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# TAVR THROUGH TRANS CAROTID ROUTE

**Dr. Raja Ramesh N[1], Dr. Ramesh Daggubati[2], Dr. Shivaprasad B[3], Dr. Ramesh babu P[4]**

**1.Interventional cardiologist, Aster Ramesh hospitals, Vijayawada, India**
**2. Associate Chief of cardiology and Director of structural heart disease, WVU, USA**
**3. Senior cardiothoracic and vascular surgeon, Aster Ramesh hospitals, Vijayawada**
**4. Chief cardiologist and Managing director, Aster Ramesh hospitals, Vijayawada**

**Corresponding author: Dr. Raja Ramesh N, Interventional cardiologist, Aster Ramesh hospitals, Vijayawada, India, Email ID: nukavarapuraja@gmail.com, Tel: +917094110346**

## INTRODUCTION

Aortic valve diseases are most common in elderly age group individuals. The prevalence of severe aortic stenosis after the age of 75 years was around 3% (1). The conventional treatment for the symptomatic severe aortic stenosis was replacement of valve by surgically which carries a high morbidity and mortality in elderly patients especially with multiple comorbidities. TAVR (transcatheter aortic valve replacement) is an effective alternative to surgery in high-risk patients (2). Of the various access routes to TAVI transfemoral is the most preferred route as it is safest and less invasive (3). However femoral approach is possible in about 80% of cases (4). Remaining 20% of cases are not suitable for transfemoral access (5). The transfemoral approach is contraindicated in tortuous iliofemoral vessels, extensive calcified atherosclerotic iliofemorals and abdominal aorta aneurysms (6). Other alternative routes considered were transapical, subclavian, trans carotid and transaortic (7). The choice of route should be decided based on patient thoracic and extra thoracic factors (4).

Trans carotid aortic valve implantation is a new and valid nonfemoral route described (8,9). Trans carotid route creates a direct access to the aortic valve without any need for incision on chest. It also improves the stability of catheter during valve deployment (6). Trans carotid access was feasible only if the minimal luminal diameter of common carotid artery is 7 mm with absence of significant stenosis in contralateral common carotid artery, internal carotid artery and vertebral arteries (10).

The following case report highlights the choosing a case for trans carotid TAVR and obtaining access through common carotid artery for TAVI in a patient with severe symptomatic aortic stenosis not suitable for transfemoral access.

## CASE REPORT

A 70-year-old female with past medical history of diabetes, hypertension and PCI (Percutaneous coronary intervention) to left circumflex artery (LCX) presented with NYHA III dyspnea. On examination an ejection systolic murmur was present in aortic area. ECG showed sinus rhythm with LBBB (left bundle branch block) pattern. Echocardiogram showed trileaflet severely stenosed aortic valve (valve area 0.6 $cm^{2)}$ with normal LV function and no regional wall motion abnormality. Aortic valve Vmax is 4.2 m/sec with peak gradient of 65mmHG and mean gradient of 40 mmHG. As the coronary angiogram showed patent stent in LCX and no significant lesion in other coronaries the current symptoms were attributed to critical aortic stenosis and Aortic valve replacement (AVR) was suggested.

