improved RV function, reverse clinical status, better exercise capacity and lower incidence of symptomatic arrhythmias both in childhood and adolescence [11-13]. In the other study, Shiokawa et al, showed significantly improvement of cardiothoracic ratio from 61.0 ± 5.2 % before PVR to 56.2 ± 4.8 % after PVR (P < 0.001). The New York Heart association functional class had significant increase from 2.4 ± 0.8 preoperatively to 1.2 ± 0.4 postoperatively and also left ventricular ejection fraction improved significantly [14]. Normalization of the ventricular volumes after PVR have usually been defined as restoration of RV function [15]. In the present study, we evaluated the cardiac volume indices in patients with
TF history before and after PVR. In a previous study by Quail et al, the majority of patients have received at the normal RV end-diastolic volume and end systolic volume after PVR [16]. Also Jang et al found RV end-diastolic and end-systolic volume were obviously dropped during the follow-up time[17]. Thus, in line with previous studies, our study clearly confirms that PVR in patients with pulmonary insufficiency after the repair of TOF can lead to significant improvements in RV performance indicators. It has been reported that RV ejection fraction (EF) has a strong association with LVEF after TOF repair[18]. The effect of severe pulmonary regurgitation (PR) on LV systolic function has been explained by Frigiola et al as ventricular-ventricular interaction [5]. Therefore, other adverse events such as progressive heart failure and death may be followed by significant right heart disease [18-19]. The impact of PVR on the left heart late after TOF repair was investigated by Tobler et al[20]. They showed that LVEF increased significantly in all patients and in those with moderate impairment received a better results than those with sever dysfunction. With the advances in surgical techniques early mortality of TOF repair has become very low.[17, 21-22] However TOF repair through transannular opening is often necessary to relieve RV outflow stenosis which can result in PR over long-term periods. It has also been reported that PR after a TOF repair may lead to ventricular arrhythmias and sudden cardiac death. Major corrective technique in our TF patients who required to PVR was transannular patch. Inline with our study, in a study by Tsang et al , of 16 patients who underwent PVR , 11 had previous transannular patch(68%)[23]. However Therrien et al reported 39% of transannular patch in PVR patients[24]. In another study transannular patch was used in 44% of the patients[25]. Although some evidences confirm early intervention to pulmonary valve recovery lead to better return of the RV function [26-28] but there are still concerns about homograft dysfunction over years. [29-30]. In our study, the mean age of our patients at PVR surgery was 20 years. The mean age of patients in Tsang study was 6 (SD, 5) years when they underwent TOF repair and 24 (SD, 13) years

Table 3: Cardiac volume indices in two groups before PVR

<table>
<thead>
<tr>
<th>PVR group</th>
<th>PVR Before and after PVR</th>
<th>None PVR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Before</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>mean</td>
</tr>
<tr>
<td>0.00</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>0.57</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>0.00</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>0.85</td>
<td>0.037</td>
<td>0.00</td>
</tr>
<tr>
<td>0.36</td>
<td>---</td>
<td>(7.50)</td>
</tr>
<tr>
<td>0.25</td>
<td>0.79</td>
<td>(0.00)</td>
</tr>
<tr>
<td>0.41</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>0.76</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>0.34</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>0.96</td>
<td>0.99</td>
<td>0.50</td>
</tr>
<tr>
<td>0.103</td>
<td>0.006</td>
<td>0.71</td>
</tr>
<tr>
<td>0.59</td>
<td>0.009</td>
<td>4.04</td>
</tr>
<tr>
<td>0.134</td>
<td>0.078</td>
<td>0.00</td>
</tr>
<tr>
<td>0.76</td>
<td>0.041</td>
<td>2.40</td>
</tr>
<tr>
<td>0.216</td>
<td>0.00</td>
<td>19.69</td>
</tr>
<tr>
<td>0.00</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>0.18</td>
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</tr>
</tbody>
</table>
when they underwent PVR. In another study by Jang et al, PVR was performed at a mean age of 14.8 ± 6.7 years. Other authors’ reported various age of PVR between 12 and 34 years old[31] and the time of this intervention is in controversy.

Conclusion
In patients with pulmonary insufficiency after previous TOF repair, PVR can effectively improve right ventricular performance indices. However, it should be considered before RV dilation. Thus, the proper timing of surgery is very important, especially patients who have received transannular-patch. They must be visited and evaluated for PI and its complication in shorter time. This process depends on the knowledge of patients and availability of skilled medical team for follow up.

References:
Ventricular Septal Dysfunction After Surgical Closure of Multiple Ventricular Septal Defects

The Annals of Thoracic Surgery, Volume 96, Issue 3, Pages 891-897, September 2013

**Background:** We assessed the global and regional ventricular septal functions using conventional echocardiography and two-dimensional speckle tracking imaging in children with postoperative multiple ventricular septal defects.

