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Research Article

HURDLES FOR STARTING MINISTERNOTOMY AORTIC VALVE REPLACEMENT PROGRAM IN OUR INSTITUTE

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ABSTRACT
It's our own experience while starting ministernotomy Aortic valve replacement program in our institute Grant Medical College, Mumbai. Twenty patients of aortic valve replacement surgery, ten by ministernotomy and ten by full sternotomy were studied at our institution, from May 2013 to May 2016. Middle age patients, out of which seven had regurgitant and three had stenotic lesion of aortic valve. Sternotomy time was more in initial cases but it decreased with experience. Difficulties we faced are while deairing left heart and also for giving shock with routine internal shock paddles. It required special sterile chest shock paddles. We required conversion to full sternotomy in two patients because heart continued to fibrillate even giving shock with external shock paddles. CPB time, cross clamp time, CCU stay was same as compared to full sternotomy AVR patients. Overall patient has pain on scale 6. Cosmetically, incision was better and also healed faster. Even with early failure and bad results we continued our efforts to improve and succeeded in it. Ministernotomy AVR will always maintain its place in between full sternotomy AVR and minithoracotomy AVR.

Keywords: *Aortic Valve, Ministernotomy, CPB [Cardiopulmonary Bypass], AVR [Aortic Valve Replacement]*

INTRODUCTION
In this era of percutaneous intervention and minimal invasive surgery, ministernotomy aortic valve replacement is good option to start minimal invasive cardiac surgery in any institute. Aortic valve replacement seems more feasible through ministernotomy as aorta is anterior structure and cannulation required can be done through exposed aorta and right atrium (Benetti *et al.*, 1997). Most importantly it can be done with same instruments as the conventional full sternotomy aortic valve replacement. Patients with same selection criteria [Table 1] are divided into two groups- Group one- 10 cases of ministernotomy AVR compared with Group two- 10 cases of conventional full sternotomy AVR.

MATERIALS AND METHODS
Patients and Methods
Twenty patients of aortic valve replacement surgery - ten by ministernotomy and ten by full sternotomy studied at our institution Grant Medical College, Mumbai from May 2013 to May 2016.

Table 1: Patient Selection Criteria

Criteria	Ministernotomy
Male/Female	6/4
Age Group	20-40 years
Aortic Annulus	20-22 mm
Regurgitant/Stenotic lesion	7/3
Pathology	Rheumatic 7/Bicuspid 3

In both groups technique used for heparinisation, cannulation [Figure 1], going on bypass, aortic valve excision [Figure 2a and 2b], mechanical valve used, suturing technique [pledgettedethi bond with pledget on left ventricle side] all are same what intraopt and postopt observations I noted are compared.

