Introduction:
Aortic valve disease, mainly aortic stenosis, is associated with ascending aortic aneurysm (Silva IA, 2019). Both aortic stenosis and ascending aortic aneurysms are now frequently treated simultaneously depending on whether the lesion may be repaired or requires replacement (Vendramin I, 2021). In modern era, reduction of surgical trauma to achieve faster recovery is the goal for every cardiac surgeon. Consequently, the journey of minimally invasive aortic valve replacement is more preferred than the standard open procedure (Staromlynski J, 2020). Minimal invasive procedure provides better thoracic stability and improves cosmetic purposes (Kaczmarczyk M, 2015). We hereby report a patient, who successfully underwent surgical replacement of ascending aorta and aortic valve replacement, through minimal invasive approach; and to best of our knowledge this is the first reported case of its kind in our country.

Case Report:
A33 year’s old, young male patient was admitted into our hospital as a known case of severe aortic stenosis with moderate aortic regurgitation with bicuspid aortic valve and ascending aortic dilatation. He complained of exertional dyspnoea with palpitation for last 3 years. On examination, he was having an ejection systolic murmur over the aortic area. No biochemical abnormality was detected. Doppler echocardiogram showed bicuspid aortic valve with severe aortic stenosis (PPG/MPG 84/54 mm of hg) with moderate aortic regurgitation along with dilated ascending aorta (Aortic annulus 22, sinus 36 mm, STJ 37mm, ascending aorta 46mm, arch 34 mm), normal ventricular functions. CT aortogram also showed dilated ascending aorta (48mm), severely calcified aortic valve with severe aortic stenosis and an otherwise normal aortic root, arch and descending aorta.

OnX of Jan, 2023 after optimization of patient’s condition, he was operated thorough upper-mini
sternotomy. Incision extended from 2nd to 4th space and a “J” sternotomy was done. Sternal spreader was used to apart sternum and thymus was dissected. After doing pericardiotomy, pericardial stay sutures were taken. Ascending Aorta was found grossly dilated. Central aortic cannulation, two stage venous and CP cannulation was done, while left ventricle (LV) was vented through right upper pulmonary vein. After arresting heart with del-Nido cardioplegia, aortotomy was done and aortic valve was checked. Aortic valve was found severely calcified, stenosed and was replaced with 21 mm On-X mechanical aortic valve. Ascending aorta ( supra-coronary) was replaced with 24 mm tube graft. We placed the pacing wire at RVOT before releasing cross-clamp. Aortic cross-clamp was released after de-airing (CO₂ was used) and heart was gradually weaned from CPB to normal sinus rhythm. As TEE showed no residual air in the cardiac chambers, we decannulated and administered protamine. We did some hemostasis and closed the chest with sternal wires after putting a chest tube.

**Discussion:**

Replacement of aortic valve during aortic surgery is typically time consuming (Silva IA, 2019) and minimizing surgical trauma for quicker recovery is a key goal in cardiovascular and thoracic surgery (Phan K, 2014). Early results of post-operative renal failure and cerebral complication showed no significant differences between upper-mini or complete sternotomy, but the respiratory function recovery was better in upper-mini group. Although the cross-clamp time was longer in the minimal invasive group the cardio-pulmonary bypass time was similar in both groups, (Wu, Y, 2020) and the outcomes were excellent.

Stroke rate is significantly reduced in minimal invasive procedure. Because, prior to the release of aortic cross-clamp and during the weaning from cardiopulmonary bypass, presence of air in the left ventricle can be precisely detected by intra-operative trans-esophageal echocardiography. Furthermore, filling the thoracic cavity with carbon-di-oxide lessen the risk of air embolism and its consequences by increasing gas solubility (Schroeyers P, 2001).

In the same way, minimally invasive aortic surgery leads to a much shorter ICU stays and hospital stays (Ram sharony, 2003). According to our experience, which is consistent with other published reports, mini-AVR naturally evolved into minimally invasive aortic surgery. Single stage aortic replacement was gradually added to the normal mini-AVR operation, and at present, single isolated aortic aneurysm is treated in this way (staromtynski J, 2020). Literatures support the observation that patient treated with minimally invasive method had a strong trend toward less wound problems and evidences showed patient received minimal invasive treatment have a lower incidence of postoperative wound infection and mediastinitis (Sebastian V. Rojas, 2013). MI-AVR (minimally invasive aortic valve replacement) is currently comparable to open sternotomy in terms of hospital morbidity and mortality as well as mid-term survival (Ram sharony, 2003).
Limitations of this procedure are mainly diminished access to the heart and the distal arch of the aorta. Learning curve is absolutely important and gradual extension of techniques should be considered from ascending aorta replacement, hemi-arch replacement, to total arch replacement with or without aortic root repair.

Conclusion:
We have done a few aortic replacements along with aortic valve replacement through upper partial sternotomy and the short-term results are promising. Regardless of the degree of repair, from supra-coronary aortic replacements to sophisticated root surgery, minimally invasive aortic surgery conducted through partial upper sternotomy is a conceivable alternative to full median sternotomy and safe in appropriate patients.

References: