Partial occlusion of left axillary artery in a patient undergoing robot-assisted radical cystectomy

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Abstract

Robot-assisted surgeries are associated with steep positions which provide free operative field to surgeons; however, it becomes more challenging to the anaesthesiologists. In robot-assisted surgery, the patient is not usually accessible after docking in of robot, so monitors, circuits and tubes should be tightly secured and confirmed before handing over the patient to the surgeons. We report a patient with partial left axillary artery occlusion in a patient posted for robot-assisted radical cystectomy.

Keywords: Neurovascular compression, operative positioning, padding, partial axillary artery compression, robot-assisted radical cystectomy, Trendelenburg

INTRODUCTION

Robot-assisted surgeries are the new trend in surgery and are very useful in pelvic and abdominal surgeries where access is difficult and for enhanced recovery of a patient. For most cases, the patient is positioned in steep Trendelenburg or reverse Trendelenburg position, which provides better access for surgical procedure but is associated with significant changes in cardiovascular system, respiratory system and regional circulation. Although these positions have become a routine with evolving surgical and anaesthetic techniques, there is possibility of neurovascular injury. The reported incidence of post-operative neuropathies for robotic positioning is 0.8%–6.6%, suggesting higher rates of position-related injuries in robotic compared to 0.10%–3.2% for laparoscopic surgeries.[1] Cases of complete vascular occlusion in lateral and park bench positions are reported in the literature; however, we could not find any case with findings which lead to suspicion of partial vascular compression in Trendelenburg position. We wish to highlight the use of pulse oximetry parameters in early detection of partial vascular compression to reach the cause and timely correction of overdamping of arterial pressure.

CASE REPORT

A 39-year-old male, American Society of Anesthesiologists (ASA) physical status I, diagnosed with muscle invasive bladder carcinoma was scheduled for robot-assisted radical cystectomy and ileal conduit. Standard ASA monitoring in the form of electrocardiogram, non-invasive blood pressure cuff on the right arm and pulse oximetry
probe on the left hand finger were attached. General anaesthesia with endotracheal intubation was performed with induction agent injection propofol 2 mg/kg and analgesic injection fentanyl 2 mcg/kg intravenously after ensuring adequate neuromuscular blockade with injection vecuronium. Collateral circulation by modified Allen’s test was confirmed, and the left radial artery was cannulated and transduced. The invasive arterial pulse waveform and values were obtained which were comparable to non-invasive blood pressure from other arm. After securing all the monitors, tubings and circuit connections, the patient was positioned to facilitate surgical exposure.

The patient was positioned in steep Trendelenburg position, securely fastened in position by shoulder support, cross bandage over the chest and cotton cushioning at dependent areas. The left upper limb was positioned in 60° abduction at shoulder and 70° flexion at elbow joint, padded and covered with cotton and away from field of robotic arms [Figure 1].

Within 10 min of positioning, we noticed overdampening of arterial waves with fall in invasive blood pressure despite normal value of non-invasive blood pressure in the right arm. The dampening could not be corrected even after repeated flushing, recalibration and changing the transducer. On aspiration, there was good backflow from arterial line. Position of transducer in relation to heart level was also reconfirmed.

We also observed that pulse oximeter applied on the left hand also showed significant pulse pressure variation (PPV) with perfusion index reduced to 2.48 (suggestive of hypovolaemia) which was 8.0 before positioning [Figure 2]. Considering hypovolaemia, fluid input was reviewed which was adequate according to calculated fluid for that duration. The simultaneous dampening of PPV and arterial waveform with normal reading of non-invasive blood pressure suggested towards arterial compression. The ulnar, brachial and axillary artery pulsations were checked and found to be feeble. Although the arm was not hyperabducted, even then we attempted to further reduce abduction and flexion at elbow joint which did not lead to improvement in arterial waveform or pulse oximetry waveform. Finally, supraclavicular area was checked where a cotton pad applied between the shoulder and the support was found to be misplaced. Both waveforms and perfusion index improved on applying additional cotton pads between shoulder and brace. Cotton pad removal to confirm these findings again leads to dampening of arterial waveform and decrease in perfusion index.

**DISCUSSION**

A case of axillary artery occlusion has been reported in the past in park bench position, which was noticed when
both arterial and pulse oximetry traces disappeared on positioning and returned to normal after repositioning arm in near neutral position.\[5\] Non-dependent axillary artery compression is reported in needlescopic thoracic sympathectomy on flexion beyond 90°. This was noticed when temperature did not increase after sympathectomy, which was confirmed by the absence of pulse oximetry waveform and pulses.\[3\] In our case, arterial trace dampened and previously normal pulse oximetry on the same limb started showing features of hypovolaemia with wide variation in pulse waves and reduced perfusion index. This along with normal non-invasive blood pressure in opposite limb suggested partial recurring vascular compression. Thus, we conclude that axillary artery may get compressed at its origin if cotton pads are not placed appropriately between shoulder and brace in steep Trendelenburg position. The variation in pulse oximetry waveform and perfusion index may provide a hint towards such partial vascular compression and can prevent limb ischaemia. Limb Doppler may be used to identify limb hypoperfusion in the absence of hypotension. Increase of the peak systolic velocity in triplex mode and turbulence in colour Doppler with the use of point of care ultrasound may indicate limb hypoperfusion.\[4\] The optimal position of the arms in steep Trendelenburg position would be slightly pronated, tucked along the side of body, however, this might restrict access to vital monitors and intravenous access.\[8\]

Declaration of patient consent
The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understands that name and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

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