

Original Research Article

Redo Surgery in Mitral Valve Diseases

Walla Luay Al-Falluji^{1*} Wisam Al-Obaidy² Ammar Naif²
¹College of Medicine, University of Babylon, Hilla, IRAQ
²Ibn Al-Bitar Cardiac Center, Baghdad, IRAQ

*E-mail: walla_alfalluji@yahoo.com

Accepted 30 November, 2016

Abstract

This is a retrospective study of a total 70 patients underwent redo mitral valve surgery from 2010 to 2015 in Ibn Al-Bitar Cardiac Center at Baghdad. The objectives of this research are to discuss the outcome of redo surgery in mitral valve, assesses the causes of death for surgery in patients underwent a mitral valve redo surgery, and evaluation of the late outcomes after mitral valve surgery especially after open and closed valvotomy. The gender of our patients is 64% females and 36% males; the middle old age of the suffers at the redo surgery time was 39.6 years (ranged from 13-65 years). Previous mitral surgery was closed mitral commissurotomy (CMC) in 30 patients (42%), mitral valve replacement (MVR) in 20 patients (29%), opened commissurotomy of mitral valve in 12 suffers (19%) while repair of mitral valve in 8 suffers (10%). Re-operative surgery included mitral valve replacement with mechanical valves St. Jude type in all suffers. The mean time to redo surgery was 15 years run between 6 months – 35 years. Surgical indication were valve restenosis after open type of commissurotomy & closed type of commissurotomy in 40 patients were restenosis of valve surface area of prosthesis in 10 patients, mitral regurgitation in 8 patients, infected endocarditis in 6 suffers and paravalvular leak in 6 suffers. An operative mortality was 14% (10 patients). We now have proven in this be trained that mitral valve reoperations can be done with a suitable death rate at surgery that compares nicely with results in other studies.

Key Words: Closed mitral valve commissurotomy, Open mitral valve commissurotomy, Mitral valve replacement.

أعادة الجراحة في أمراض الصمام الاكليلي للقلب

الخلاصة

دراسة أستعادوية لسبعون مريض أجروا إعادة جراحة الصمام الاكليلي للقلب للفترة من 2010 لغاية 2015 في مركز ابن البيطار لجراحة القلب في بغداد وكان الهدف منها هو مناقشة النتائج في موضوع إعادة جراحة الصمام الاكليلي وتقدير عوامل الخطورة التي تؤدي الى الوفاة في مثل هذه الجراحة مع تقييم النتائج النهائية في جراحة الصمام الاكليلي الاولية خصوصا فتح تضيق الصمام الاكليلي المغلق و المفتوح. كانت جراحة الصمام الاكليلي الاولية لدى المرضى على الشكل الاتي هي فتح تضيق الصمام الاكليلي المغلق لدى 30 مريض بنسبة 42% و تبديل الصمام الاكليلي لدى 20 مريض بنسبة 29% وفتح تضيق الصمام المفتوح لدى 12 مريض بنسبة 19% و اخيرا تصليح الصمام لدى 8 مرضى بنسبة 10% علما ان جميع هؤلاء المرضى اجروا إعادة جراحة الصمام الاكليلي عن طريق تبديل الصمام الاكليلي بأخر صناعي. كانت أسباب إعادة جراحة الصمام الاكليلي كانت على النحو الاتي هي إعادة تضيق الصمام الاكليلي بعد عملية فتح تضيق الصمام المغلق والمفتوح لدى 40 مريض و إعادة تضيق الصمام الاكليلي بعد عملية تبديل الصمام لدى 10 مرضى وتلف الصمام الاكليلي لدى 8 مرضى والتهاب بطانة القلب لدى 6 مرضى وتسريب حول الصمام الصناعي لدى 6 مرضى علما ان عدد المرضى المتوفين نتيجة هذه الجراحة هو 10 مرضى بنسبة 14% وقد كانت اسباب الوفاة حسب مايلي : النزيف مع أنصباب غشاء التامور لدى 4 مرضى والتهاب بطانة القلب لدى 3 مرضى وعجز عضلة القلب لدى 2 مريض وأخيرا الخثرة النزفية لدى 1 مريض. قد تبين من خلال البحث بأن إعادة جراحة الصمام الاكليلي ممكن أجروها مع خطورة مقبولة اثناء العملية بالمقارنة مع النتائج النهائية لهذه الجراحة علما ان إعادة فتح عظم القص في هذه الجراحة يكون مصحوب بنسبة خطورة عالية بينما اجراء الجراحة عن طريق فتح صدر ايمن امامي جانبي مع تزوية القلب والرئة عن طريق الشريان الفخذي يكون مصحوب بخطورة قليلة.

