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Abstract

The clinical examination forms the fundament for decision making in a patient with an extended parotid tumor. The examination starts with an elaborate interview of the patients looking for clinical hints for a malignant disease. The clinical examination comprises a complete head and neck examination including an investigation of all major salivary glands. Thereafter, ultrasound is the first-choice imaging technique for an immediate assessment of the parotid tumor. If available, fine-needle aspiration cytology (FNAC) continues the diagnostic workup. FNAC will determine whether the parotid tumor process is malignant. Core-needle biopsy or an open biopsy may offer an additional effective diagnostic tool in cases in which FNAC has failed to provide a definitive diagnosis. In extended parotid tumors, often the situation will occur that ultrasound does not allow visualizing the parotid tumor completely, due to its location in the deep lobe. In such a situation, or if FNAC or a biopsy argue for a malignant disease, further imaging with computed tomography (CT) or magnetic resonance imaging (MRI) are indicated. MRI is the first choice. If a malignant parotid tumor is suspected, MRI and CT scanning are important for the tumor staging of the primary tumor and the neck.

10.1 Introduction

The clinical diagnosis of an extended parotid tumors starts with a history and examination of the complete head and neck region including all

salivary glands and not only the affected parotid gland [1, 2]. Concerning the differential diagnosis, the duration of the history and the clinical features of the tumor are relevant. Any history of systemic disease should also be carefully assessed as the parotid tumor can be the expression of a systemic disease. Nevertheless, the symptoms of a parotid mass are often nonspecific. Several investigative methods might be necessary to confirm the final diagnosis. Sonography is the easiest, a cheap, noninvasive, and fast method for

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completing the initial clinical examination. Sonography is appropriate to get an overview about the dimension of the tumor and its relation to the neighboring structures. Sonography can be immediately combined with fine-needle examination of the tumor itself but also neighboring structures if there is any suspicion that the mass has expanded outside the parotid space.

10.2 Medical History and Important Clinical Signs

A careful history will often already confirm a probable diagnosis of a parotid tumor and rule out other diseases, respectively [1]. The duration of the disease, the description of the symptoms, and the patient's age in particular are important: Developing an extended parotid tumor takes time. It is not an acute disease occurring within a few days, although the patient might have detected the disease as a painless swelling only a few days before the consultation. Especially malignant tumors are more frequent in older age (>60 years of age). Older age may contribute to a delayed notice of the parotid tumor. Normally, a parotid tumor does not disturb the salivary function of the affected gland. Due to his larger size, an extended parotid tumor could lead to an obstruction of the main excretory duct (Stenson's duct). A blockage of the saliva flow usually does not affect the moistening of the mouth and throat because the other major salivary glands work normal. But such a blockage could produce symptoms similar to a blockage by sialolithiasis, i.e., acute painful swelling of the affected gland related to eating, which gradually subside after eating, and rising of the pain again with the next meal.

Ultrasonography or other imaging (see below) excludes this differential diagnosis of sialolithiasis.

If the obstruction exists over a longer period, the accumulation of saliva could lead to a retrograde bacterial infection. Untreated, the parotid gland even can become abscessed. Both infection and abscess can obscure the parotid mass as primary disease. Therefore, persistent swelling after

antibiotic treatment of a local infection or abscess drainage has to be inspected for a persistent parotid mass.

Primary and secondary, benign and malignant parotid tumors usually present as painless enlargement [2]. Both benign and malignant tumors typically manifest as a slowly growing tumor. If the patient presents case of an extended parotid tumor, this fact alone, unless proven otherwise, argues for an aggressive and malignant tumor. A primary tumor typically involves only the affected parotid and surrounding structures but not the other salivary glands. Lymphomas and metastases are the only malignant parotid tumors that might occur bilaterally. There are at present no specific clinical signs, tests, or tumor markers available to definitively predict malignancy of the discovered parotid tumor. Smoking is the only known risk factor, but only for a Warthin tumor. Warthin tumors normally do not present as parotid tumor with extension beyond the parotid space. Fast growth but also a sudden growth spurt of the mass, local pain, immobility of the mass, skin infiltration, and concurrent facial palsy are indicators for a malignant disease. Pain may be an expression of the tumor infiltration into the surrounding structures. Facial palsy typically occurs due to a facial nerve infiltration by the tumor. The incidence of facial nerve infiltration by parotid cancer with consecutive facial palsy on presentation has been reported to be <20 %.

