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Chondrosarcoma treated with transoral near total resection of the cricoid

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Abstract. *Chondrosarcoma treated with transoral near total resection of the cricoid. Introduction*: Chondrosarcomas of the larynx are usually slow-growing tumours. Their prognosis is reportedly unaffected by local tumour recurrence. Nevertheless, total laryngectomy is often performed in fear that resection of the posterior lamina of the cricoid cartilage may cause laryngeal collapse and stenosis. Transoral laser surgery (TLS) is not considered among the treatment options. This case report supports the feasibility of a radical yet organ- and function-preserving tumour excision using TLS.
Case report: A female patient presented with dyspnoea due to an extensive low-grade laryngeal chondrosarcoma. TLS treatment involved total resection of the posterior lamina of the cricoid cartilage. The patient was decannulated 8 months later with normal swallowing and satisfactory voice quality, which allowed her to have a normal personal and social life.
Conclusion: TLS excision of the posterior lamina of the cricoid cartilage seems to be a feasible and radical yet function- and organ-preserving technique with minimal morbidity.

Introduction

Chondrosarcomas of the larynx are usually low-grade, slow-growing tumours that rarely metastasize. The prognosis for these tumours is reported to be unaffected by local tumour recurrence.[1,2] Approximately 70-77% of chondrosarcomas of the larynx arise from the posterior lamina of the cricoid cartilage.[3] This location of the tumour often raises concern about the structural integrity of the larynx after tumour resection. The fear of causing laryngeal collapse and stenosis rather than tumour size often seems to lead the treating surgeon to decide to perform total laryngectomy, which may be done in as many as one third of these patients according to the results of an analysis of 111 cases.[3] Alternatively, other surgeons prefer to perform an incomplete tumour resection and treat the inevitable subsequent tumour regrowths with repeated debulking procedures.[4] In other cases of chondrosarcoma presented in the literature, open-surgical techniques are performed, most often accompanied by interposition grafts[5,6] or tracheal advancement.[2,6-9] Therefore, a conservative but radical surgical excision that maintains a functional cricoid stent and preserves the voice seems to be a surgical challenge, with increased morbidity. Performing a tracheostomy and inserting a stent T-tube also seems to be mandatory.

In this study, we present the case of a 42-year-old female patient with a chondrosarcoma in the posterior lamina of the cricoid cartilage. The aim of this report is to advocate the potential role of transoral CO_2 laser microsurgery in the radical but laryngeal- and voice-preserving treatment of such tumours, and the feasibility of cricoidectomy using this technique. Open surgical approaches are compared with TLS in terms of morbidity, hospitalization length, and quality of life. Transoral LASER surgery (TLS) has mainly been reported as a method of restricted vaporization of the recurrences of laryngeal chondrosarcomas within the laryngeal lumen in order to maintain an adequate patent airway, or as a technique of partial resection of primary lesions,[2,10] but rarely as a method of radical excision[11] for smaller tumours.

Case report

A 42-year-old female patient with dyspnoea and a history of hoarseness was referred to our hospital, which had progressively deteriorated over the past 8 years. The laryngoscopic examination revealed a submucosal subglottic neoplasm under the facet of the left cricoarytenoid joint at the posterior lamina of the cricoid cartilage, which completely suspended the mobility of the respective true vocal cord. The mass projected into the respiratory tract causing

Figure 1
Preoperative magnetic resonance imaging (axial)

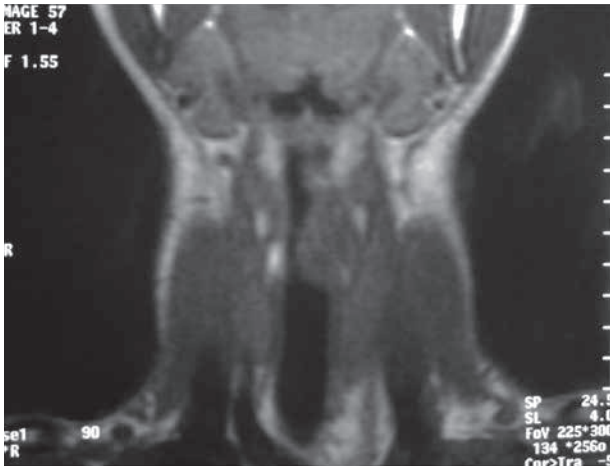

Figure 2
Preoperative magnetic resonance imaging (coronal)

considerable stenosis. The motility of the contralateral (right) vocal cord was somewhat impaired. Evaluation was difficult due to the substantial projection of the tumour into the larynx. The tumour most likely sustained the motility of the right vocal cord mechanically through its large size rather than through infiltration. Magnetic resonance imaging verified the clinical findings, showing a moderately enhancing tumour mass with multiple calcifications and no nodal extension (Figures 1,2). Total laryngectomy had been proposed at another medical centre, but the patient refused this treatment.