Introduction

Mitral valve illness may be narrowing, regurgitation or combined (regurgitation and stenosis). The etiology varies from inherent, rheumatic, chronic, neoplastic, and ischemic. Reconstruction are shown to possess variety of benefits over valve replacement, not least the preservation of subvalvular equipment that best-known to possess useful result on left chamber perform. However cases requiring reoperation as a result of restenosis of bicuspid valve or prosthetic valve dysfunction are increasing. Reoperation itself contains a risk, and early and late results aren't essentially satisfying as a result of the

Normal Physiology

Throughout left chamber relaxation, when the pressure drops within the heart ventricle attributable to relaxation of the chamber cardiac muscle, the atrio-ventricular valve opens, and blood travels from the left atrium of the heart to the heart ventricle. concerning 70-80% of the blood that travels across the bicuspid valve happens throughout the first filling section of the left ventricle [3]. Left chamber contraction (left chamber contraction) (during left chamber diastole) causes more blood to flow across the atrioventricular valve straightaway before left chamber systole. The late filling of the LV contributes concerning 20 % to the amount within the ventricle before chamber beat, and is thought because the chamber kick [4].

Mitral Stenosis

Pathophysiology: Mitral stenosis is more often than not induced by means of rheumatic involvement of the mitral equipment. Single or continual bouts of rheumatic inflammation might purpose innovative thickening and calcification of the leaflets and chordae. Fusion of the mitral commissures decreases the size of the mitral gap. Less customary etiologies of stenosis embody infective carditis,

persistent left chamber pathology.. Several impacts such old age and NYHA class before valve surgery is the most important factors of outcome after surgery[1].

Anatomy

The bicuspid valve is formed of 2 valve leaflets (the anteromedial leaflet and also the posterolateral leaflet) and a hoop round the valve, called the bicuspid valve annulus. These valve leaflets area unit prevented from prolapsing into the atrium of the heart by the sub-valvular equipment. The subvalvular equipment, that lies fully within the LV, is created of the papillose muscles and also the chordae tendineae [2].

extreme calcification of the mitral annulus, tumors, S LE, and neoplasm [5].

Signs and symptoms:

Symptoms of stenosis a lot of usually develop once the sector of the valve is down to not up to 50 % of its traditional dimension (average valve discipline: four to six cm²). most typically, symptoms do not arise at relaxation except the valve becomes at the smallest amount moderately stenosed (valve discipline: one to one.5 cm²). Severe stenosis (valve field: < one cm²) is generally symptomatic. Exertional dyspnoea typically is that the initial symptom. totally different common manifestations of stenosis (eg, orthopnea, attack nocturnal dyspnoea, and hemoptysis) Fatigue is also pronounced in advanced stenosis [6].

Diagnosis:

The attribute findings of stenosis on hearing ar AN accentuated 1st coronary heart sound, a gap snap, and a mid-diastolic rumble, that is nice, detected on the heart apex .

Chest radiography:

The attribute findings of stenosis are congestion, enlargement of the necessary pulmonic arteries, and enlargement of the left atrium of the heart without symptom [7].

Electrocardiogram :could reveal proof of left chamber enlargement or chamber fibrillation; in developed illness, the cardiogram would possibly replicate underlying pulmonic high blood pressure with correct chamber hypertrophy [7].

Echocardiography: is that the most dear noninvasive experiment for the analysis of stenosis. standard findings on two-dimensional diagnostic technique

Mitral Regurgitation

Pathophysiology: As in mitral stenosis, left atrial hypertension results from mitral regurgitation. This pressure is transmitted retrograde into the pulmonary circulation and, if high enough, produces pulmonary

Etiology:

1. degeneration of mitral valve.
2. Coronary artery disease.
3. Infective endocarditis.
4. Collagen vascular disease, SLE, Marfans syndrome.
5. Rhumatic cardiac disease.
6. injury.
7. valvulotomy by balloon of mitral valve [12].

