A limited thoracocervical approach for accessing the anterior mediastinum in retrosternal goiters: Surgical technique and implications for the management of head and neck emergencies

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Abstract

In this article we describe the surgical management of retrosternal goiters via a limited thoracocervical approach, and we explore how the respective surgical know-how can be used in the management of the carotid blowout syndrome. Four cases involving patients who had undergone thyroidectomy via a limited thoracocervical approach are retrospectively reviewed. An acute blowout of the innominate artery managed with the same principal surgical technique is also reviewed. Three patients had a total thyroidectomy and one had a hemithyroidectomy. No malignancy was found. There was no mortality or unexpected morbidity from the limited thoracocervical approach. The median length of the inpatient stay was 3 days. The blowout survivor lived for 9 months, with no rebleeding and with an acceptable quality of life. We conclude that a limited thoracocervical approach can be safely performed by head and neck surgeons for accessing the anterior mediastinum in retrosternal goiters, and the respective surgical know-how can be used in the immediate management of an acute carotid blowout syndrome with satisfying long-term results and provision of quality end-of-life care.

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Introduction

A retrosternal goiter is one that extends beyond the thoracic inlet. Although a precise definition is not uniformly accepted among all authors,[1] the most commonly held concept is to consider a goiter retrosternal when more than 50% of the total bulk of the thyroid tissue resides below the thoracic inlet.[2] The cumulative incidence of retrosternal goiter has been estimated to be 6.28% of all goiters.[3]

Retrosternal goiters usually progress slowly and can remain asymptomatic for many years. When symptomatic, they can cause compression to the trachea and esophagus (dyspnea, swallowing difficulties) or, less commonly, to vascular and nervous structures (i.e., superior vena cava syndrome, Horner syndrome, hoarseness, etc.).[4] There seems to be a consensus among surgeons that such goiters should be removed even in the absence of clinical symptoms[5] because of their tendency to resist medical treatment, the potential for a life-threatening emergency relating to the goiter, and the non-negligible risk of malignancy.[4,6-8]

Thyroidectomy in the presence of retrosternal extension is performed via a cervical approach in more than 70% of cases,[3] with the remaining goiters requiring some form of thoracic approach. Although the presence of a thoracic/vascular surgeon may be required in some of the latter cases (i.e., for a thoracotomy), a limited upper median sternotomy (manubriotomy) represents an excellent alternative for gaining access to the anterior mediastinum.

This approach has recently gained popularity among head and neck surgeons.[9-11] Furthermore, the indications for such an approach can be expanded for the surgical exploration of the mediastinum in a range of indications.[10]

The aim of this article is to present our experience in the surgical management of retrosternal goiters that require a limited sternal split, and explore how the surgical know-how that results from this approach can be used in the management of the carotid blowout syndrome, which represents one of the most dramatic and life-threatening ENT emergencies.

Patients and methods

Patients with retrosternal goiter. A series of 4 patients who had undergone thyroidectomy with sternal split at a single center by the senior coauthor (G.M.) between 2003 and 2011 were retrospectively analyzed. Two of them were men and 2 were women. The mean age was 72 years (range: 58 to 86).

All patients had a preoperative computed tomography (CT) scan of the neck and chest performed by an experienced head and neck radiologist with hyperextension of the neck. All 4 patients were determined to have a retrosternal goiter. A goiter was considered retrosternal and requiring a thoracocervical approach when it extended below the level of the aortic arch on the CT scan. Three of these patients had a total thyroidectomy and one had a hemithyroidectomy.

Patient with acute artery blowout. In addition to the 4 cases of retrosternal goiter, a case of an acute blowout of the innominate artery, which was surgically managed by the same surgeon (G.M.) through a cervicothoracic approach, was also retrospectively reviewed. The patient was a 41-year-old man who had undergone a total laryngectomy, a partial pharyngectomy, a bilateral neck dissection, and postoperative irradiation for a T4 cancer of the larynx. The patient was being regularly followed in the Head and Neck Outpatient Clinic for 2 years after his definitive treatment.

