

The Evolution of Mitral Valve Repair in India

Varun Bansal¹ and Arkalgud Sampath Kumar²

¹ Medanta - The Medicity

Received: 8 December 2019 Accepted: 1 January 2020 Published: 15 January 2020

Abstract

This is a review of the evolution of Mitral valve repair in India. Because of the prevalence of Rheumatic heart disease in India most of the techniques have been developed for this etiology. There was a need to adapt these techniques for the poor patients in order to reduce cost. As a consequence this review does not allude to the commercially available rings. Also this review does not cover the areas of ischemic and degenerative Mitral regurgitation because these techniques were not developed in India and only a couple of publications mention results in these two etiologies.

Index terms— rheumatic heart disease, mitral regurgitation, mitral valve repair.

1 I.

The Beginning lost Mitral valvotomy (CMV): Mitral Valve surgery came to India in the early 50's, Reeve Betts and Gopinath in Vellore 1,2 Leigh Collis in Aundh near Pune and PK Sen in Bombay began to perform CMV with immense success. Although confined to Rheumatic Mitral Stenosis it was an operative procedure easily applicable to most patients. Rheumatic Heart Disease (RHD) was rampant and the leading cause of mitral valve disease. Patients with significant Mitral regurgitation (MR) had to wait longer to be treated by surgery 3,4.

2 II.

3 Mitral Valve Replacement (MVR)

It was in early 60's that open heart surgery become possible. Christian medical college (CMC), Vellore 3,4,5, King Edward memorial (KEM) hospital in Bombay, Madras Medical College in Chennai, All India Institute of Medical Sciences (AIIMS) 6,7 in Delhi and few other centres began MVR for Rheumatic mitral regurgitation 7. This step actually began the procedure of MV surgery. Surgeons from KEM in Bombay and AIIMS in Delhi began a program of stented homograft MVR. The stents were imported and cadaver Aortic valves were carefully sutured and used as substitute for the mitral valve. It was evolutionary and also revolutionary since it helped these poor patients by reducing the expense as well as avoiding anticoagulation. It was only applicable to patients with isolated mitral valve disease (MS or MS+MR). Patients with additional Aortic valve disease could not benefit from these stented valves.

4 III.

5 Mitral Valve Repair

Realising the hardships of patients, especially children and adolescents, women in child bearing age, few surgeons introduced mitral valve repair (1968) in highly selected patients. Dr. Gopinath in Delhi and Nemish Shah, and K N Dastur in Bombay Began to repair the MV in a few patients. There was no Echocardiography and on table and postoperative assessment depended on intuition, clinical examination and immediate postop left atrial (LA) pressure tracing. The results were quite unpredictable and unsatisfactory. In the late 70's M mode Echocardiography became available for assessment of the mitral regurgitation pre and postoperatively. This

actually dampened the enthusiasm for repair since the results appeared unsatisfactory. The techniques used were only the Wooler Commissural plication and a circular suture (akin to the DeVega Technique). The Duran and Carpentier annuloplasty rings were expensive. Surgeons in Bombay used a piece of Teflon felt to mould the posterior mitral annulus with limited success in selected patients.

The introduction of 2D and Doppler Echocardiography in the early 80's made the assessment of mitral regurgitation more accurate. It also provided additional and vital information on MV morphology such as thickening, prolapse, rupture of chordae and perforation in endocarditis. Mitral regurgitant jets were visible and degree of MR could be assessed more accurately. Surgeons were now more careful in selection of patients for MV repair and postoperative assessment was more frequently performed non-invasively.

The MV Repair program took a giant leap in the year 1982 at AIIMS. Expertise in Echocardiography combined with a modified Denton Cooley technique (C ring annuloplasty) in addition to other Carpentier techniques of cleft suture, chordal shortening/transfer improved the results greatly. Cardiologists who were reluctant to refer patients for repair were now more enthusiastic and recommended repairs. Postoperative Echo assessment and careful follow up of these patients added to the enthusiasm to repair the Mitral and Tricuspid and even the Aortic valves in patients with RHD.

A second technical procedure introduced at the AIIMS, of Cusp thinning by peeling off the fibrous layer of deposit from the Anterior Mitral Leaflet (AML) and Posterior Mitral Leaflets (PML) made the leaflets larger, thinner and more pliable providing a more successful correction of MR with better co-optation.

Another simple technique for Chordal shortening at the cusp level proved useful in correcting prolapsed chordae.

By 1990, Trans Oesophageal Echo (TEE) was introduced and proved extremely useful in on table assessment of morphology, severity of regurgitation and assess the effects of the above technical modification. Postoperative assessment on table improved the learning and correction of residual MR at one operation. This reduced the complications and satisfied the cardiologists in the postop assessment. MV repair had reached the goal of a routine procedure and was taught to residents in training.

Workshops, Video clips, live demonstrations and publication of good results extended to children, adolescent and childbearing women encouraged surgeons to learn and apply these techniques. It benefitted a large number of patients by reducing cost, improving survival, avoiding anticoagulation and its consequences for up to 15-20 years following the procedure.