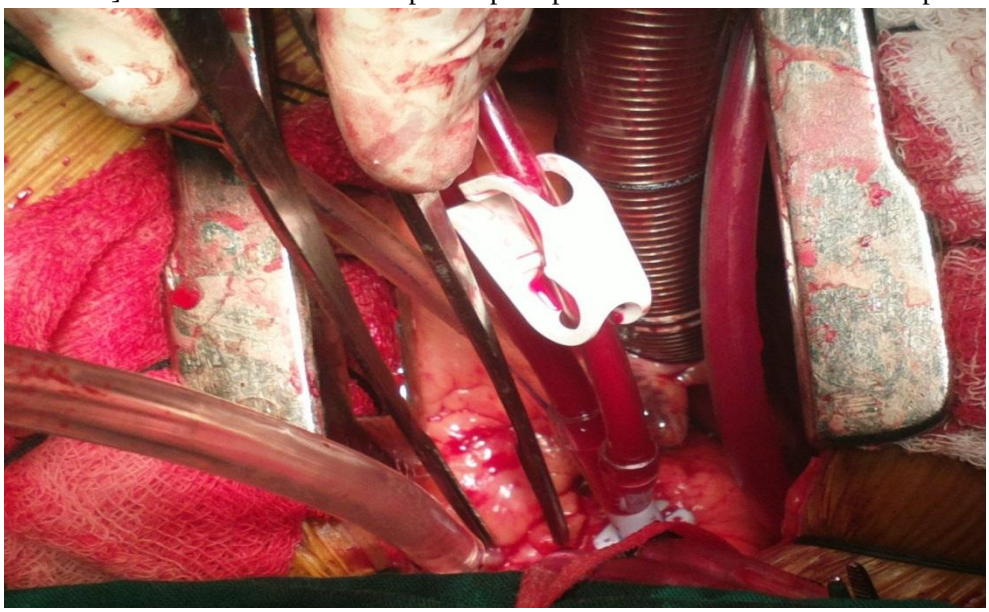

Figure 1: All Canulation as Routine. Arterial Aortic Cannula, Venous Dual Stage Cannula in Right Atrial Appendage and Cardioplegia Needle in Ascending Aorta

Intraopt Observation

Table:???

	Ministernotomy AVR	**Full Sternotomy AVR**
Sternotomy to cross clamp time	30 minutes[20-40]	30 minutes[20-40]
Total cross clamp time	60 minutes[40-90]	60 minutes[40-90]
Closure time	25 minutes[20-40]	30 minutes[20-40]

a] **b]**

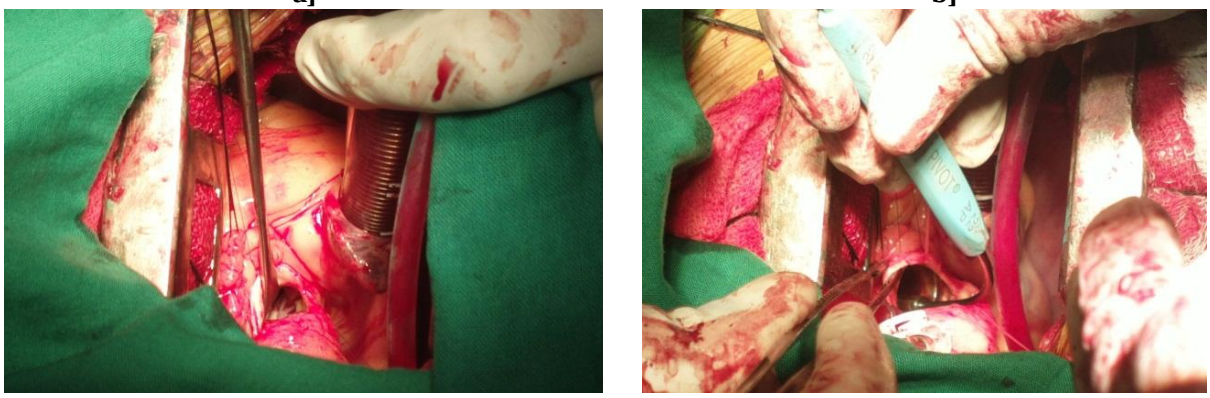

Figure 2: a] Adequate Aortic Valve Exposure; b] No Difficulty in Sizing the Aortic Annulus

Postopt Observation

- Single pericardial drain was placed which was removed after 48 hours and incision size was 5 cm only [Figure 3a and 3b].
- Less pain [pain score reduced to 6].
- Early mobilisation and discharge from hospital.

- No reexploration.
- Reoperation required in one patient due to significant paravalvular leak.
- Mortality nil.

