

# Cartilage framework reconstruction after resection of thyroid cartilage chondrosarcoma: A case report



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## ABSTRACT

**Background:** surgical treatment of laryngeal chondrosarcoma is extremely broad and varies according to the affected subsite. Cricoid cartilage is the most commonly affected subsite. Thyroid cartilage localization is less frequent and is considered more favourable but there is no general consensus about current best practice for treatment of this rare tumor.

**Case report:** we discuss the successful case of a young patient with thyroid cartilage chondrosarcoma, treated with radical surgery and cartilaginous graft reconstruction taken from costal synchondrosis in order to preserve laryngeal function and structure.

**Results and conclusion:** in our experience this procedure was perfectly adapted to laryngeal reconstruction, providing easy graft harvesting and fast revascularization, laryngeal function preservation, avoiding postoperative rehabilitation arising from surgical damage of the donor site.

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## 1. Introduction

Primary chondrosarcoma of the larynx is rare, representing approximately 0.2% of all head and neck tumors and up to 1% of all laryngeal malignancies [1].

Laryngeal chondrosarcoma (LC) arises mostly from the hyaline cartilage of the cricoid cartilage, but it may also originate from the epiglottis, thyroid, arytenoid, and accessory cartilages [1].

Signs and symptoms are often misleading; in fact LC usually presents as a painless slow-growing mass causing dysphonia or dysphagia.

Surgery is the standard treatment, radiation is reserved for non-resectable tumors, while chemotherapy does not yet have a clear role for these tumors [2]. Recently, it has been reported that low-grade tumors may be successfully treated with newer surgical techniques such as CO<sub>2</sub> lasers while high-grade and recurrent tumors require more aggressive therapeutic approaches such as partial or total laryngectomy [1]. Despite advances in surgery, the matter of “laryngeal function preservation” still remains debatable in the light of the possible consequences of radical surgery on patient's quality of life related to phonation and swallowing.

The aim of this work is to present a case of thyroid cartilage chondrosarcoma treated with partial laryngectomy and cartilaginous reconstruction with costal synchondrosis. The described surgical management resulted in a good functional and oncological outcome.

## 2. Methods

Retrospective review of a clinical case and review of the literature.

### 2.1. Case report

A 37 year-old man referred to our institution in January 2012 because of a painless bulging of the neck, persisting for the previous 12 months, and slowly increasing in size. He complained of dysphonia and denied suffering from dysphagia.

Physical examination revealed a firm mass of approximately 4 cm, mobile with deglutition, without overlying skin changes. Laryngeal endoscopy showed medialization of the right hemilarynx, complete occlusion of the ipsilateral pyriform sinus and mechanical impairment of the arytenoid cartilage.

Ultrasound examination revealed a nodule of the supra-thyroid region with mixed components, hypoechoic structure and calcific shell originating from thyroid cartilage. Fine-needle biopsy (FNB)

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was performed and histopathological findings indicated “low-grade chondrosarcoma”.

Computed tomography (CT) results showed a round-shaped lesion arising from the right ala of the thyroid cartilage, with inhomogeneous contrast enhancement surrounded by an incomplete calcified shell, partially dislocating the surrounding structures without signs of infiltration (Fig. 1).

## 2.2. Surgery

The surgical procedure was performed under general anaesthesia with orotracheal intubation. A sterile surgical field was set from the mandibular line, down to the abdomen.

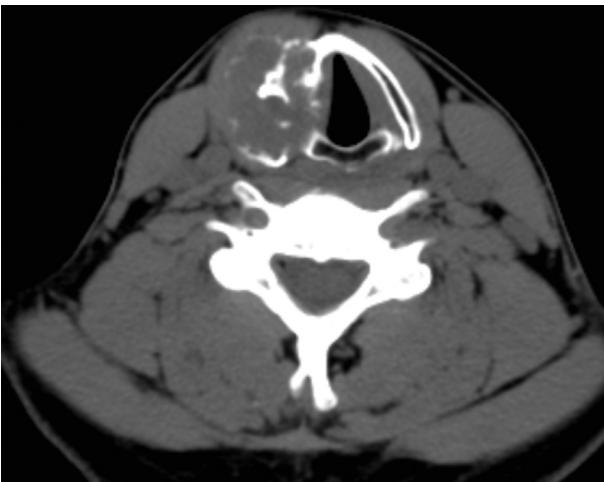
A 6-cm cervical incision was performed at the level of the thyroid cartilage along a natural skin crease of the neck. Sternothyroid and sternohyoid muscles were separated in order to expose the larynx. After cutting the inferior constrictor muscle, the upper and lower horns of the thyroid cartilage were identified and cut, preserving the upper and lower laryngeal nerves, in accordance with the standards of a partial laryngectomy.

