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CASE REPORT

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Reversed L-type Upper Partial Sternotomy in Aortic Valve Replacement: an Initial Experience

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ABSTRACT

Introduction: Degenerative aortic stenosis (AS) is the most frequent cause among aortic valve stenotic changes. Mini Sternotomy Aortic Valve Replacement is a replacement of aortic valve through upper partial sternotomy. **Aim:** The aim of this approach is to improve postoperative convalescence by leaving pleural spaces closed and do not compromise respiratory function, to decrease bleeding, and reduce post op ventilation time and ICU stay. All these advantages decrease cost during hospital stay by reducing ICU stay, respiration time, bleeding and using blood products, pain killers and shortening hospital stay. Esthetic effect is also considerable result of this method. **Case report:** This case report presents an initial experience with Reversed L-Type Upper Partial Sternotomy in Aortic Valve Replacement. The goal is to demonstrate that minimally invasive advanced cardiac surgery procedures can be performed in our country.

Key words: Partial, Sternotomy, Reversed, L-Type, Aortic, Valve, Replacement.

1. INTRODUCTION

Degenerative aortic stenosis (AS) is the most frequent cause among aortic valve stenotic changes. When aortic valve area is critically stenosed down to 0.7 cm2, or when patient become symptomatic, an aortic valve replacement (AVR) is indicated. It is save procedure, done by medial sternotomy and with main mortality rate 2-4% (1, 2) .

Mini sternotomy aortic valve replacement (MS AVR) is a replacement of aortic valve through upper partial sternotomy, extending from jugular notch to the right 3rd or 4th intercostal space. The aim of this approach is to, using partial sternotomy, improve postoperative convalescence by leaving pleural spaces closed and do not compromise respiratory function, to decrease bleeding, and reduce post op ventilation time and ICU stay (3). All those advantages of MS AVR decrease cost during hospital stay by reducing ICU stay, respiration time, bleeding and using blood products, pain killers and shortening hospital stay (3, 4). Esthetic effect is also considerable result of this method (5). MSAVR has been performed since late 1990-es, and is not a new method in cardiac surgery but it is considered as advanced one (4).

This case report presents an initial experience with Reversed L-Type Upper Partial Stenotomy MS AVR at our department and the goal of it is to demonstrate that even advanced cardiac surgery procedures can be successfully performed in our country.

2. CASE REPORT

We report a case of 64-years-old female patient scheduled for replacement of severely stenosed aortic valve (AS) of degenerative etiology. Coronary angiogram was performed, in presurgery period, and revealed as follows: Left main, LAD, CX and RCA showed no signs of coronary disease. Trans thoracic

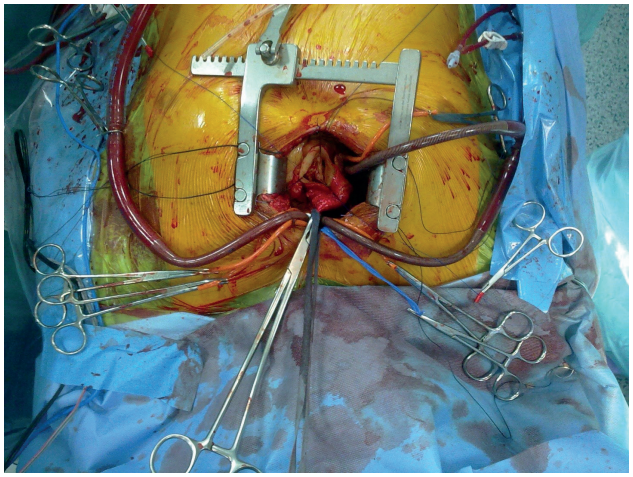

Figure 1. Opened ascending aorta, Aortic valve elevated on commissural stitches end exposed for excision

Figure 2. Closed chest and soft tissue of the wound with thoracic drain in retrosternal position

echocardiogram (TTE) verified concentric hypertrophy of the left ventricle (IVS 1.45cm), normal dimension of heart chambers and good Ejection fraction (EF 55%), severe aortic stenosis (AVA less than 1cm^2, V_{max} 5.04m/sec., PG_{mean} 62.5mmHg, PG_{max} 102mmHg). In previous medical history patient had verified COPD and was suffering from chest pain and effort dyspnea. Laboratory findings at the day of surgery were as follows: Glucosis 7.10, Urea 9.20, Sodium 140, Potassium 3.8, WBC 6.54, RBC 4.08, Htc 0.367, PLT 202, Preoperative ECG: Regular sinus rithm, Heart rate 103bpm, depressed descending ST junction and R height 25mm in precordial leads V_4-V_6 (signs of LV hypertrophy).

