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Surgical strategies for glottic carcinoma with a giant thyroid tumor

A case report and literature review

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Surgical strategies for glottic carcinoma with a giant thyroid tumor. A case report and literature review

Description of strategies for preventing surgical complications in the treatment of laryngeal carcinomas associated with giant thyroid cancer.
For this study, the clinical data of an elderly patient with laryngeal carcinoma associated with a large thyroid tumor, diabetes and hypertension were used. The patient's tumor was removed with simultaneous surgery performed by the thyroid surgery department and the laryngeal surgery department; the patient was followed for more than 3 years and the scars of tracheal granulation and laryngeal adhesions were removed with repeated laser interventions.
The literature review was carried out on the Wanfang database, on the China How Net database and on the MEDLINE database via Computer. The final research keywords used for the study were "squamous cell carcinoma" and "glottis" or "larynx" / "larynx", "surgery", "thyroid cancer" and "simultaneous surgery".
RESULTS: *After completion of the intervention, the nasogastric tube and tracheal cannula were successfully removed, the glottis was successfully reconstituted and oral respiration, phonation and oral feeding were normally resumed.*
CONCLUSION: *The multidisciplinary approach for the simultaneous removal of a laryngeal carcinoma associated with a bulky thyroid tumor in elderly subjects with multi-system and multi-organ damage has been successfully implemented. There are only a few such cases presented in the literature to illustrate risk prevention strategies for postoperative complications, including postoperative infection, extubation difficulties and loss of speech, which deserve to be known.*

KEY WORDS: Glottic carcinoma, Thyroid tumor, Laser surgery multidisciplinary, Tracheal cannula, Vocal cords

Case Profile

A 62-year-oldmale patient with laryngeal cancer (glottic type T2N0M0) accompanied by a giant thyroid tumor, diabetes, and hypertension was enrolled in this study. Both thyroid surgery and laryngeal surgery were performed to resect the tumors, reconstruct the laryngeal function, and support laryngoscope micro-laser staging surgery at the patient's follow-up session. The gastric tube and tracheal cannula were successfully removed, the glottis was successfully reconstructed, oral eating, throat breathing, and vocalization were restored, and the patient's normal life was restored (Figs. 1-7).

A brief introduction of simultaneous and staging surgery

Concurrent surgery on December 5, 2016: Bilateral and nearly total thyroidectomy was performed during thyroid

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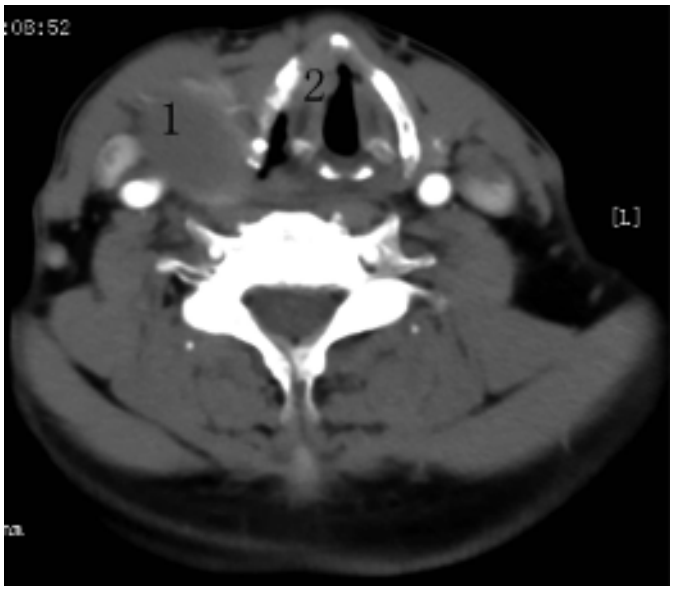

Fig. 1: CT of the neck before surgery: multiple thyroid masses and nodular vocal cords. 1 Right goiter mass 2 Right vocal cord nodule.

Fig. 2: Preoperative laryngoscopy: a nodular mass in the right vocal cord, rough, and the larynx is full. 1 Nodular mass in the front 1/3 of the vocal cords. 2 Left vocal cord.

surgery while rapid freezing pathology during thyroid surgery suggests malignant thyroid lesions, tracheotomy, partial laryngectomy, and laryngeal function reconstruction under the platysma flap that was performed by thyroid surgery. Hypothyroidism occurred in the patient after surgery and was complicated with a sore throat and a neck abscess (Fig. 5). After the abscess removal, the repair of the sore throat, and the reconstruction of the larynx, the nasogastric tube was successfully removed, and oral eating resumed. In February 2017, the patient

