CASE REPORT

Giant recurrent intrathoracic goitre treated by clamshell thoracotomy and reverse sternotomy

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SUMMARY

A 59-year-old man with a giant recurrent intrathoracic goitre was admitted for completion thyroidectomy for recurrent severe retrosternal pain. The patient had undergone a cervical thyroidectomy elsewhere 13 years earlier, during which only the cervical part of the goitre had been resected. Owing to the previous operation with an expected scar around the innominate vein, and the goitre's size and localisation obstructing the upper chest aperture, we chose an alternate access. Clamshell thoracotomy with reverse sternotomy allows central vascular control and excision of large goitres bypassing predictable problems at the cervicothoracic junction. Surgery was performed with minimal blood loss and with excellent functional outcome. The described access adds to the repertoire to deal with this unusual situation.

BACKGROUND

Giant intrathoracic goitres can entirely obstruct the upper thoracic aperture and create serious compression symptoms due to size and localisation. The surgical access chosen for their resection is of critical importance, especially in re-do surgery. Large intrathoracic goitres can be challenging as to the control of bleeding from the innominate vein and superior vena cava due to scarring. Goitres significantly larger than the upper thoracic aperture may anyway need sternotomy in order to allow complete unfragmented excision. The inferior surgical approach of clamshell thoracotomy and reverse sternotomy allows central vascular control and excision of mediastinal masses of any size, offering a safe approach avoiding predictable hazards at the cervicothoracic junction.

CASE PRESENTATION

A 59-year-old man with a giant recurrent or persistent intrathoracic goitre without neck recurrence was admitted for completion thyroidectomy and removal of the goitre.

The patient had a history of cervical thyroidectomy performed elsewhere 13 years before, during which only the cervical part of the goitre had been resected, and he was on thyroxine ever since. For more than 5 years prior to the second operation he suffered from episodes of significant retrosternal and epigastric pain.

The chest CT imaging ([figure 1](#)) and the chest X-ray ([figure 2](#)) a few months prior to the second operation showed that the goitre had significantly grown since the last chest CT scan ([figure 3](#)) 5 years earlier.

INVESTIGATIONS

The chest CT scan demonstrated a 19×14×10 cm well-circumscribed anterior mediastinal mass yielding an approximated volume of about 1.5 L (estimated average radius 7 cm; spherical volume $V=4/3\pi r^3=1450\text{ cm}^3$) extending from the upper thoracic aperture to the xiphoid. The heart was displaced posteriorly and inferiorly. Diffuse foci of high density (calcification) scattered throughout the mass rendered a differential diagnosis of goitre, lymphoma, germ cell tumour or a thymic tumour.

Figure 1 Chest CT scan showing the giant intrathoracic goitre a few months prior to the second operation.

Figure 2 Chest X-ray showing the giant intrathoracic goitre a few months prior to the second operation.

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Figure 3 Chest CT scan showing the giant intrathoracic goitre 5 years prior to the second operation.

A ^{123}I thyroid scintigraphy uptake scan confirmed that the intrathoracic mass consisted of thyroid tissue ([figure 4](#)).

The patient was preoperatively euthyroid on T_4 $50\text{ }\mu\text{g}$ once daily. Thyroid-stimulating hormone was 1.1 mIU/L (normal range $0.3\text{--}5.5$) and free thyroxine (fT_4) was 12.9 pmol/L (normal range $9\text{--}25$). Ultrasound-guided needle aspiration was not performed due to the mass's anatomical position and a low likelihood of thyroid malignancy.

TREATMENT

Surgery was performed starting with a clamshell incision following the fifth intercostal spaces extending 7 cm right and left of the midline. The internal mammary arteries were ligated and divided in the process. The sternum was mobilised away from the mass using a gentle upward traction of the sternum. The