3. METHOD

After anesthesia introduction, short skin incision was done (7cm long) and partial stenotomy starting from jugular notch down to 4th intecostal space and horizontal sternotomy then extended from mid line to 4th intercostal space, forming upper partial reversed L-shape sternotomy. If in sight the right internal thoracic artery (RITA) was then ligated and divided at this space to prevent tearing due to stretching of divided parts of sternum.

Fat tissue in the front of the pericardial sac was removed, and inverted T shaped pericardiotomy, in line with sternotomy, followed. Pericardiotomy was done in middle line, from brachiocephalic vein, down to 4 th intercostal space, and then redirected ortogonaly on both sides, forming inverted T shape. Plane around Aorta was made, and ascending aorta hooked by linen tape. Four Pericardial stay sutures (two at each side) were used to elevate the heart and improve access to the aortic root, ascending aorta and right atrium.

Cannulation was performed by flexible Medtronic EOPA Aortic cannula No 24, and Right atrium and Superior Vena Cava with Medtronic venous vire-reinforced cannulas No 22. CPB was instituted by vacuum assistance for better drainage when needed. Carioplegic arrest was introduced via antegrade cardioplegia cannula set at the ascending aorta, and maintained by direct left and right coronary artery cannulation during AVR. Left ventricle venting was obtained by vent cannula placed in LV through right superior pulmonary vein. After cardioplegic cardiac arrest was accomplished, hockey stick aortotomy was done, and three commissural stay stitches placed to lift AV up in the operating field for better exposure (Figure 1).

AV excision and AVR with ATS 21mm mechanical valve was implanted, and followed with Blalock Aortotomy two line-sewing in standard fashion with Prolene 4.0 stitch. While heart was in arrest, retrosternal drain was placed through subxyhpodin incision and retrosternal plain made by blunt digital dissection, Pace Maker wire was placed on anterior wall of the right ventricle during cardiac arrest. Starting heart beating, weaning from HLM and decannulation were done in standard fashion.

The sternotomy was closed using 4 standard wires to the sternum and an absorbable suture to the soft tissues and skin (Figure 2). Three were placed around in a horizontal manner, and one was set in vertical manner approximating intact and horizontally cut part of sternum, which is contracted first. Patient was transversed to Intensive Care Unit (ICU) for early convalescence and awaking by standard anesthesiology procedure. Total postoperative drainage was 685ml. Respiratory time 475 min (7h and 55min). One dose of blood (330ml), and two doses of Cryoprecipitate (350ml) were transfused to the patient. ICU stay was one night. During post-op course only one episode of AF was noticed on the second post-op day and converted into sinus rithm by Amiodaron infusion. Postoperative hospital stay was 5 days. Patient was discharged in sinus rithm without any complains, and checked seven days after discharge when no complication was noticed and with no complains.

It was the first successful mini sternotomy AVR (MS AVR) in Bosnia and Herzegovina performed completely by domestic staff. This case report is to show advanced cardiac surgery can be safely performed in our country

and it is small contribution to development and advancement of cardiac surgery in Bosnia and Herzegovina.

4. DISCUSSION

Minimally invasive techniques for valve replacement have become increasingly popular over the past 15 years, with good early and long-term results having been achieved (3-6). The greatest experience with MSAVRs has been reported by Cohn and colleagues (7-9) who described an initial learning curve (7) that improved with increasing experience (4, 10, 11).

The aortic cross-clamp times were found to be very slightly greater with MSAVR; likewise, the median CPB times were 17 min longer with MSAVR, due to the extra time spent on CPB for 'deairing'. A lower bleeding rate with MSAVR has been suggested in some studies (10, 12) but not in others (3, 4). Previous reports have described shorter ICU stays, a lower incidence of respiratory complications (10, 12), shorter hospital stays (4, 8) and, therefore, a lower resource utilization (4) with MSAVR. In randomized trials alone, there was no difference between the groups for any of the above parameters, except for slightly longer CPB (8 min) and overall operating (16 min) times with MSAVR; however, this was not clinically relevant (11). Mihaljevic et al. (4) reported no difference in perioperative mortality, but did demonstrate a 4% three-year survival benefit with MSAVR. Other studies failed to demonstrate any differences in early or late mortality, or complications with MSAVR (3).

However, given that MSAVR is a relatively new technique, and has been adopted by surgeons only over the past 10-15 years, long-term results of MSAVR should begin to emerge at the start of the next decade.

5. CONCLUSIONS

This initial experience has provided an insight into the safety of MSAVR performed by a single surgeon, providing a cosmetically acceptable result.

Given that the incidence of postoperative complications, the duration of the ICU and hospital stays, and early survivals were similar for SAVR and MSAVR, it can be concluded that the latter procedure can be performed safely, by paying meticulous attention to the surgical techniques involved.

- Conflict of interest: None declared.
- Author's contribution: Alen Karić made substantial contribution to conception, design, drafting the article and critical revision for important intellectual content. He also made analysis and interpretation of data and critical revision for important intellectual content. Author approved the final version to be published.

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