Urgent complications of thyroidectomy

Introduction

In the late 19th century the mortality rate of thyroidectomy was reported as being as high as 20% and it was suggested that thyroidectomies should only be performed to save life and never for discomfort or deformity (Bliss et al, 2000). Theodore Kocher pioneered surgical advances in thyroidectomies and since the early 20th century the mortality and morbidity have been dramatically reduced (Bergamaschi et al, 1998). Despite the low mortality complications can still occur that have the potential to be life threatening and this article will focus on these complications.

The main pathologies presenting to the surgeon are nodular thyroid disease, thyroid cancer and thyrotoxicosis. A full understanding of the thyroid anatomy and physiology is essential for a surgeon to achieve both safe and effective results. Haemorrhage, airway obstruction, vocal cord injury, hypocalcaemia and recurrent laryngeal nerve injuries are complications of thyroidectomy. The risk of complications increases with the complexity of the pathology, such as malignancy, Graves' disease or in patients requiring re-operation (Reeve and Thompson, 2000). Surgical experience and expertise play a significant role in reducing the incidence of complications (Sosa et al, 1998) (*Table 1*).

Recurrent laryngeal nerve palsy

The recurrent laryngeal nerve is a branch of the vagus nerve, on the left side it passes the arch of the aorta and on the right side it passes the subclavian artery, supplying the intrinsic muscles of the larynx. The most common sites for injury to the recurrent laryngeal nerve are near to the inferior thyroid artery, near the ligament of Berry (posterior suspensory ligament) and at the inferior pole of the thyroid gland.

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If there is unilateral damage to the recurrent laryngeal nerve, the patient may present with phonatory symptoms of hoarseness and impaired coughing. Rarely there may be injury to both recurrent laryngeal nerves, which results in bilateral vocal cord paralysis. The incidence of bilateral vocal cord paralysis is very low, occurring in 0.1% of cases (Benninger et al, 1998). Bilateral vocal cord palsy is most commonly associated with thyroid surgery (Witt, 2004). The risk of recurrent laryngeal nerve palsy is reported as being eight times higher in patients requiring reoperation for relapses (Muller et al, 2001).

In bilateral recurrent laryngeal nerve injury patients can present with respiratory symptoms because they have a limited glottal airway. There may be severe respiratory distress requiring a tracheostomy during the initial stages of recovery. Where possible early visualization of the cords with laryngoscopy is useful. There is some debate over the role of early intravenous steroids and its effectiveness in reducing vocal cord oedema.

Although tracheostomy is an effective treatment option it is generally unacceptable long term for maintaining breathing and voice. Surgical procedures include cordectomy and carbon dioxide laser endoscopic arytenoidectomy, although it is prudent to wait 6–12 months for spontaneous recovery of vocal cord function. More than 50% of cases of vocal cord paralysis are transient, as intraoperative trauma usually results in neuropraxia rather than transection of the nerve (Rovo et al, 2000). Neuropraxia is the physiological interruption of an anatomically intact nerve, the axons are intact but conduction is lost because of segmental demyelination. This is a transient lesion, recovering after a few days or weeks.

Damage to the recurrent laryngeal nerve may occur without symptoms, leading some thyroid surgeons to examine the vocal folds preoperatively, and to perform fibreoptic laryngoscopy as part of postoperative follow-up (Steurer et al, 2002). If the patient has a pre-existing unilateral recurrent laryngeal nerve palsy,

Table 1. Minimizing risk of complications of thyroid surgery

Appropriate planning	Identify patients at risk	Inflammatory thyroid disease
		Extensive malignancy
		Unsuspected unilateral vocal cord palsy
	Laryngoscopy preoperatively	
Surgical technique		Identification of recurrent laryngeal nerve
		Meticulous haemostasis
		+/- Surgical drains
		+/- Intraoperative nerve monitoring
Postoperative management	Avoidance of coughing/valsalva manoeuvre in recovery	
	Trigger signs require urgent medical review	Presence of neck swelling
		Large drain output
		Recognition of stridor, intercostals recession
	Adequate nursing care postoperatively	Frequent nursing observations and careful documentation
		Oxygen saturation monitoring
		Respiratory rate
		Patient in head-up position
	Availability of helium-oxygen mix if re-intubation/surgical airway required	

it is important for the surgeon to be aware of this preoperatively. Preoperative unilateral recurrent laryngeal nerve palsy has been shown to occur in 1.9% of patients without and 3% of patients with thyroid carcinoma (Rosato et al, 2004). This may change the surgical technique used by the surgeon, to minimize the risk to the functioning recurrent laryngeal nerve.

