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Right vocal fold paralysis as a result of central venous catheterization

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Abstract

Invasive peri- and post-operative monitoring is being increasingly utilized, and a corresponding increase of concomitant complications are becoming apparent.

Two cases of complete right vocal fold paralysis are reported as a possible complication of right central venous catheterization. The underlying aetiology of this complication is presumed to be either direct trauma at the time of introduction of the central venous catheter, or by thrombosis and fibrosis around the recurrent laryngeal or vagus nerve. It is suggested that multiple attempts at cannulation and leaving the central line *in situ* for long periods increases the risk of this complication.

When the integrity of the left recurrent laryngeal nerve or vagus is jeopardized or must be sacrificed during surgery, it is suggested that ipsilateral central lines are inserted to minimize the risk of bilateral vocal fold paralysis.

Cases of vocal fold paralysis secondary to central line insertion should be followed expectantly and surgical intervention only be considered after 12 months review.

Key words: Vocal fold paralysis; Catheterization, central venous

Introduction

The risk of complications after insertion or exchange of central venous catheters has been well documented. The majority of early complications are created at the time of introduction of the catheter when important surrounding anatomical structures have been inadvertently injured; such as great vessels, trachea, oesophagus, lungs and thoracic duct.

A review of the literature for neural complications shows cases of injury to the brachial plexus (Smith *et al.*, 1965), sympathetic chain (Parikh, 1972; Davis and Watson, 1982), and two case reports of vocal fold paralysis (Davis and Watson, 1982; Sim and Robertson, 1989) that were noted to have not recovered in a six-month period.

The case reports described in this paper illustrate the risk of isolated complete right vocal fold paralysis as a complication of simple right internal jugular cannulation for peri- and post-operative monitoring. Each patient made a full recovery after one year.

Case reports

Case 1

A 57-year-old lady with mucinous cystadenoma of the ovary and associated pseudomyxoma peritonei presented with acute bowel obstruction. Previously she had had multiple laparotomies. After a second attempt, a right central venous catheter was inserted prior to laparotomy. The patient underwent a six-hour operation for removal of a pelvic cystic mass involving the uterus, ileum, and rectum. Post-operatively the patient was monitored on ITU for a period of eight days, her recovery being complicated by primary haemorrhage and returning to the theatre on two occasions. The right internal jugular line was removed on the 10th post-operative day.

It was noted that the patient was markedly hoarse with a slight cough immediately after ventilation had ceased and was referred for an ENT opinion. Examination revealed bruising at the site of cannulation and a complete right vocal fold paralysis. At review eight months later this paralysis had recovered fully.

Case 2

A 43-year-old lady with mitral valve disease underwent open heart surgery for valve replacement. Peri- and post-operative central venous pressure monitoring was utilized via a right internal jugular route after two attempts at cannulation. The patient made a good post-operative recovery and the central line was removed on the fourth post-operative day. The patient immediately complained of hoarseness and ENT examination revealed a complete right vocal fold palsy. The patient was followed-up for one year before recovery occurred.

Discussion

When performing central venous cannulation neural damage resulting in disabling vocal fold paralysis must be considered as a possible complication.

To assess the possible anatomical complications of percutaneous cannulation of the central venous system, Stern *et al.* (1990) dissected 18 cadavers cannulated via an anterior or posterior internal jugular route and by an infraclavicular route. Although it is appreciated that venous access in a cadaver is somewhat more difficult

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than in a patient, it was concluded that the posterior route to the internal jugular vein was associated with the lowest complication rate. Interestingly, the commonest complication was inadvertent arterial puncture which highlights the possibility of vagal trauma.

Usually the right internal jugular vein is utilized because of its anatomical continuity with the superior vena cava. However, puncture at this site can directly traumatize the recurrent laryngeal or vagus nerves, cause haematoma formation, thrombosis or fibrosis (Raz and Ramanathan, 1984). Multiple attempts at cannulation and leaving the cannula *in situ* for long periods increase the risk of complications.