MV repair had come to stay. Patients are seeking repair and surgeons are applying these techniques both in India and abroad. South East Asian surgeons are recognised the world over as experts in repair of rheumatic mitral valves.

6 Ethical statement: Not applicable

74 [Valve (ed.) ()] , The Bjork Shiley Valve . India. K.S.Iyer, P.Venugopal, I.M.Rao, Sampath Kumar A, B.Das,
75 M.L.Bhatia, M.L.Sharma, K.S.Reddy, H.S.Wasir and N.Gopinath. Thai J Surg (ed.) 1987. 8 p. .

76 [Cardiology et al. ()] , : Cardiology , Ed , Khalilullah . *The Heart Centre* 2018.

77 [Gupta et al. (2010)] ‘Anterior mitral leaflet length: predictor for mitral valve repair in a rheumatic population’.
78 A Gupta , P Gharde , A S Kumar . *Ann Thorac Surg* 2010 Dec. 90 (6) p. 1930.

79 [Aortic Valve Repair : Technique and Results A. Sampath Kumar, Prashant Gundane Asian Cardiovasc Thorac Annals ()]
80 ‘Aortic Valve Repair : Technique and Results A. Sampath Kumar, Prashant Gundane’. *Asian Cardiovasc & Thorac Annals* 1994. 2 p. 75.

82 [Aortic valve repair for rheumatic aortic valve disease. Sachin Talwar, Cheemalapati Saikrishna, Anita Saxena, Sampath Kumar A]
83 ‘Aortic valve repair for rheumatic aortic valve disease. Sachin Talwar, Cheemalapati Saikrishna, Anita Saxena,
84 Sampath Kumar A’. *Ann Thorac Surg* 2005. 79 p. .

85 [Carpentier and Thorac Cardiovasc (1983)] *Cardiac valve surgery—the ”French correction*, A Carpentier , Thorac
86 Cardiovasc . Surg 1983 Sep. 86 p. 323.

87 [Cusp-Level et al. ()] ‘Chordal Shortening for Rheumatic Mitral Regurgitation’ ; A. Sampath Cusp-Level , Anil
88 Kumar , R V Bhan , S Kumar , A K Shrivastava , N Sood , Gopinath . *Texas Heart Inst J* 1992. 19. p. .

89 [Cherian et al. ()] ‘Closed mitral valvotomy in young patients’. G Cherian , K I Vytilingam , I P Sukumar ,
90 Gopinath N Brit . *Heart J* 1964. 26 p. .

91 [John et al. (1983)] ‘Closed mitral valvotomy: early results and long-term follow-up of 3724 consecutive patients’.
92 S John , V V Bashi , P S Jairaj , S Muralidharan , E Ravikumar , T Rajarajeswari , S Krishnaswami , I P
93 Sukumar , P S Rao . *Circulation* 1983 Nov. 68 (5) p. 891.

94 [Dillon et al. ()] ‘Comparative long-term results of mitral valve repair in adults with chronic rheumatic disease
95 and degenerative disease: Is repair for ”burnt-out” rheumatic disease still inferior to repair for degenerative
96 disease in the current era’. J Dillon , M A Yakub , P K Kong , M F Ramli , N Jaffar . *J Thorac Cardiovasc
97 Surg* 2015. 149 p. .

98 [Venugopal et al. ()] ‘Early and late results of Valve replacement using Bjork Shiley Valves’. P Venugopal , I M
99 Rao , Sampath Kumar , A , B Airan , B Das , K S Iyer , U Kaul , H S Wasir , M Rajani , M L Bhatia , N
100 Gopinath . *Proceedings of the world conference on open heart surgery*, K R Shetty, G B Parulkar, Mcgraw
101 Hill (ed.) (the world conference on open heart surgery) 1985. p. .

102 [Intraoperative transoesophageal echocardiography (ITEE) in mitral valve surgery Sampath Kumar A, Saxena A Ind J Thorac C
103 ‘Intraoperative transoesophageal echocardiography (ITEE) in mitral valve surgery’. *Sampath Kumar A,
104 Saxena A Ind J Thorac Cardiovasc Surg* 2009. 25 p. .

105 [Kumar et al. ()] Sampath Kumar , A , R V Kumar , S Shrivastava , P Venugopal , A K Sood , N Gopinath .
106 *Mitral Valve Reconstruction: Early Results of a Modified Cooley Technique*, 1992. 19 p. .

107 [Long-term results of cusp level chordal shortening for anterior mitral leaflet prolapsed John Santosh Kumar Murala Et al. Texas
108 ‘Long-term results of cusp level chordal shortening for anterior mitral leaflet prolapsed’. *John Santosh Kumar
109 Murala Et al. Texas HIJ* 2004. 31 (3) p. .

110 [Grover F Mack MJ Eds. Wolters Kluwer, 1st Ed (ed.) ()] *Master techniques: Cardiac surgery*, Grover F &
111 Mack MJ Eds. Wolters Kluwer, 1st Ed (ed.) 2016.

112 [Kumar et al. ()] *Mitral valve reconstruction in children with Rheumatic Heart Disease*, Sampath Kumar , A Rao
113 , P N Saxena , A . 1995. Ann of Thorac Surg. 60 p. .