**Methods:** Thirty-six children were studied: 16 with postoperative multiple ventricular septal defects and 20 normal control subjects. In children with multiple ventricular septal defects, 60 ventricular septal defects were closed using one of three different techniques (patch closure, the sandwich technique, direct closure). Speckle tracking imaging was applied to three short-axis echocardiographic images.

**Results:** The total patch area used in the multiple ventricular septal defects group was correlated with the postoperative ejection fraction ($r = 0.703$) and Tei index ($r = 0.778$). The global septal peak systolic radial displacement and global septal peak systolic radial strain in the multiple ventricular septal defects group were significantly lower than those observed in the control subjects. The peak systolic radial strain in the segments closed with patches and the peak systolic radial displacement in the segments closed with the felt sandwich technique were significantly lower than those observed in the intact septal segments. No significant regional functional depressions were identified in the segments that were closed directly.

**Conclusions:** The postoperative ventricular global and septal functions were significantly reduced in children with multiple ventricular septal defects, especially in the cases with complex congenital heart disease and that were closed with large prosthetic materials. These results suggest that an effort to minimize the use of patch materials may lead to preserved postoperative ventricular function.

Outcomes of Surgical Therapy for Infective Endocarditis in a Pediatric Population: A 21-Year Review

The Annals of Thoracic Surgery, Volume 96, Issue 1, Pages 171-175, July 2013

**Background:** Infective endocarditis is a rare disease in the pediatric population. We sought to define patient characteristics and outcomes of surgical therapy for endocarditis in children.

**Methods:** We performed a retrospective review of all patients with infective endocarditis who received surgical therapy between January 1, 1990, and March 1, 2011. We were interested in their congenital heart defect, prior surgical procedures, and outcome of the operation.

**Results:** We identified 35 cases of endocarditis in 34 patients requiring surgical intervention. Mean age was $10.7 \pm 8.8$ years. There was a bimodal age distribution at presentation: 11 (31%) were younger than 1 year and 15 (43%) were 10 to 21 years. Of the 34 patients, 22 (63%) had no history of prior cardiac operation. The infective organism was identified in 30 (86%), with Staphylococcus aureus ($n = 8$) and Streptococcus viridans ($n = 6$) predominating. Valve replacement was performed in 22 patients and valve repair in 10. All patients received 6 weeks of postoperative intravenous antimicrobial therapy. Operative mortality was 15% (5 of 34). The 5 deaths occurred in infants who were a mean age of 2.5 months, and 3 of the 5 infants (60%) were premature. Of 4 patients with fungal infection, 3 patients died. The Ross operation was performed successfully in 5 patients with severe aortic valve disease. Reoperations ($n = 10$ [28%]) included valve replacement in 5 and conduit replacement in 3, all but 1 due to somatic growth resulting in functional stenosis.
**Conclusions:** The outcome of surgical therapy for endocarditis in children was similar to that reported for adults, with an overall mortality of 15%. The Ross operation was very effective in patients with aortic valve endocarditis. There is a significant incidence of late reoperation for valve and conduit replacement due to somatic growth. Age younger than 1 year, prematurity, and fungal organisms appear to be risk factors for death. Patients surviving to discharge had good outcomes, with no episodes of recurrent endocarditis.

**Short- and intermediate-term survival after extracorporeal membrane oxygenation in children with cardiac disease**

**Objectives:** In children with cardiac disease, common indications for extracorporeal membrane oxygenation (ECMO) include refractory cardiopulmonary resuscitation (E-CPR), failure to separate from cardiopulmonary bypass (OR-ECMO), and low cardiac output syndrome (LCOS-ECMO). Despite established acceptance, ECMO outcomes are suboptimal with a survival between 38% and 55%. We evaluated factors associated with significantly increased survival in cardiac patients requiring ECMO.

**Methods:** We conducted a retrospective investigation of consecutive patients undergoing ECMO between 2006 and 2010. Demographic, pre-ECMO, ECMO, and post-ECMO parameters were analyzed. Neurologic outcomes were assessed with the pediatric overall performance category scale at the latest follow-up.

**Results:** There were 3524 admissions, 95 (3%) of which necessitated ECMO: 40 (42%) E-CPR, 31 (33%) OR-ECMO, and 24 (25%) LCOS-ECMO. The overall hospital survival was 73%. The within-groups hospital survival was 75% in E-CPR, 77% OR-ECMO and 62% LCOS-ECMO. In the multivariable logistic regression analysis, chromosomal anomalies (odds ratio [OR], 8; 95% confidence interval [CI], 2-35), single ventricle (OR, 6; 95% CI, 3-33), multiple ECMO runs (OR, 15; 95% CI, 4-42), higher 24-hour ECMO flows (OR, 8; 95% CI, 4-22), decreased lung compliance (OR, 5; 95% CI, 2-16), and need for plasma exchange (OR, 5; 95% CI, 3-18) were all significant factors associated with mortality. From the univariate analysis, a common parameter associated with mortality within all groups was intracranial hemorrhage. At 1.9 years (0.9, 2.9) of follow-up, 66% were still alive, and 89% of survivors had normal function or only mild neurodevelopmental disability.