Signs and Symptoms: Respiratory distress, pulmonary edema, dyspnea at rest, nocturnal dyspnea, degrades exercise

Mitral Valve Surgery

Mitral Valvotomy: Signals for closed valvotomy differ from those for open valvotomy: they are single valve lesion, sinus rhythm and no calcification. Surgical mitral valvotomy or commissurotomy will also be applied utilising either a closed procedure, which does now not necessitate the use of full cardiopulmonary pass, or making use of an open process with full cardiopulmonary pass. Both methods may be implemented by way of a median sternotomy or left thoracotomy incision [14].

Mitral Valve Repair: It has countless advantages over mitral valve alternative: the issues of degeneration, thrombogenicity, infection and discount in left ventricular operate related to valve alternative are avoided. The keys to successful repair are a thorough working

comprise valve thickening and down leaflet movement and gap. furthermore to size of the valve gap, diagnostic technique demonstrates completely different prognostically necessary morphologic parts of the valve equipment, such as calcification and involvement of chorde buildings. Doppler investigation of the flow through-out the bicuspid valve is employed to estimate the trans mitral strain gradient [8].

hypertension. On the other side, long term, volume overload of left atrium that occur slowly may result in significant left atrial enlargement with low pressure of left atrium relatively [9,10].

intolerance, cardiovascular collapse with shock (in acute papillary rupture), and congestive heart failure. On examination holo systolic murmure at apex and radiated to axilla [11].

Diagnostic study: ECG finding of left atrial chamber enlargement and left ventricular chamber hypertrophy, fibrillation of atrium. Chest radiography enlargement of left side of heart (atrium and ventricle). Echocardiography is always used to ascertain the diagnosis [11].

out of the realistic structure of the mitral valve, and matching the choice of restore procedure to the underlying pathological procedure. Intra-operative transoesophageal echocardiography and epicardial probe utility permit the healthcare professional to verify the diseased valve and the restore [15].

Mitral Valve Replacement: After the primary victorious implantation of a caged ball prosthesis through Starr in 1961, mitral valve substitute, with entire excision of the native valve leaflets and subvalvular equipment, speedily replaced mitral valve restore as the operation of choice. It used to be no longer except the significance of the subvalvular apparatus grew to become apparent by way of laboratory reports, small scientific trials and the improved success of valve repair, that traditional mitral valve alternative was modified to

incorporate upkeep of the chordal constructions. At present entire excision of the subvalvular equipment is reserved for patients with developed rheumatic stenosis, with scarring and calcification. The alternative of mitral valve substitute versus restore is totally based on the expertise of the individual physician: in skilled arms

The objectives of this research are to:

1. Discuss the outcome of redo surgery of mitral valve in Ibn Al Bitar cardiac center from 2010 to 2015.
2. Assesses the causes and risks for death rate in patients underwent a mitral valve redo surgery.
3. Evaluation of the late outcomes after mitral valve surgery especially after open and closed valvotomy.

Materials and Methods

This is a retrospective study of a total 70 patients underwent redo surgery for mitral valve reported by patients hospital files from 2010 to 2015 in Ibn Al Bitar cardiac center at Baghdad \ Iraq.

Results

The gender of our patients is 64% females and 36% males; the mean age of the patients at time of operation was 39.6

scientific and echocardiographic outcomes are sophisticated with mitral valve restore. Alternative, however, is less based on the individual health practitioner's capabilities for reliably satisfactory outcome. It is also quicker, which is why it remains the method of option for a lot of surgeons [16].

years (ranged from 13-65 years). Previous mitral surgery was closed mitral commissurotomy (CMC) in 30 patients (42%), mitral valve replacement (MVR) in 20 patients (29%), opened commissurotomy of mitral valve in 12 suffers (19%) while repair of mitral valve in 8 suffers (10%). Reoperative surgery included mitral valve replacement with mechanical valves St. Jude type in all patients. The mean interval to reoperation was 15 years run between 6 months – 35 years. Surgical indication were valve restenosis after open type of commissurotomy and closed type of commissurotomy in 40 patients were restenosis of valve surface area of prosthesis in 10 patients, mitral regurgitation in 8 patients, infected endocarditis in 6 patients and paravalvular leak in 6 patients.

Most of our patient were females (64%), where males were only (36%) with female to male ratio 1.8:1 as shown in figure 1.

