Chapter

Swallowing Disorders in Cervical Facial Tumors

Daniela Vrinceanu and Mihai Dumitru

Abstract

We review current state of the art protocols on swallowing disorders associated to cervical facial tumors. The clinician needs to translate physiology notions to bedside diagnosis. Facing such a case the ENT surgeon must follow several key steps: thorough history taking, barium transit, endoscopy evaluation of swallowing, high resolution diagnosis imaging. Afterwards surgical treatment plan should take into consideration the need to careful dissection of vascular and nervous structures. Dysphagia may present from initial diagnosis or after surgical resection of the tumor or during radiation and chemotherapy. We discuss the use of various staging scales or questionnaires for assessing quality of life. We illustrate the importance of swallowing disorders management with various cases of tumors at the level of skull base, pharynx, salivary glands, larynx, esophagus, etc. There are various solutions for dysphagia ranging from nasogastric feeding tube placement to percutaneous endoscopic gastrostomy to specially designed exercises. Sometimes the surgeon neglects these disorders and focuses on airway management. However, the rule should be to encourage swallowing as soon as possible after surgery. A good nutritional status is necessary for a positive prognosis in swallowing disorders. Team effort in tertiary oncology units is the key in supporting such complex cases.

Keywords: tumors, cervical, facial, swallowing, disorders

1. Introduction

Pharyngeal dysphagia is defined as a disorder affecting the passage of food from the oral cavity to the stomach. When swallowing associates pain it is described as odynophagia. Tumors at the level of head and neck frequently associate dysphagia and odynophagia [1].

Swallowing disorders represent the first sign of tumor pathology in upper aerial and digestive tract. In 14–18% of the cases the isolated symptom of dysphagia requires a complete screening for primary occult tumors [2].

Surgical removal of cervical and facial tumors hinders swallowing process by removing parts from the pharyngeal muscles or nerves. Even for removal of benign tumors there may be inflicted lesions of cranial nerves responsible with swallowing and lowering the quality of life of the patient mostly because reconstruction achieves structural continuity but not function. Moreover, radiotherapy and chemotherapy lead to oral mucositis hindering correct swallowing [3].

After completing therapy, we can define a residual dysphagia. Unfortunately swallowing disorders become permanent in 40% of cases, diminishes in 39% of the

cases and worsens in 20%. In all these cases dysphagia needs further evaluation and require prevention of aspiration and improvement of quality of life [4].

In cervical facial tumors, dysphagia is connected to factors such as: direct extension of the tumor, aggressiveness of the surgical resection, radiotherapy and chemotherapy. Swallowing disorders may represent an element of diagnosis, an indicator of the postsurgical recovery and an important factor the quality of life [5].

2. Clinical physiology of swallowing

The swallowing process presents three stages: oral, pharyngeal and esophageal. All these stages are marked by activation of specific anatomical and functional connections enabling early diagnostic topography of dysphagia [6].

Oral stage is the only voluntary moment in swallowing. Aliments are submitted to mechanical transformation during mastication and mixture with saliva thus forming the alimentary bolus. Masseter muscles are central in mastication and are innervated by the motor branch of the trigeminal cranial nerve. Consistency of the bolus is also important during swallowing process enabling the correct backward movement towards the pharynx due to the pressure of the tongue on the soft palate. From this point swallowing is becomes uncontrolled and automatic [7].

During pharyngeal stage the bolus stimulates receptors at the level of the anterior region of the pharyngeal tonsils. Impulses from this level reach the brainstem initiating a series of reflex muscular contractions with simultaneous purposes: propulsion of the bolus through digestive tract and protection of superior airways. Therefore, the soft palate is stiffened closing the choana; palatal-pharyngeal arches are medial delineating a sagittal slit through which the bolus passes into the pharynx; epiglottis moves posterior over the laryngeal inlet; vocal cords adduct thus closing and the larynx is displaced anterior and upwards by external muscle groups [8].

All these contractions prevent the entrance of bolus in the larynx and trachea. Upwards movement of the larynx opens the esophageal inlet. Simultaneously the complex of the pharyngeal and superior esophageal sphincters relaxes enabling the passage from hypopharynx to superior esophagus. In the same sequence the entire posterior pharyngeal wall records the contraction of middle and inferior pharyngeal constrictor muscles towards the esophagus. All these processes last only 1–2 seconds [9].

