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Case Report

Anaesthesia Section

Central Venous Catheterisation of the Internal Jugular Vein in the Sitting Position: A Case Report on Overcoming the Challenges of Severe Kyphosis

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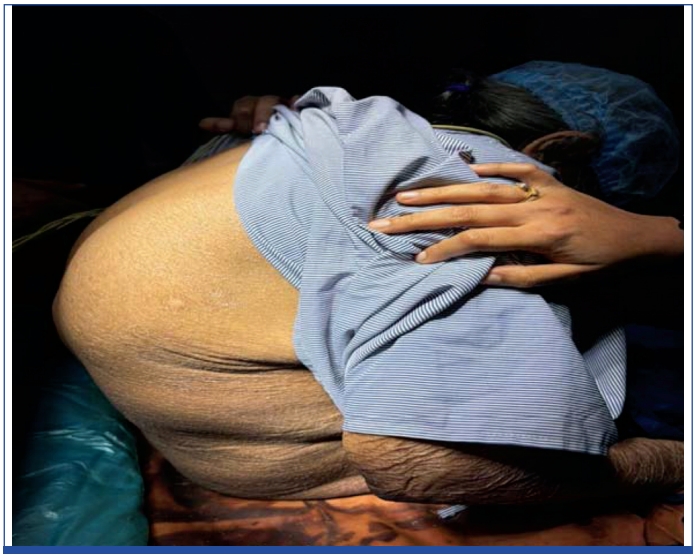
ABSTRACT

Securing central venous access is a fundamental requirement for high-risk surgical interventions, yet severe skeletal deformities such as kyphosis can render conventional supine or Trendelenburg positioning impossible. This case report describes a 67-year-old female with a complex history of peripheral vascular disease and prior femoral popliteal bypass grafting who presented for emergency bilateral below-knee amputation. The patient's severe thoracic kyphosis prevented supine positioning and was complicated by difficult peripheral intravenous (i.v.) access and fused spinal spaces. Consequently, Internal Jugular Vein (IJV) catheterisation was performed with the patient in a 60° sitting position. Due to the lack of ultrasound guidance and the effects of gravity on venous filling, a significant challenge occurred when the guidewire met resistance at the 10 cm mark, likely due to anatomical kinking or postural decrease in venous cross-sectional area. This was successfully navigated by employing a coordinated Valsalva manoeuvre, which increased intrathoracic pressure to distend the vein and facilitate smooth guidewire advancement. Following successful central access, spinal anaesthesia was administered via a paramedian approach in the sitting position. Despite intraoperative blood loss and the need for vasopressor support, she was discharged without complications. This case highlights the clinical novelty of performing IJV cannulation in an upright position and emphasises the utility of the Valsalva manoeuvre as a rescue technique when severe anatomical distortion and postural constraints hinder standard technique.