**Conclusions:** ECMO was successfully used in children with cardiac disease with 73% and 66% short- and intermediate-term survival, respectively. The majority of the survivors had normal function or only a minimal neurodevelopmental deficit.

**Early elevation of cardiac troponin I is predictive of short-term outcome in neonates and infants with coronary anomalies or reduced ventricular mass undergoing cardiac surgery**

**Objective:** The present study aimed to assess the usefulness of routine monitoring of cardiac troponin I concentrations within 24 hours of surgery (cTn-I<24h) in neonates and infants undergoing cardiac surgery.

**Methods:** The added predictive ability of a high peak cTn-I<24h (within the upper quintile per procedure) for a composite outcome, including 30-day mortality and severe morbidity, was assessed retrospectively. The predicted risk for the composite outcome was estimated from a logistic regression model including preoperative and intraoperative variables. Adding a high peak cTn-I<24h to the risk model resulted in reclassification of the predicted risk. It also allowed quantification of the improvement in reclassification and discrimination by the difference between c-indexes, the Net Reclassification and the Integrated Discrimination Indexes (NRI and IDI).

**Results:** Overall, 1023 consecutive patients were included. Adding a high peak cTn-I<24h to the model resulted in no
improvement in reclassification or discrimination in the overall population (difference between c-indexes: 0.011 [−0.004 to 0.029], NRI = 0.06, P = .22, IDI = 0.02, P = .06), except in a subgroup of patients undergoing the arterial switch operation with or without ventricular septal defect closure and/or aortic arc repair, anomalous origin of the left coronary artery from the pulmonary artery repair, truncus arteriosus repair, Norwood procedure, and Sano modification, in whom NRI = 0.23 (P = .005) and IDI = 0.05 (P < .001).

**Conclusions:** Patients with coronary anomalies and patients with reduced ventricular mass should benefit from the routine monitoring of cTn-I concentrations after surgery for congenital cardiac disease.

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**Clinical and echocardiographic outcomes after surgery for severe isolated tricuspid regurgitation**

*The Journal of Thoracic and Cardiovascular Surgery, Volume 146, Issue 2, Pages 278-284, August 2013*

**Objective:** Few studies have investigated the outcomes after surgical correction of severe isolated tricuspid regurgitation.

**Methods:** The medical records of 51 consecutive patients (aged 55.8 ± 12.9 years, 25 male) who underwent tricuspid valve surgery at the Asan Medical Center between September 1996 and July 2010 were evaluated retrospectively. All patients had severe isolated tricuspid regurgitation but no significant left-sided cardiac disease or history of heart surgery.

**Results:** Tricuspid valve repair (n = 37, 72.5%) or replacement (n = 14, 27.5%) was performed. Replacement involved mechanical (n = 4) or bioprosthetic valves (n = 10). One early death occurred (2.0%). During a median follow-up period of 47.4 months (interquartile range, 10.4-61.4 months), 9 late deaths, 3 readmissions for congestive heart failure, 2 heart transplantations, and 1 tricuspid valve reoperation occurred. Overall and event-free survivals at 5 years were 83.5% ± 5.4% and 77.3% ± 6.1%, respectively. In the multivariable Cox regression analysis, preoperative hemoglobin (P = .045), serum bilirubin (P = .008), estimated glomerular filtration rate (P = .045), and systolic right ventricular dimension (P = .047) were significant and independent determinants of clinical outcome. On serial echocardiographic evaluations (median follow-up period, 28.5 months; interquartile range, 18.9-68.7 months), moderate-to-severe tricuspid regurgitation was detected in 21 patients (41%). Severe tricuspid regurgitation after tricuspid valve repair or bioprosthetic valve replacement was a significant predictor of poor event-free survival, even after adjustment for preoperative risk factors (P = .036).

**Conclusions:** In the present cohort, preoperative anemia, renal/hepatic dysfunction, right ventricular dilatation, and significant postoperative tricuspid regurgitation were associated with poor outcomes. Timely surgery is advisable in patients with severe isolated tricuspid regurgitation before the development of anemia, organ dysfunction, or right ventricular dilatation.

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**Chordal replacement with polytetrafluoroethylene sutures for mitral valve repair: A 25-year experience**

*The Journal of Thoracic and Cardiovascular Surgery, Volume 145, Issue 6, Pages 1563-1569, June 2013*

**Objective:** The study objective was to examine the late results of mitral valve repair with chordal replacement with polytetrafluoroethylene sutures.

