Ipsilateral nonrecurrent laryngeal nerve palsy and delayed palsy of the contralateral recurrent laryngeal nerve in a case of third-time reoperative thyroid surgery

S Wijerathne¹, X Goh², R Parameswaran¹

¹Department of Endocrine Surgery, National University Hospital, Singapore

²Department of Otolaryngology and Head and Neck Surgery, National University Hospital, Singapore

ABSTRACT

The occurrence of nonrecurrent laryngeal nerve and delayed nerve palsy of the contralateral nerve occurring simultaneously has never been described. A 67-year-old woman underwent reoperative completion thyroidectomy for enlarging thyroid nodules with recurrent hyperthyroidism and obstructive symptoms. Preoperative computed tomography of the neck showed a large compressive goitre with an aberrant right subclavian artery.

At surgery, a type 1 nonrecurrent laryngeal nerve was found and inadvertently transected due to dense adhesions. It was repaired with ansa cervicalis graft. A fully preserved and functional recurrent laryngeal nerve was seen on the contralateral side at the end of surgery. However, the patient developed a delayed palsy on day 4 of the recurrent laryngeal nerve requiring a tracheostomy. Following successful speech and swallowing therapy, the patient was decannulated with good phonation and recovery of the left cord.

Patients are at risk of bilateral nerve injury and late onset palsy in reoperative thyroid surgery. Management can be challenging and should be recognised to ensure appropriate therapy.

KEYWORDS

Nonrecurrent laryngeal nerve – Recurrent laryngeal nerve – Palsy – Thyroidectomy – Neuromonitoring

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CORRESPONDENCE TO

Rajeev Parameswaran, E: Rajeev_parameswaran@nuhs.edu.sg

Case history

A 67-year-old woman presented with recurrent hyperthyroidism with a progressively enlarging thyroid nodule over the previous two years and associated with symptoms of dysphagia. She had undergone a subtotal thyroidectomy in 1997 and redo-completion surgery in 2002. Preoperative nasoendoscopy revealed normally functioning cords and her thyroid status was normal at the time of surgery (thyroid-stimulating hormone 2.6; T4 12.4). Computed tomography of the neck showed a large compressive goitre with an aberrant right subclavian artery (Fig 1a,b). This raised the possibility of a nonrecurrent laryngeal nerve (NRLN). Surgery was performed under general anaesthesia and intraoperative neuromonitoring was used to track the nerve (Fig 2). The large left side was resected first with an intact recurrent laryngeal nerve (RLN) at the end of the procedure (Fig 3). Intraoperative neuromonitoring on the right side showed the nerve as arising higher from the vagus and tracked towards the superior pole. However, the

previous two surgeries had caused dense adhesions, resulting in the nerve being inadvertently transected, and hence ansa to RLN anastomosis was performed using 7-0 prolene. The patient was successfully extubated and returned to the ward. However, on day 4 she developed acute stridor, with cord evaluation showing bilateral palsy necessitating an urgent tracheostomy. Speech therapy and tracheostomy care was initiated. Her left cord was paretic but functioning and after two months she was weaned off her tracheostomy completely, with return of speech and swallowing functions.

Discussion

We discuss the rare combination of a NRLN palsy and delayed RLN palsy on the contralateral side in a patient undergoing third time redo-thyroid surgery for recurrent large toxic nodular goitre. Recurrent laryngeal nerve palsy is well described in thyroid surgery in up to 12% of

Figure 1 (a) Axial computed tomography (CT) showing the presence of the large recurrent nodular with significant tracheal compression and deviation. (b) CT angiogram showing the aberrant right subclavian artery traversing behind the oesophagus.

patients,^{1,2} with most recovering normal function.³ Most nerve palsies are identified earlier with intraoperative neuromonitoring and sent for earlier voice physiotherapy to improve the voice outcomes. However, a small proportion of patients have been shown to develop a late-onset palsy, after normal neuromonitoring in the postoperative period.^{4,5}

The late-onset palsy may develop anywhere between 3 days to 12 weeks postoperatively.^{5,6} Dionigi *et al* suggest that the best time to evaluate and detect RLNP following thyroid surgery is on the second postoperative day.⁷ The reasons for delayed RLNP include those of mechanical damage by compression or stretching during local cicatrization, perineural devascularisation during inflammatory remodelling or direct affection by postoperative inflammatory processes.⁴ The importance of the understanding of this condition is that such cases may be missed with short-stay or ambulatory surgery, which is practised in certain units.

