

Case Report

Ignorance shown on arterial waveform and impending recurrent laryngeal nerve injury was missed during anterior cervical spine surgery

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Abstract

Anterior cervical spine surgeries pose a risk to the recurrent laryngeal nerve (RLN), especially with right-sided roaches. A 4-year-old girl with T1 aneurysmal bone cyst and C7–T2 spondylolisthesis underwent T1 corpectomy and anterior fixation. Intraoperatively, dampened arterial waveform from a right radial arterial line coincided with retractor placement. Postoperatively, transient hoarseness suggested RLN neuropraxia. The dampened waveform likely reflected subclavian artery compression, anatomically adjacent to the right RLN. Aberrant intraoperative blood pressure or pulse oximeter readings on the ipsilateral limb may serve as surrogate markers for RLN compression, warranting retractor adjustment.

Keywords: Arterial Dampening, Intraoperative ignorance, Recurrent laryngeal nerve

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1. Introduction

Recurrent laryngeal nerve (RLN) palsy is a well-known complication following cervical spine surgery through the anterior approach.¹ Injury to the RLN can manifest as hoarseness of voice, vocal fatigue, aspiration, weak cough, dysphagia and sometimes as life-threatening postoperative airway obstruction.^{2,3} The overall incidence of RLN palsy following anterior cervical spine surgery ranges between 0.2–24.2%.^{1,2,4} Here we present a case of a 4-year-old child who presented with signs of RLN injury in the immediate post-operative period following anterior cervical spine surgery. Importantly there was a warning indicated on monitor which was ignored during the surgery.

2. Report

A 4-year-old female child with diagnosis of T (Thoracic vertebrae) 1 aneurysmal bone cyst with C (cervical vertebrae) 7–T2 spondylolisthesis was scheduled for T1 corpectomy and rigid cage insertion, fixation using anterior cervical plates rib graft. The child underwent posterior approach surgery included decompression of the lesion followed by fixation 20

days back. This surgery was uneventful and power in lower limbs improved subsequently.

On arrival to the operation theatre, standard ASA monitors were attached to the patient and baseline readings were recorded. Intravenous induction was done with fentanyl, propofol and atracurium and endotracheal tube was uneventful. An arterial line was secured in the right radial artery and transduced. Surgery included harvesting of rib bone graft in prone position followed by anterior approach - T1 corpectomy, cage placement and fixation using anterior cervical plates and screws and rib graft in the supine position. After the surgical incision on neck muscle and soft tissue was retracted and vertebrae was exposed. During this period, we noted dampening of arterial waveform and underestimation of arterial blood pressure readings as compared to the NIBP (**Figure 1 a**). Troubleshooting was done to rule out technical issues related to arterial canula, lines and transducer. There was good backflow and no resistance while flushing. Since MAP value in IBP value was lower (>10%) than in NIBP, we switched to later for monitoring BP for rest of the surgery. The surgery was uneventful and vitals remained stable. Once surgeon released the retractors for closure, we noted the

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arterial wave form on the monitor started to appear normally and IBP value was correlating with NIBP. Following closure child was reversed and extubated. Child was conscious and responsive, however was agitated with hoarseness of voice. There was no respiratory difficulty or signs of upper airway obstruction. Child was nebulised with adrenaline and intravenous hydrocortisone 30 mg was administered. After observing for 30 minutes child was shifted to post-operative care unit. Vitals were stable with room air oxygen saturation

of 99% but hoarseness remained same. The child had no difficulty or pain while swallowing. With above clinical features neuropraxia of recurrent laryngeal nerve (RLN) was suspected. Patient was continued on steroid for next 48 hours with child was started oral feeds as per institutional practice. There was no incidence of difficulty in breathing or swallowing. The family was reassured about reversible nature of injury. Over first 24 hours hoarseness improved and child started speaking similar to preoperative period.