Esophageal stage presents primary peristalsis waves and secondary peristalsis waves transporting the bolus till the stomach. Primary peristalsis continues the pharyngeal contraction and reaches the stomach in 8–10 seconds. Secondary peristalsis waves are generated by esophageal distension. These are initiated by the esophageal plexus and reflexes with afferent vague fibers to the medulla oblongata [10].

All three stages unite the control from cranial nerves IX–XII and trigeminal and facial nerves. Therefore six cranial nerves and more than 25 muscles are responsible for swallowing completion [11].

3. Neurology syndromes affecting cranial nerves

Syndromes affecting the last four pairs of cranial nerves are frequently encountered in cervical facial tumors mostly when superior jugular lymph nodes enlarge due to metastasis and compress these nerves and posterior cervical sympathetic trunk. Other scenario is regarding the evolution of skull base tumors extending to posterior cranial fossa [12].

Vernet syndrome was described in 1916 and implies affliction of cranial nerves IX, X and XI. These jugular foramina syndrome presents with: paralysis of half of the soft palate, paralysis of laryngeal recurrent nerve, paralysis of sternocleidomastoid and trapezius muscles on the same side. As etiology possible is trauma or external tumor compression at the level of the jugular foramina [13].

When a patient with the aforementioned syndrome has further lesion of the XII cranial nerve, we describe the Collet-Sicard syndrome. Hypoglossal paralysis leads to deviation of the protruding tongue towards the affected part and atrophy of the tongue on the same side after 6 months [14].

Involvement of the sympathetic chain leads to Horner syndrome associating enophthalmia, ptosis, myosis, vascular disorders and redness and sweating on the same side of the face [15].

Tapia described as early as 1905 a syndrome affecting nerves X and XII with recurrent laryngeal nerve palsy and tongue palsy on the same side [16].

Causes of these syndromes could be trauma, inflammation or tumor compression. So, facing the case of an isolated neurological syndrome with dysphagia one must take into consideration the possibility of a primary occult or high secondary metastatic cervical tumor [17].

4. Principles of positive diagnosis in swallowing disorders

From the very beginning the specialist should focus on complete history taking and symptoms accurate recording, pharyngeal clinical exam and swallowing clinical exam [18].

History taking is a key element in diagnosis of swallowing disorders. One should record: pain during swallowing, provocation of cough during swallowing, avoiding food with higher consistency, weight loss, prior history of pneumonia and other neurological diseases. Should be very clear the beginning of dysphagia and associated symptoms such as dysphonia and dyspnea. Very important is the exposure to tobacco smoke and alcohol consumption. Moreover, it is important to record other neurological symptoms as presences of herpes simplex virus lesions, previous trauma or other associated diseases such as diabetes. Another aspect is the swallowing difficulty with solids or liquids, because solid dysphagia points to a possible tumor while dysfunction with liquid aliments is encountered mostly in neurology diseases [19].

Clinical ENT exam should be thorough with an extensive flexible fiber endoscopy for occult tumors at the level of the rhinopharynx, palatine tonsils, tongue base, and pharyngeal-laryngeal junction. Analyze the dental status, use of dental prosthesis, dryness of the mucosa, tongue, lips and soft palate symmetry. Tactile sensibility of lips, tongue and pharynx should be also assessed. Very important is correct palpation of the neck for lymph nodes enlargement and thyroid pathology. There are documented cases in which a large goiter can compress the esophageal inlet and thus lead to dysphagia. A consistent amount of time should be allotted to cranial nerves exam along with a complete neurology consult [20].

Discovering a swallowing disorder requires a controlled passage test with aliments of different textures [21].

5. Objective analysis of swallowing disorders

There is hardly a consensus regarding optimum evaluation of pharyngeal dysphagia with various strategies at level of diagnosis center or country. ICON

2018 consensus querying five experts from four continents recommends functional endoscopic evaluation swallowing (FEES) and video fluoroscopic swallowing study (VFSS). FEES visualize the pharynx through a trans nasal endoscope and detect rapid movement of solid and liquid aliments with a high risk of aspiration. VFSS may be combined with conventional manometers and enables the correlation between motility and pressure patterns inside the lumen [22].