**Methods:** From 1986 to 2004, 606 consecutive patients with degenerative mitral regurgitation had mitral valve repair with chordal replacement with polytetrafluoroethylene sutures. Patients' mean age was 57 years, and 73.6% were men. Isolated prolapse of the anterior leaflet was present in 17.6% of patients, isolated posterior leaflet prolapse was present in 29.5% of patients, and bileaflet prolapse was present in 52.9% of patients. Prolapse was corrected by creating 2 to 38 neochords of polytetrafluoroethylene sutures (mean, 13 ± 9 per patient). The mean follow-up was 10.1 years, and 96% of the patients had multiple echocardiographic studies over the years.

**Results:** There were 5 early and 106 late deaths. Age, dia-
One thousand minimally invasive mitral valve operations: Early outcomes, late outcomes, and echocardiographic follow-up


**Objective:** The present study assessed the clinical and echocardiographic outcomes for 1000 patients undergoing minimally invasive mitral valve surgery.

**Methods:** The Brigham Cardiac Valve database was reviewed. From August 1996 to November 2011, 1000 patients had undergone minimally invasive mitral valve surgery (median follow-up, 7 years). Data on the surgical approach, complications, reoperations, and late survival were tabulated. Late echocardiographic data on the recurrence of mitral regurgitation after mitral repair in myxomatous disease were also collected. Survival, freedom from reoperation and recurrent mitral regurgitation (grade ≥ 3+) were evaluated with life tables and Kaplan-Meier analyses.

**Results:** The mean patient age was 57 years. Of the 1000 patients, 41% were women. Myxomatous degenerative disease was the predominant pathologic entity (86%). A lower hemisternotomy was the predominant surgical approach (75%). Mitral repair was performed in 923 patients and replacement in 77. Eight operative deaths (0.8%) occurred. A total of 44 patients with failed mitral repairs underwent reoperation, with 1 mitral valve replaced again on the same operative day for atrioventricular groove disruption. Nine failed repairs were repaired again (9/44 [20%]). A total of 106 late deaths occurred. The overall survival at 15 years was 79% ± 3%. Freedom from reoperation at 15 years was 90% ± 3% for repairs and 100% for replacements. Late echocardiograms were acquired for 615 of 815 eligible mitral repair patients with myxomatous disease (75%). Freedom from recurrent mitral regurgitation (grade ≥ 3+) at 1, 5, and 10 years was 99% ± 1%, 87% ± 2%, and 69% ± 4%, respectively.

**Conclusions:** Minimally invasive mitral valve surgery is effective, with excellent late results. The durability of minimally invasive mitral valve repair compared favorably with conventional full sternotomy methods at late follow-up.

Mitral valve repair or replacement for ischemic mitral regurgitation? The Italian Study on the Treatment of Ischemic Mitral Regurgitation (ISTIMIR)

The Journal of Thoracic and Cardiovascular Surgery, Volume 145, Issue 1, Pages 128-139, January 2013

**Objective:** It is uncertain whether mitral valve replacement is really inferior to mitral valve repair for the treatment of chronic ischemic mitral regurgitation. This multicenter study aimed at providing a contribution to this issue.

**Methods:** Of 1006 patients with chronic ischemic mitral regurgitation and impaired left ventricular function (ejection fraction < 40%) operated on at 13 Italian institutions between 1996 and 2011, 298 (29.6%) underwent mitral valve replacement whereas 708 (70.4%) received mitral valve repair. Propensity scores were calculated by a nonparsimonious multivariable logistic regression, and 244 pairs of patients were matched successfully using calipers of width 0.2 standard deviation of the logit of the propensity scores. The postmatching median standardized difference was 0.024 (range, 0-0.037) and in none of the covariates did it exceed 10%.

**Results:** Early deaths were 3.3% (n = 8) in mitral valve repair versus 5.3% (n = 13) in mitral valve replacement (P =
Objective: Management of a patent left internal thoracic artery graft during reoperation is controversial. The “no-dissection” technique avoids dissection and clamping of the left internal thoracic artery graft, and myocardial protection is achieved using adjunctive systemic hypothermia and hyperkalemia. We compared the postoperative outcomes after isolated reoperative aortic valve replacement in patients with previous coronary artery bypass grafting with a patent left internal thoracic artery graft using a no-dissection technique with the outcomes of patients with previous coronary artery bypass grafting without a left internal thoracic artery graft.

Methods: The outcomes were analyzed for patients who underwent isolated reoperative aortic valve replacement with previous coronary artery bypass grafting from January 1, 2002, to June 30, 2011. Patency of the left internal thoracic artery was confirmed using either coronary angiography or computed tomography angiography. The patent left internal thoracic artery group did not undergo dissection or clamping of the left internal thoracic artery graft, and myocardial protection was obtained using systemic hyperkalemia and hypothermia. The no left internal thoracic artery group underwent isolated aortic valve replacement with previous coronary artery bypass grafting but had no left internal thoracic artery graft.