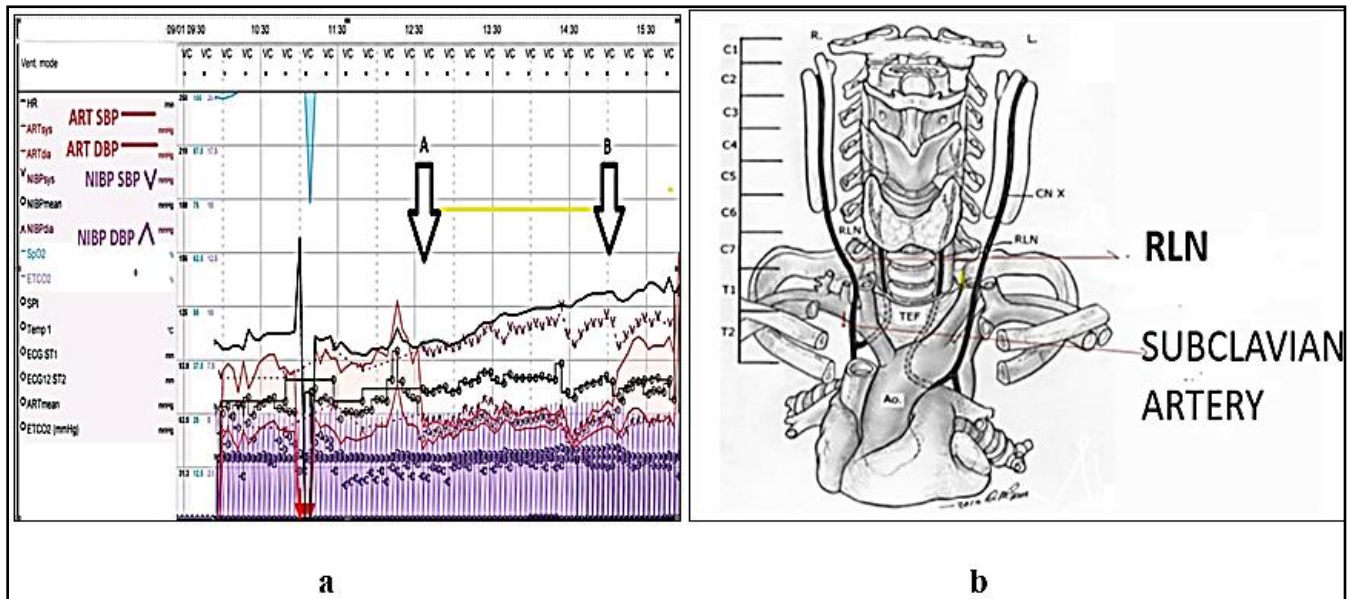


Figure 1 a: Intraoperative anaesthesia record showing arterial blood pressure (Red lines) and non-invasive blood pressure (arrows). Point A corresponds to application of retractor and point B corresponds to removal of retractor. Between these two points SBP and DBP on IBP is closer to each other indicating dampening of waveform. At the same period NIBP values are unaffected. After the point B IBP pulsatile waveform resumes and values are similar to NIBP. **b:** Schematic diagram of the course of recurrent laryngeal nerve on both the sides and showing relation of right RLN to right subclavian where probably retractor was placed. (RLN; Recurrent laryngeal nerve).

3. Discussion

The RLN can be injured intra-operatively by various mechanisms such as entrapment of the nerve between the retractor blade and cuff of the endotracheal tube, traction injury to the nerve causing stretching and distension of the nerve, post-operative soft tissue edema, direct injury to the nerve either by the retractor or by direct nerve ligature.³ The neurosurgeons and the spine surgeons do not routinely expose the RLN and monitor intraoperatively unlike the head and neck surgeons. Hence the risk of RLN injury is more with the anterior cervical spine surgeries.⁵

Right sided approach to the anterior cervical spine surgery is also an attributed risk factor for RLN injury when compared to that of left sided approach due to the anatomical variation in the course of RLN.^{3,5} This is because the left RLN is longer in length and ascends the trachea-oesophageal groove in a more vertical fashion and therefore it is better protected. Whereas the the right RLN is shorter in length, loops around the right subclavian artery and ascends towards the midline making a more oblique angle to the sagittal plane.

It lies anterior and lateral to the trachea-oesophageal groove making it more prone for injury due to surgical retraction^{3,4} (**Figure 1 b**). IBP is not a routine monitoring utilised in ACDF surgeries. However, considering the patient history we decided to monitor IBP. It is a routine practice to place NIBP cuff and SPO2 probe on opposite side as right sided values may not be reliable. It also comforts surgeon providing undisturbed working space. In this case right sided arterial canula was secured incidentally which had blunting in waveform and underestimation of MAP. This did indicate the possibility of partial compression on subclavian artery by retractor blade. The compression of RLN is inevitable since it is closely related to subclavian vessel (**Figure 1b**). However, we failed to pick this warning sign on the monitor and convey the same to surgeon. This could have allowed surgeon to readjust the retractor and hence nerve compression could be avoided. Techniques like EMG can be used to prevent such injuries. With this case we learnt any aberration in values of BP or SPO2 on ipsilateral limb do indicate possible vascular compression. Hence retractors can be readjusted by surgeon accordingly.

4. Conclusion

It is not a routine practice to monitor RLN intraoperatively to prevent injury to the same. There are various neuromuscular monitoring techniques described in literature. Any aberration in values of BP or SPO2 during surgery on ipsilateral limb should warrant about compression of subclavian vessels.

5. Source of Funding

None.

6. Conflict of Interest

None.

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