Also useful is barium transit which facilitates direct dynamic view of the swallowing process and aspiration of the contrast media in the larynx and trachea. Sometimes, the contrast media should be sterile and soluble for preventing aspiration lesions (**Figure 1**). Sometimes even a standard cervical column X-ray can reveal ossification of the anterior vertebral longitudinal ligament leading to Forrestier syndrome [23].

It is recommended the use of and objective evaluation scales such as the one designed by Carnell et al. According to this scale grade 1 is normal performance. Second grade is within functional limits with an abnormal oral stage but a normal diet. Third grade records mild impairment of the pharyngeal stage with a modified diet. Grade 4 requires further therapeutic precautions to minimize aspiration risk. Fifth grade notes the presence of aspiration. Grade 6 will require the use of enteral feeding support. Final grade presents with severe impairment and inadequate transit to esophagus [24].

This objective scale evaluates swallowing for introduction of parenteral nutrition and monitoring the patient evolution. The impact of swallowing dysfunction on quality of life is made through self-evaluating questionnaires. Such tools are: the swallowing questionnaire quality of life (SWAL-QOL) and SWAL-CARE and MD Anderson Dysphagia Inventory (MDADI). SWAL-QOL contains 44 questions reunited in several scores with the purpose of identifying patients with dysphagia. MDADI has only 20 questions with scales for emotional, functional and physical impact of dysphagia [25].

The best management decision takes into consideration both objective and subjective evaluations of swallowing dysfunction.

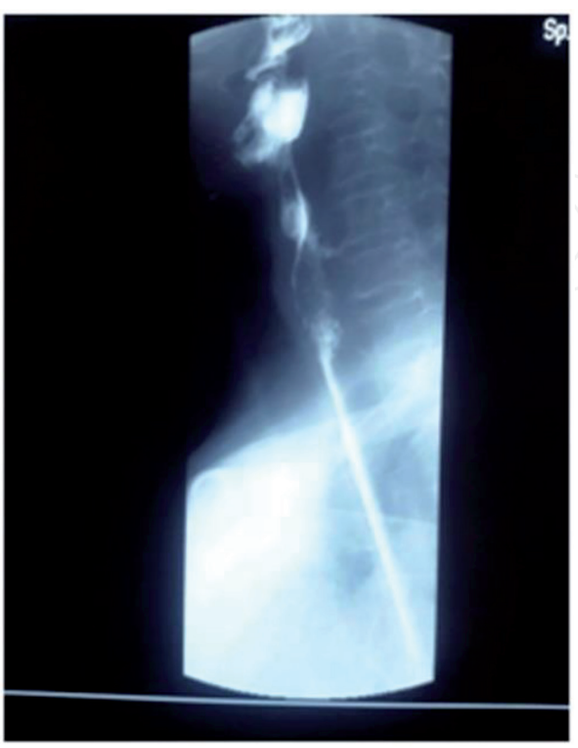

Figure 1.
Barium transit revealing obstruction and diminished passage of the contrast substance posterior to the larynx.

6. Imaging in swallowing disorders

Given the history data and clinical exam the next management step should be based on cranial and cervical CT scan or MRI imaging. Imaging enables correct planning of biopsy which is the gold standard in diagnosing tumors at the level of head and neck. A distinct chapter is primitive metastatic lymph nodes which require a thorough imaging screening for detecting the original neoplasm [26].

Up to this point the work-up should follow careful history taking, complete clinical exam, multi-level flexible endoscopy, barium enema with sterile contrast media, head and neck CT scan or MRI, targeted biopsy with pathology exam.

Differential diagnosis of swallowing disorders focuses on tumors if upper aerodigestive tract or a head and neck tumor, neurology syndromes or degenerative neural disease, infectious diseases such as herpes zoster, stroke, cervical vertebra pathology and rare conditions such as dilation of esophageal inlet [27].

7. Clinical aspects of dysphagia in cervical and facial tumors

Malignant tumors of the tongue and mouth floor have an important effect on deglutition. Large resections of the tongue require mounting a nasopharyngeal feeding tube for up to 14 days after surgery. This tube is necessary for preventing resection margins dehiscence and preventing aspiration. During these 2 weeks period the patient performs small exercises in order to develop compensatory mechanisms. Coughing before removal of the tube should require prolongation of its use [28].

