British Journal of Anaesthesia **111** (4): 594–9 (2013)
Advance Access publication 19 May 2013 · doi:10.1093/bja/aet151

BJA

Anaesthesia for massive retrosternal thyroidectomy in a tertiary referral centre

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Editor's key points

- Patients with a massive retrosternal goitre (mRSG) may present difficulties with airway management.
- Specific concerns include problems with tracheal intubation, mechanical ventilation, or postoperative tracheomalacia, but opinion on the optimal anaesthetic management is divided.
- A technique of i.v. induction, direct laryngoscopy, and tracheal intubation was successful in 18 patients with benign multi-nodular mRSGs.
- However, intubation and ventilation were impossible in one patient and an emergency tracheostomy was required.

Background. Retrosternal goitre (RSG) is an uncommon problem encountered rarely by anaesthetists working outside specialized head and neck (H&N) surgical units. Traditional anaesthetic teaching warns of difficult airway management in these patients. The incidence and extent of these problems is unclear.

Methods. We have performed a retrospective review of the anaesthetic management all patients with massive RSG (extending to the aortic arch or beyond) presenting for thyroidectomy at University Hospital Aintree from January 2007 to May 2012.

Results. Five hundred and seventy-three patients underwent a thyroidectomy procedure at Aintree University Hospitals NHS Foundation Trust (AUH) between January 2007 and May 2012. Of these, 34 cases were documented as having a RSG. Review of each patient's preoperative computerized tomography imaging identified 19 patients with massive RSG. There was one case of failed intubation. All other patients underwent uneventful tracheal intubation via direct laryngoscopy. All glands were removed through the neck with no requirement to proceed to sternotomy. There were no instances of postoperative respiratory problems or tracheomalacia. Three patients suffered recurrent laryngeal nerve (RLN) injuries.

Conclusion. When managed within a dedicated H&N operating theatre we have found a low incidence of difficult tracheal intubation, difficult mechanical ventilation nor postoperative respiratory difficulties in patients with massive RSG and mid-tracheal compression because of benign multi-nodular goitre. Surgical complications, however, are more frequent than those associated with cervical thyroidectomy with RLN injury and postoperative bleeding more likely.

Keywords: airway management; anesthesia; general; thyroidectomy

Accepted for publication: 18 February 2013

Retrosternal goitre (RSG) is an uncommon problem encountered rarely by anaesthetists working outside specialized head and neck (H&N) surgical units. While there are numerous reports in the literature concerning the surgical management of RSG[1–5] and ensuing problems[6–8] those considering anaesthetic management are frequently limited to isolated case reports[9–14] and small case series.[15]

Although RSG is well described there is still much confusion as to the precise definition. In a review of 34 papers comprising 2426 patients, Huins and colleagues[5] found four definitions of RSG. These definitions included the presence of a gland which:

(i) any part extends below the thoracic inlet with the patient in the surgical position,
(ii) more than 50% lies within the thoracic cavity,
(iii) extends to the level of the fourth thoracic vertebra on chest X-ray, and
(iv) extends to the level of the aortic arch.

It is clear from a clinical perspective that those patients with RSG to the level of the aortic arch and beyond are a very different cohort to those where the gland just extends into the thoracic inlet. Huins and colleagues, therefore, proposed a revised classification of RSG based on the anatomical extent of thyroid enlargement into the thoracic cavity. They divided RSG into three groups and suggested optimal surgical approaches when considering thyroidectomy (Table 1). In an attempt to better define anaesthetic morbidity related to RSG, we have performed a review of the anaesthetic

management all cases of massive RSG (mRSG), defined as Huins Grade 2 or 3, presenting for thyroidectomy at University Hospital Aintree from January 2007 to May 2012.

Methods

As this was a retrospective audit formal ethical approval was not sought, however, appropriate institutional agreements to carry out the project were secured. All thyroidectomies performed from January 2007 onwards were identified using the Operating Room Management Information System (ORMIS—CSC Healthcare). These cases were then cross referenced with the hospital picture archiving and communications system to assess retrosternal extension using computerized tomography (CT) images taken before planned surgery. In an attempt to identify those patients most at risk of anaesthetic morbidity only those patients with mRSG were included.