cranial part of the goitre involved a highly scarred area cranial of the aortic arch which was not sufficiently exposed by the clamshell thoracotomy alone. Consequently a reverse sternotomy with the saw moving from caudal (level of the fifth rib) to cranial (jugulum) was performed. The inferior sternum was left intact. The goitre was highly vascular. Arterial supply was provided by a main branch originating from the inferior aspect of the aortic arch, likely representing an inverted thyroid ima artery. Additional major arterial vessels were supplied from the pericardiophrenic artery. Venous drainage was observed into right pulmonary vein, superior vena cava, internal mammary veins and azygos vein. The mass reduced significantly in volume following division of the feeding vessels. The goitre was dissected off the pleurae, pericardium and from central mediastinal vessels and mobilised to gain a single pedicle superiorly. The preparation allowed exact demonstration of the recurrent, vagus and phrenic nerves, all intimately involved with the goitre. Following complete resection, chest drains were inserted, followed by pleural closure, sternal closure using steel wires and finally sutures for the intercostal incisions. The heart, initially found squashed between goitre and lower thoracic spine, regained its natural position with visible improvement of output and overall function.

HISTOLOGY

The histology diagnosis was thyroid gland tissue with nodular hyperplasia. The goitre weighed 531 g and measured $150\times 105\times 50\text{ mm}$. It was multinodular, dusky and congested with multiple calcifications ranging from 3 to 25 mm in maximum dimension and presented a lot of fibrosis.

OUTCOME

The operation was performed with minimal blood loss. Chest drains were removed on days 9 and 13 . The postoperative chest X-ray demonstrated a now regular position of all intrathoracic

Figure 4 The thyroid uptake scan confirmed that the giant intrathoracic mass consisted of thyroid tissue.

Figure 5 Postoperative chest X-ray showing regular position of all intrathoracic organs.

organs (figure 5). The patient experienced no complications following surgery or during his now 3 year follow-up. Specifically, the sternum healed without instability. There was no injury to the recurrent laryngeal nerves or postoperative hypocalcaemia.

DISCUSSION

Although ‘forgotten’ goitres after cervical thyroidectomy are rare, they have been described in the literature.^{1 2} The cervical approach is considered the preferred surgical approach for the majority of intrathoracic goitres.^{3 4} However, a surgical approach requiring sternotomy is preferred in cases of recurrent goitres, goitres of very large dimensions and volume and larger than the thoracic inlet, ectopic intrathoracic goitres and suspicion of malignancy.^{4–6} To this repertoire we add the inferior surgical approach of clamshell thoracotomy and reverse sternotomy, which allows central vascular control and excision of giant goitres. In our experience with recurrent retrosternal goitres the entry into the mediastinum can prove to be difficult when tissue planes have scarred after former surgery. The narrowness of the cervicothoracic junction and its plenitude of vascular structures can result in access difficulties during surgery. While these can always be overcome, the use of the current access has proven very comfortable with reduced risk and actual bleeding. It is noteworthy, that the current approach allowed early ligation of arterial feeders with significant shrinkage of this highly vascular goitre. This is corroborated by comparison of the preoperative volume estimated by CT to be 1.5 L with the histological weight of 531 g or about 0.5 L. This significant peroperative shrinkage much eased access to the draining veins.

Some centres use clamshell thoracotomies as standard approach for lung transplantation and other major intrathoracic surgery.^{7–9} They also offer a quick and easy approach to the chest in major trauma.¹⁰ Comparison between standard sternotomy and clamshell thoracotomy does not reveal any significant

disadvantages of either technique in terms of short-term complications and long-term outcomes. The combination of clamshell thoracotomy and reverse sternotomy has been previously described.¹¹ This procedure provides an excellent approach to anterior and posterior superior and inferior mediastinum and particularly to perivascular tumours at the cervicothoracic junction.¹² This easy access has not been previously described for surgery of benign or malignant goitre. In our opinion, it is a valuable tool in selected cases providing major access risks.

Learning points

- ▶ A giant intrathoracic goitre can entirely obstruct the upper thoracic aperture, dislodge the heart and create compression symptoms, such as retrosternal and epigastric pain.
- ▶ It can, particularly in re-do surgery, pose a life-threatening access problem as the innominate vein and superior vena cava can be firmly attached to the tumour.
- ▶ The inferior surgical approach of clamshell thoracotomy and reverse sternotomy allows early central vascular control and complete excision of a large goitre circumventing the intricacies of the cervicothoracic junction.

Competing interests None.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

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