a] **b]**

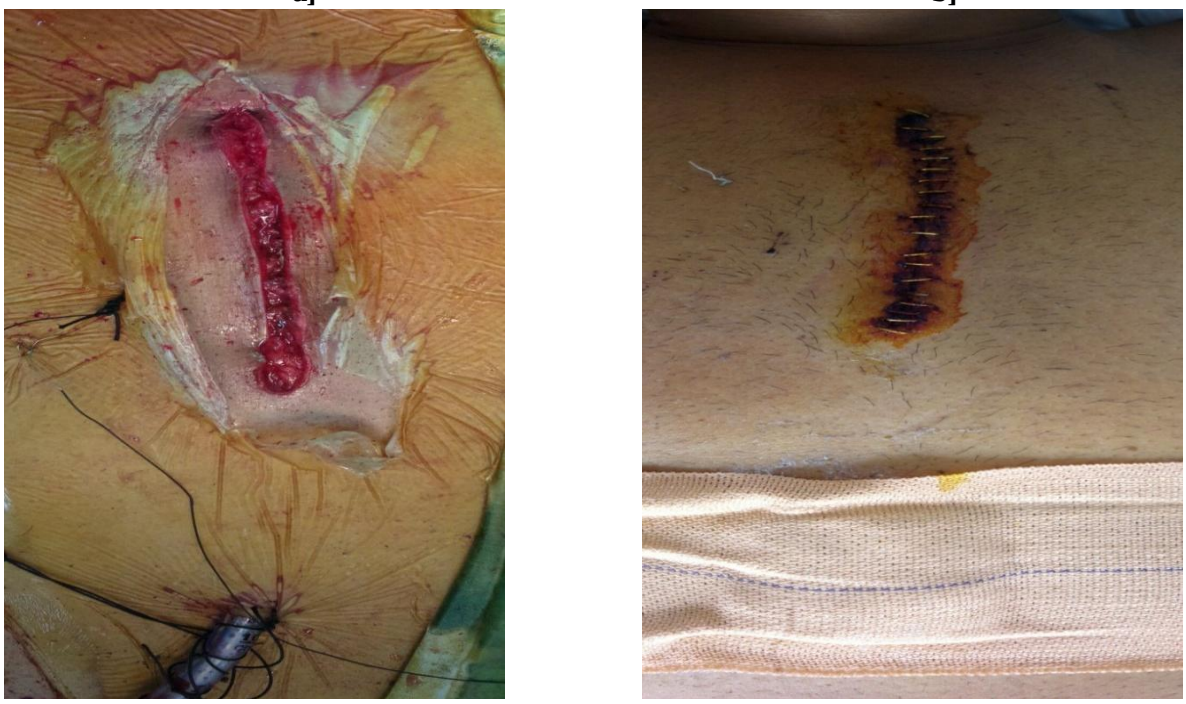

Figure 3: a] Single Pericardial Drain; b] 5 cm Incision Site

Comparison (*Liu *et al.*, 1999; Detter *et al.*, 2002*)

- Sternotomy opening and closing time was more in initial cases of ministernotomy group but it decreased with experience.
- CPB time, cross clamp time, CCU stay was same as compared to full sternotomy AVR patients.
- Ministernotomy incision was cosmatically superior and without any complications as compared to full sternotomy patients.
- Pain was less in ministernotomy group.

RESULTS AND DISCUSSION

Discussion

Starting ministernotomy aortic valve replacement program was challenging one. Hurdles faced and how we overcame them are discussed here:

1] Sternotomy

Initial cases it was slightly difficult and time consuming to do ministernotomy but with time and experience, duration became less than the time required for full sternotomy. For easy access to right atrial appendage and for insertion of vent through LA-RSPV junction, we preferred right side ministernotomy that is J shaped rather than L shaped. We preferred to keep the saw side by in sterile tray after ministernotomy so that in emergency if full sternotomy required we can easily do it (Svensson and D'Agostino, 1998).

First suprasternal notch and xiphoid was marked and then 2 cm below suprasternal notch manubriosternal joint marked. 5cm incision was taken starting from manubriosternal joint [Figure 4].

2] Pursestring and Suturing

It became easy to take purse string by open hand grip method of holding the needle holder [Figure 5]. It allowed us to use minimum space without any difficulty.

3] Deairing

Difficulty indeairing because of limited exposure and enlarged left ventricle, is experienced. This difficulty is overcome by giving hot shot and deairing through left atrium roof and appendage. It can be overcome by use of carbon dioxide insufflation if available. Transesophageal echocardiography is useful for complete deairing.