A direct sign of the extension of the tumor into the neighborhood beyond the parotid space is an immobility resulting from a fixation to adjacent tissue. Thereby, by proceeding infiltration, the overlying skin or mucosa or the adjacent tissues may become swollen, inflamed, or even ulcerated. Complaints indicating an extension of the parotid tumor beyond the parotid space are:

- Muscle weakness on one side of the face
- Numbness in part of the face
- Persistent local pain in the parotid
- Dysphagia
- Difficulty in opening the mouth

Nevertheless, it has to be emphasized that most patients with parotid cancer present with a

slowly enlarging, painless mass. A discrete mass in an otherwise normal-appearing gland is the usual finding. Even the local extension into the surrounding tissue might be discrete and symptomless.

10.3 Clinical Examination

Examination of the patient comes first and is the basis of any diagnostic workup for patients with parotid masses. Further investigations are directed on the results of the clinical examination. The clinical examination comprises a complete head and neck examination including an investigation of all major salivary glands (Fig. 10.1). Otoscopy or ear microscopy, for instance, is important to detect or rule out an extension of the parotid tumor in posterior direction through infiltration of the outer ear canal. Inspection of the mouth is mandatory to detect an extension of the tumor into the parapharyngeal space. This is indicated by a swelling or displacement of the tonsillar region. The salivary gland examination includes bimanual palpation of the upper neck tissues located under the mandible for the submandibular and sublingual glands and anterior to the ear for the parotid gland. In order to detect a lump, all major salivary glands, not only the suspicious gland, are palpated for masses and asymmetry of the soft tissues around the mandible and anterior and inferior to the ear. Especially for extend tumors, it is necessary to perform bimanual palpation of the salivary gland in order to detect dumbbell-shaped tumors that grow into the deep lobe of the parotid gland and to evaluate lateral pharyngeal wall extension. It is to check if the parotid tumor is mobile or fixed, as fixation is a sign of malignant tumor infiltration, especially when also the skin is involved into the fixation. Involvement of the masseter muscle or of the deeper lying pterygoid muscles is indicated by painful or painless trouble or blockage to open the mouth. Asking the patient to clench on his teeth also helps to demarcate the masseter muscle from the parotid gland and the tumor mass. Movement of the tumor mass during contraction of the masseter muscle is a hint for an

extension of the tumor into the masseter muscle. A secondarily acute inflamed parotid gland is tender, while the gland is usually non-tender beyond the tumor mass. Fever and swelling, pain, or erythema over the affected parotid gland can go along with the acute sialadenitis. Erythema combined with fluctuating swelling in the region of the mass is a signal for a secondary abscess formation. Abscess formation can be confirmed by ultrasound examination (see below) and/or puncture and aspiration of pus. Of course, the neck is also examined for lymphadenopathy, in case of the malignant parotid tumor to clinically stage the neck.

Intraoral inspection and bimanual palpation and massage of the submandibular gland duct orifices anterior to the base of the tongue in the floor of the mouth and parotid gland duct punctum opposite to the upper second molar are necessary in order to assess the salivary flow out of the related salivary duct punctum. In a healthy patient, massaging the parotid gland from posterior to anterior expresses clear saliva from the parotid duct. Purulent saliva is expressed when there is bacterial parotitis, and clear saliva with small yellow curds may be expressed in chronic sialadenitis. Both parotitis and chronic sialadenitis accompany and thereby camouflage a parotid tumor. If no saliva appears, a blockage of the salivary duct or severe chronic sialadenitis might be the underlying reason.

It is mandatory to evaluate the facial nerve (VII) function (Fig. 10.2): Both facial symmetries at rest and during movement have to be examined in all facial regions in order to detect even minor and partial facial nerve palsy [3]. In case of a facial palsy, electrodiagnostics is recommended. Electromyography can reveal signs of a degenerative lesion of the facial, indicating a malignant etiology in case of a parotid tumor [4, 5]. Sensation of the facial skin has to be tested to check the function of the trigeminal nerve (V). Of utmost importance is the testing of the maxillary nerve (V2) as this branch is passing the skull through the foramen rotundum to cross the pterygopalatine fossa. Numbness in the dermatome V2 is indicating a parotid tumor with infiltration of the pterygopalatine fossa. The cranial nerve