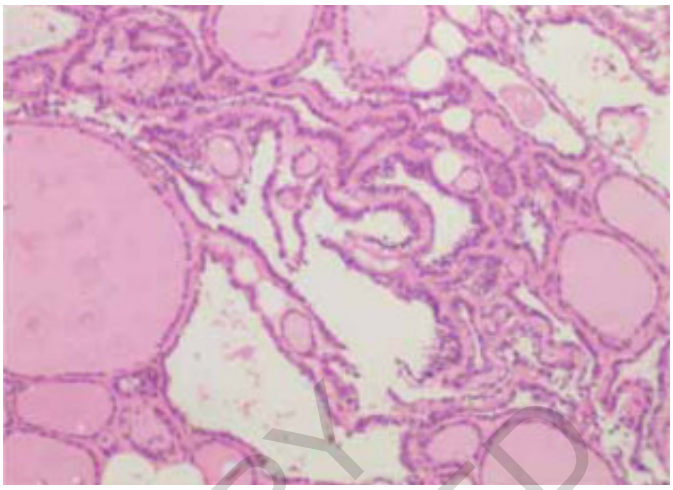

Fig. 3: Pathology of thyroidectomy: thyroid adenoma with papillary hyperplasia.

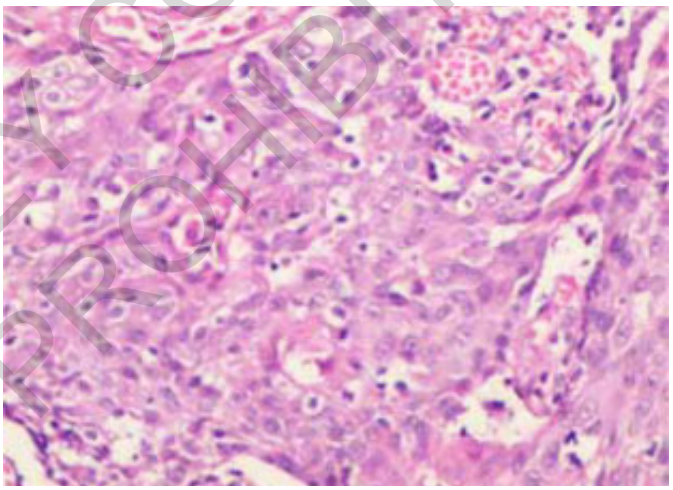

Fig. 4: Laryngeal mass pathology: middle differentiated squamous cell carcinoma in the larynx.

complained of hemoptysis for several days. The follow-up examination revealed intratracheal granulation and the intratracheal granulation was removed by a microscope CO_2 laser (pathological diagnosis). In June 2017, the patient appeared to be distressed with obvious breathing difficulty during sleep while the tracheal tube was blocked. However, he could breathe smoothly while the tracheal tube was blocked at daytime and at nighttime when the clinicians removed the block of the tracheal tube at the patient's home. A laryngoscopy and CO_2 laser were used to loosen the laryngeal adhesions and expand the glottis. The tracheal cannula was successfully removed in September 2017 and the patient's clear voice was mostly restored. Currently, the patient is being followed-up for 3 years. Our findings also showed that he had a good diet, clear pronunciation, and no breathing difficulties during night sleep and day walks.

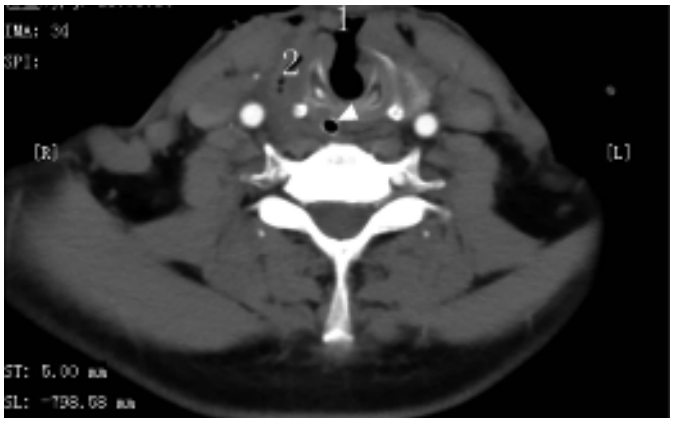

Fig. 5: Bilateral major thyroidectomy-concurrent laryngectomy + epiglottic laryngoplasty complicated infection, CT showed neck emphysema and wound dehiscence. 1 The suture of the thyroid cartilage is cracked. 2 Emphysema at the right thyroidectomy. White solid arrow shows stomach tube.