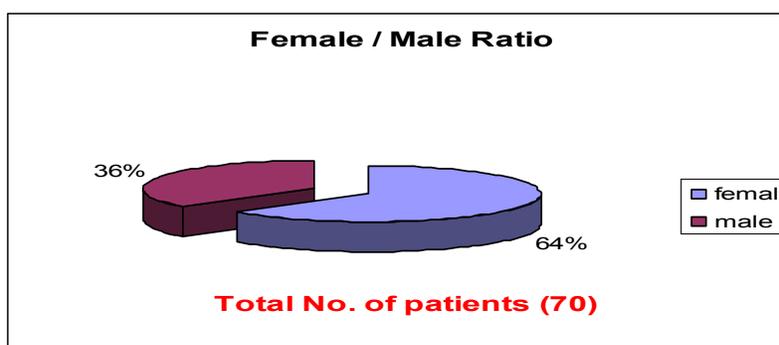
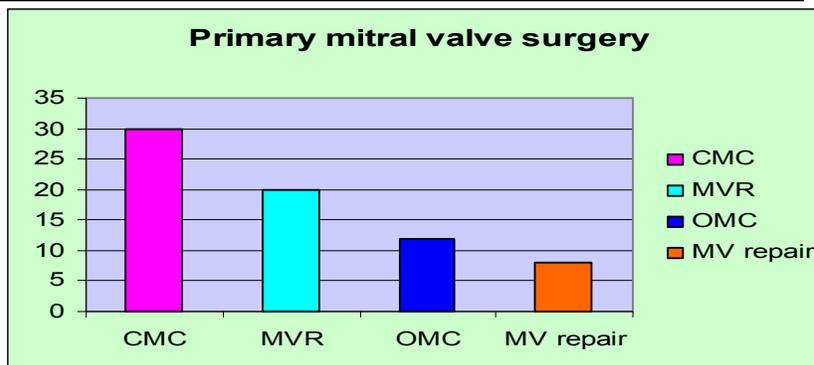


Figure 1: (Female / Male Ratio)

The ages of our patients ranged from 13 – 60 years old with mean age 39.6 years. The primary mitral valve surgery with mean interval to reoperation as shown in table (1) and figure (2).

Table 1: (The mean interval to reoperation)

Primary mitral valve surgery	No. of Patient	%	Mean interval to reoperation
CMC	30	42%	18 (years)
MVR	20	29%	15 (years)
OMC	12	19%	20 (years)
MV repair	8	10%	7 (years)

**Figure 2:** Primary mitral valve surgery

Causes of reoperation as shown in table 2.

Table 2: (Causes of reoperation)

Causes	No. of Patients	%
Restenosis	40	59%
Thrombosis of prosthetic valve	10	14%
Mitral regurgitation	8	11%
Infective endocardities	6	8%
Paravalvular leak	6	8%

All incisions of redo surgery were performed by median sternotomy and replacement of mitral valve done in all patients with SynJude mechanical valves. An operative mortality was 14% (10 patients). The causes of death as shown in the table (3). 4 patients died due to hemorrhage, 2 of them in the operating

room due to direct cardiac chambers injury because of sever adhesion and 2 patients underwent reoperation for cardiac tamponade and died after 6 hours. The rest died with mean interval 3 months because of infective endocardities and advance heart failure.

Table 3: (Causes of death)

Causes of death	No. of patients
Hemorrhage and cardiac tamponade	4
Infective Endocardities	3
Heart failure	2
Thromboembolism	1

The relation between the primary mitral valve surgery and percentage of mortality

between males and females and mean age as shown in following table:

Table 4: The relation between primary MV. Surgery and Percentage of deaths

Primary mitral valve surgery	Mortality	Mean age	Male	Female
MVR	6	36	2	4
CMC	3	50	2	1
OMC	1	58	1	0
MV REPAIR	0	0	0	0
TOTAL NO.	10	48 YEARS	5	5

Discussion

The patients undergoing mitral valve surgical procedure are a heterogeneous crew, patient vary in terms of their primary type of valve surgery. In addition to risks when it comes to the redo surgery. The intention of this series was once to establish the reasons for death rate amongst patient present process mitral valve reoperation in Ibn Al_ Bitar Cardiac Center, overall mortality was 14% which slowly higher than the results published by lytle [19] (11%, cohn 10%[18], akins 7.3% [20], pansini 10%[17], tyeres 11% [21] and their associates).

Regarding the etiology of redo, Mortality was higher for those patient requiring reoperation on prosthetic valve, obstructed and infected.

