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CLINICAL REPORT

Severe stridor and marked respiratory difficulty after right-sided supraclavicular brachial plexus block

Sohan Lal Solanki · Amit Jain · Jeetinder Kaur Makkar · Sapna Annaji Nikhar

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Abstract Brachial plexus block is commonly used for upper limb surgery. Although the procedure is safe, it may be associated with some life-threatening complications. We performed right-sided supraclavicular brachial plexus block for below-elbow amputation in a 45-year-old female. At completion of the block the patient developed marked respiratory difficulty with audible inspiratory stridor. Although SpO_2 decreased to 82% initially, it was increased to 100% by continuous positive airway pressure with a face mask. On conventional direct laryngoscopy, the left vocal cord was found to be in the midline position and the right vocal cord was in the paramedian position. The trachea was intubated and surgery proceeded without any other complication. Postoperative indirect laryngoscopy revealed that the left vocal cord was fixed, whereas the right vocal cord was mobile, and diagnosis of pre-existing incomplete left vocal cord paralysis was made. This clinical report is to emphasize the importance of thorough pre-operative evaluation of the vocal cord in patients who have undergone any surgical procedure or radiation treatment of the neck before planning for brachial plexus block. If such an evaluation cannot be obtained, an alternative technique, for example axillary approach, should be preferred.

Keywords Brachial plexus · Recurrent laryngeal nerve · Vocal cord

S. L. Solanki · A. Jain · J. K. Makkar · S. A. Nikhar
Department of Anesthesia and Intensive Care,
Post Graduate Institute of Medical Education and Research,
Chandigarh 160012, India

S. L. Solanki (✉)
1012, First Floor, Sector 15-B, Chandigarh 160015, India
e-mail: me_sohans@yahoo.co.in

Introduction

Interscalene and supraclavicular brachial plexus blocks have been widely studied and are regarded as reliable and safe in ambulatory surgery [1]. Acute respiratory complications in the form of phrenic and recurrent laryngeal nerve (RLN) palsies have been reported but are usually of no or minimal clinical significance [2–4]. We encountered a case of severe respiratory distress after right-sided supraclavicular block in a patient with unrecognized pre-existing left-sided vocal cord palsy. We report this case to emphasize the significant risk of brachial plexus block in a patient with previous surgical procedure involving neck dissection.

Case report

A 45-year-old, 66 kg woman sustained a crush injury of her right hand after a road-traffic accident. She was scheduled to undergo a below elbow amputation of her right upper extremity. Patient's surgical history included left hemithyroidectomy, under general anesthesia, a year previously. She denied any complication related to the surgery. She had a 4 cm long transverse surgical incision scar mark on her neck. Airway examination revealed a small receding chin with a thyromental distance of 7 cm. Her mouth opening was 3 cm. She was mallampatti class III with full range of neck movements. A preoperative chest radiograph was normal and ECG showed normal sinus rhythm. A supraclavicular brachial plexus block with sedation was planned as the sole anesthetic technique. Difficult airway cart was kept ready. After explaining the procedure and risks involved, written consent was obtained. Sedation was achieved with intravenous midazolam 1 mg. The brachial plexus block was performed by

supraclavicular approach, using a 21-gauge stimulator needle. A total of 30 ml local anesthetic solution (300 mg, 15 ml lidocaine 2% with epinephrine, 1:200,000 and 75 mg, 15 ml bupivacaine 0.5%) was injected after contraction of the biceps muscle was noted at 0.5 mA of current. After 10 min, a loss of sensation to pin prick and inability to produce any movement at elbow and shoulder joints were observed. Oxygen (FiO_2 0.5) was supplemented via a Venturi mask. Soon after, however, the patient developed an audible inspiratory stridor with marked difficulty in breathing. Oxygen saturation decreased to 82% from the baseline of 97%. It was decided to intubate the trachea immediately.

SpO_2 was increased to 100% by continuous positive airway pressure of 100% oxygen with a face mask. However, because of the tightly applied facemask, the patient became anxious and non-cooperative. Anesthesia was induced with intravenous morphine 6 mg and intravenous thiopental 300 mg. Bag-mask ventilation was possible at high airway pressures. Conventional laryngoscopy was performed under deep plane of sevoflurane anesthesia (concentration of inspired sevoflurane 6% with oxygen). The left vocal cord was found to be in the midline position and the right vocal cord was in the paramedian position. After an initial attempt with a 7.0-mm tracheal tube failed, the trachea was secured with a 6-mm I.D. tracheal tube. The position of the tracheal tube was confirmed by capnography and intravenous vecuronium 5 mg was administered. Anesthesia was maintained with isoflurane in a mixture of oxygen and nitrous oxide (30:70). Surgery proceeded uneventfully without any complication. At the end of surgery, residual neuromuscular blockade was reversed with intravenous neostigmine 3.5 mg and glycopyrolate 0.7 mg. Once the patient became awake, the trachea was extubated on the tube exchanger. Because there was mild stridor with no respiratory difficulty, the tube exchanger was removed. Total duration of anesthesia was 3 h. The patient was then shifted to the postoperative anesthesia care unit. Otorhinolaryngology consultation was obtained and indirect laryngoscopy was performed 5 h after the surgery, when no residual sensory loss or muscle weakness was evident in the right upper extremity. The right vocal cord was mobile, whereas the left vocal cord was fixed in the midline position. A diagnosis of left vocal cord paralysis was made. Postoperative chest radiograph findings were unremarkable.