Fig. 6: Postoperative follow-up laryngoscope: glottis after tracheal cannula extraction. 1 Left vocal cord 2 Right vocal cord reconstructed with epiglottis. 3 the cricoarytenoid joint of the left.

Case Report

A 62-year-old male patient with a right neck mass and hoarseness for 20 days was admitted to the hospital on the 2nd of December, 2016. Computerized Tomography (CT) of the patient's neck showed multiple thyroid nodules. After reaching the sternum, a nodular mass was found in the patient's right vocal cord. The laryngoscope showed a rough mass in the right vocal cord. The patient's previous medical history: In 2000, the patient was diagnosed with diabetes and insulin and oral hypoglycemic drugs were given for the hypoglycemic treatment. In 2016, the patient was diagnosed with "hypertension" and oral "irbesartan" and received antihypertensive treatment. Personal history: the patient smoked for 40 years, 20 cigarettes/day and denied a history of trauma and drug allergy. On the 5th of December, 2016, a laryngoscope biopsy was performed on a laryngoscope. The postoperative pathology included a differentiated squamous cell carcinoma in the larynx. On the 15th of December, 2016, thyroid surgery and otolaryngology surgery were performed concurrently and the postoperative routine pathology showed cystic changes in the thyroid adenoma, differentiated squamous cell carcinoma in the high and middle throat, and moderate to severe atypical hyperplasia in some areas (Figs. 3, 4).

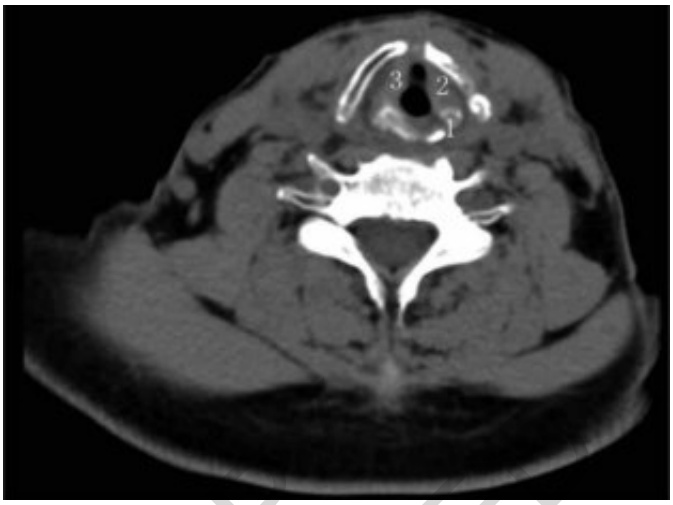

Fig. 7: Laryngeal CT at 2 years after surgery: 1 left cricoarytenoid joint; 2 left vocal cord left; 3 right vocal cord reconstructed by epiglottis.

Discussion

As a result of the limited number of cases of glottic cancer with huge thyroid tumors that have been reported to date, there is no consensus on a preferred simultaneous surgery or staged surgery.

Giant thyroid tumors compress the trachea, resulting in the softening of the trachea, which may affect the function of the superior laryngeal nerve and the recurrent laryngeal nerve and even present laryngeal nerve palsy. Moreover, the rimavocalis is the narrowest part of the upper respiratory tract and the development of glottic cancer affects the vocal cord abduction to a certain extent, restricting or fixing the vocal cord movement and the blockage of the tumor tissue can cause symptoms of laryngeal obstruction [1,2]. A. Galli considered that open laryngeal surgery could obtain better outcomes and could treat neck lesions through the same incision. The patient analyzed in this study is obviously not suitable for laryn-

geal surgery followed by thyroid surgery, because a huge incision in the neck is required to deal with a large thyroid mass. After the patient received the consultation with the thyroid surgeon and the day that the thyroid surgery was completed, a support laryngoscopy was performed by the otolaryngologist to determine whether microscopy laser surgery was necessary at the same time [3,4]. A partial softening of the trachea was found during the patient's thyroid surgery. After the tracheotomy was completed under the neck platysma flap, the microscopic laryngoscopy also revealed a cauliflower mass near the entire vocal cord that partially covered the ventricular zone and edema on the left vocal cord, making it difficult to expose the safety margin. Staged thyroid surgery and laryngeal cancer surgery may lead to the further development of laryngeal cancer and can increase the risk for laryngeal function reconstruction. This case utilizes the advantage of the multidisciplinary benefits of large-scale tertiary hospitals and included bilateral total thyroidectomy, tracheotomy, partial laryngectomy, and laryngeal function reconstruction at the same time. Our literature search was completed on the Wanfang database, China HowNet database, and MEDLINE database. The search took place in October 2019 and the keywords included "thyroid tumor", "laryngeal cancer", "surgery", and "synchronous period" and the English word was "squamous cell". The terms "cancer" and "glottis" or "larynx"/"laryngeal", "surgery", "thyroid tumor", and "simultaneous surgery" were searched for in the relevant literature regarding simultaneous surgery for thyroid tumors and laryngeal cancer, so the relevant literature on laryngeal cancer was reviewed in full, the treatment experience of this disease was analyzed, and the experience and lessons of the surgery were examined.