All associated with a high operative mortality, additionally was once larger for those sufferers that needed substitute of a mechanical valve compared with tissue valve. This concurs with the findings of tyeres [21], magilligan [22], bortolotti [23] and their colleagues. Possible

clarification might even be the valve operate deteriorates instantly (eg, thrombosis) in some patients with subsequent decompensation sooner than a quite imperative operation. AN illustration of this among our study was once the work force of sufferers who needed reoperation for obstructed mechanical valves. Cohn [18] and associated found that NYHA class IV and emergency operation had been enormous reasons in elevating the mortality of reoperation.

The preoperative NYHA type or urgency of the operation were not assessed due to the fact that of an inability to establish this understanding from sufferer file. However, despite larger numbers of mechanical valves being inserted in our center, fewer sufferers needed re substitute of mechanical valves. And as a consequence these figures cannot be wont to have an effect on the choice of prosthetic device to be inserted at the preliminary operation

Sex: had no influence on the ultimate result, an statement that has constant opinion with the conclusion

of Cohn and neighbors this contrasts with the conflicting findings of Lytle [19] and colleagues who found that girls gift method reoperation had an accelerated risk, and Akins [20] and colleagues who determined that guys gift method valve reoperation had an enlarged operative mortality

Age: Mentioned studies differ, with some results age to be related to extended threat where as others have found no such association, however in our center the mean age of mortality was 48 years.

The majority of deaths had been due to hemorrhage and cardiac tamponade and secondly due to heart failure which suggest the severely compromised state of these suffers . in proper cardiac function might be remain and other attacks of heart failure might have occur.

Commissurotomy: The reward be taught showed first-rate long run outcome in each types comissurotomy (close one and open one), the survival charges of our sufferers are with limit range of different reviews [24,25]. Most reviews confirmed no change in survival charges between the both methods(close one and open one). Also we found fewer reoperations and cut down expense of death related to valve in open commissurotomy.

The varying surgical incisions: all cases in our study operated through conventional median sternotomy, disadvantage of this approach was direct right atrial and right ventricle injuries because of sever adhesion and difficulty in cannulation because of previous procedures. The advantage of right anterolateral thoracotomy through fifth intercostal space over the median sternotomy appears in the following points:

1. Enlarged right atrium and right ventricle, sever adhesions, danger of entering on sternotomy incisions are greater.
2. Good access to atria
3. Can use right atrial-femoral artery cannulation. Or used femoral artery-femoral vein bypass ,the cannulation of right atrium can be hard due to the presence of thin and friable atrial wall after release of adhesions of the pericardium. varying studies shows decrease mortality in mitral

valve reoperations in comparison to median sternotomy.

The right anterolateral thoracotomy approach became a good choice that replaced resternotomy for replacement of mitral valve as it provides proper exposure of the valve with less need for pericardial release [26,27,28].

Conclusions

Mitral valve reoperations will also be done with an acceptable death rate that compares nicely with results in different other studies, however a number of classes of suffers have an multiplied risks of demise at redo surgery, as the following:- Age, NYHA class four, Emergency redo, endocarditis and Reoperation for prosthesis dysfunction. Long term outcome for both types of commissurotomy are nice with mean age to reoperating ranged between 18-20 years, in addition to that the incidence to reoperation and Mortality had been greatly cut back after open commissurotomy. Median sternotomy for redo in mitral valve surgery associated with high incidence of mortality while the right anterolateral thoracotomy associated with low mortality rate and easily access to atria.

References

1. Anderson RH: The disposition and innervation of atrioventricular ring specialized tissue in rats and rabbits. *J Anat* 2015; 113:197.
2. Walmsley R: Anatomy of human mitral valve in adult cadaver and comparative anatomy of the valve. *Br Heart J* 2015; 40:351.
3. Ranganathan N, Lam JH, Wigle ED, et al: Morphology of the human mitral valve, II: the valve leaflets. *Circulation* 2014; 41: 459.
4. Rushmer R, Finlayson B, Nash A: Movements of the mitral valve. *Circ Res* 1956; 4:337. Wood P: An appreciation of mitral stenosis. *Br Med J* 2013; 1:1051.
5. Waller BF, Howard J, Fess S: Pathology of mitral valve stenosis and pure mitral regurgitation, part I. *Clin Cardiol* 2012; 17:330.