The mass was inseparable from the rest of the thyroid cartilage. The laryngeal mucosa was undamaged and gently detached from the neoplasia. The thyroid cartilage was cut at the midline and the neoplasia was safely removed without opening the hypopharynx and larynx. (Fig. 2). The perichondrium was included with the resection.

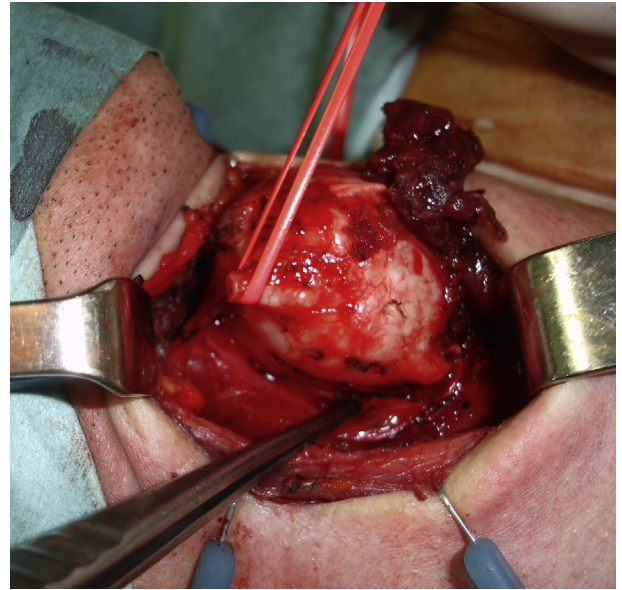
The ala was reconstructed with a cartilaginous fragment taken from the cartilaginous synchondrosis located between the sixth and eighth rib. During harvesting, we took care to avoid perforating parietal pleura.

The cartilaginous graft was harvested with a synthetic template based on the left residual thyroid ala. It was carved by thinning the internal concave face while the external convex perichondrium was rescued in order to spare graft vascularization.

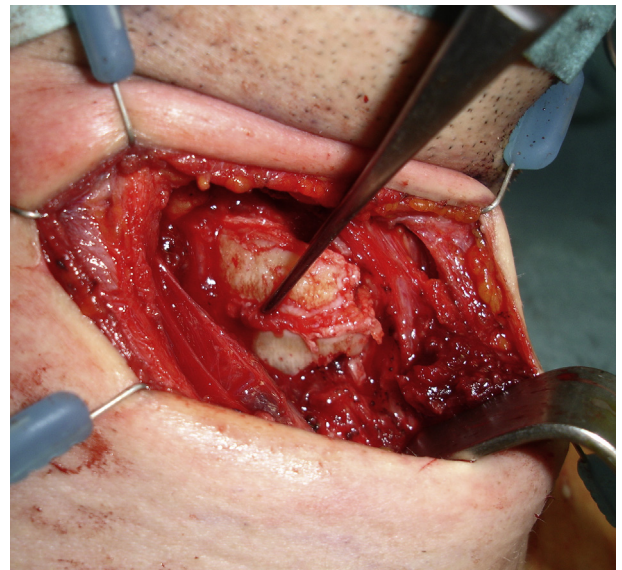
The graft was placed inside, fixed to the remaining part of the thyroid cartilage along the midline (Fig. 3) with the graft perichondrium facing towards the infra-hyoid muscles to facilitate revascularization of the rib cartilage. A temporary tracheotomy was performed and removed in the fourth day after surgery. No major events occurred during the hospitalization, oral feeding was restored on the second day after surgery and the patient was dismissed after six days. Post-operative laryngeal endoscopy revealed normal laryngeal function and motility with mild ecchymosis of



**Fig. 1.** Preoperative CT scan showing a round shaped, calcified neoplasia of the right ala of the thyroid cartilage.



**Fig. 2.** Intraoperative view: the thyroid ala is cut at the midline and the neoplasia is removed.



**Fig. 3.** The cartilage graft replaces the right ala of the thyroid cartilage.

the right hypo-pharyngeal wall. The pathological examination confirmed the diagnosis of low-grade chondrosarcoma, radically excised with safe margins. A CT scan was prescribed at three and six months of follow up, showing no recurrence of disease, the correct inserting of the cartilaginous graft and restoration of its blood supply (Fig. 4). After five years the patient is fully satisfied without evidence of disease.