Regarding malignant tumors of tongue base, we encounter a low survival with a diminished quality of life (**Figure 2**). Mostly in these cases the only management pathway available is centered on radiotherapy. Gastrostomy is necessary to be maintained up to 6 months and its removal should be attempted only after clinical and imaging confirmation of remission and low probability of bolus aspiration [29].

Nonetheless during palliative oncologic treatment, the nutritional status is very important because symptoms such as oral mucositis may contribute to weight loss and treatment failure.

Parotid gland tumors both benign and malignant greatly influence swallowing through various mechanisms. For example, sectioning the facial nerve will lead to poor preparation of the alimentary bolus during mastication. In many cases this aspect is neglected by the specialist surgeon already troubled by the facial neurologic deficit [30].

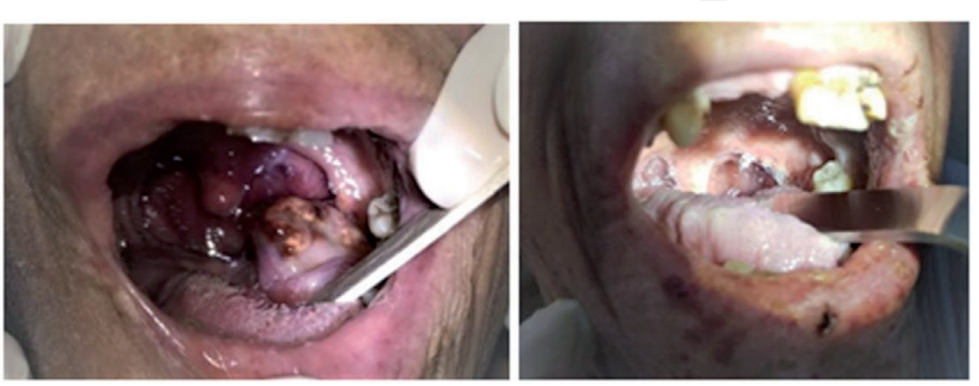

Figure 2.
Tumor in the left tongue base requiring resection for radical oncology surgery and thus leading to major swallowing dysfunctions.

Pharyngeal tumors associate swallowing problems from the very beginning. Unilateral pain during swallowing should grow the suspicion of a palatine tonsil tumor. After surgery many of the swallowing deficits are corrected using specially design exercises and head positioning during food intake. Facing a tumor on the posterior of the pharynx the swallowing dysfunction has an early onset but neglected by patients coming from poor economic environments with deficit in healthcare coverage (**Figure 3**). The current treatment possibilities are reduced to radio and chemotherapy after placement of gastrostomy [31].

Tumors at the level of the retro cricoids region present rapid onset of swallowing difficulties with marked weight loss and usually without voice hoarseness (**Figure 4**). Their evolution has a bad prognosis due to the invasion of recurrent laryngeal nerves and development of a Gerhardt syndrome. Often the gastrostomy procedure is preceded by tracheotomy [32].

Esophageal tumors have a clinical debut with swallowing difficulties with a rapid progression. When attempting surgical removal of the tumor the surgeon must take into consideration the reconstructive process with stomach or colon prior to performing gastrostomy. In these cases, the most difficult aspect is the risk of fistula and the cooperation of the patient during exercises in order to prevent aspiration of alimentary bolus [33].

Laryngeal tumors and their extension to the pharynx require total laryngectomy procedures with partial pharyngectomy and preservation during surgery of the middle and inferior constrictor pharyngeal muscles and negotiating between radical oncology and economy of the pharynx mucosa (**Figure 5**) [34].

Reconstruction of the new pharyngeal junction over the placement of a nasogastric tube held in place up to 14 days. Development of a salivary fistula implies the prolonged use of the nasogastric tube and forbidding any swallowing even for saliva in order to expedite healing. Correct food regimen through the probe is important in assuring the nutritional support to scar healing. After removal of the nasogastric tube after total laryngectomy it will be given only half solid aliments able to pass through the new pharyngeal inlet without the use of the muscular fibers removed during surgery. Patients undergoing vocal training also surpass swallowing disorders quicker in the next 3 months [35].

