# Ultrasound Guided TTP / Superficial Cervical Plexus Block for Postoperative Analgesia for Transcatheter Aortic Valve Replacement: A Case Report

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## Figures

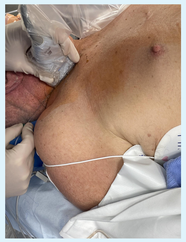

Fig 1: Staged photograph showing transducer and needle orientation during superficial cervical block.

Fig 2: Staged photograph showing transducer and needle orientation during TTP block.

Fig 3: Staged photograph showing the operative field. Xiphoid process denoted by arrow

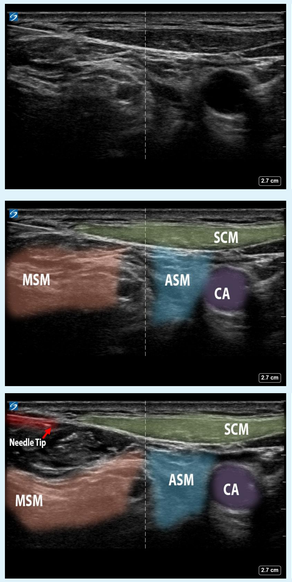


Fig 4a/b: Ultrasound image showing anatomy prior to the superficial cervical block/Image with false color overlay.
Fig 4c: Ultrasound image showing the needle position and local anesthesia deposit spread with false color overlay.
(Abbreviations: SCM = Sternocleidomastoid, MSM = Middle Scalene Muscle, ASM = Anterior Scalene Muscle, CA = Carotid)

Fig 5a/b: Ultrasound image showing anatomy prior to the TTP block/Image with false color overlay.
Fig 4c: Ultrasound image showing the needle position with false color overlay.
(Abbreviations: PM = Pectoralis Major, IM = Intercostal Muscle, TTM = Transversus Thoracic Muscle, Pl. = Pleura)



## Introduction

Transcatheter aortic valve replacement is a developed surgical option for patients with severe aortic stenosis who are judged to be too high risk for aortic valve replacement surgery. Direct aortic access is acceptable when iliofemoral or subclavian approaches are not possible. Postoperative patient care for direct aortic TAVR patients is particularly important because of the discomfort and pain associated with any thoracotomy. Perioperative anesthetic options for TAVR patients include general anesthesia and/or monitored local anesthesia. A cervical plexus block for carotid artery surgery, transcarotid TAVR, and trans-subclavian TAVR patients has been proven to avoid the complications associated with general anesthesia while improving recovery. Bilateral Transversus Thoracic Plane (TTP) blocks can cover sternotomy incisions. This case report describes a novel multimodal analgesia technique used for a high-surgical-risk patient undergoing a direct aortic transcatheter aortic valve replacement. Written consent for publication of non-identifying medical information and Health Insurance Portability and Accountability Act authorization was obtained from the patient.

## Case Description

An 86 year old, 90.5 kg man with a past medical history of aortic stenosis (mean gradient of 37.5 mmHg, valve area of 0.6 $cm^2$) presented for a transcatheter aortic valve replacement via direct aortic approach. Patient comorbidities included hypertension, coronary artery disease, peripheral vascular disease, and remote history of non-ST-elevation myocardial infarction. The patient underwent percutaneous revascularization in 1996. Carotid duplex showed evidence of significant stenosis of the right internal carotid artery and moderate stenosis of the left internal carotid artery. General anesthesia was planned to facilitate transesophageal echocardiography. A right superficial cervical plexus block and bilateral transversus thoracic plane blocks were planned and discussed with the patient in order to minimize postoperative pain.

## Case Description (continued)

On the day of surgery, the patient had standard anesthetic monitoring as well as invasive arterial blood pressure monitoring and transesophageal echocardiography. General anesthesia was induced with lidocaine 1% (PF), etomidate, and rocuronium. General anesthesia was maintained with inhaled anesthetics as well as a continuous infusion of remifentanil at 0.05 mcg/kg/min and dexmedetomidine at 0.6 mcg/kg/hr.

Prior to beginning the superficial cervical plexus block, the patient neck and anterior chest was was prepped with chlorhexidine 4%. A SonoSite X-Porte HFL50xp 15-6 Mhz linear ultrasound probe (Sonosite, Bothell WA) was positioned at the midpoint of the patient's clavicle and moved to identify the sternocleidomastoid muscle, carotid artery, C6 nerve root, and C5 transverse process. A 22-gauge, 50-mm 22-gauge Stimulplex needle (B-Braun, Melsungen, Germany was advanced between the sternocleidomastoid and the scalene muscles via in-plane approach under ultrasound guidance. After the position of the needle tip was confirmed, 10 mL of 0.25% bupivacaine was injected.

Following the superficial cervical plexus block, bilateral TTP blocks were performed at the T4 level. The ultrasound probe was positioned in a parasagittal orientation to obtain a parasternal view. The ribs were identified as hyperechoic structures with acoustic shadowing below. The block needle was inserted in a cranial-to-caudal direction using the in-plane technique and advanced until the tip was below the intercostal muscles and above the transversus thoracic muscles. 20 mL of 0.25% bupivacaine was injected. This procedure was repeated on the opposite side for a total of 40 ml of local anesthetic. The table below summarizes the patients postoperative pain scores and opioid consumption.

| Postop Day | Pain Score | Opioid Consumption | MEQ | Cumulative MEQ |
|---|---|---|---|---|
| 0 | 2 | Oxycodone 5 mg | 7.5 | 7.5 |
| 1 | 3 | none | 0 | 7.5 |
| 2 | 0 | none | 0 | 7.5 |

## Discussion

This case report presents the successful use of a superficial cervical plexus block and bilateral TTP blocks to provide opioid-sparing anesthetic for a patient undergoing a direct aortic TAVR. Ultrasound guidance has made superficial cervical plexus block safer and more accessible. The multimodal anesthetic approach resulted in patient pain score of 0 two days after the procedure. A TTP block is an established technique for anesthetizing the chest wall. The patient required one 5 mg oxycodone dose on postoperative day one to manage pain. No adverse side effects were reported for this aged and high-risk patient. These postoperative outcomes are satisfactory, and should encourage further studies into the efficacy of the superficial cervical plexus block and transversus thoracic plane block for procedures requiring thoracotomies such as direct aortic TAVRs.

## Acknowledgements & Discussion

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