Keywords: Hypotension, Spinal anaesthesia, Valsalva manoeuvre

CASE REPORT

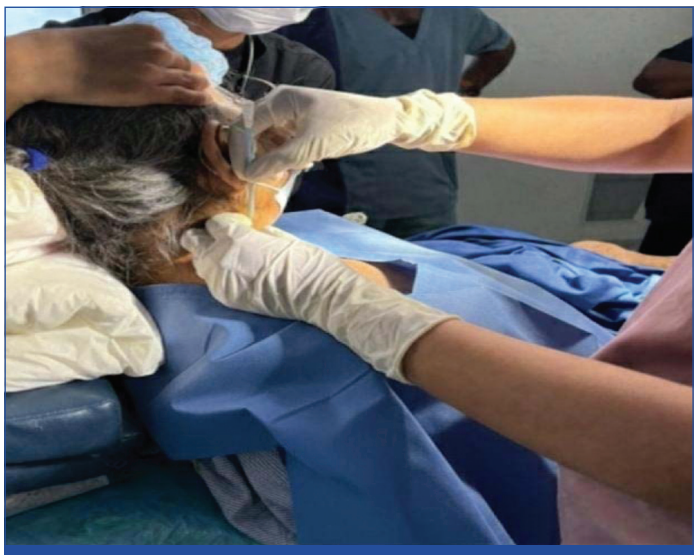
A 67-year-old female patient presented to the casualty with chief complaints of blackish discolouration, pain, foul smelling discharge from both lower limbs which gradually developed over three weeks. She had a known history of peripheral vascular disease for five years. She was posted for emergency bilateral lower limb below knee amputation. During the preanaesthesia assessment, her history revealed that she had undergone femoro-popliteal bypass five-year-ago. She also had a history of Coronary Artery Bypass Grafting (CABG) 14-year-ago. She was on Tablet Aspirin 150 mg once daily and Tablet Atorvastatin 10 mg once daily. The patient had a poor compliance with medications and was not on any medication since the past one month. The patient weighed 60 kilograms and had a height of about five feet two inches. Upon airway examination the patient had adequate mouth opening, her Mallampati grade was II. The patient's vital parameters were as follows: heart rate - 98/min, blood pressure -122/70 mmHg and SpO_2 was 92% on room air. Examination of her spine revealed severe kyphosis [Table/Fig-1] due to which she was unable to lie in supine position and the spinal spaces appeared to be fused. The investigations for Complete blood count, chest X-ray, ECG, and 2D ECHO were done [Table/Fig-2]. Pulmonary function tests could not be done as it was an emergency surgery. After taking written and informed consent the patient was taken for surgery under the American Society of Anaesthesiologists (ASA) grade IV (E). The patient had a difficult i.v. access and attempts to secure peripheral venous access in both arms were unsuccessful. Hence, the decision of central venous catheterisation was taken. As supine position was not possible, due to severe kyphosis, the patient was maintained in a 60° sitting position throughout the intervention with her back supported by the operating table [Table/Fig-3]. Multiparametric monitor containing ECG, pulse oximetry, and Non Invasive Blood Pressure (NIBP) monitoring were attached. Under all aseptic precautions after painting and draping the patient's neck was rotated to 40° left and right internal jugular venous cannulation was done with the central approach. A pilot puncture was taken at the apex of a triangle formed by two heads of sternocleidomastoid muscle. The procedure was performed by standing in front of the patient rather than from behind for better visualisation and access. The pilot puncture was followed by a puncture with an 18G Y shaped introducer needle with a syringe attached to its apex. The needle was directed towards the ipsilateral nipple at an angle of 45° to the skin; aspiration with syringe was done and continuous aspiration of blood was achieved. The colour of the blood was dark red, and a J-tipped guidewire was advanced through the Y shaped introducer needle. The guidewire was unable to pass smoothly after the 10 cm mark. Changing the direction of the bevel and angle of the needle also did not help the guidewire to pass with ease. The ultrasonography machine was not available at the time of insertion. The patient was asked to perform a Valsalva manoeuvre during the procedure. While the manoeuvre was being performed, the guidewire was advanced, thus abolishing the hindrance and allowing for smooth passage. Continuous ECG monitoring was done while advancing the guidewire. After adequate dilatation a triple Lumen catheter of 7 Fr (BBRAUN cetrofix trio V715) which was preflushed with 0.9% normal saline was passed over the guidewire and guidewire was removed. All three ports of the catheter were checked for the blood flow and were flushed with normal saline. The position of the catheter was confirmed with chest x ray. The catheter was then fixed at 13 cm with 3-0 silk sutures and transparent dressing was applied. The back of the patient was painted and draped in sitting position then the spinal anaesthesia was administered in L3- L4 interspace via a paramedian approach and 3.4 mL of



[Table/Fig-1]: Severe kyphosis of patient.
Patient in sitting position with kyphosis of spine