The patient was initially subjected to tracheotomy because a) orotracheal intubation was difficult owing to the expansion of the tumour, b) aspirations were expected postoperatively, and c) the airway needed to be ensured in case of postoperative laryngeal collapse. The tumour was exposed with the Steiner distending laryngoscope. Dissection of the left arytenoid cartilage preceded the removal of the tumour and the posterior lamina of the cricoid cartilage using a CO_2 laser in continuous superpulse mode at 8-15 Watts, depending on the phase of the operation. The tumour was excised in a stepwise technique, with blocks of tumour being consecutively removed under microscopic magnification. The tumour blocks were specified and oriented for the pathology examination. The specific tissue-cutting characteristics of the CO_2 laser helped the surgeon to differentiate between healthy and tumour tissues. The dissection of the surgical margins through the remaining cricoid cartilage was performed last under high magnification. Due to metaplastic ossification of the cartilage, it was not possible to evaluate the frozen sections. In cases of thyroid cartilage sections, we usually document our surgical margins by excising an additional section of the cartilage and marking the external surface with Indian ink. In this case, no such surgical margins were dissected in order to preserve as much healthy and functionally important tissue as possible.

Three weeks later, the patient could eat normally, although minimal aspirations were noted with thin liquid swallowing. The patient was released from the hospital with a fenestrated tracheostomy tube with a speaking valve. According to the pathology report, the tumour was a well differentiated chondrosarcoma (grade I) with clear surgical margins.

Three months later, laryngoscopy revealed synechia of the vocal cords in their posterior endings. Inferiorly, at the site where the posterior quadrate lamina of the cricoid cartilage had been removed, there was no connective tissue formation. Since this vocal cord synechia was probably helpful in protecting the trachea during swallowing, a unilateral Dennis-Kashima posterior cordectomy was performed in order to improve breathing without jeopardizing the patient's swallowing function. Three months later, it was still not feasible to decannulate the patient. After explaining the possible risks to the patient's ability to swallow, it was decided to cut through the synechia, thereby unifying the remaining larynx and the trachea. Two months later, the patient was able to swallow normally. Postoperatively, the right vocal cord

Figure 3
Postoperative CT scan (axial)

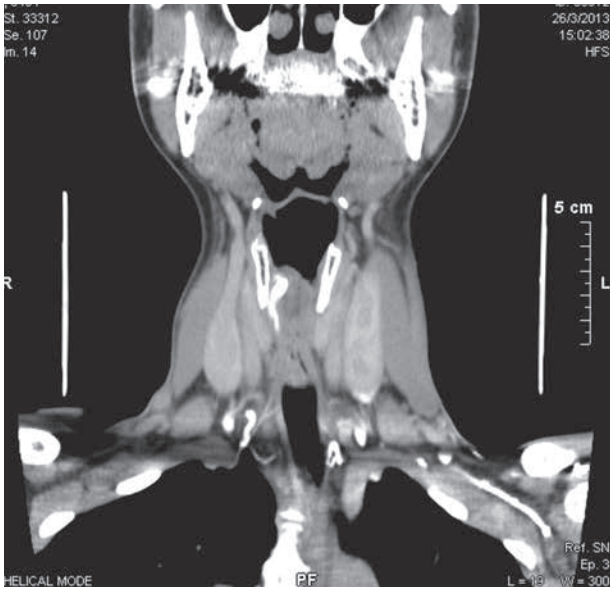

Figure 4
Postoperative CT scan (coronal)

showed impaired motility, possibly due to the postoperative formation of fibrous tissue. She had a satisfactory voice quality and was successfully decannulated. "Satisfactory" voice quality was determined at first in terms of voice intensity permitting the patient to participate in normal conversation, although she was hoarse and her voice of lower intensity. Upon re-examination, we asked the patient to evaluate her voice with regard to its impact on her social and personal life, as well as the psychological consequences of her abnormal voice. The patient, who is an architect, felt that her voice met her social, personal, and professional needs and that her abnormal voice did not affect her psychologically. Four years after her first surgery, laryngoscopic and imaging follow up of the patient have shown no signs of recurrence (Figures 3,4). No graft, intraluminar, or T-tube stent was placed at any stage of the treatment.