Data collected included patient characteristics (age, sex, and weight), presence of co-morbidities, and ASA grading. Additional information, which related to presenting symptoms, including the presence of preoperative dyspnoea, dysphagia, stridor, voice change or all was also collected. Reported preoperative examination findings including obesity (as defined by body mass index >30 kg m^{-2}), venous congestion in the territory of the superior vena cava (SVC), anaesthetic airway assessment and, in particular, whether a difficult airway was anticipated were noted.

Reported CT radiographic findings which were recorded as part of this study included the extent of thyroid gland descent into the thoracic cavity and the presence of tracheal narrowing, tracheal deviation or both from the midline.

Anaesthetic data recorded included the method of induction of general anaesthesia (i.v. *vs* inhalation), tracheal intubation (awake *vs* post-induction), Cormack and Lehane grade of laryngoscopy, difficult or failed intubation, difficulty ventilating the lungs after tracheal intubation, and difficulties after tracheal extubation.

Operative data included the operating theatre used (H&N *vs* general), procedure performed (total *vs* hemi-thyroidectomy), need for sternotomy, volume of intra-operative blood loss and the need for blood transfusion, identification of the recurrent laryngeal nerve (RLN), and identification of clinically evident tracheomalacia. Postoperative data recorded included the need for re-intubation (and reason), immediate postoperative bleeding requiring re-operation, postoperative critical care admission (planned *vs* unplanned), hospital length of stay and identification of prolonged RLN palsy.

Table 1 Huins and colleagues' classification of RSGs and suggested surgical approach for thyroidectomy

Grade	Anatomical location	Suggested surgical approach
1	Above aortic arch	Cervical
2	Aortic arch to pericardium	Manubriotomy
3	Below right atrium	Sternotomy

Results

Five hundred and seventy-three patients who had undergone a thyroidectomy procedure at Aintree University Hospitals NHS Foundation Trust (AUH) between January 2007 and May 2012 were identified. Of these, 34 cases were documented as having a RSG. Review of each patient's preoperative CT imaging identified 19 cases in which the thyroid gland descended retrosternally to the aortic arch or beyond.

There were 20 attempted thyroidectomies in 19 patients. One procedure was abandoned because of a failed intubation, this patient subsequently underwent a successful excision (see below).

The mean age was 65 years (range 35–93), there were 11 male and 8 female patients. Co-morbidities included hypertension (seven patients), chronic obstructive pulmonary disease (three patients), and obesity (eight patients). Major presenting clinical features are detailed in Table 2. Two patients had cervical venous distension suggestive of superior vena caval obstruction with the presence of thrombus in the internal jugular vein confirmed on CT scanning. One patient presented with an axillary vein thrombosis and unilateral Horner's syndrome and evidence of acute pulmonary emboli on CT pulmonary angiography. All patients had good mouth opening as indicated by Mallampati scoring, one patient had limited neck extension on clinical examination.

The extent of mediastinal gland extension is presented in Table 2. All patients had evidence of tracheal narrowing on

Table 2 Patient characteristic data and clinical features of patients successfully undergoing removal of RSG ($n=19$)

Mean age, yr (range)	65 (35–93)
Percentage male	56
Mean tracheal deviation, mm (range)	27 (12–41)
Mean tracheal diameter, mm (range) (% reduction)	9.6 (5.8–15) (25–70)
Clinical presentation	
Asymptomatic	9
Shortness of breath	5
Shortness of breath when supine	4
Patient reported dysphagia	3
Clinically evident stridor	3
Degree of mediastinal extension	
To aortic arch	14
Beyond aortic arch but above tracheal carina	1
To tracheal carina	4
Histology	
Multi-nodular goitre	17
Multi-nodular goitre and thyroiditis	1
Follicular carcinoma	1
Weight of gland, g (range)	221 (107–685)