Elderly patients with hypertension and huge thyroid adenoma combined with laryngeal cancer who also have diabetes have a higher risk of infection after surgery [5]. Organ dysfunction in the elderly, often accompanied by multiple organ functional or organic diseases, reduced the ability of anesthesia and surgery outcomes and impacted the patients' stress, compensation, repair and healing, and made the patients more prone to infection, including pharyngeal fistula, tracheostomy infections, and pulmonary infections [6,7]. A pharyngeal leak and the formation of a subcutaneous flap abscess occurred at 1 week postoperatively. During debridement, a tracheal fragment under the tracheotomy opening was found and it was not repaired. This patient had been smoking and drinking for more than 40 years. The inhaled airflow after the tracheotomy had also lost the temperature and moisturizing function of the nasal cavity and frequent coughing occurred. After coughing, the gas and respiratory secretions from the patient entered the skin flap from the trachea rupture and caused an infection and abscess formation, resulting in the anastomosis at the piriform fossa to open and the throat to leak. The trachea rupture was repaired during the debridement, the laryngeal formed again, and the infection was finally controlled.

Patients with large thyroid adenoma and laryngeal cancer often need a tracheotomy, which may cause difficulty in extubating [8,9]. The main functions of the larynx include breathing and pronunciation. Whether laryngeal cancer can be extubated depends on the degree of patency of the trachea after the tracheotomy is performed, the reconstruction of the "new larynx", and whether the "new larynx" is narrow during the rehabilitation process.

Changes in the local anatomy after partial laryngectomy often leads to a decrease in the patients' swallowing protection of the "new larynx" and can induce aspiration [10]. Tracheal stenosis is another major complication of tracheotomy in laryngeal cancer. Stenosis mainly occurs in three parts: damage to the annular cartilage to the subglottic stenosis and improper incision management resulting in stenosis at the incision level [11]. In this case, during regular follow-ups with the patients, it was found that there was excessive skin hyperplasia and granulation in the repaired tracheal cartilage fragmentation and tracheostomy opening. This case included a tracheotomy that was performed directly under the platysma flap after thyroidectomy. There was no damage to the circular cartilage and the causes of tracheal stenosis were the excessive proliferation of granulation after the repair of cartilage in the trachea. The hypertrophic granulation was cut out and the granulation was removed by laser ablation. Furthermore, the patient's tracheal stenosis was improved after the follow-up session. After partial laryngectomy and the reconstruction of the laryngeal function, although the left cricoarytenoid joint was retained, the glottic fissure of the "new larynx" was small. The wound also cracked after infection and the reconstructed glottic scar increased. Six months after surgery, the laryngoscopy revealed anterior joint adhesions. Anterior joint adhesion reduces the glottic cavity and makes vocal cord adduction relatively easy, but the narrowed glottis causes larynx stenosis [12]. Patients have a strong desire for extubation. The scars before the combined laryngoscope laser was removed, the glottic fissure was widened, After vocalization and deep breathing training and tube blocking tests, the tracheal cannula was successfully removed. At present, more than 2 follow-up visits were made in one year.

Patients with large thyroid adenoma combined with laryngeal cancer have a high risk of postoperative sound loss. The quality of the sound is related to the location and extent of the disease, the degree of reconstruction, and whether scar hyperplasia is involved in the vocal cord movement during the rehabilitation process.

The recurring laryngeal nerve innervates all internal laryngeal muscles except the ciliary thyroid muscle, which is innervated by the superior laryngeal nerve, the sensation of the mucosa above the glottis is innervated by the superior laryngeal nerve, and the sensation below