Test		Value	Normal value
Complete blood count	Haemoglobin (g/dL)	8.9	12-15
	Total leucocyte count (/µL)	22,000 cells	4,000-10,000
	Platelet count (/µL)	400,000	150,000-450,000
Random blood sugar (mg/dL)	118		70-140
Blood urea (mg/dL)	32		17-49
Serum creatinine (mg/dL)	0.8		0.6-1.35
Serum electrolytes	Serum sodium (mEq/L)	130	135-145
	Serum potassium (mEq/L)	4.2	3.5-5
	Serum chloride (mEq/L)	112	98-106
Chest X-ray	Prominent bronchovascular markings		
ECG	Left bundle branch block		
2D ECHO	Ejection fraction: approximately 50% Mild aortic stenosis, mild mitral regurgitation		

[Table/Fig-2]: Investigations of the patient.



[Table/Fig-3]: Insertion in sitting position.
Intervention being done in sitting position

0.5% heavy bupivacaine was administered. The patient was allowed to lean back on the pillows and operating table. The onset of the spinal block was at three minutes. A sensory level of T12, complete motor blockade was achieved at 18 minutes. The patient remained in sitting position throughout the surgery with an inclination of about 60° as supported with pillows. The surgery lasted for 1.5 hours. The patient's vitals remained stable following the spinal anaesthesia during the course of surgery the patient had developed hypotension. The i.v. crystalloids were administered rapidly and the patient was started on i.v. Noradrenaline infusion at 0.2 µg/kg/min to keep the mean arterial pressure greater than 65 mm of Hg. The estimated total blood loss during the procedure was approximately 500 mL. One unit packed with red cells was given intraoperatively and the patient was shifted to the Intensive Care Unit (ICU) for haemodynamic monitoring. The effect of spinal anaesthesia lasted for four hours. There were no other complications of spinal anaesthesia. At the ICU, one unit packed red cell transfusion was done along with gradual tapering of the noradrenaline injection guided by serial blood pressure measurements every 15-30 minutes. The patient was shifted to ward on the second day from the ICU. She was discharged from the hospital after five days.

DISCUSSION

A central venous catheter is an important device, especially in patients whose peripheral venous access cannot be achieved. It can be placed in internal jugular, femoral and subclavian veins. The right IJV is the most preferred site for insertion [1]. The patient in this case had a peripheral vascular disease and multiple prior cannulation attempts, due to which achieving peripheral venous access was not successful. Insertion of the central venous catheter is usually done in the Trendelenburg position (headlow). This position is known to increase the filling in the IJV and make it more palpable. Marcus HE et al., in their study, compared cross-sectional areas for the IJV in various positions with and without application of positive end expiratory pressure application. Their findings suggested that the 20° Trendelenburg position helps in increasing the cross-sectional area there by increasing the success rate of cannulation [2]. Presence of severe kyphosis made the positioning difficult. Trendelenburg position or rather even supine position was impossible to achieve in this patient. Hence, the choice was made to insert the catheter in a sitting position. Central venous catheter insertion employs seldinger technique in which the catheter is sheathed over the guidewire. It marks an important step in successful catheterisation. Guidewire insertion is associated with a lot of unforeseen complications. Khasawneh FA and Smalligan RD in their case report and literature review enumerated a number of complications like arrhythmia, perforation of Valsalva, cardiac tamponade, change of shape, complete loss of catheter in the vascular system [3]. In this patient, though the insertion of guidewire initially encountered obstruction, the performance of valsalva manoeuvre helped in its smooth gliding and advancement. The physiological rationale for this manoeuvre is robustly supported by Suzuki T et al., who demonstrated that increasing intrathoracic pressure distends the IJV and, crucially, optimises the venous-atrial junction angle. Their research found that the Valsalva manoeuvre reduced guidewire locking from 16.7% to 3.4% and successfully rescued 67% of cases where initial advancement had failed [4]. While the Valsalva manoeuvre was instrumental in this case for mechanical success, we remained vigilant for potential rhythm disturbances by monitoring ECG.