Unfortunately, this patient developed a stoma recurrence. After staging, the decision was made to treat him surgically. He underwent excision of the stoma recurrence with radial forearm flap reconstruction and made a full recovery. Four weeks after the surgery, the patient became unwell and began hemorrhaging from the inferior aspect of the newly fashioned laryngectomy stoma. He was examined by the senior ENT surgeon on call, who decided that immediate surgical intervention was necessary.

After an anterior thoracocervical incision and sternal split were done, an acute blowout was found to involve the innominate artery, proximal to the aortic arch and well within the thoracic inlet. An attempt was made to repair the inmominate artery defect with the help of a vascular surgeon. Unfortunately, because the wall of the artery was very fragile, the artery had to be ligated.

Figure 1. Intraoperative photo shows placement of the Richardson retractor during the manubriotomy.

Surgical procedure. The basic steps of the surgical technique used in the present case series include an anterior cervical incision, after which the neck strap muscles are divided to afford maximal exposure of the cervical portion of the goiter. The chest wall incision starts from the suprasternal notch and extends 6 cm. Blunt dissection of the undersurface of the manumbrium is achieved using two fingers. A Richardson retractor is then passed retrosternally (figure 1). This provides protection to the underlying mediastinal structures during splitting of the manubrium with a sternal saw (figure 1). A 4-cm incision is usually adequate but can be extended if necessary.

Once the manubrium is split, a Tuffier retractor is used to retract both halves of the divided manubrium (figure 2). Once hemostasis has been achieved, parallel holes are drilled approximately 1 cm lateral to the cut edges of the sternum using a hand drill, and 1-mm sternal wires are threaded through, facilitating sternal closure (figure 3).

The vertical extension of the cervical incision downward, toward the manubrium (limited upper median sternotomy), has many advantages: It can be performed quickly, reliably, and with very low morbidity by head and neck surgeons, providing excellent mediastinal exposure without repositioning the patient.[12,13] Moreover, the manubriotomy only minimally increases the average hospital stay.[14] Indeed, 3 of the patients in our series stayed in the hospital for less than 4 days.

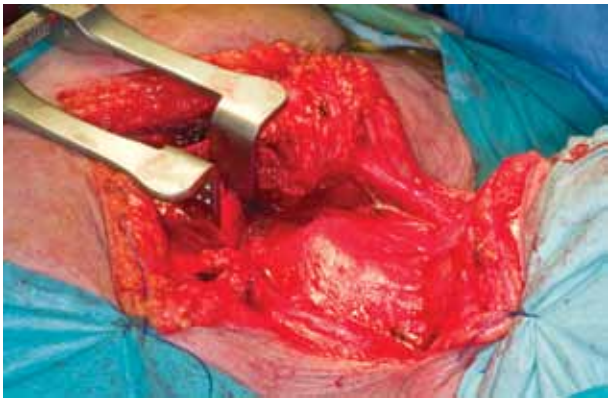

Figure 2. The divided manubrium is stabilized with a Tuffier retractor.

Figure 3. Sternal closure is achieved with 1-mm sternal wires, threaded through parallel holes 1 cm lateral to the cut edges of the sternum.

Results

Demographic data and information regarding the patients' diagnoses, procecdures, and length of hospital stay are presented in the table.

Of the 3 patients who had a total thyroidectomy and the 1 patient who had a hemithyroidectomy, none was found on histologic examination of the excised glands to have a malignancy. There was no mortality or unexpected morbidity as a result of the surgery performed via a thoracocervical approach; 1 patient experienced temporary postoperative hypocalcemia. The postoperative course was uneventful in 3 patients, and additional surgery was required in 1 patient, although it was unrelated to the preceding thyroidectomy. The median length of hospital stay was 3 days.

The patient who experienced the blowout of the innominate artery survived for 9 months after the operation with an acceptable quality of life. He experienced no rebleeding and died as a result of disease progression.