Results: A total 174 patients were identified for the patent left internal thoracic artery group and 26 for the no left internal thoracic artery group. The perfusion and crossclamp times were similar. No differences were seen between the 2 groups in operative mortality (6.9% vs 7.7%, P = 1.00). The complication rates were similar, and the peak creatine kinase-MB values within 24 hours of surgery were not significantly different between the 2 groups (median, 27.4 vs 29 μ/mL; P = .72).

Conclusions: Reoperative aortic valve replacement in patients with previous coronary artery bypass grafting and a patent left internal thoracic artery graft can be performed safely without dissection or clamping of the left internal thoracic artery using systemic hyperkalemia and hypothermia. The no left internal thoracic artery group underwent isolated aortic valve replacement with previous coronary artery bypass grafting but had no left internal thoracic artery graft.

Adenosine instead of supranormal potassium in cardioplegia: It is safe, efficient, and reduces the incidence of postoperative atrial fibrillation. A randomized clinical trial

Objective: We aimed to evaluate the efficacy and safety of a cold crystalloid cardioplegic solution with adenosine (1.2 mmol/L) instead of supranormal potassium.

Methods: Sixty low-risk patients scheduled for elective coronary artery bypass grafting (CABG) were randomized to receive standard cold crystalloid hyperkalemic cardioplegia (hyperkalemic group) or normokalemic cardioplegia in which supranormal potassium was replaced with 1.2 mmol/L adenosine (adenosine group). End points were postoperative release of troponin T and creatine kinase MB,
Immediate rescue operations after failed diagnostic or therapeutic cardiac catheterization procedures

**Background:** Allosensitization in potential orthotopic heart transplant recipients is evaluated with the panel reactive antibody assay. Sensitized patients have prolonged wait times and increased waitlist and post-transplant mortality. Although low panel reactive antibody activity at the time of orthotopic heart transplantation is associated with improved outcomes, literature regarding the survival benefit of a panel reactive antibody reduction in the sensitized orthotopic heart transplant recipient remains limited.

**Methods:** Adult orthotopic heart transplant recipients listed in the United Network for Organ Sharing database (October 1, 1987, to June 29, 2004) were stratified by peak panel reactive antibody activity and whether a substantial decline from peak to most recent panel reactive antibody activity occurred before transplant. Propensity matching compensated for these differences. Kaplan–Meier survival analysis of matched groups showed that the median graft survival was 120 months in patients with a significant panel reactive antibody reduction and 103 months in patients with a trivial reduction (P = .007, log-rank). In Cox proportional hazards modeling, a significant reduction in panel reactive antibody activity had an independent protective effect on graft survival (hazard ratio, 0.88; confidence interval, 0.80-0.96; P = .006).

**Conclusions:** Sensitized patients who had a substantial reduction in panel reactive antibody activity had an associated decline in panel reactive antibody activity and those who did not. Propensity matching compensated for these differences. Kaplan–Meier survival analysis of matched groups showed that the median graft survival was 120 months in patients with a significant panel reactive antibody reduction and 103 months in patients with a trivial reduction (P = .007, log-rank). In Cox proportional hazards modeling, a significant reduction in panel reactive antibody activity had an independent protective effect on graft survival (hazard ratio, 0.88; confidence interval, 0.80-0.96; P = .006).

Outcomes in the current surgical era following operative repair of acute Type A aortic dissection in the elderly: a single-institutional experience

**Objective:** We reviewed our single-centre experience with emergent operative repair of Stanford Type A aortic dissections, with particular attention to outcomes in the elderly.

**Methods:** Consecutive adult patients undergoing emergent operative repair of acute Type A aortic dissections between February 2004 and December 2011 at a single institution were identified. Patients were stratified into elderly (≥70 years) and control cohorts (<70 years). Kaplan–Meier anal-
Abstract: Traditional outcome measures such as long-term mortality may be of less value than symptomatic improvement in elderly patients undergoing coronary artery bypass grafting (CABG). In this systematic review, we analyse health-related quality of life (HRQOL) as a marker of outcome after CABG. We aimed to assess the role of HRQOL tools in making recommendations for elderly patients undergoing surgery, where symptomatic and quality-of-life improvement may often be the key indications for intervention. Twenty-three studies, encompassing 4793 patients were included. Overall, elderly patients underwent CABG at reasonably low risk. Our findings, therefore, support the conclusion that performing CABG in the elderly may be associated with significant improvements in HRQOL. In order to overcome previous methodological limitations, future work must clearly define and stringently follow-up this elderly population, to develop a more robust, sensitive and specialty-specific HRQOL tool.

Does coronary artery bypass grafting improve quality of life in elderly patients?

Interactive CardioVasc Thoracic Surgery, Volume 17, Issue 3, Pp. 542-553

Objective: Mitral annular calcification is associated with significant morbidity and mortality at the time of mitral valve surgery. However, few data are available describing the impact of mitral annular calcification on early and late outcomes following mitral valve repair in the current era.