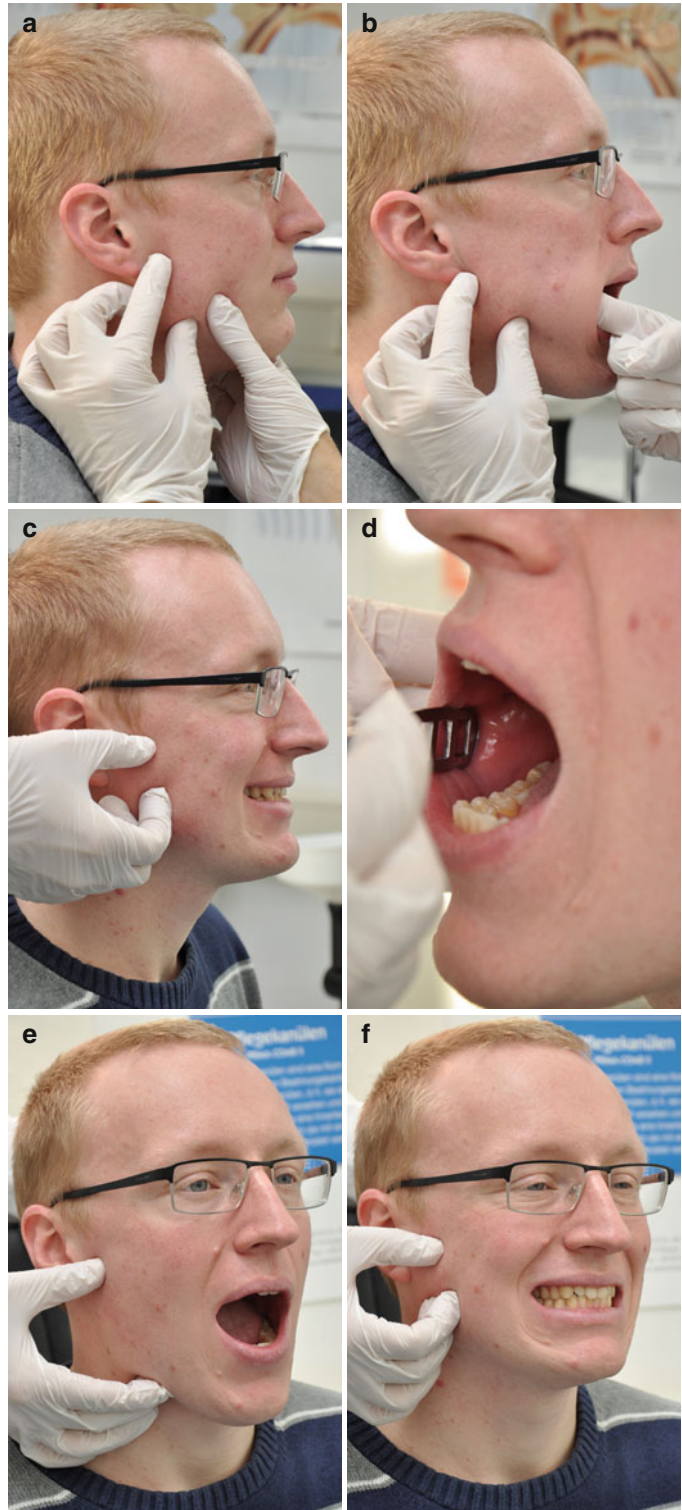


Fig. 10.1 Additional examinations in patients with extended parotid tumors. (a, b) Bimanual palpation of the parotid tumor in the right parotid gland. (c) Clenching the teeth helps to determine an infiltration of the masseter muscle. (d) Inspection of the orifice of the Stenon's duct. (e, f) Opening the mouth and clenching teeth are tests to discover functional deficits of the chewing muscles because of a tumor infiltration

