Leaflet and Chordal Procedures in Functional Mitral Regurgitation

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Abstract

Leaflet and chordal procedures are newer repair techniques in functional ischaemic mitral regurgitation. Early studies with leaflet augmentation and secondary chordal cutting are promising. Long term studies are needed.

Keywords

Functional ischaemic mitral regurgitation • Restricted leaflet motion • Mitral leaflet augmentation • Second order chordal cutting • Edge-to-edge repair

Interventions on the mitral valve leaflets and chordae are less commonly performed procedures in functional mitral regurgitation, performed to increase leaflet coaptation and reduce leaflet tethering. These procedures include leaflet augmentation, edge-to-edge repair and second order chordal cutting. Leaflet augmentation and second order chordal cutting are commonly performed in rheumatic mitral regurgitation, another condition where the lesion is that of restricted leaflet motion. Its use in functional ischaemic mitral regurgitation is showing promise.

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Leaflet Augmentation

Experimental studies have shown that mitral leaflet area increases in response to chronic tethering, and that inadequate leaflet enlargement may be a cause of functional mitral regurgitation, whereas if sufficient leaflet enlargement occurs in response to ventricular remodeling, mitral regurgitation would not result [1].

Leaflet augmentation is commonly performed in rheumatic mitral regurgitation to increase the surface area of coaptation in fibrosed, retracted leaflets. It has also been used in chronic functional ischaemic mitral regurgitation [2]. The principle here is to increase the leaflet coaptation surface area to compensate for the leaflet tethering. Leaflet tethering was shown to be improved in one study but not in another, but the increased leaflet surface area from the leaflet augmentation

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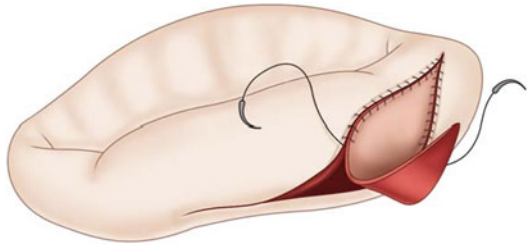

Fig. 9.1 Posterior leaflet augmentation for functional ischaemic mitral regurgitation (From de Varennes et al. [2])

was more than sufficient to reduce the mitral regurgitation in either case [3, 4].

Autologous or bovine pericardium can be used. The posterior leaflet is detached from its base from the middle of P2 all the way to the posterior commissure. Annuloplasty sutures are then applied around the annulus. The pericardial patch is rinsed thoroughly and cut in an oblong fashion with a height of 1 cm and a length of 3.5 to 4.5 cm. The patch is sutured to the edge of the posterior leaflet defect and the posterior mitral annulus using 5/0 polytetrafluoroethylene suture (W.L. Gore and Associates, Flagstaff, Arizona) or equivalent (Fig. 9.1) [2]. The annuloplasty is then sized using the inter-commissural distance and the exact surface area of the anterior leaflet. No downsizing is needed as the leaflet surface area has been increased. The posterior leaflet is effectively increased in height by about 1 cm in the area of P3 and the medial half of P2.

Early results are good using this technique with Varennes, et al, reporting freedom from moderate or more mitral regurgitation of 90 % at 2 years, and 90 % of patients were in NYHA class I [2]. Long term results are awaited.

Second Order Chordal Cutting

This technique was first proposed by Messas, et al, and popularized by Borger, et al. [5, 6] Secondary chords attach to the basal and mid body of the mitral leaflet and typically restrict leaflet motion in chronic functional ischemic mitral regurgitation, particularly of the anterior leaflet, leading to the so called "seagull wing". This bend in the anterior leaflet represents abnormal tethering by the basal chordae. Experimentally, cutting secondary chords relieved leaflet tethering and improved leaflet coaptation, reducing mitral regurgitation [5]. There is, however, some concern that cutting secondary chords may affect local haemodynamics, shear stress distribution, and left ventricular function [7, 8].

Borger, et al, describe cutting all secondary chords arising from the papillary muscle causing leaflet restriction, usually the posteromedial papillary muscle [6]. The chords are cut at their insertion to the anterior and posterior leaflets. An undersized annuloplasty ring is then implanted.

Follow-up echocardiography in Borger's series revealed trivial or mild mitral regurgitation in 97 % of patients at 2 years. Long term results are awaited [6].

Edge-to-Edge Leaflet Repair

The edge-to-edge leaflet repair, first described by Alfieri, is used in many mitral valve lesions [9]. A suture is used to join the edges of the anterior and posterior leaflets creating a double orifice mitral valve. A mitral annuloplasty ring is implanted to improve long term durability. Recently, Bhudia, et al, reported that at 2 years, 24 % of patients who had undergone this procedure for functional ischemic mitral regurgitation had developed recurrent moderate-severe mitral regurgitation, and 23 % had moderate mitral regurgitation [10]. The authors recommended against the use of this technique in functional ischemic mitral regurgitation.

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