Methods: Between 2001 and 2011, 625 patients were referred for mitral valve repair of severe mitral regurgitation due to myxomatous degeneration. The mean patient age was 63.9 ± 12.7 years and 164 (26%) were female. Concomitant coronary artery bypass grafting was performed in 91 (15%) and 24 (4%) had previous cardiac surgery. Calcification of the mitral annulus was observed in 119 patients (19%), of whom complete debridement and extensive annulus reconstruction were performed in 14. The mean follow-up was for 2.4 ± 2.3 years.

Results: There were no deaths within 30 days of surgery. Risk factors associated with mitral annular calcification included older age (odds ratio 1.05 ± 0.02 per increasing year), female gender (odds ratio 1.88 ± 0.42) and larger preoperative left atrial size (odds ratio 1.04 ± 0.03 per increasing mm) (all P<0.01). Severe renal impairment defined as a creatinine clearance <30 mL/min was observed in 9 patients, all of whom had mitral annular calcification. Intraoperative conversion to mitral valve replacement was performed in...
19 patients (97% repair rate), 5 of whom had mitral annular calcification. Extension of mitral annular calcification into one or more leaflet scallops was observed for all patients who required conversion to valve replacement. Five-year survival, freedom from recurrent mitral regurgitation ≥2+ and freedom from recurrent mitral regurgitation ≥3+ was 88.1 ± 2.4, 89.6 ± 2.3 and 97.8 ± 0.8%, respectively. Mitral annular calcification was not associated with survival or recurrent mitral regurgitation.

**Conclusions:** Risk factors for mitral annular calcification in patients with myxomatous degeneration and severe mitral regurgitation include older age, female gender, severe renal dysfunction and larger preoperative left atrial size. Nevertheless, favourable early and late results can be achieved with mitral valve repair in this population.

**Stent Versus Off-Pump Coronary Bypass Grafting in the Second-Generation Drug-Eluting Stent Era**

*The Annals of Thoracic Surgery, Volume 96, Issue 2, Pages 535-541, August 2013*

**Background:** Second-generation drug-eluting stents (DESs) are known to have better safety and clinical outcomes compared with the first-generation DESs. We compared the clinical results of off-pump coronary artery bypass grafting (OPCAB) with percutaneous coronary intervention (PCI) using second-generation DESs.

**Methods:** The study enrolled 1,821 patients with triple-vessel or left main coronary disease, or both, who underwent OPCAB or PCI with second-generation DESs from 2008 to 2011. Major adverse cardiac and cerebrovascular events (MACCEs), including death, myocardial infarction, stroke, and target vessel revascularization, were retrospectively compared between the two groups in a real-world and in a matched population (n = 1,294). Follow-up duration was 23.0 ± 13.0 months (range, 0 to 56 months).

**Results:** The postprocedural mortality rate was comparable between the two groups (p = 0.384). The overall rate of MAACEs was 7.3% in the PCI group and 3.8% in the OPCAB group (p = 0.001). The 3-year rate of freedom from MACCEs was 88.4% ± 1.5% in the PCI group and 94.9% ± 1.0% in the OPCAB group (p < 0.001). In a matched population comparison, the 3-year rate of freedom from a MACCE was 87.5% ± 2.0% in the PCI group and 95.3% ± 1.2% in the OPCAB group (p = 0.001). The determining factors were nonfatal myocardial infarction and target vessel revascularization. The OPCAB group showed a superior rate of freedom from MACCEs in the triple-vessel (p = 0.008) and left main subset analysis (p = 0.001).

**Conclusions:** The OPCAB showed superior outcomes in triple-vessel or left main disease, or both, compared with PCI in the second-generation DES era after 23 months of follow-up. Nonfatal myocardial infarction and target vessel revascularization were the determining factors. Longer follow-up with randomization will clarify our results.

**Role of Surgical Ventricular Restoration in the Treatment of Ischemic Cardiomyopathy**

*The Annals of Thoracic Surgery, Volume 95, Issue 4, Pages 1315-1321, April 2013*

**Background:** Surgical ventricular restoration (SVR) has been applied as a valuable adjunct procedure for patients undergoing coronary artery bypass grafting (CABG) to correct the geometry of the left ventricle on the basis of myocardial revascularization. It is necessary to find out at least which patient cohort is more likely to benefit from this procedure.

**Methods:** A case-control study was conducted on 221 patients with ejection fraction (EF) ≤0.35 and New York Heart Association (NYHA) class III or IV, who received CABG + SVR or CABG alone from 1998 to 2008. Comparisons were made between CABG + SVR and CABG alone within two groups of patients: group 1 (preoperative left ventricular end-systolic volume index [LVESVI] <80 mL/m2, n = 127) and group 2 (preoperative LVESVI ≥80 mL/m2, n = 94). Outcomes included improvement in EF, NYHA class, readmissions, and survival.