Lymph node metastasis can generate swallowing disorders due to compression over cranial nerves IX–XII (**Figure 6**). Ideally during neck dissections proceed carefully in order to preserve hypoglossal nerve [36].

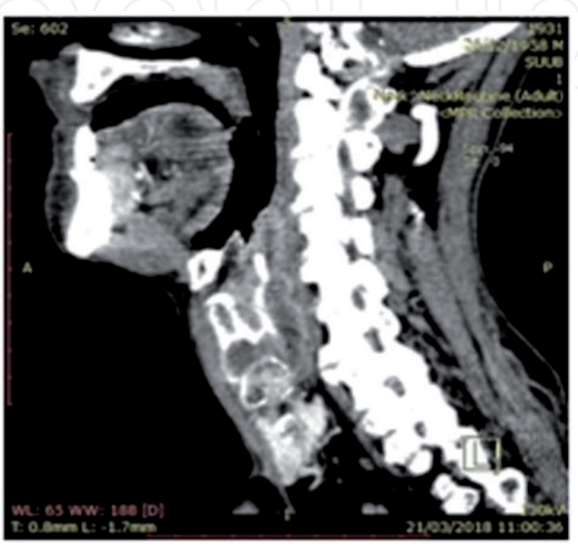

Figure 3.
Carcinoma of the posterior wall of the pharynx with complete dysphagia.

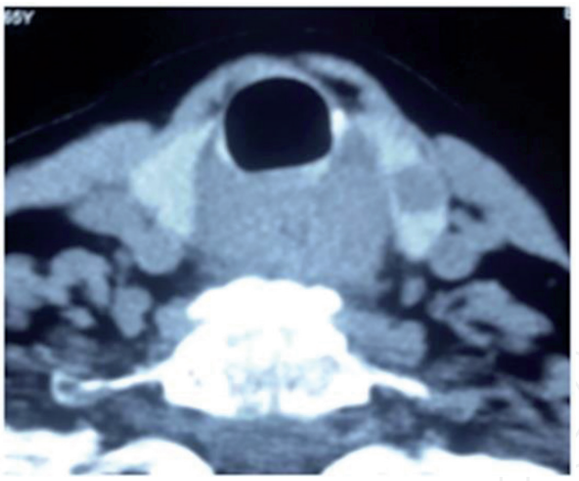

Figure 4.
Tumor behind cricoids cartilage with complete obstruction.

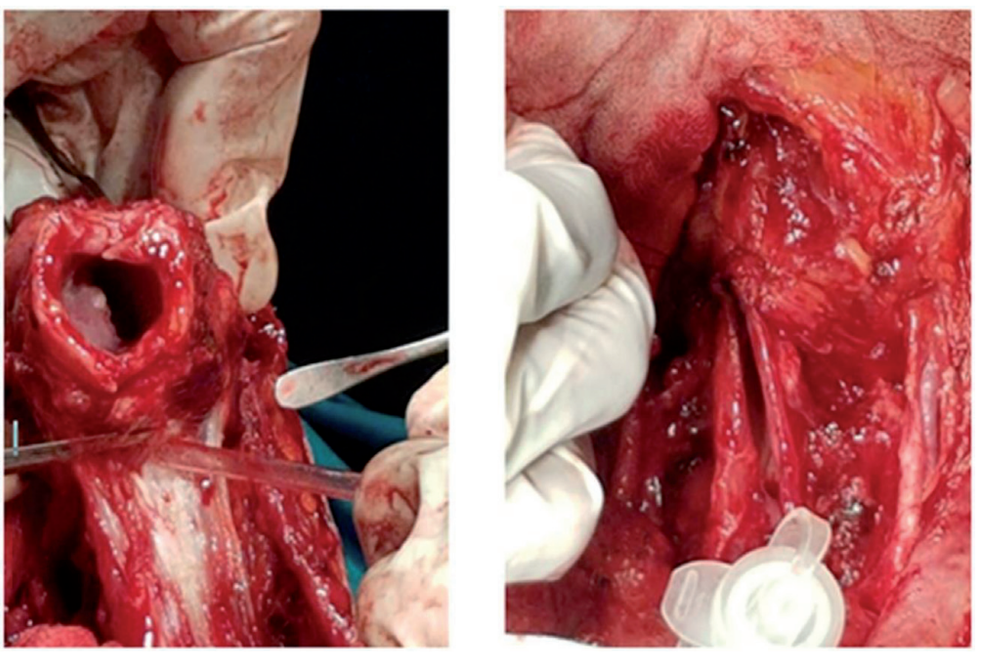

Figure 5.
Reconstruction of the pharynx after total laryngectomy with preservation of the constrictor pharyngeal muscles.