Exposure of the recurrent laryngeal nerve during surgery has been established to reduce the incidence of postoperative recurrent laryngeal nerve palsy and permanent injury (Hermann et al, 2002; Robertson et al, 2004). It has been suggested that further monitoring of the integrity of the recurrent laryngeal nerve intraoperatively may further help reduce the risk of nerve injury. While continuous recurrent laryngeal nerve monitoring may have some benefit for trainee endocrine surgeons, it has significant disadvantages including a high incidence of false negatives, the requirement for spontaneous ventilation and the time consuming and expensive equipment setup (Farling, 2000). Controlled trials have shown no statistical reduction in paralysis, paresis or total injury rates to the recurrent laryngeal nerve (Beldi et al, 2004; Dralle et al, 2004; Robertson et al, 2004; Snyder and Hendrick, 2005).

Haemorrhage

Haematomas post-thyroidectomy have an incidence of 1% (Rosato et al, 2004) and may be immediate or be delayed. Haemorrhage usually occurs within the first 24 hours postoperatively. Clinically significant haematomas become apparent within 6–8 hours. Unless a large haematoma is surgically evacuated it can cause acute airway obstruction and may be fatal. It is for this reason that the wound should be closed appropriately with a prolene suture or clips, to allow quick and easy access to decompress the airway. Rarely laryngeal oedema may occur if a slow haemorrhage is not identified and in this scenario a tracheostomy may be required.

Patients who have a higher risk of bleeding should be identified preoperatively and precautions taken to stop or reverse the effects of medications, such as aspirin, heparin and warfarin. Meticulous haemostasis is mandatory for the surgeon. Surgical drains are not safeguards against haematoma formation as they may become blocked. If the surgeon is uncertain about the haemostasis the anaesthetist may perform a Valsalva manoeuvre which increases cervical venous pressure and stresses possible bleeding points. These can then be identified and controlled before closing the neck (Reeve and Thompson, 2000) (*Figure 1*).

