

Upper Partial Sternotomy versus Right Anterior Minithoracotomy for Isolated Aortic Valve Replacement

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ABSTRACT

Aortic Valve Replacement (**AVR**) can be performed using minimally invasive techniques that involves small incision compared to conventional approach. Moreover, the MIAVR techniques are increasingly being carried out to be able to same efficiency, character and safety. The most common MIAVR approaches are upper partial sternotomy and right anterior minithoracotomy. These two surgical modalities are associated with less pain, better chest wall and sternal stability, shorter hospital stay, faster recoveries and better cosmetics outcomes. But there may be many similarities and differences related to technical aspects and cosmetic results between them for both the surgeon and the patient.

INTRODUCTION

A median full sternotomy is the conventional surgical approach for many cardiac disease. However, over the last decade, minimally invasive procedures have been increasingly performed for the surgical treatment of aortic valve disease because of their well-known benefits such as earlier mobilization, use of less blood products, and better cosmetic outcomes [1,2]. In view of

this, right Minithoracotomy (**rMT**) and upper Mini-Sternotomy (**uMS**) can be preferred as a minimally invasive treatment modality in patients undergoing Aortic Valve Replacement (**AVR**). Besides, patients should be informed of the risks, benefits, and alternatives to a particular treatment modality. I would like to postulate two surgical modalities which are used in replacing aortic valve.

Evolution and Technical aspects of MIAVS

Firstly, Cosgrove and Sabik used a 10-cm right parasternal incision for MIAVR in 1996 at the Cleveland Clinic Foundation [3]. They cannulated the common femoral artery and vein to provide excellent exposure of the aortic root and left ventricular outflow tract. But exposure issue is still existing in performing aortic valve surgery via rMT. For this reason, many surgeons inclined to prefer performing upper mini-sternotomy due to its easiness of all cannulations in the surgical field. Moreover, rMT may require excision of one or two costal cartilages and sacrifice the right thoracic artery. On the other hand, upper partial sternotomy may provide adequate exposure without sacrificing the right thoracic artery and cartilages. Although both methods are less technically demanding and useful, rMT approach may raise some issues. Firstly, significant ascending aortic dilatation is a relatively common problem in patients who require AVR. Due to this reason, this technique should be carried out by surgeons who are extremely experienced at proximal aortic surgery. Secondly, patients may have to be placed on CPB by using femoral cannulation to facilitate view of the operative field. Because, arterial cannulation of the ascending aorta can be technically demanding in view of reduced operative area due to cannula itself. Moreover, during the removal of the cannula may compromise haemostasis. On the other hand, femoral arterial cannulation may carry downsides of the retrograde flow. It may even cause wound infection, pseudoaneurysms and neurological events. Given these challenges, many may incline to perform this surgery using mini sternotomy which have more operative field for both arterial and venous cannulation. Apart from that, axillary artery can be used as an alternative cannulation site in this modality. Because it can provide antegrade perfusion, no issues with peripheral atherosclerotic disease, easy bleeding control and haemostasis at removal and better cosmetics [4,5]. That being the case, uMS approach to patients with ascending aorta pathology is finding wide consensus [6]. Conversely, Miceli et al insisted that perioperative outcomes including postoperative atrial fibrillation, ventilation time, intensive care unit stay and hospital stay in patients in rMT group better than those in patients in uMS group [7].

Another issue, to obtain good exposure especially along the right coronary annulus can be difficult in some patients and deployment of sutured valves can also be challenging. Although this problem can be overcome using titanium clips to secure sutures and eliminated manual knot tying, it brings extra cost. Usage of sutureless valve may also make surgery easy especially in patients with poor exposure due to inappropriate anatomical chest structure such as barrel chest [8]. After all, sutureless valves already appeared very effective and safe in diminishing aortic clamp time [9]. For this reason, this operation may be particularly well suited for patients with

acceptable body mass index and chest shape. Based on this information, MIAVR with a sutureless valves might be seen as an “alternative” to transcatheter aortic valve implantation in patients with high-risk for surgery. As a result, a randomized prospective studies are necessary to confirm this hypothesis.

Another issue, CT scan can guide the surgeons to consider whether the cases are eligible for this approach. We can assess the anatomic landmarks among the intercostal spaces, aortic root, and aortic valve using CT scan [8]. Glauber et al., insisted that the ascending aorta should be rightward at the level of main pulmonary artery for the candidate of rMT surgery. Also, it should be the distance between the ascending aorta and the sternum lower than 10 cm as well as angle from the angle midline to the inclination of ascending aorta $>45^\circ$ [10].

CONCLUSION

Many surgeons demonstrated that aortic valve operations could be carried out safely and reliability via either a right mini-thoracotomy or partial sternotomy incision [11]. We think that these modalities may be very attractive in patients willing to have a rapid convalescence. Both surgical approach reduces assisted ventilation duration, the need for blood product transfusion, and incidence of post-surgery atrial fibrillation compared to the conventional techniques [8,10]. In addition to this, minimally invasive AVR using mRT is associated with lower postoperative morbidities and a shorter hospital stay than MS [7]. As another advantage, rMT can be performed in patients with previous cardiac surgery safely, and is associated with a trend towards lower morbidity and mortality [12].

Minimally invasive surgical instrumentations are more expensive. Frankly, I believe that the less rate of postoperative adverse events, the shorter length of hospital stay and the faster recovery period may decrease cost in the healthy system and therefore it balances. The merit of a new minimally invasive surgical procedures is measured by the overall outcomes. Certainly, MIAVS will go in its evolutionary journey over time.

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