Discussion

Many study groups have attempted to define the factors that increase the likelihood of a sternotomy, but a consensus does not yet exist. Huins et al proposed that an extension of the goiter below the level of the aortic arch is an indication that the gland cannot be safely delivered via a cervical approach alone.[3] More recently, Cohen proposed that there are four factors that significantly increase the need to perform a sternotomy: (1) the presence of malignancy, (2) involvement of the posterior mediastinum, (3) the extension of the goiter below the aortic arch, and (4) the presence of ectopic goiter.[15] In our case series, we considered the goiters to be retrosternal if they extended below the level of the aortic arch on the CT scan, which was performed by an experienced head and neck radiologist with hyperextension of the patient's neck.

We also have presented in this series a case of surgical management of an acute blowout of the innominate

Table. Demographic and general data of the case series

Pt. no.	Age/sex	Diagnosis	Procedure	LOS* (days)
1	76/F	Nodular thyroid hyperplasia	Total thyroidectomy	4
2	81/F	Multinodular colloid goiter	Total thyroidectomy	23†
3	74/M	Lymphocytic thyroiditis, benign thyroid cyst	Right hemithyroidectomy	3
4	58/M	Multinodular goiter, follicular adenoma	Total thyroidectomy	3

** Length of (hospital) stay.*
† This patient remained in the hospital because of postoperative dysphagia associated with a large pharyngeal pouch, which was endoscopically stapled.

artery employing the same principal surgical technique. The carotid blowout syndrome is a life-threatening end-stage complication of head and *n*eck cancer with high neurologic morbidity and mortality rates, occurring in as many as 4.3% of patients,[16] especially in the presence of radiation-induced tissue necrosis, tumor recurrence, and pharyngocutaneous fistulas.[17]

Although a number of reports in the literature advocate endovascular neuroradiologic intervention (covered stents, coil embolization, detachable balloons, etc.) as the treatment of choice for the management of the carotid blowout syndrome,[18-21] considering the surgical ligation of the vessel as having unacceptably high morbidity and mortality,[22] recent case series advocate a more skeptical approach in readily and uniformly accepting this notion.[22] Although initial hemostasis may be achieved with the use of neuroradiologic techniques,[23] the longer-term (so to speak) safety of the patients, the patency of the stents (in reconstructive techniques), and the permanence of hemostasis appear unfavorable.[24,25]

Nevertheless, the purpose of this report is not to deny the potential role of endovascular neuroradiologic interventions in the management of carotid blowouts. In contrast, such interventions may be successfully performed in a threatened or impending blowout setting. However, patient selection should be made carefully, as patients with a life expectancy of more than 3 months seem to fare worse after this approach than those who are closer to the inevitable outcome.[25] Our patient survived for 9 months after his episode of acute blowout and passed away as a result of the progression of his disease. No rebleeding occurred after the surgical management of his blowout, nor did he encounter any postoperative neurologic morbidity.

We strongly believe that the surgical management of the carotid blowout syndrome is not an obsolete treatment modality, especially in an acute setting, and that the trend of referring all these cases for neuroradiologic endovascular interventions needs to be reevaluated in light of the relatively long-term findings of the case series reported by Roh et al and Chang et al.[24,25]

Conclusion

More than 2 decades ago, Nielsen et al suggested that the surgical treatment of patients with large intrathoracic thyroid extension could be successfully performed in ENT Departments by surgeons experienced in head and neck surgery.[26] In light of the strenuous efforts of ENT surgeons to establish ENT as the main head and neck specialty, and taking into account the advances in head and neck surgery, this call seems more timely than ever. In addition, the hard-earned skills of head and neck ENT teams for achieving access to the anterior mediastinum independently (in selected cases) can also be used for the immediate management of the most devastating complication of head and neck cancer—the acute carotid blowout—with satisfying long-term results. This provides the patients under their care with a definite treatment without passing their end-stage management to other medical specialties.

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