

REVIEW ARTICLE

The mini Bentall procedure – How to do it.

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Introduction

One of the goals of modern cardiac surgery is to reduce surgical trauma and recovery time. This has led surgeons to the path of smaller incisions for aortic valve surgery and via upper mini sternotomy or mini right thoracotomy. The mini Bentall procedure involves an aortic root replacement with re-implantation of the coronary buttons through an upper hemi-sternotomy.

The technique

A 48 year old male was referred to us from his cardiologist with severe aortic insufficiency and aortic root and ascending aorta enlargement. This patient started to develop symptoms of reduced functional capacity (NYHA II) during the past 3 months. His CT angiography was negative for severe coronary artery disease. Because of the young age and lack of other risk factors we decided that standard coronary angiography was not necessary. After discussion with the patient,

we decided to proceed to surgery with a mini Bentall procedure.

After careful examination of his chest computed tomography, we identified our landmarks (fig. 1) and the body surface anatomy was clearly marked with a permanent skin marker (fig. 2).

A 6cm incision was performed cm below the manubrium to the 3rd intercostal space. We then marked the cutting line using cautery from top to the right 4th intercostal space in an upper J manner and performed the sternotomy with care not to damage the right mammary artery. Hemostasis was carried out and the small blade retractor was utilized for retraction.

The pericardium was opened from the pericardial reflection at the level of the innominate artery and extended down as far as possible. Four stay sutures were used for pericardial retraction. The sternal retractor was then removed and placed again over the pericardium to facilitate better exposure of the aorta.

The EOPA cannula (Elongated One-Piece Arterial **Cannula**- EOPA© - Medtronic) was used with a Seldinger technique to cannulate the aortic arch. We then cannulated the right atrium directly and went on bypass. The two chest tubes were inserted at that point, with the heart empty from the level of the xiphoid process and the retracted out of the operating field but still in the mediastinum. The ascending aorta was dissected out of the

surrounding tissues in a bucket handle manner and then clamped at the level of the aortic arch right below the origin of the innominate artery. The aorta was transected and custodial cardioplegia was given directly to the coronary ostia. After the heart was arrested a vent was placed in the pulmonary artery (fig. 3).

The coronary ostia were carefully prepared and aortic valve excised. Three 3.0 silk sutures were placed on the three aortic commissures and clipped out of the operating field for better exposure. The aortic annulus was decalcified and a size 25 mechanical valve conduit was implanted followed by the implantation of the coronary ostia, first the left and then the right with a running 5.0 prolene suture starting at the 4 o'clock position and continuing forehand in clockwise direction. Each anastomosis was completed with the second end of the suture coming anti-clockwise, again in forehand and tied at the 11 o'clock position. This way, each anastomosis is carried out with a forehand, particularly useful in such closed space. A dose of cardioplegia was again given through the graft to check for any leaks from the coronary anastomosis since it is essentially impossible to place any repair sutures after the cross clamp is removed. The distal anastomosis is performed with a running 4.0 prolene suture starting from the 5 o'clock position in a forward manner and continued up to the 10 o'clock position. We then continue with the other end again forward and anticlockwise. Once the anastomosis is completed two pacing wire

were placed on the right ventricle. This is crucial, as it becomes very difficult to do so with the cross clamp off.

An aortic root vent is placed and after meticulous deairing the cross clamp was removed. Hemostasis was performed and the sternum was closed with 3 double steel wires. Total cross clamp time was 149 minutes and bypass time 168 minutes. The patient was transferred to the intensive care unit and extubated on day 0. Mechanical ventilation time was 6 hours. The patient was discharged on day 5.

Conclusion

This technique has shown to have better results in terms of post-operative bleeding, re-operation rates and hospital stay (1) when utilized in experienced centers. This technique can be used for simpler operations, such as aortic valve replacement in patients with suitable anatomy, not requiring concomitant coronary artery bypass surgery, with excellent results (fig. 4).

References:

1. The mini-Bentall approach:
Comparison with full sternotomy. V. Shah, M. Kilcoyne, et al. *JTCCVS Techniques*, vol.7, 59-66, 06-2021, doi.org/10.1016/j.xjtc.2021.01.025

Figure legends

Figure 1a. The yellow line marks the skin incision.



Figure 1b. The yellow line on the right panel marks the sternal cutting line



Figure 2. The skin markings. The uppermost curved line marks the supra sternal notch, the flat line marks the bottom border of the manubrium, each group of arrows mark the 2nd, 3rd, 4th intercostal space. The curved line at the bottom represents the xiphoid process and the two flat lines below that are the chest tube exit points.



Figure 3. A view from the operating field. You can appreciate the space you have to operate through this incision.

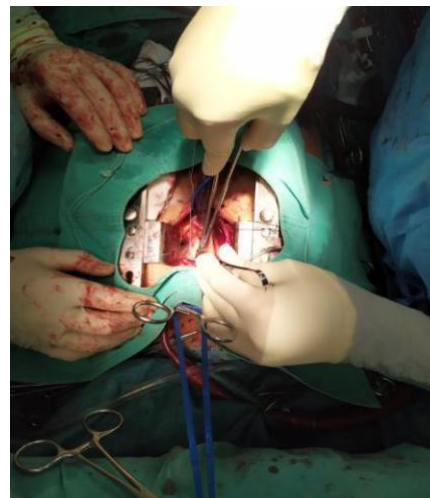


Figure 4. Results from aortic valve replacement through a smaller mini sternotomy.