NRLN, first described by Stedman in 1823, is commonly seen on the right side and is associated with an aberrant right subclavian artery.⁸ The frequency of NRLN in clinical practice is about 0.5–0.7%.⁹ Anomalies in the way the nerve courses to the RLN have been described as type I (where the non-RLN originates from the vagus nerve above the laryngotracheal junction and descends into the larynx, running together with the vessels of the superior thyroid lobe) and type II (the non-RLN that originates from the vagus nerve runs on a level with the lower thyroid artery and then follows a transverse path parallel to the inferior thyroid artery).¹⁰ Abboud and Aouad reported three types of courses for non-RLN,¹¹ while Hong *et al* described four types.¹²

The implication of the presence of NRLN is that the nerve is at risk of injury (almost six times) more than RLN.¹³ Pointers to NRLN include the presence of an

aberrant right subclavian artery usually diagnosed on CT or reoperative ultrasound scan.^{8,14} However, the detection rate of NRLN has improved with intraoperative neuromonitoring,¹⁵ more so in reoperative thyroid surgery.¹⁶ Brauckhoff *et al* showed that positive intraoperative neuromonitoring signals proximally and negative signals distally of the vagus nerve predict the occurrence of a non-recurrent inferior laryngeal nerve, which allows for early diagnosis and prevention of nerve injury. Another pointer to NRLN intraoperatively using intraoperative neuromonitoring is a medially placed vagus nerve.¹⁵ In our patient, we correctly identified a NRLN using intraoperative neuromonitoring, but previous two surgeries made it difficult to salvage the nerve.

The management of unilateral nerve injury can be intraoperative and postoperative. Intraoperative management involves those where the nerve has been transected inadvertently and can be salvaged via the techniques of: primary end-to-end anastomosis, ansa cervicalis to RLN anastomosis (Miyachi *et al* technique)¹⁷ and primary interposition graft when there is a gap of greater than 5 mm using the ansa cervicalis, transverse cervical nerve or supraclavicular nerve.¹⁸ Postoperative treatment includes voice physiotherapy but there is a lack of evidence of its benefit. Surgical intervention for vocal cord palsy is to boost the voice, reduce the risk of aspiration and diminish the sensation of dyspnoea, and may be achieved by vocal cord augmentation with temporary or permanent injection or laryngeal framework surgery.²

For bilateral cord palsies, the treatment would be tracheostomy for 6–12 month. Patients may require a secondary surgical intervention to establish a glottic opening that allows for a functioning airway and voice in the absence of a tracheostomy.¹⁹ Interventions may include posterior cordotomy, arytenoidectomy or cord lateralisation procedures such as suturing if there is any difficulty in

Figure 2 The intraoperative neuromonitoring record of the patient showing a short latency of the right vagus and an intact left recurrent laryngeal nerve (RLN) at the end of the procedure.

Figure 3 The last nasoendoscopy before decannulation of the tracheostomy in the patient showing some mobility of the left cord.

being decannulated if one of the cords does not return to functional activity. This must be balanced against the risk of aspiration, which at an increased age would be quite risky for the patient. In our patient, there was slow spontaneous recovery of the left RLN, allowing for a successful decannulation of the tracheostomy.

In summary, reoperative thyroid surgery is challenging, with increased risk of RLN palsy. This risk is significantly higher in a patient with NRLN and may be predicted with preoperative imaging and intraoperative neuromonitoring. One should also be aware of delayed nerve palsy, which should be carefully looked for in the first few postoperative days. Patients with unilateral palsy should be referred for appropriate voice and therapy and secondary interventions if needed to improve the quality of voice and life. Bilateral palsy is life threatening and requires tracheostomy for immediate airway management, followed by surgical interventions to allow for decannulation of the tracheostomy and improved quality of life.

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