Discussion

Due to the non-aggressive behaviour of low-grade chondrosarcomas of the larynx, laryngeal-preserving though radical procedures seem to be the treatment of choice,[2,12] with the maintenance of a functional cricoid stent being the most important surgical challenge. To the best of our knowledge, TLS has not yet been used as a primary surgical technique in the treatment of such tumours. Apart from advocating for the feasibility of this approach, this case report supports that TLS may actually be advantageous compared with open-surgical techniques. The ability to perform precise and effective resection of laryngeal tumours according to the expansion of the neoplasm without interfering with the unaffected structures of the larynx[13] is the first obvious advantage of TLS.

A second obvious advantage of a TLS approach is in preserving the integrity of the overlying strap muscles and the thyroid cartilage. This may explain why no stent was placed in our patient. Open-surgical techniques include midline division of the overlying strap muscles and, in some cases, resection of the lower half of the thyroid cartilage. This may further compromise the stability of the larynx and jeopardise the function of the crico-arytenoid joint, the recurrent laryngeal nerves, and the continuity of the cricotracheal junction. The insertion of a stent T-tube seems to be mandatory in open-surgical cricoidectomies or hemi-cricoi-dectomies.[5,7,14] The T-tube is usually removed six months later through direct laryngoscopy, and the patient is decannulated. Hantzakos *et al*. (2007)[5] proposed covering the hemi-cricoidectomy defect with a composite osseomuscular interposition graft attained from the body of the hyoid bone attached to a pedicle formed by one sternohyoid muscle along with a T-tube, which is removed after the third postoperative month.

A third considerable advantage of TLS is that surgery is confined to the larynx, which might mean fewer postoperative complications and a shorter recovery time. A near total cricoidectomy, such as the one presented in this case, would probably require tracheal advancement[2,6-9] if open-surgery had been done. In 2011, Zeitels *et al*.[7] described 6 patients with large chondrosarcomas of the cricoid who were also treated with transcervical partial laryngectomy and reconstruction involving tracheal advancement, a free aortic homograft, or a local free patch graft of fat or dermis without any additional support of the reconstructed larynx with an intraluminal stent. Additional surgical requirements, such as microlaryngoscopic removal of granulation, oedema, or part of the arytenoids cartilage were needed in 5 out of 6 patients to facilitate tracheotomy decannulation. After hemi-cricoidectomies, where smaller segments of the cricoid were infiltrated by tumour and the intact remnants of the arch offers some support for the reconstruction of the airway, the placement of interposition grafts[5,6,15] has also been successfully performed. Many authors describing open-surgical techniques suggest covering the defects with free grafts, such as dermis, fat, or buccal mucosa.[6,7,14,15] This procedure has been questioned by other surgeons who have performed open surgical techniques.[5] In the case presented here, the mucosal defects were healed by means of secondary epithelialization as the rule following laser assisted resection.

In both TLS and open surgical techniques, recurrences may be expected and patients need to be closely observed. However, when properly treated, grade one chondrosarcoma recurrences do not seem to compromise survival,[3] with the possibility of secondary procedures being maintained. This may constitute another advantage of the TLS technique. The extent of the operation is modulated for each patient as the surgeon follows the tumour. Consequently, the tissues overlying the larynx, as well as the laryngeal structures that were not implicated in the first operation, are intact and not subject to the post-operative fibrous tissue formations that may compromise the results of redo operations.

On the other hand, performing a tracheostomy seems to be mandatory in both TLS and open surgical techniques. The patient in this case report was successfully decannulated 8 months later, which is longer than but still comparable to that reported by other authors (3 months to 1 year).[5,7,15] Decannulation in our patient was achieved through 3 surgical procedures. Despite aiming for a single-phase resection and reconstruction, this is rarely reported in clinical practice. Even in a simple microlaryngoscopic removal of granulation, oedema, or part of the arytenoid cartilage, additional surgical procedures have been reported by almost all authors in a majority of patients.[7,15] Of note, in both TLS and open-surgical approaches, an experienced surgical team is required to perform the surgery and treat any post-surgical morbidities and complications. Summarizing, the clinical course of our patient treated with TLS seems similar to those treated with transcervical partial laryngectomy. The absence of a large neck trauma caused by either the approach itself or the application of interposition grafts may reduce the morbidities of the operation. In conclusion, the carbon dioxide laser may, in the hands of an experienced surgeon, constitute an alternative therapeutic option for radical yet laryngeal-preserving treatment of laryngeal chondrosarcoma.

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