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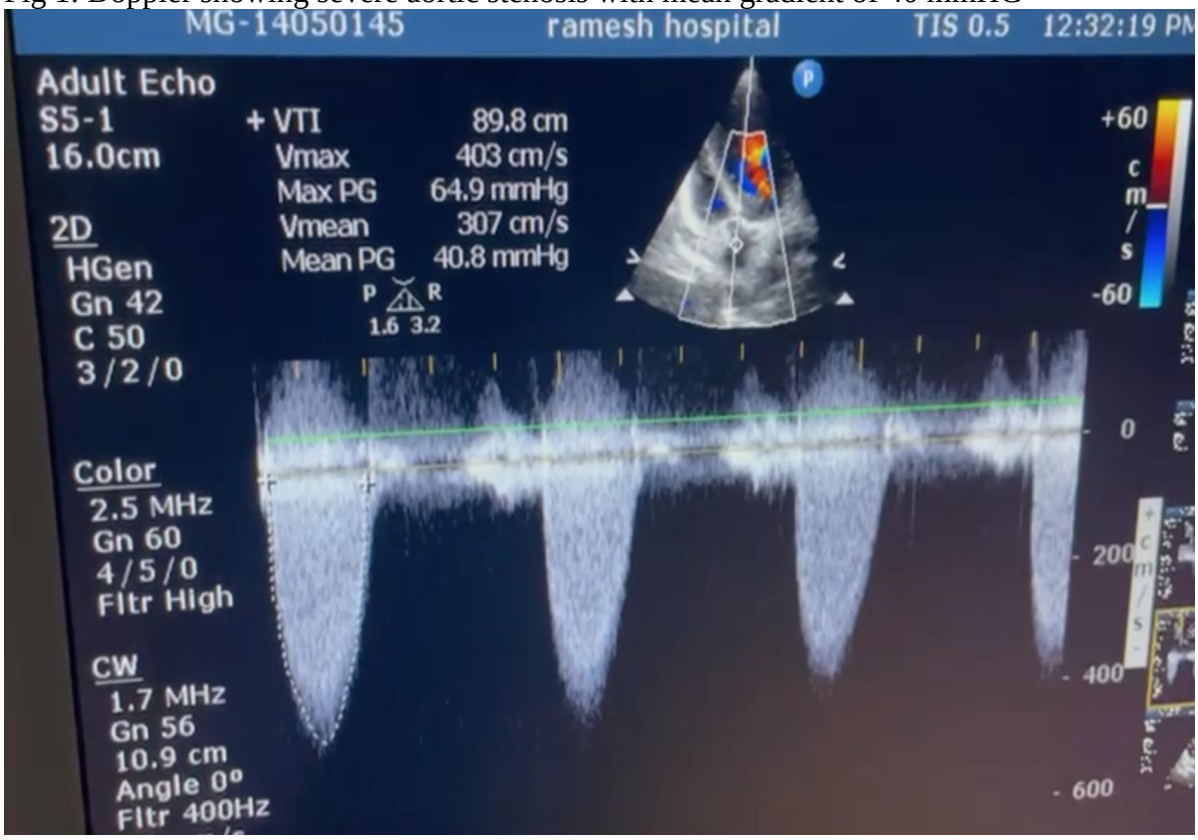
Fig 1: Doppler showing severe aortic stenosis with mean gradient of 40 mmHG




Heart team discussion was done regarding the mode of AVR.As the patient has high STS risk score and in view of high frailty, TAVR (transcatheter aortic valve replacement) was planned. CECT (contrast enhanced computed tomography) of aortic valve and entire aorta was done as a part of pre-TAVI evaluation. CT of aortic valve showed the annulus diameter of 20 mm, LVOT diameter of 21 mm, average sized sinuses of Valsalva of 26 mm each with borderline coronary heights of 9.2 mm on left side and 10.4 mm on right side.

CECT of aorta and peripheral vessels were evaluated for the access route to TAVI valve. Although the femoral arteries were reasonable size(6.5mm) for procedure, the presence of heavy calcium from iliac bifurcation to descending thoracic aorta precludes the usage of femoral arteries for procedure. In some areas of abdominal aorta there was a $360^0$ arc of calcium with atheromas. So, an alternate access (non femoral) was searched which can accommodate the larger sheath for TAVI. CT showed good sized carotid arteries with less calcium. Frail chest and presence of COPD excludes the usage of other access routes like subclavian, transaortic and transapical in this patient. So left common carotid artery was selected as an access for TAVI.

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Fig 2: CT aortogram showing severe calcification from iliac bifurcation to thoracic aorta

