Editorial

Surgical management of the anterior leaflet in mitral valve repair: the legacy of Professor Alain Carpentier

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Professor Carpentier introduced and developed major issues concerning mitral valve repair, especially for the anterior leaflet (AL).

First, he introduced a clear understanding of the lesions into three types: Type I: normal leaflet motion (usually with isolated annular dilation); Type II: excess leaflet motion (prolapsed or flailed leaflet); and Type III: restricted leaflet motion (1). Introducing the segmentation of the mitral valve has allowed, and still does, a common language between cardiologists, echocardiographers, and surgeons. Furthermore, he defined the three fundamental principles for a longstanding valve repair: restore a good coaptating area between leaflets, remodel the annulus, and preserve/restore leaflet mobility.

Carpentier did, in a very clear fashion, demonstrate that resection of the AL was needed in very rare occasions and in a very limited way (roughly when the length of the width of the prolapse is less than 1 cm) (2). He also stressed many times that any mitral valve repair should end up with a closure line of 2/3 for AL and 1/3 for the posterior leaflet (PL) and that this closure line should be parallel to the posterior rim. This concept remains key to provide good early and late results, especially in degenerative mitral valve disease (3,4). He also stressed that the coaptation height between A2 and P2 should be at least 8 mm once the cardiopulmonary bypass was weaned.

The main techniques used for the AL free edge support he advocated were PL chordal transfer or AL secondary chordae transposition to the free edge after checking the adequate height of such chordae compared to the height of the reference point (located at P1 in most instances).

Chordal transposition requires identifying one secondary chord, not too far away from the free edge, and detaching it from its leaflet attachment, without perforating the leaflet itself. The perfect example is when there is a ruptured AL marginal chord, along with a "seagull sign", which is a plication of the body of the AL, in relation to a near secondary chord at the adequate height. In such cases, the identification of this secondary chord may allow, once trimmed of the AL, its use in supporting the prolapsed free edge. The technique itself is quite simple: the tip of the chord usually has a small portion of the leaflet body. A 5/0 or a 4/0 monofilament mattress suture is enough to hold the transposed chord and attach it to the ventricular aspect of the AL free edge at the identified area. This type of suture may seem fragile, but it is not and secures excellent long-term results (5).

Chordal transfer of the PL to the AL requires either some pathology of the PL in order to perform a triangular resection and reconstruct the PL without tension, or a transfer of one chord, quite close to another one, followed by a direct closure of a tiny segment of the PL free edge. The transferred chordae can either be with the PL body (the so-called "flip-over" technique) or just with the base of the chordae where it is attached to the ventricular aspect of the PL (6). This technique may allow to transfer two or three

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chordae at once.

When such techniques were not possible, Carpentier advocated chordal shortening, initially into a trench created at the tip of the papillary muscle (PM), however this was progressively abandoned given a higher failure rate than expected and then moved to a PM shortening (PM wedge resection). Along with this concept, we advocate PM repositioning, which allows shortening of chordae arising either from the anterior PM or from the posterior PM (7). This technique may address elongated chordae pathology, not only in A2 prolapse but also A1 or A3, as well as in posterior commissural prolapse. Since the posterior PM is usually composed of three heads, posterior PM repositioning is easily performed to shorten all chordae arising from one head by using one of the other heads as a suturing stake, whereas the most-often one-headed anterior PM would need to be incised vertically and split (8). Chordal transfer or transposition is of course best used in cases of chordal rupture(s).

Finally, Carpentier introduced the systematic use of an annuloplasty ring to restore a systolic shape of the annulus, as well as to stabilize the repair (9). Initially, it was a flat, rigid ring. Then the ring was still rigid but with an opening in the middle of the anterior aspect at the trigonal level to allow small systolic expansion of the left outflow tract. Carpentier used to bend both parts to give a saddle shape to this ring.

Then came the semi-rigid rings Physio I and Physio II, which were complete rings but with flexible areas at the trigone level and posteriorly as well.

The use of chordal transfer or transposition is very straightforward, and once mastered is very simple and efficient as these chordae are the adequate height. It may avoid issues, such as those encountered with artificial chordae being either too long or too short, which is crucial when dealing with the AL free edge, and could eventually happen after left ventricular remodelling.

Even though native chordae transfer are more frequently being replaced by artificial chordae, rings keep changing shape, and brands gain popularity despite showing more failures than rings in the past. Carpentier's principle remain intangible and should perhaps be reconsidered. Alike "new cuisine", there is only bad cuisine and good cuisine, similarly, there is no "new mitral repair" and "old mitral repair", there are only good or bad repairs. Sticking to basic rules always provides good results for the patient's sake.

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Footnote

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