Regarding brachial cysts, lymphangiomas, schwannomas and lipomas their surgical removal implies preservation of neural function. Up to 12% cases with vagus schwannomas present swallowing disorders prior to surgery. After surgery 85% of the cases become dysphonic and even develop Horner syndrome. An extensive informed consent of the patient should be obtained before surgery. Also, the phoniatric treatment should begin as soon as possible after surgery [37].

Carotid body and glomus tumors are benign in nature but difficult to treat. Swallowing disorders are rare before surgery and caused by the contact between the tumor and lateral pharyngeal wall. During surgical dissection sometimes is necessary to section the superior laryngeal nerve with diminished swallowing function for 14 days after surgery. Clinical exam reveals a slight paresis of soft palate and vocal cord on the same side. Steroid therapy and supplementary vitamin B are very useful. Food intake should be in small quantity with anterior neck flexion usually without the need for a nasogastric tube [38].

Parapharyngeal tumors have a latent debut of the symptoms. Frequently these are benign tumors but grow in size and compress adjacent structures. Swallowing

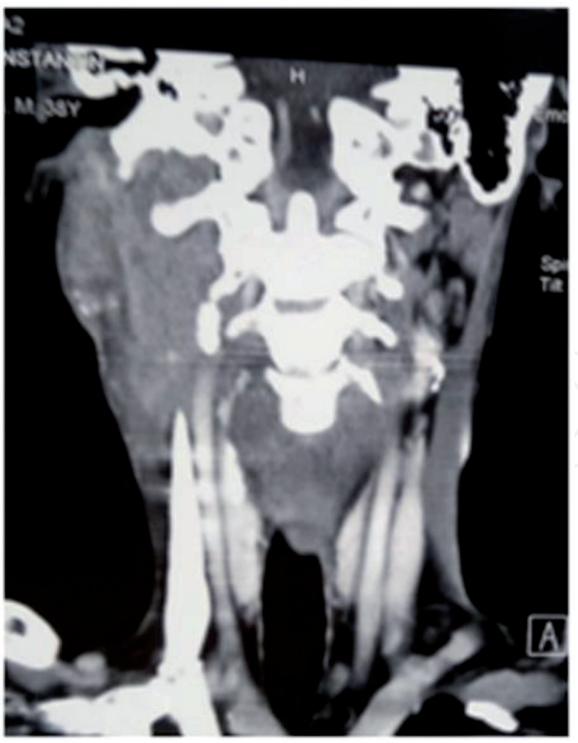

Figure 6.
Metastatic lymph node in the skull base with compression of cranial nerves IX–XII and swallowing disorders.

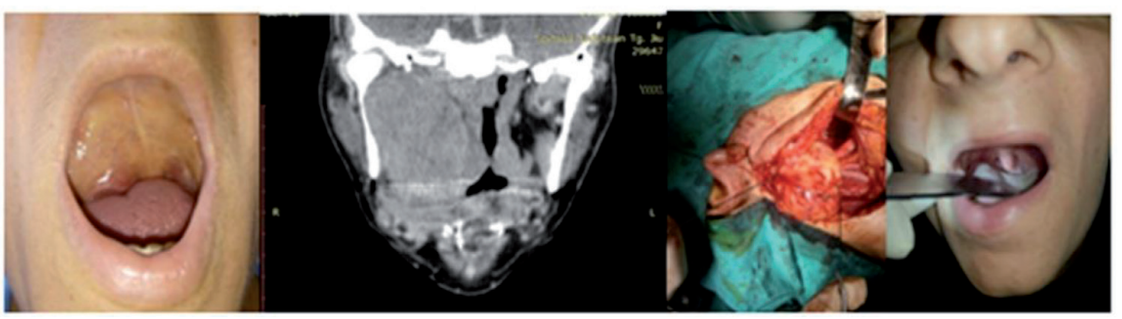

Figure 7.
Parapharyngeal schwannoma with progressive swallowing dysfunction and complete recovery after surgery.

disorders may be the first signs of this pathology. Masses in front of the styloid process grow towards lateral pharyngeal wall between the superior pole of the palatine tonsil and the Eustachian tube. During clinical exam is noted the protrusion of the pharyngeal wall towards the soft palate and sometimes it may be mistaken for a peritonsillar abscess (**Figure 7**) [39].