Discussion

Recurrent laryngeal nerve (RLN) palsy is a rare but known complication in perivascular brachial plexus block and there are two case reports of life-threatening airway obstruction in patients who had had neck surgery. Rollins et al. [5] reported this complication after right-sided supraclavicular subclavian perivascular block in a patient with a prior history of hemi-glossectomy and neck dissection with radiation treatment. The authors attributed this to the development of RLN palsy superimposed on the preexisting left vocal cord palsy. The patient was extubated the following day. There was no residual stridor.

Plit et al. [6] reported similar symptoms in a patient who had undergone a total thyroidectomy for papillary carcinoma 35 years previously. Their patient developed marked stridor secondary to an acute right vocal cord palsy after administration of right interscalene brachial plexus block for shoulder hemi-arthroplasty. The presence of undiagnosed preexisting left-sided vocal cord palsy was considered to be the risk factor involved. The injury was permanent, because the vocal cord palsies failed to resolve over the subsequent 18-month follow-up.

Our patient had a preexisting partial left vocal cord injury secondary to hemi-thyroidectomy resulting in median position of the cord. Supraclavicular block performed by us produced a right complete RLN palsy and paramedian position of the right cord. This resulted in sudden onset of inspiratory stridor and severe respiratory distress. The concomitant phrenic nerve block, which can be anesthetized (36–67%) when a supraclavicular block is performed, might have further aggravated the patient's symptoms [2, 3]. The onset time of inspiratory stridor in our patient coincided with the development of sensory loss and muscle weakness in the ipsilateral limb. Furthermore, as supported by previous case reports, the complication lasted approximately 4 h in our patient [4]. The postoperative chest radiograph was unremarkable and there was no evidence of airway edema or injury on direct or indirect laryngoscopy.

The RLN may be traumatized during surgery on the thyroid and parathyroid glands [7]. The abductor fibers are more vulnerable (Semon's law) to injury [8]. Incomplete damage to the RLN results in the fixed midline position of the involved cord, because of the unopposed action of adductors [9]. In the case of incomplete unilateral RLN injury i.e., pure unilateral abductor palsy, both cords meet in the midline on phonation and only the normal cord abducts during inspiration. The history of minimal change in the quality of voice after left hemi-throidectomy and fixed midline position of the left vocal cord on ENT examination support the diagnosis of pre-existing left incomplete RLN palsy in our patient. Sudden development of complete right RLN palsy after brachial plexus block led to further reduction in the glottic opening, resulting in severe respiratory distress in our patient. RLN palsy after a brachial plexus block is a well described complication and commonly presents as hoarseness after the ipsilateral

involvement, with incidence varying from 3 to 6% [10, 11]. The RLN can be reached by the diffusing anesthetic solution when perivascular interscalene and supraclavicular approaches are used [5, 6]. Further paralysis more commonly involves the right side, because the injected anesthetic can travel along the subclavian artery [10].

Airway management of a patient with glottic obstruction requires special attention, and several techniques could be selected, for example awake fiberoptic intubation, fiberoptic bronchoscopy, or direct laryngoscopy under sedation with spontaneous ventilation. Awake fiberoptic intubation with the spray-as-you-go technique may be the safest. However, it is difficult in emergencies, especially in an apprehensive patient with dyspnea and hypoxia. Also, the narrowed airway may become further obstructed by the instrument, hindering spontaneous ventilation ("cork in a bottle" phenomenon). Tracheal intubation using fiberoptic bronchoscopy or direct laryngoscopy under anesthesia with continuous propofol infusion or sevoflurane inhalation while maintaining spontaneous ventilation may be an option [12]. Muscle relaxants should be avoided until the trachea is secured, especially when the diagnosis of stridor is uncertain. Thus, our decision of rapid induction with thiopental and morphine was a result of apprehension caused by undiagnosed and unanticipated onset of severe stridor. In this case, the patient's lungs could be ventilated at high peak airway pressure. However, as a result of this consideration, we realized potential risk in adopting airway management in a patient with glottis obstruction.

In conclusion, ipsilateral RLN paralysis after supraclavicular brachial plexus block in a patient with preexisting contralateral vocal cord paralysis can create a life-threatening airway obstruction and emergency. Therefore, before planning brachial plexus block, thorough preoperative evaluation for vocal cord paralysis, including laryngoscopy, should be stressed for patients who have received any type of neck surgery or radiation treatment to the neck. If such an evaluation is not available or cannot be obtained, an alternative technique, for example axillary approach, should be preferred. Furthermore, we recommend prior preparation for difficult airway, if subclavian perivascular brachial plexus block is considered in such patients, especially when difficult intubation is expected.

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