## 3. Discussion

Chondrosarcomas are a group of heterogeneous tumors that behave very differently depending on the site and the biological characteristics. Low-grade chondrosarcoma has a torpid evolution and good prognosis, while high-grade chondrosarcoma may have a fast negative course [3].

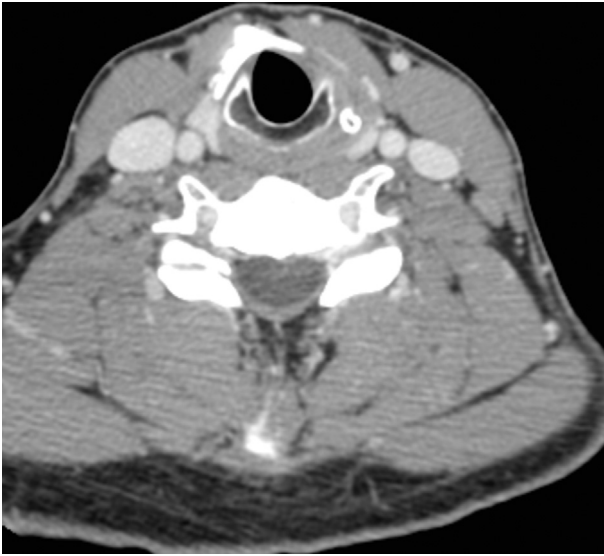


Fig. 4. CT scan after 6 months.

Clinical diagnosis is somewhat difficult because of its slow-growing nature. Depending on the anatomical structure affected, the patient may complain of dyspnoea and wheezing. Biopsy may be difficult and frustrating, but is a crucial tool in diagnosis [4].

CT is currently considered the best radiological examination although in some cases MRI may better define the soft tissue invasion [5,6].

The current best practice for treatment is surgery. In a recent review, Chin et al. reported how treatment approaches vary widely, mainly due to the lack of a general consensus and the rarity of this kind of tumor. More aggressive tumors are referred for radical procedures and more precisely, the involvement of the cricoid cartilage has been traditionally approached with total laryngectomy [7].

Today, the main challenge of surgery remains the preservation of vocal function, which can be achieved by carefully respecting the recurrent nerves. Secondary problems are the consequent scar narrowing of the larynx and emphysema. These can both be avoided by means of accurate reconstruction.

Currently in the literature, there are several articles focusing on cricoid reconstruction and thyroid reconstruction [8,9]. Obeso et al. described a clavicle periosteum flap for thyroid cartilage reconstruction [3]. More recently, Banaszewski et al. reported a case of large thyroid chondrosarcoma reconstructed with a medial condyle femur corticoperiosteal free flap as the donor site underlining possible limits including unusual anatomy of the vascular pedicle, its restricted length and the lack of adequate vessels on the neck [10].

We decided to use costal synchondrosis as a cartilage donor site. This wide synchondrosis is often used in reconstructive surgery for three-dimensional reconstruction because of the easy harvesting and the large amount of available tissue [11].

This is the first time, to our knowledge, that this technique has been applied successfully to reconstruct the thyroid ala.

As reported by Han et al., the successful outcome of this procedure depends on various factors, including the surgeon's ability, adequate size and strength of rib cartilage, and sufficient healthy tissue without age-related calcifications associated with stiffness of the cartilage [12].

In our experience this procedure is perfectly adapted to laryngeal reconstruction, providing easy graft harvesting and fast revascularization, avoiding post-operative rehabilitation arising from surgical damage of the donor site. Age-related calcifications of the costal cartilage can be easily investigated with CT scan or MRI prescribed for preoperative staging.

#### 4. Conclusion

Laryngeal chondrosarcoma is rare, and surgery is recognised as current best practice. Future work will mainly focus on the definition of a surgical algorithm based on less invasive procedures with maximal functional preservation. To this end, the costal synchondrosis graft is a feasible solution and may offer good functional outcomes.

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