Absence of fever and trismus indicates the possibility of a parapharyngeal tumor and requires high resolution CT scan or MRI. During surgery perform careful dissection of the cranial nerves X–XII, the later in close contact with the lateral pharyngeal wall. If this dissection is successful swallowing dysfunctions resolve after local edema retraction in 4 days without further complications [40].

Frequently these tumors are pleiomorphic adenomas of minor salivary glands or derived from the profound lobe of the parotid gland. These tumors evolve behind the styloid process neighboring internal carotid artery, internal jugular vein, cranial nerves IX–XII and cervical sympathetic chain. Swallowing disorders are secondary in these cases and their prognosis depends on the chance of a radical surgical removal and further use of radiation and chemotherapy [41].

Masses from retropharyngeal space are rare. Their approach is transoral if imaging studies tend to support a benign tumor like schwannoma. Swallowing disorders

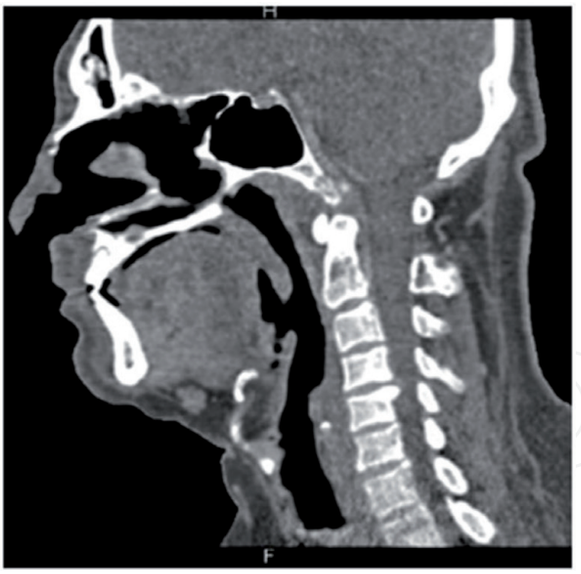

Figure 8.
Metastasis at the level of the skull base on the right side with origin in the kidney and associating paralysis of the right hypoglossal nerve and right recurrent laryngeal nerve with severe swallowing disorders.

usually disappear after tumor ablation. Nasogastric tube should be used till complete healing of the incision on the posterior pharyngeal wall [42].

Skull base tumors produce dysphagia and dysphonia through compression of cranial nerves IX–XII leading to the aforementioned neurology syndromes. Frequently such tumors are metastasis from distant primitive tumors, for example renal malignant tumors (**Figure 8**). These primitive origin tumors must be documented carefully and should benefit from maximum oncologic therapy according to specific guidelines. Otherwise tackling the secondary distance metastasis is not recommended because of the poor vital prognosis of the patient [43].

8. Swallowing disorders secondary to oncologic treatment

During radiation therapy the patient complains of an early onset swallowing difficulty due to oral and pharyngeal mucositis and a latent dysphagia produced by muscular fibrosis. Secondary xerostomia is produced by fibrosis of the salivary glands affected by radiation field and can become permanent [44].

WHO developed a scale for oral mucositis starting from grade 0 without mucositis, first grade with erythema, second grade with ulcers, in grade 3 is necessary to have only a liquid diet and the last stage in which the alimentation is not feasible [45].

9. Treatment principles for swallowing disorders associated to cervical facial tumors

The management of these swallowing disorders should focus on three stages: before tumor ablation, during treatment modality and after oncologic treatment. Tumor ablation may be achieved through surgery, radiation or chemotherapy. Before this stage the patient must be prepared to withstand treatment aggression through parenteral nutrition. For optimum nutritional status is also recommended the use of a gastrostomy either classic or PEG. The maximum treatment modality comprises surgical ablation with anatomy reconstruction but not always with great

functional results. In this stage the use of nasogastric tube is a facile technical solution in order to gain the necessary time for proper pharyngeal sutures healing. At this stage an important aspect the need for an increase uptake in albumin and other proteins to facilitate tissue scaring. The stage after oncologic treatment unfortunately in many cases records the presence of definitive gastrostomy. Palsy of cranial nerves IX–XII will benefit from administering steroids and B vitamins supplements along with phoniatric exercises [46].