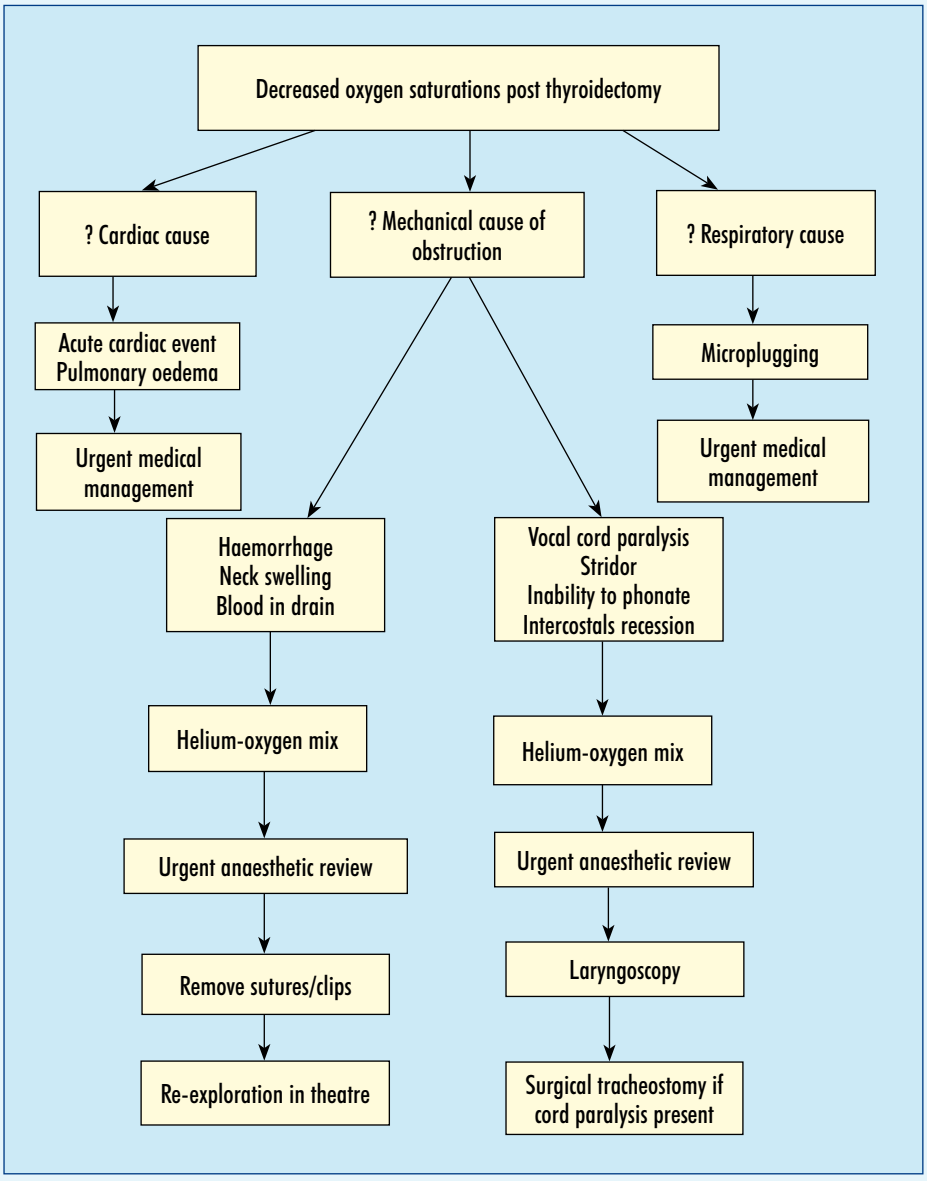

Figure 1. Management of respiratory complications post-thyroidectomy.

Hypocalcaemia

Hypocalcaemia caused by transient or permanent hypoparathyroidism is a major concern following thyroidectomy. Pattou et al (1998) reported a 3.7% incidence of severe postoperative hypocalcaemia in patients undergoing total or subtotal thyroidectomy. Although most patients had a spontaneous recovery of hypocalcaemia after 48 hours, a 0.5% incidence of permanent hypoparathyroidism was reported. The British Thyroid Association (2002) recommends that the serum calcium level should be checked the day after surgery and daily until stable. If hypocalcaemia develops or the patient becomes symptomatic at a higher calcium level, calcium supplementation is required.

In patients who have significant hypocalcaemia postoperatively (less than 2 mmol/litre), the cause is probably hypoparathyroidism secondary to trauma to the parathyroid gland intraoperatively. Typically

there are four parathyroid glands lying in close association with the thyroid gland; however, the number and position of the parathyroids may vary. Each parathyroid gland has its own small end artery, supplied by the inferior thyroid artery. If a parathyroid gland cannot be preserved during the dissection of the thyroid gland or it becomes ischaemic, it can be minced and autotransplanted onto the ipsilateral sternocleidomastoid muscle (Bliss et al, 2000).

Temporary hypocalcaemia following total thyroidectomy has been reported to be related to the number of parathyroid glands transplanted during the surgery (Palazzo et al, 2005). The aim of the autotransplant procedure is to create new functioning parathyroid tissue in total thyroidectomy and reduce the risk of permanent hypoparathyroidism.

When severe, hypocalcaemia can lead to serious complications and can be fatal. The clinical manifestation of hypocalcaemia is tetany, which is characterized by repetitive neuromuscular discharge after a single stimulus. Tetany is seen in more severe hypocalcaemia (ionized Ca <1.1 mmol/litre). Milder forms of neuromuscular irritability are paraesthesia and numbness of the fingertips and perioral area. Twitching of the ipsilateral facial musculature by tapping over the facial nerve at the ear is known as Chvostek's sign. Spontaneous muscle cramps are commonly seen in hypocalcaemia and in severe hypocalcaemia carpopedal spasm may develop. Prolonged contraction of the respiratory and laryngeal muscles causes stridor and can cause cyanosis.

Management should be replacement intravenous therapy or oral replacement, depending on the serum calcium level and presence of symptoms. If the patient is symptomatic of hypocalcaemia then intravenous calcium replacement should be considered. Calcium gluconate is preferred over calcium chloride because it causes less tissue necrosis if extravasated. The first 100–200 mg of elemental calcium (1–2 g calcium gluconate) should be given over 10–20 minutes. Faster administration may result in cardiac dysfunction, even arrest. This should be followed by slow calcium infusion at 0.5–1.5 mg/kg/h. Calcium infusion should be continued until the patient is receiving effective doses of oral calcium and vitamin D.

Conclusions

Intraoperative nerve stimulation has not been shown to reduce the incidence of recurrent laryngeal nerve injury. Review of the patient postoperatively should be performed routinely to check for the presence of haematoma. If there is a drain in situ which has little or no drainage, patients should still be clinically assessed, as a lack of drainage does not guarantee there is no bleeding. Patients whose wounds are closed with clips should have a clip remover by the bed.

Postoperative calcium should be checked in all patients, but those complaining of symptoms of hypocalcaemia and patients who had suspected intraoperative trauma to the parathyroid glands require urgent investigation.

It is possible that in the future complications of thyroidectomy may be increased, as minimally invasive techniques are being introduced; however, awareness of the anatomy and physiology of the gland and the possible complications that can occur will improve the outcome of surgery. **BJHM**

Conflict of interest: none.

KEY POINTS

- Thyroidectomy has a low incidence of morbidity.
- However, urgent complications of haemorrhage, airway obstruction and hypocalcaemia may occur.
- Awareness of potential complications with early and effective management can reduce mortality.

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