**Results:** Patients in either group receiving SVR achieved significant LVESVI reduction postoperatively (p < 0.001). In group 1, EF improvement (defined as over .05 improve-
A similar percentage of patients improved to NYHA class I or II (63.0% for CABG + SVR versus 55.9% for CABG, p = 0.430). Readmissions after CABG + SVR were 27.8% compared with 38.2% after CABG (p = 0.225). There was no difference in survival between CABG + SVR and CABG (p = 0.709). In group 2, the CABG + SVR patients showed greater EF improvement (55.6% versus 30.8%, p = 0.020) and were more likely to improve to NYHA class I or II (58.3% versus 36.5%, p = 0.044). Readmissions were fewer for the CABG + SVR patients than for the CABG patients (30.6% versus 57.7%, p = 0.012). CABG + SVR yielded better survival than did CABG (p = 0.031).

Conclusions: Patients with much advanced LVESVI are more likely to benefit from surgical ventricular restoration, and this surgical procedure still holds its ground in the treatment of ischemic cardiomyopathy.

Background: Coronary artery bypass graft surgery is superior to percutaneous intervention in diabetic patients with multivessel disease. The use of bilateral internal thoracic arteries (BITA) may provide better long-term graft patency, but the risk of postoperative deep sternal wound infection has limited its use in diabetic patients. However, studies have reported conflicting results, and require systematic evaluation.

Methods: MEDLINE, EMBASE, World of Science, and the Cochrane library were searched for randomized controlled trials and observational studies comparing the incidence of deep sternal wound infection in diabetic patients undergoing either left internal thoracic artery (LITA) or BITA harvest. We used random effect models to compare risk ratios within groups.

Results: One randomized controlled trial and 10 observational studies (126,235 diabetic patients: 122,465 LITA, 3,770 BITA) met inclusion criteria. Deep sternal wound infection occurred in 3.1% and 1.6% for the BITA and LITA cohorts, respectively. The risk ratio for deep sternal wound infection development was 1.71 (1.37 to 2.14) for BITA compared with LITA. Patients who underwent skeletonized BITA harvest had a similar risk of deep sternal wound infection compared with LITA (0.9 [0.42 to 2.09]), although pedicled harvest demonstrated increased risk (1.77 [1.4 to 2.23]). Early mortality was comparable in the LITA cohort (2.5%) and the BITA cohort (2.3%; p = 0.8).

Conclusions: The risk of deep sternal wound infection can be minimized in diabetic patients undergoing coronary artery bypass graft surgery by performing ITA harvested in a skeletonized manner with meticulous attention to preserving sternal blood flow. Pedicled harvest is to be discouraged when utilizing both ITA owing to a significant increase in the risk of postoperative deep sternal wound infection.

Background: There are a variety of modified elephant-trunk methods, including use of endovascular stents. Our objectives were to classify these modifications, compare outcomes between the classic anastomotic site and these alternatives, and investigate time to second-stage elephant-trunk completion.

Methods: From May 1992 to January 2011, 526 patients underwent a first-stage elephant-trunk procedure and were the subject of analysis.

Results: Distal aortic anastomosis was located before the brachiocephalic artery in 6 patients (1.1%), between brachiocephalic and left common carotid artery (LCCA) in 1 (0.19%), between LCCA and left subclavian artery (LSCA) in 154 (29%), and beyond the LSCA (classic) in 365 (69%). Stroke occurred in 8% (n = 42) overall, 10% (n = 16) in the LCCA-LSCA group, and 6.8% (n = 25) in the classic group. Risk factors were older age and acute dissection. Thirty-day mortality was 7.6% (n = 40) and was similar for LCCA-
Background: Heart transplantation requires substantial personal, financial, and psychosocial resources. Using an existing multisite data set, we examined predictors of mortality at 5 to 10 years after heart transplantation.

Methods: All 555 participants completed a self-report quality of life instrument. Of these patients, 55 (10%) died 5 to 10 years after heart transplantation. Statistical analyses included frequencies, means, Pearson correlation coefficients, and Cox proportional hazard modeling.

Results: Educational level and higher levels of social and economic satisfaction were predictive of improved survival. Conversely, married status, more cumulative infections, the presence of hematologic disorders, higher New York Heart Association (NYHA) class, and poor adherence to medical care predicted worse survival.

Conclusions: Demographic, clinical, psychosocial, and behavioral factors were important predictors of long-term survival after heart transplantation. These findings have important implications for patient selection for heart transplantation, as well as for posttransplantation care.
Adventitious Aortic Pulmonary Fistula

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Abstract:
Aortic pulmonary fistula is an uncommon complication of an aortic aneurysm that can lead to several complications; by the way it is a highly fatal occurrence at the end. Young man with history of aortic valve replacement was admitted due to recent dyspnea. Diagnosis was determined aortic pulmonary fistula, but before the surgery he died. Although this group of patients have poor prognosis, early and accurate diagnosis and management can save their lives. On the other hand we should evaluate aorta while managing aortic valve disorder.