Venous air embolism is the most dreaded complication of the central venous line. Wysoki MG et al., in their study, compared the Central Venous Pressure (CVP) during various manoeuvres performed by patients with central venous line. Their study demonstrated that Valsalva manoeuvre increases the CVP and hence prevents the occurrence of venous air embolism [5]. Valsalva manoeuvre performed while insertion of catheter in this patient helped in the prevention of venous air embolism which is most common in upright

position. The ASA guidelines by Rupp SM et al., in central venous line insertion advocate to use the static or real-time ultrasound guidance for locating it and confirmation of guidewire and catheter placement. Absence of ultrasound in this case made the landmark guided technique a must [6].

The spinal anaesthesia given in this case was at the level of L3-L4 interspace. In this case, the kyphosis was not associated with any degree of scoliosis which usually co-exists. Despite severe kyphosis, spinal anaesthesia was administered with ease in this case. Paramedian approach was used as it is preferred in fused and osteoporotic spine as seen in this patient. Heavy bupivacaine of volume 3.4 mL was given as the patient could not be positioned supine to achieve adequate block height due to the presence of kyphosis. Neeta S et al., in their study proved that in spite of prolonged sitting for 20 minutes after saddle anaesthesia given with hyperbaric bupivacaine at standard dosing provided the complete motor block in lower limbs and a sensory level of T12 in half of the study population [7]. This was true in this case because, in spite of the continuous sitting position, the motor block in the lower limbs was complete and a sensory level of T12 was achieved. Saddle block can be considered an advantageous technique because of conditions that adversely affect recoveries, such as nausea, and vomiting due to general anaesthesia [8].

Kyphosis is a common spinal deformity. It is usually associated with ankylosing spondylitis and advanced age. Kyphosis is an abnormal anterior convex curvature of the thoracic spine. It disables the affected person to stand upright. It is usually associated with a restrictive pattern of lung disease [9]. It poses a great challenge to anaesthetists for both general and regional anaesthesia techniques. This patient had severe thoracic kyphosis. Pulmonary function testing could not be done due to the emergency nature of surgery. This patient was definitely not suitable for general anaesthesia for various reasons -the site of surgery was lower limbs and her co-morbidities made the airway difficult. As the patient could not lie down supine the alignment of upper airways for successful Bag and mask ventilation or intubation would be challenging [10]. Hence, the choice of regional anaesthesia (spinal anaesthesia) was made.

The continuous sitting position after the spinal anaesthesia helped not only in preventing the excessive upward spread of the drug but also helped in maintaining stable haemodynamics [7]. The hypotension in this case was attributed to the bilateral lower limb amputation and blood loss. Moreover, the head up position causes the venous pooling in the lower limbs and reduced venous return. The kyphosis also causes restriction of the thoracic cage and poor cardiovascular tolerance. Patients with kyphosis have low tolerance to sudden sympathectomy [9,10]. The anaesthesia given in this case also addressed the deleterious effects of cardiovascular complications that could occur after conventional spinal anaesthesia.

CONCLUSION(S)

In conclusion, this report demonstrated that severe thoracic kyphosis presents a significant challenge for both central venous access and regional anaesthesia. The successful use of the landmark guided technique in a sitting position highlights the feasibility of unconventional positioning when constraint for standard Trendelenburg posture was present. Moreover, the application of a coordinated Valsalva manoeuvre served as a rescue technique, overcoming mechanical guidewire resistance by distending the vein and optimising the course. This, combined with a paramedian approach for spinal anaesthesia, allowed for a stable intraoperative course despite the patient's complex skeletal and cardiovascular history. Ultimately, this report underscores the importance of integrating physiological manoeuvres and modified positioning in the management of patients with extreme anatomical distortions. Such an approach remains a life-saving alternative, particularly in resource-limited settings where advanced imaging like ultrasonography may be unavailable.

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