6. Spencer FC: A plea for early, open mitral commissurotomy. *Am Heart J* 2011; 95: 668.
7. James M. Douglas Jr. The mitral valve disease in: Sabiston M.D, Spenner. C M.D surgery of the chest. 9th edition U.S.A:W.B SAUNDER company.2015.P.2146.
8. Lange A, Palka P, Burstow DJ, et al: Three-dimensional echocardiography: historical development and current applications. *J Am Soc Echocardiogr* 2012; 14:403.
9. Luther RR, Meyers SN: Acute mitral insufficiency secondary to ruptured chordae tendineae. *Arch Intern Med* 2011; 134:568
10. Fenster MS, Feldman MD: Mitral regurgitation: an overview. *Curr Probl Cardiol* 2010; 20:193.
11. Lange A, Palka P, Burstow DJ, et al: Three-dimensional echocardiography: historical development and current applications. *J Am Soc Echocardiogr* 2012; 14: 403.
12. Braunwald E, Turi ZG: Pathophysiology of mitral valve disease, in Wells FC, Shapiro LM (eds): *Mitral Valve Disease*. Oxford, England, Butterworth-Heineman, 2012; p 28.
13. Hanson TP, Edwards BS, Edwards JE: Pathology of surgically excised mitral valves: one hundred consecutive cases. *Arch Pathol Lab Med* 2011; 109:823.
14. Carpentier A. Cardiac valve surgery - the French correction. *J. Thoracic Cardiovasc Surg.* 2010; 86:323-337.
15. Antunes MJ. Franco CG. Advances in surgical treatment of acquired valve disease. *Current opinion in Cardiology.* 2012; 11(2): 139-154.
16. Lee EM, Shapiro LM, Wells FC. Importance of subvalvular preservation and early operation in mitral valve surgery. *Circulation* 2011; 94(9): 2117 - 2123.
17. Pansini S, Ottino G, Forsennati PG, et al. Reoperations on heart valve prostheses: an analysis of operative risks and late results. *Ann Thorac Surg* 2010;50:590–6.
18. Cohn LH, Aranki SF, Rizzo RJ, et al. Decrease in operative risk of reoperative valve surgery. *Ann Thorac Surg* 2011; 56: 15–20;discussion 2011:20.
19. lytle BW, cosgrove D M, Taylor PC, Gill CC, Goormastic M, Golding LR, et al, Reoperations for valve surgery, perioperative mortality and determinants of risk for 1000 patients,1958-1984.*Ann thoracsurg.*2010,42:632-43.
20. Akins, Cw, Buckley Mj, Daggett Wm, Hilgenery AD, Vlahakes Gt, Torchiana DF, et al, Risk of Reoperative valve replacement for Failed Mitral and aortic bioprostheses, *Ann Thoracic surgery* 1998; 65:1545-1552.
- 21-Tyers Gfo, Jamieson WRE, Murno AI, Germann E, Burr LH, Miyagishma RT, et al, reoperation in Biological and mechanical valve population: fate of the reoperative patient. *Ann Thoracic surgery.* 1995; 60:5,464-469.
22. Mogilligan DJ, oyama C Alam M. comaresion of dysfunction with Mechanical and porcine mitral valve prosthesis, *circulation.* 1995;72 (supple) II-129-134.
23. Bortolotti U, Milano A, Mossuto E, Mazzaro E, Thiene G, Casarotto D. Early and late outcome after reoperation for prosthetic valve dysfunction: analysis of 549 patients during a 26-year period. *J Heart Valve Dis* 1994;3: 81–87.
24. Hickey MSJ, Blackstone EH, Kirklin JW, Dean LS. Outcome probabilities and life history after surgical mitral commissure-tomy: implication for ballon commissura-tomy. *JAM coll cardiol* 1991; 17: 29-42.
25. John S Bashi VV, Jariraj Ps, et al. Closed mitral valvotomy: early results and long-term follow-up of 3724 consecutive patients. *Circulation* 1993, 68: 891-896.
26. Dobell AR, Jain AK:Catastrophic hemorrhage during redo sternotomy .*Ann Thorac surg.* 1994, 37:273.
27. Tripple CG,Killinger WA.jr,Harman pk,et al: antero lateral Thoracotomy as an alternative to repeat median sternotomy for replacement of the mitral valve *Ann. Thorac surg.*1997,43:380.
28. Berreklouw E, Alfieri O: revival of right thoracotomy to approach atrio-ventricular valves in reoperation *Thoracic and cardiovascular Surg.*1994, 32:331.