114 [Kumar et al. ()] ‘Mitral Valve Reconstruction: Eight years experience in 531 patients’. Sampath Kumar , A , P
115 N Rao , Anita Saxena . *J Heart Valve Dis* 1997. 6 p. .

116 [Kumar and Rao ()] ‘Mitral Valve Reconstruction: Intermediate Term Results in Rheumatic Mitral Regurgita-
117 tion’. A Sampath Kumar , Pantula N Rao . *The J Heart Valve Disease* 1994. 3 p. .

118 [Mitral valve repair in children with rhematic heart disease Surg ()] ‘Mitral valve repair in children with rhe-
119 matic heart disease’. *Surg* 2005. 129 p. . (Sachin talwar et al. The Journal of thorac & cardiovasc)

120 [Manithara Raman Rajesh et al. ()] ‘Mitral valve repair in children with rheumatic heart disease Sachin Talwar’.
121 Anandaraja Manithara Raman Rajesh , Anita Subramanian , Saxena . *Sampath Kumar A. The J Thorac and
122 Cardiovas Surg* 2005. 129 p. .

123 [Sk Choudhary ()] ‘Mitral valve repair in predominantly rheumatic population: Long term result’. Sk Choudhary
124 . *Texas Heart Inst J* 2001. 28 p. .

125 [Carpentier et al. ()] ‘Reconstructive surgery of mitral valve incompetence: ten-year appraisal’. A Carpentier , S
126 Chauvaud , J N Fabiani . *J Thorac Cardiovasc Surg* 1980. 79 (3) p. .

127 [Repair of rheumatic mitral regurgitation in children. A S kumar Ann Pediatr Cardiol ()] ‘Repair of rheumatic
128 mitral regurgitation in children. A S kumar’. *Ann Pediatr Cardiol* 2011. 4 (1) p. .

- [Repair of rheumatic mitral regurgitation in children. Kumar AS *Ann Pediatr Cardiol* (2011)] ‘Repair of rheumatic mitral regurgitation in children. Kumar AS’. *Ann Pediatr Cardiol* 2011 Jan. 4 (1) p. .
- [Kumar and Rao ()] ‘Restoration of Pliability to Mitral leaflets during reconstruction’. Sampath Kumar , A , P N Rao . *The J Heart Valve Disease*, 1995. 4 p. .
- [Results of mitral valve repair in rheumatic mitral regurgitation Interact Cardiovasc Thorac Surg ()] ‘Results of mitral valve repair in rheumatic mitral regurgitation’. *Interact Cardiovasc Thorac Surg* 2006. 5 p. .
- [Results of mitral valve repair in rheumatic mitral regurgitation Sampath Kumar A Rajvir Singh and Devagourou Velayoudam In] ‘Results of mitral valve repair in rheumatic mitral regurgitation Sampath Kumar A’. *Rajvir Singh and Devagourou Velayoudam Interact Cardiovasc Thorac Surg* 2006. 5 p. .
- [Rheumatic mitral valve repair: Experience of 221 cases from central chest institute of Thailand. Chotivatanapong T, Lerdsomboon P, Sungkahapong V.] ‘Rheumatic mitral valve repair: Experience of 221 cases from central chest institute of Thailand. Chotivatanapong T, Lerdsomboon P, Sungkahapong V’. *J Med Assoc Thai* 2012. 95 (8) p. . (suppl)
- [Sk Choudhary et al. ()] Sachin Sk Choudhary , Talwar , Dubey , Chopra , Saxena . *Mitral valve repair in a predominantly rheumatic population: Long term results*, 2001. 28 p. .
- [Results et al. ()] ‘Surgery of rheumatic heart disease in children Essential aspects. A sampath kumar’. A Results , Anil Sampath Kumar , Rajiv Bhan , S Bajaj , P Rao , Savitri Venugopal , Srivastava . *Mitral Valve Repair: Techniques and*, 1990. 1997. 42 p. . (IAP J Prac Paed)
- [Surgical options in rheumatic mitral valve disease in children: a surgeon’s perspective. A S Kumar World J Pediatr Congenit Heart Surg] ‘Surgical options in rheumatic mitral valve disease in children: a surgeon’s perspective. A S Kumar’. *World J Pediatr Congenit Heart Surg* 2014. 5 (1) p. .
- [John et al. ()] ‘The profile and surgical management of mitral stenosis in young patients’. S John , S Krishnaswami , P S Jairaj , G Cherian , S Muralidharan , I P Sukumar . *J Thorac Cardiovasc Surg* 1975. 69 (4) .
- [Sampath Kumar (ed.) ()] *Valvular Heart Surgery*, A Sampath, Kumar (ed.) (New Delhi) 2nd Ed, 2009. (CBS publishers)
- [Valvular heart surgery: repair or retain. A Sampath kumar Ind J of Thorac and cardiovasc Surg ()] ‘Valvular heart surgery: repair or retain. A Sampath kumar’. *Ind J of Thorac and cardiovasc Surg* 2000. 16 p. .