Following the Young and Stewart (1953) report there have been numerous articles describing both unilateral and bilateral vocal fold paralysis as a result of endotracheal intubation (Nunn *et al.*, 1989; Weymuller, 1992; Hartley and Vaughan, 1993; Cheong *et al.*, 1994; Santos *et al.*, 1994) by a process of pressure neuropraxia. Few of these case reports note whether central lines were inserted. The recurrent laryngeal nerve divides into anterior and posterior branches at the superior level of the cricoid cartilage. The posterior branch supplies the posterior crico-arytenoid muscle and is not vulnerable to pressure damage; but the anterior division is susceptible to pressure by an endotracheal cuff along its course between the thyroid lamina laterally and the arytenoid cartilage supero-medially (Hahn *et al.*, 1970). One would expect an adductor paralysis in this situation although it is understood there can be variability in the distribution of the recurrent laryngeal nerve (Katz and Nemiroff, 1993). Certainly this mechanism cannot be ruled out in the described case reports. Evidence to support trauma from the central line as a cause for the vocal fold paralysis includes multiple attempts at cannulation on the ipsilateral side resulting in direct injury.

Right vocal fold paralysis in isolation causes disabling loss of phonation and possible post-operative chest complications due to inadequate cough. This complication however assumes paramount importance when the left recurrent laryngeal nerve may be traumatized or sacrificed during surgery. In this instance bilateral voice fold palsies may condemn the patient to a tracheostomy. The authors therefore recommend ipsilateral placement of the central line.

When considering the treatment of such traumatic vocal fold paralysis the same recommendation should be applied as that given to post-thyroidectomy palsies by Sadek *et al.* (1987). Recovery may take up to 12 months and corrective surgery to the vocal fold should be delayed for this period of time.

References

Cheong, K. E., Chan, M. Y., Sin-Fai-Lam, K. N. (1994) Bilateral vocal cord paralysis following endotracheal intubation. *Anaesthesia and Intensive Care* **22:** 206–208.

Davis, P., Watson, O. (1982) Horner's syndrome and vocal cord paralysis as a complication of percutaneous internal jugular vein catheterisation in adults. *Anaesthesia* **37:** 587–588.

Hahn, F. W., Martin, J. T., Little, J. C. (1970) Vocal cord paralysis with endotracheal intubation. *Archives of Otolaryngology, Head and Neck Surgery* **92:** 226–229.

Hartley, M., Vaughan, R. S. (1993) Problems associated with endotracheal extubation. *British Journal of Anaesthesia* **71:** 561–568.

Katz, A. D., Nemiroff, P. (1993) Anastomoses and bifurcations of the recurrent laryngeal nerve: report of 1177 nerves visualized. *American Surgeon* **59:** 188–191.

Nun, J. F., Utting, J. E., Brown, B. R. (1989) Intratracheal intubation. In *General Anaesthesia.* 5th Edition. Butterworth & Co., London, p 537.

Parikh, R. K. (1972) Horner's syndrome: a complication of percutaneous catheterization of the internal jugular vein. *Anaesthesia* **27:** 327–329.

Raz, S., Ramanathan, V. (1984) Injection injuries of the recurrent laryngeal nerve. *Laryngoscope* **94:** 197–200.

Sadek, S. A. A., Nassar, W. Y., Tobias, M. A. (1987) Teflon injection of the vocal cords under general anaesthesia (review of 262 cases). *Journal of Laryngology and Otology* **101:** 695–705.

Santos, P. M., Afrassiabi, A., Weymuller, E. A., Jr. (1994) Risk factors associated with prolonged intubation and laryngeal injury. *Otolaryngology–Head and Neck Surgery* **111:** 453–459.

Sim, D. W., Robertson, M. R. I. (1989) Right vocal cord paralysis after internal jugular vein cannulation. *Journal of Laryngology and Otology* **103:** 424.

Smith, B. E., Modiel, J. H., Gaub, M. L., Moxa, F. (1965) Complications of subclavian vein catheterization. *Archives of Surgery* **90:** 228–229.

Stern, W., Saver, W., Dauber, W. (1990) Complications of central venous catheterisation from an anatomical point of view. *Acta Anatomica* **138:** 137–143.

Weymuller, E. A., Jr. (1992) Prevention and management of intubation injury of the larynx and trachea. *American Journal of Otolaryngology* **13:** 139–144.

Young, N., Stewart, S. (1953) Laryngeal lesions following endotracheal anaesthesia: a report of 12 adult cases. *British Journal of Anaesthesia* **25:** 32–42.

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