the vocal cords and under the glottis is innervated by the recurrent laryngeal nerve. During partial laryngeal surgery, the recurrent laryngeal nerve and its branches that enter the larynx from behind the ring-shaped joint are protected behind the lower angle of the thyroid cartilage. It is important to prevent the accidental injury to the upper laryngeal nerve that enters the thyroid tongue duct membrane from behind the superior laryngeal artery when ligating the superior thyroid blood vessels. Carbon dioxide laser surgery has the advantages of being minimally invasive, having less surgical bleeding, and having faster postoperative recovery. It can also better preserve the vocal function for patients and is widely used in the treatment of patients with early-stage laryngeal cancer [13-15]. In this case, a carbon dioxide laser was used to remove the the scar aadhension to reconstruct the anterior vocal commissure structure to form an acute-angled glottis. The adhesion of the scar at the anterior vocal commisure may have resulted from the formation of the acute-angled glottis in the epiglottis during the formation of the epiglottis, which damages the periosteum of the epiglottis' new laryngeal surface and the postoperative infection causes the wound to crack and the hyperplasia of scars. During the surgery examined in the present study, utilizing the precision and conformability of microscope laser surgery, the acute-angled glottis was restored again. After nearly 2 years of follow-ups, the patient's voice was clear, and he could express a complete sentence at one time. However, laryngoscopy revealed that the glottis was slightly skewed and more experience was needed for the position of the cartilage incision during the epiglottic cartilage formation of the epiglottis.

For patients with giant thyroid adenoma and laryngeal cancer, postoperative complications include acute and chronic complications, such as accidental anesthesia, postoperative infection, and bleeding. Other complications include postoperative recurrence, residual tumor, secondary tumor, throat leakage, long-term dependence on a nasal feeding tube for feeding or percutaneous gastrostomy [16,17]. Postoperative complications of thyroid tumors include hypothyroidism, recurrent laryngeal nerve, and superior laryngeal nerve injury. Complications during neck dissections include chylous leak, paraneural injury, etc. The patient examined in this study had a giant thyroid adenoma with laryngeal cancer, which was able to be extubated smoothly, had basic articulation, and had a good oral intake. However, other complications, such as postoperative recurrence, secondary tumors, rickets, and hypothyroidism due to obesity and patients with concomitant diseases, such as diabetes, hypertension, and other chronic diseases need to be assessed regularly through long-term follow-ups. Prevention of further complications is, therefore, possible with good compliance from the patients. For supportive laryngoscope laser surgery and for cases that are difficult to expose in the anterior union and the tumor safety community [15], Liu *et al.* [18] recommended the combination of laser and thyroid cartilage plate windowing and Gu Quan et al. recommended Da Vinci Robotic Surgery. The surgical system has the characteristics of a more stable and flexible operation and a well-defined three-dimensional vision, which can make up for the deficiency of fiber CO_2 laser technology [19,20]. When the cost is not considered, the Da Vinci robot can be used reasonably in cases where it is difficult to expose the field and the operation is challenging.

In conclusion, multi-disciplinary tumor resection in the elderly population with laryngeal carcinomas and giant thyroid tumors was successful in the relevant literature reviewed. The risk prevention strategies for postoperative complications, including postoperative infection, difficulty in extubation, and a loss of sound are worth exploration. Furthermore, close follow-ups, increased surgical skills, and efficient equipment will provide new features to the surgical treatment of laryngeal cancer with huge thyroid tumors.

Riassunto

Descrizione delle strategie di prevenzione delle complicanze chirurgiche nel trattamento dei carcinomi laringei associati a tumore gigante della tiroide.

Per questo studio sono stati utilizzati i dati clinici di un paziente anziano con carcinoma laringeo associato ad un grosso tumore della tiroide, diabete e ipertensione. Il tumore del paziente è stato rimosso con un intervento chirurgico simultaneo operato dal dipartimento di chirurgia tiroidea e dal dipartimento di chirurgia laringea; il paziente è stato seguito per più di 3 anni e le cicatrici di granulazione tracheale e di aderenze laringee sono state rimosse con ripetuti interventi con laser.

La revisione della letteratura è stata effettuata sul database Wanfang, sul database China How Net e sul database MEDLINE tramite Computer. Le parole chiave di ricerca finali utilizzate per lo studio sono state "carcinoma a cellule squamose" e "glottide" o "laringe" / "laringeo", "chirurgia", "tumore alla tiroide" e "chirurgia simultanea".

Risultati: dopo completamento dell'intervento sono stati rimossi con successo il sondino naso-gastrico e la cannula tracheale, è stata ricostituita con successo la glottide e sono ripresi normalmente la respirazione orale, la fonazione e l'alimentazione per via orale.

Conclusione: l'approccio multidisciplinare per l'asportazione simultanea di un carcinoma laringeo associato ad un voluminoso tumore tiroideo in soggetto anziano con danni multi-sistema e multi-organo è stata realizzata con successo. Ci sono solo pochi casi di questo tipo presentati in letteratura, ad illustrare le strategie di prevenzione del rischio per complicanze postoperatorie, tra cui infezione postoperatoria, le difficoltà di estubazione e la perdita della fonazione, che meritano di essere conosciute.

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