Keywords: Aortic pulmonary fistula, aortic aneurysm

Introduction:
Thoracic aortic aneurysm is less common than abdominal aortic aneurysm, but it may have major complications including aortic rupture, aortic dissection, and congestive heart failure. These are the main causes of death in patients with aortic aneurysm (1,2) Risk factors for an aortic aneurysm are having heart disease, smoking, diabetes, family history of aortic aneurysm and age more than sixty. Incidence of an aortic aneurysm in men is more than women (3).

Aortic pulmonary fistula is an uncommon complication of aortic aneurysm that can lead to several complications such as rapid left-to-right shunt, right heart failure and death (4). Aortic pulmonary fistula is a congenital heart disorder that explores early in the life, although it is seen acquired in atherosclerotic, syphilitic, post endocarditis and rheumatologic diseases such as Marfan (5).

In patients with aortic pulmonary fistula, the most common symptoms are chest pain, shortness of breath and other respiratory symptoms such as dyspnea and hemoptysis. Early and accurate diagnosis is essential for appropriate management and treatment of these patients. Echocardiography is the commonly used imaging technique for accurate evaluation. (6)

Although aortic pulmonary fistula secondary to thoracic aortic aneurysm is a highly fatal occurrence and mortality rate is very high, few cases of successful surgical repair were reported (7, 8, 9).

Report: case
A seventeen year old man referred to our hospital in November 2010. He had been suffering from dyspnea since one month before. He was admitted to hospital for aortic valve replacement five years ago. He had received Carvedilol, Furosemide,
Digoxin and Warfarin. In physical exam he had tachypnea. He had micro chronic microcytic anemia and increased hepatic enzymes. Other lab analyzes and physical exams were normal.

While we evaluated anemia, we could observe pulmonary hypertension in transthoracic echocardiogram. For more evaluation second echocardiography was done and the aneurysm of aortic root was seen to be perforated to pulmonary artery. So we could recognize this aortic pulmonary fistula apart from pulmonary hypertension (Figure 1, 2).

Computerized tomographic scanning confirmed diagnosis (Figure 3). Patient was admitted for operation, but before any interventions died due to cardiopulmonary arrest.

Discussion:
Aortic pulmonary fistula can develop due to atherosclerotic, post endocarditis and rheumatologic diseases (5), construct iatrogenic (10) or following previous cardiac surgery like our patient or a 64-year-old female in study of Maki and Williams (11). In this patient in ecography aortic pulmonary fistula was determined in aortic root. Oguz Tagdemir reported an unusual outcome of an ascending aorta aneurysm ruptured into the main pulmonary artery. (12) A transverse aortic arch aneurysm penetrating to left pulmonary artery is reported by Crawford ES (13).

Kim et.al reported aneurysm originating from the ascending aorta and proximal left anterior descending coronary artery, which were connected to pulmonary trunk (14). We should think about aorta disease while managing aortic valve disorder and if we suspect to aorta aneurysm during this time, we must operate the aortic root other than aortic valve or do close observations for such patients. Ruptured aortic aneurysms have poor prognosis and death occurs in a great majority of patients similar to this case. Although some successful surgical operations were reported (6, 7, 8, 11) We can conclude, early and stringent diagnosis is indispensable for appropriate treatment and lifesaving of patient with aortic pulmonary fistula.

References:

Figure 1
Figure 2
Figure 3
سامانه آموزش مداوم جامعه پزشکی به منظور اجرای دقیق قانون آموزش مداوم جامعه پزشکی، سازماندهی، تسهیل و تسريع امور مراکز مجری و مشمولین محتوم قانون، راه اندازی شد.

این سامانه در مرحله اول در دانشگاه‌های علم پزشکی کشور به بهره برداری رسیده است. کلیه مشمولین به منظور شرکت در برنامه‌های آموزش مداوم و انجام امور مربوطه، لازم است به سایت http://www.ireme.ir مراجعه و از لیست مراکز مجری آموزش مداوم، دانشگاه تحت پوشش خود را انتخاب و عضو سایت دانشگاه مربوطه شوند.

مزایای عضویت در این سامانه به شرح زیر می‌باشند:

1. فقط یکبار ثبت نام کنید و برای شرکت در کلیه برنامه‌های آموزش مداوم استفاده کنید
2. روابط برنامه آموزش مداوم ارائه شده در کلیه مراکز آموزش دهنده کشور
3. امکان دریافت و روابط کارنامه آموزش مداوم پزشکی توسط مشمولین قانون
4. تسريع در صدور تمدید پروانه مشمولین محتوم در بایان هر دوره بدون حضور و بیگیری مشمولین محتوم
5. امکان اطلاعیه مناسب در خصوص برنامه‌های آموزش مداوم از طریق لیست الکترونیک و پیام کوتاه
6. اطلاع از آیین نامه و قوانین مربوط.

هم اکنون عضو سامانه آموزش مداوم کشور شوید.

امور کل آموزش مداوم جامعه پزشکی