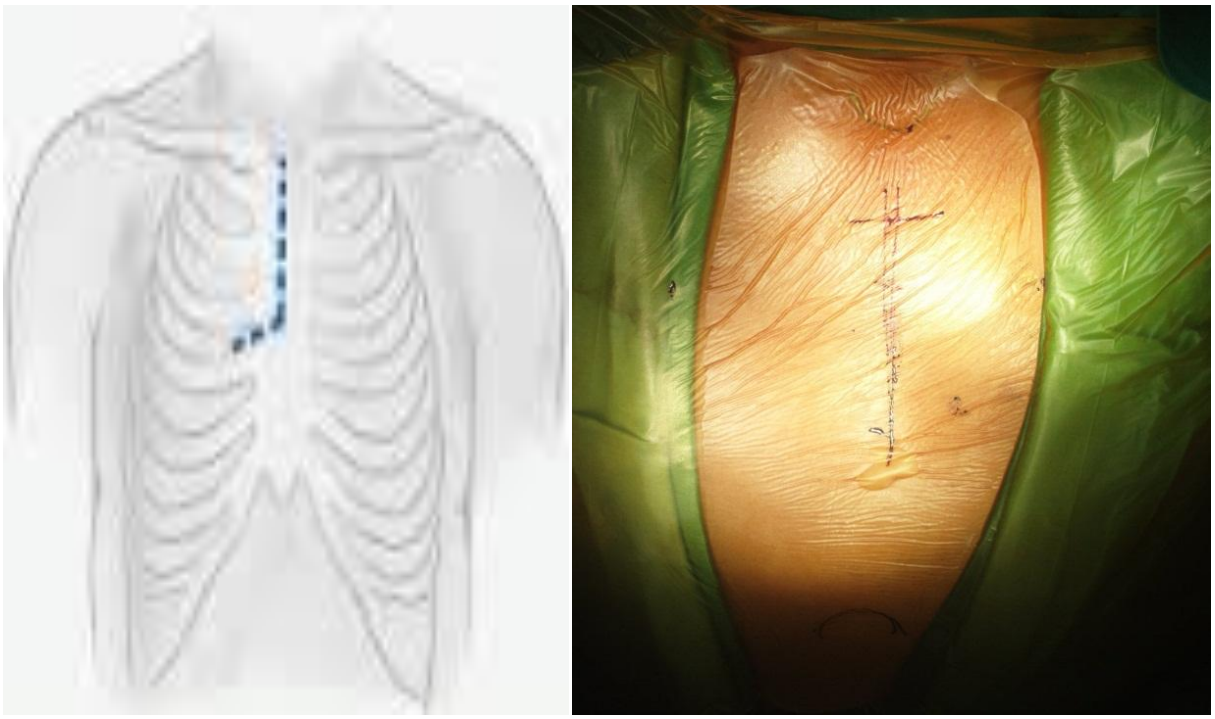

Figure 4: Incision and Sternotomy

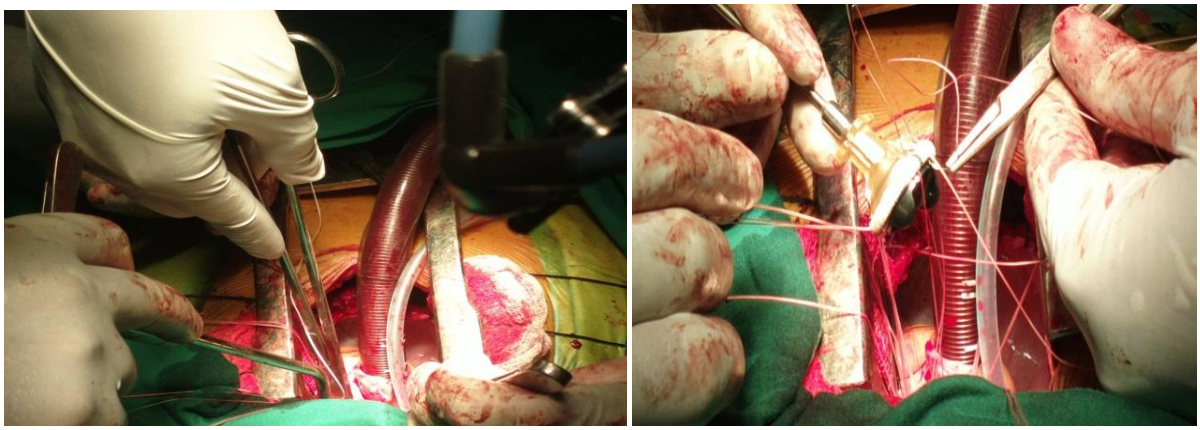

Figure 5: Open Hand Grip Technique for Suturing

4] Massaging

Proper cardiac massage was difficult due to limited exposure and enlarged left ventricle. As a result heart tends to fill with blood and become distended –prone to subendocardial ischemia hampering the myocardial protection.

5] Shock Delivery

Due to difficulty in deairing and massaging heart tend to fibrillate and even by using pediatric shock paddles it was not possible to reach left ventricle through ministernotomy route. Two of our first patients required to be converted to full sternotomy for same.

Use of disposable external shock paddles [Figure 6] became important prerequisite for ministernotomy surgeries.

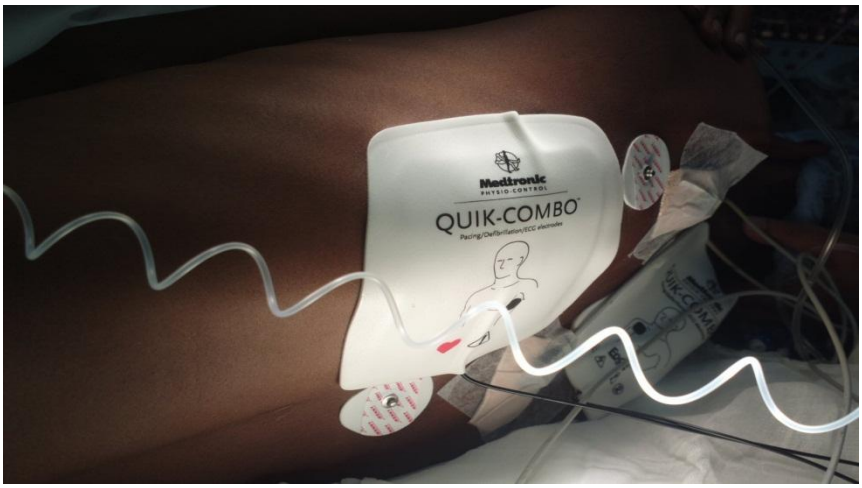

Figure 6: Disposable External Shock Paddles on Back

Advantages of Ministernotomy

- Without increase in operative time, ministernotomy provides adequate exposure, good cosmesis and less pain.
- Main hurdle we encountered was while delivering shock when heart was fibrillating and overcame by using disposable external shock paddles.
- Preserved respiratory machanics.
- Cost savings as no new equipment was required.
- Early mobilisation and reduced hospital stay.
- Ease of convertion to full sternotomy.
- Redosternotomy becomes easier (Tabata *et al.*, 2008; Byrne *et al.*, 1999) -Postopt 2 D Echo of first ministernotomy AVR patient showed significant paravalvular leak due to surgical technique problem requiring reoperation within 20 days.

Disadvantages of Ministernotomy

- Inability to visualize whole heart.
- Difficulty in deairing the left heart.
- Difficulty in applying the epicardial pacing wires.
- Limited control in case of heamorrhge.
- Steep learning curve.

Conclusion

- Disposable external shock paddles and transesophageal echocardiography is must.
- Ministernotomy AVR though technically challenging but with increasing surgical experience, it offer results comparable to the conventional full sternotomy AVR.
- Ministernotomy AVR will always maintain its place in between full sternotomy AVR and minithoracotomy AVR.
- Even with early difficulties and operative hurdles we continued our efforts to improve and succeeded in it.

Limitation of our Study

- Number of cases studied are small.
- Patients above forty years of age are not in study.

- Degenerative and calcific aorta are get excluded from study.

Conflict of Interest: No potential conflict of interest relevant to this article was reported.

Ethical Approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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