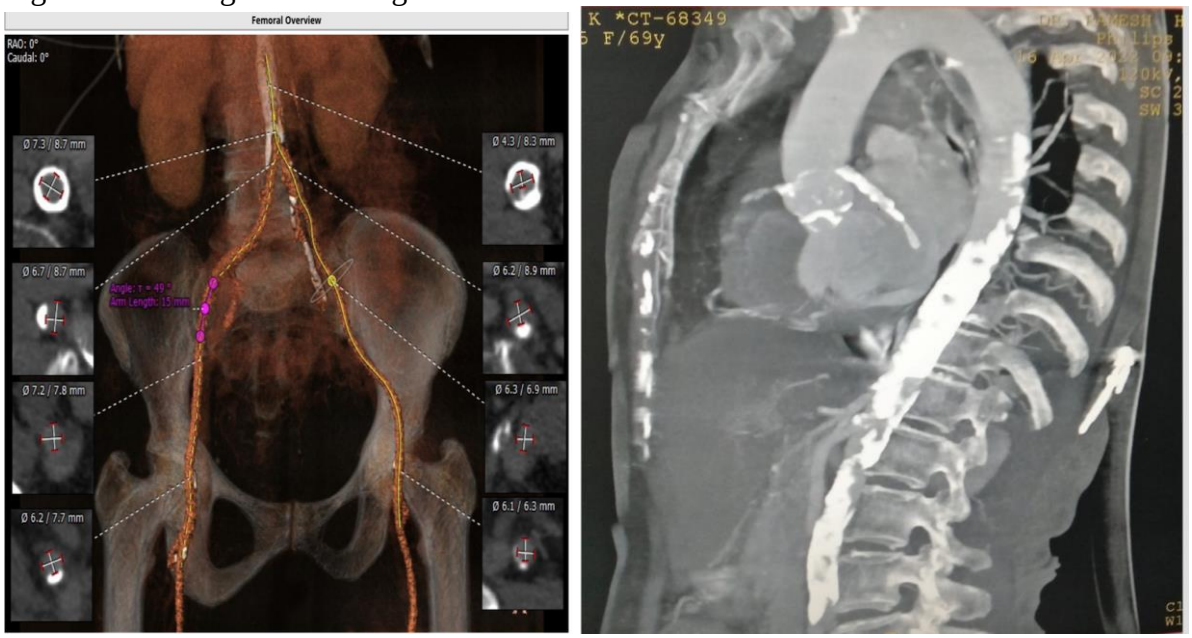
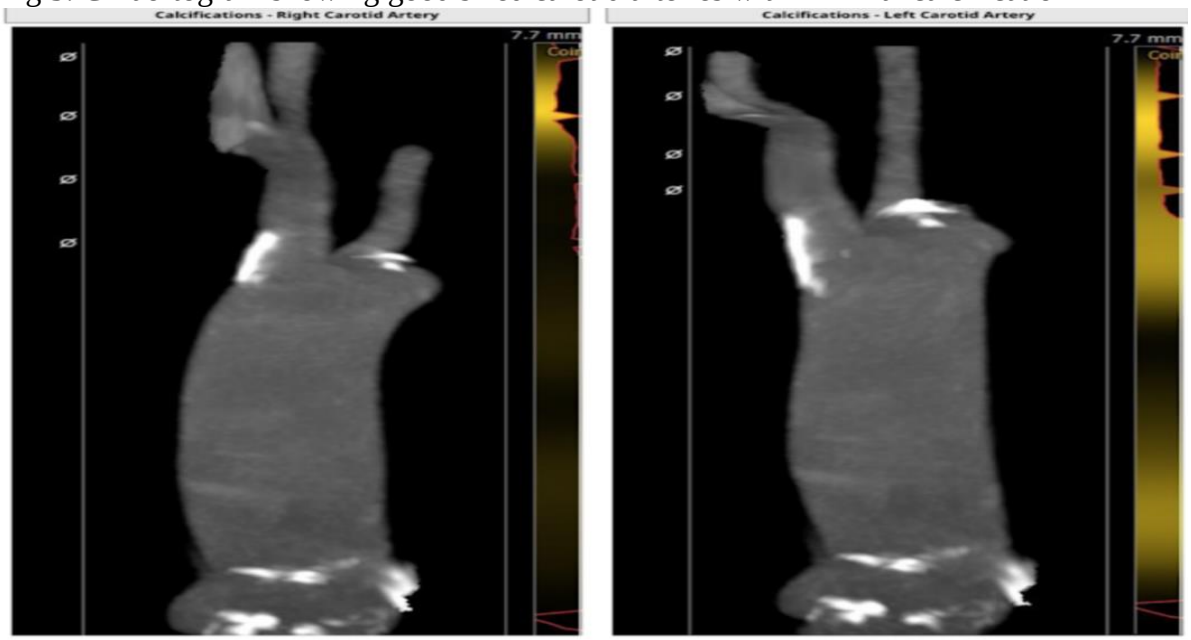



Fig 3: CT aortogram showing good sized carotid arteries with minimal calcification




Procedure was done under general anesthesia. After draping the neck, a longitudinal incision was given along the anterior border of sternocleidomastoid on left side of neck. After dissecting the skin and subcutaneous tissue, the platysma muscle was incised and retracted on both sides to expose the common carotid artery. Two umbilical slings were placed proximally and distally to gain control over hemostasis, then a purse string suture was taken with 6'0 proline over common carotid artery around the area of intended arteriotomy site for its closure post procedurally.

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Fig 4: Left common carotid artery exposed by dissection with umbilical slings tied

Common carotid artery was punctured under direct vision and by using standard seldinger technique 6F sheath was placed, then the aortic valve was crossed with AL1 catheter and straight terumo wire. 6F pigtail catheter was placed in non-coronary cusp through right femoral artery and a pacing lead into right ventricular apex through right femoral vein. Terumo wire in left ventricle was exchanged with stiff safari wire over which 14F python sheath by Meril was introduced up to the aortic root. A 20 mm balloon expandable Myvalve (Meril) was taken through the python sheath and placed across the aortic annulus and deployment position was confirmed by aortic root angiogram by pigtail and valve was deployed under rapid ventricular pacing. After deployment root angiogram showed no aortic regurgitation and echocardiogram showed a mean gradient of 10 mmHG across aortic valve.