There are some practical aspects to analyze starting from the complete informed consent of the patient regarding the functional outcome of cervical facial surgery with targeted oncologic resection. Most often the surgeon is focused on airway complications and tends to neglect the swallowing dysfunctions. There is a shortage of trained specialists for recovery of swallowing disorders. Ideally in every head and neck oncology center there should be a team of specialists focused on early recovery of swallowing and speech dysfunctions [47].

Nutrition after surgery is very important for an optimum physical and psychological recovery of the patient being an important element of the quality of life. The presence or absence of swallowing disorders after surgery is a prognostic factor for the positive evolution of the patient. The evaluation of dysphagia should be part of standard oncology survey. Monitoring the body weight is an indicator of favorable evolution of the patient according to current oncologic nutrition protocols [48].

For recovery after swallowing disorders there are various compensatory strategies: adapting the posture while swallowing with the chin, head rotation or combined movements. For patients with significant tongue resections can be used palatal augmentation or reshaping prosthesis [49].

10. Conclusions

The ENT specialist encounters swallowing disorders in cervical facial tumors as an early diagnosis element, an aspect of surgical procedures and surgical healing and a residual symptom after radiotherapy or chemotherapy. History taking is a key element in diagnosis and the specialist should record pain during swallowing, provocation of cough during swallowing, avoiding food with higher consistency, weight loss, prior history of pneumonia and other neurological diseases. Should be very clear the beginning of dysphagia and associated symptoms such as dysphonia and dyspnea. Clinical ENT exam should be thorough with an extensive flexible fiber endoscopy for occult tumors at the level of the rhinopharynx, palatine tonsils, tongue base, and pharyngeal-laryngeal junction. A consistent amount of time should be allotted to cranial nerves exam and complete neurology consults.

For objective evaluation of swallowing disorders in cervical facial tumors the barium transit can be very useful because it facilitates direct dynamic view of the swallowing process and aspiration of the contrast media in the larynx and trachea. In some particular cases, the contrast media should be sterile and soluble for preventing aspiration lesions during examination. It is important to have an objective scale to evaluate swallowing for introduction of parenteral nutrition and monitoring the patient evolution. A subjective evaluation of the impact of swallowing dysfunction on quality of life is made through self-evaluating questionnaires which can be very useful in monitoring the evolution, too.

The management of these swallowing disorders should focus on 3 stages: before tumor ablation, during treatment modality and after oncologic treatment such radiation and chemotherapy. For optimum nutritional status is also recommended to use a gastrostomy classic or PEG. The maximum treatment modality comprises surgical ablation with anatomy reconstruction but not always with great functional

results. In this stage the use of nasogastric tube is a facile technical solution in order to gain the necessary time for proper pharyngeal sutures healing. Also, an important aspect is the need for an increase uptake of albumin and other proteins to facilitate tissue scaring. A good nutritional status is necessary for a positive prognosis in swallowing disorders. Palsy of cranial nerves IX–XII will benefit from administering steroids and B vitamins supplements along with phoniatric exercises. It is important to make a complete informed consent of the patient regarding the functional outcome of cervical facial surgery.

There is a shortage of trained specialists for recovery of swallowing disorders. Ideally in every head and neck oncology center there should be a team of specialists focused on early recovery of post-therapeutically swallowing and speech disorders. Special exercises should begin as soon as possible after surgery with specific alimentary bolus volumes for every case. The swallowing disorders in cervical facial tumors are an important element for monitoring patient evolution, because a patient without dysphagia after therapy has a good local evolution and also an increased quality of life.

Author details

Daniela Vrinceanu[1*] and Mihai Dumitru[1,2]

1 ENT Department, Emergency University Hospital, Bucharest, Romania

2 Anatomy Department, Carol Davila University of Medicine and Pharmacy, Bucharest, Romania

*Address all correspondence to: vrinceanudana@yahoo.com

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