After taking out the sheath the hemostasis was secured by proximal sling over common carotid artery and arteriotomy site was repaired with Dacron patch and the wound was closed. Left common carotid artery doppler showed no gradients on 3$^{rd}$ post procedure day and patient was discharged on same day.

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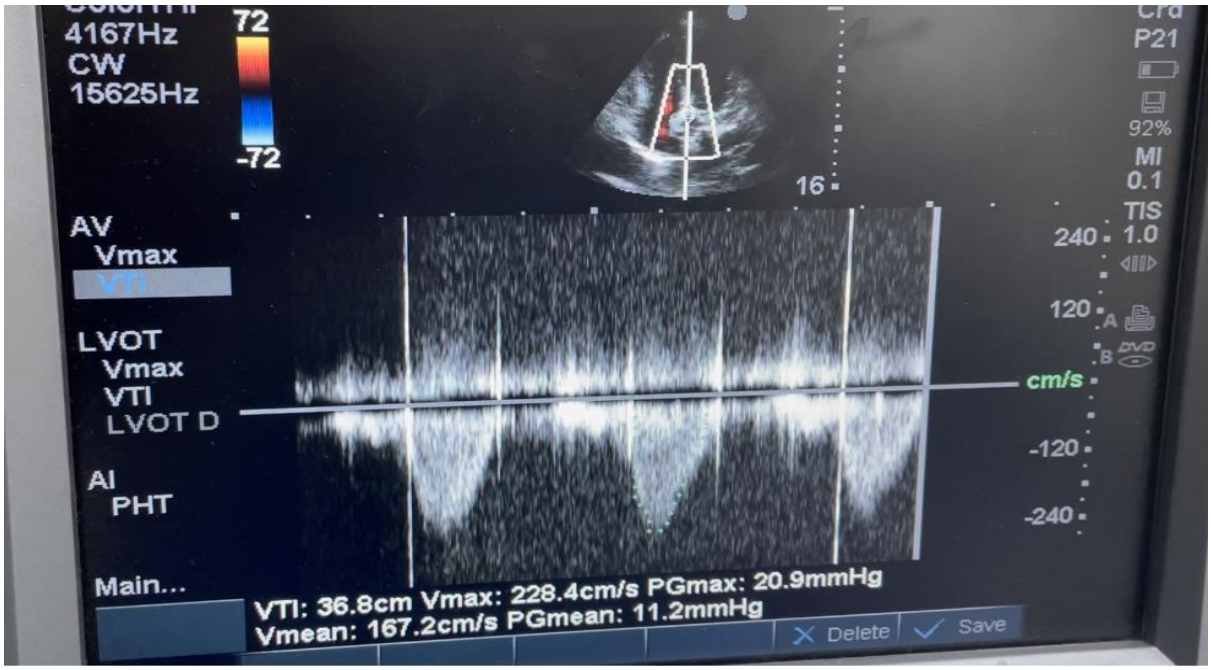
Fig 5: Deployment of 20 mm balloon expandable My valve TAVI valve through left carotid

Fig 6: Post TAVI doppler showing decreased gradient (mean of 11 mmHG) across aortic valve




On the 5th month follow up the patient has no symptoms with echocardiogram showing a mean gradient of 10mmHG across the aortic valve and normal carotid artery doppler.

## DISCUSSION

Trans carotid TAVR is safe and equally effective procedure and is non inferior in outcomes when compared with standard transfemoral TAVR. The left common carotid artery is usually preferred over right as it has less tortuosity and presents more direct access to aortic valve like in our case (4). Both the mortality and need for insertion of a new pacemaker were comparable with transfemoral TAVR (2). The rate of cerebrovascular events was similar when compared to transfemoral TAVR (11). Trans carotid TAVR is a good alternative route

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in patients with poor pulmonary reserve as there is no thoracotomy involved in obtaining access (4). Compared to other nonfemoral TAVR like transapical and transaortic TAVIs the trans carotid TAVR shows no significant difference in mortality,30-day strokes and rate of new pacemaker insertion (10). Moreover, the rate of new onset atrial fibrillation, acute kidney injury and major vascular complications were less with trans carotid TAVR when compared with other non-femoral TAVRs (10).

## CONCLUSION

Trans carotid TAVR is a novel and reasonable alternative to transfemoral TAVR in severe aortic stenosis patients and the results were noninferior to transfemoral TAVR. The short-term morbidities were better with trans carotid TAVR when compared with other nonfemoral TAVRs.

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