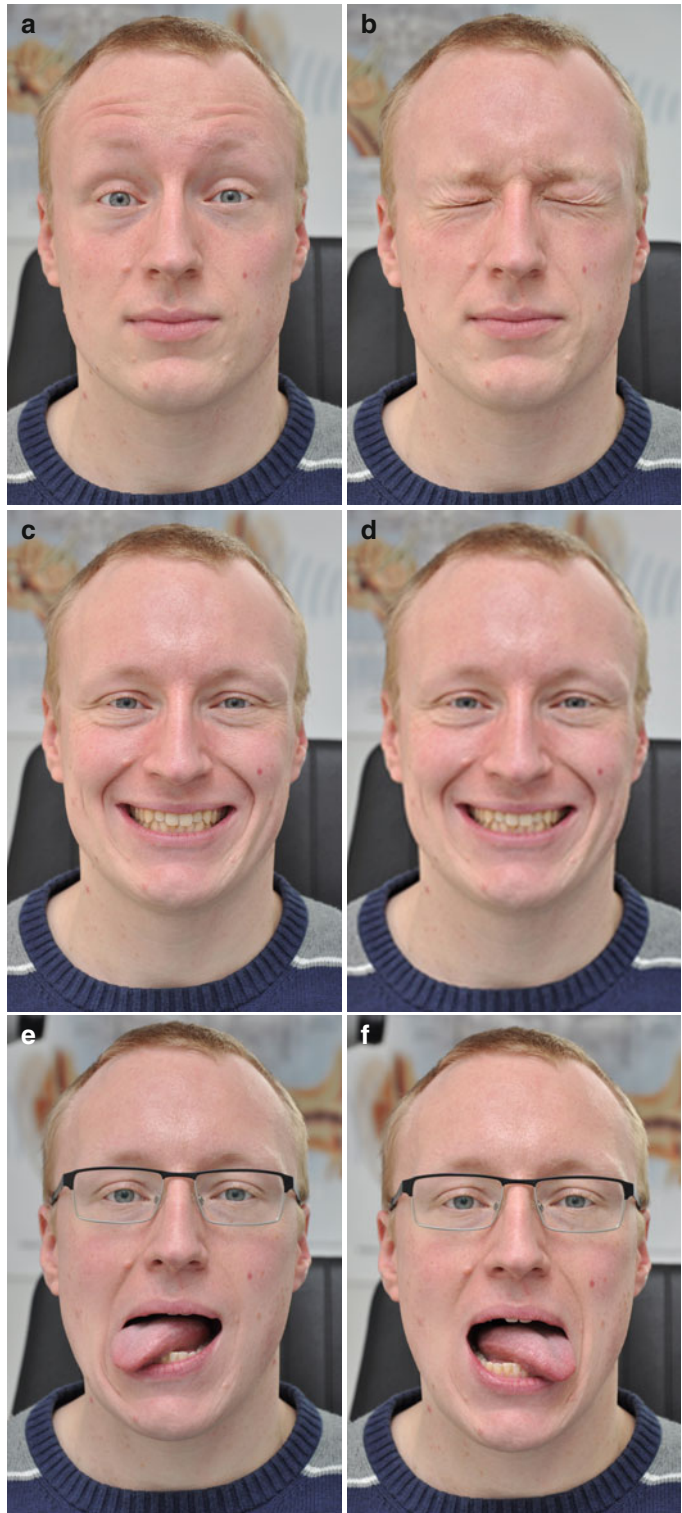


Fig. 10.2 (a–f) Examination of facial nerve function

examination should be completed. Of particular attention are also the glossopharyngeal nerve (IX), vagal nerve (X), and the accessory nerve (XI) because they are all exiting the skull through the jugular foramen. Functional deficits of these cranial nerves are signifying a tumor extension along the skull base up to the jugular foramen. Nearby is the hypoglossal canal for the hypoglossal nerve (XII). Therefore, tongue function has to be tested, too. Besides, normal hypoglossal function is a prerequisite to use this nerve for facial reanimation in case of severe facial nerve lesion (see Chap. 21).

10.4 Serologic and Saliva Examinations

The indication for serology tests is limited to differential diagnosis [6]. There are so far no specific serology tests for parotid tumors specific enough to be incorporated into clinical practice. In case of severe secondary acute bacterial sialadenitis, it might be necessary to analyze saliva samples to identify pathogens and their antibiotic resistance profile in some special or refractory situations or when a salivary abscess develops [7].

10.5 Ultrasound

Ultrasound is a quick, noninvasive, and inexpensive method to assess parotid tumors and their extension without any radiation exposure [8, 9]. If it is available, ultrasound is the first-choice imaging technique for assessing the salivary glands and a parotid tumor. The method is presented together with the clinical examination as both go hand in hand, at best by the same examiner, and can even be combined with fine-needle aspiration cytology (FNAC; see below and Fig. 10.3) [10]. In many European countries in Europe, ultrasound examination of the head and neck is part of routine training for head and neck surgeons. Ultrasonography usually is performed using linear-array transducers with a frequency of 7–12 MHz. The entire salivary glands and all



Fig. 10.3 Ultrasonographic examination of parotid tumor of the right side including fine-needle aspiration cytology

pathologies have to be evaluated and documented in frozen images on at least two perpendicular planes during ultrasonography [11]. The whole neck and both thyroid lobes are also be scanned to assess any potential lymph node enlargement and to search for concomitant or related disease. In large lesions as it is often the case in parotid tumors with considerable extension, additional transducers with a lower frequency are advisable in order to delineate the lesion completely. Using the color Doppler and the power Doppler imaging mode, the method is helpful for assessing the vascularity of the tumor and in deciding whether a mass lesion is solid or cystic. It is important to notice the limitations of the method: Ultrasonography is operator dependent and does not allow complete cross-sectional imaging of the parotid gland like with computed tomography or magnetic resonance imaging. The deep lobe of the parotid gland may be difficult to visualize or even impossible due to the adjacent mandible.

Parotid tumors with extension often affect the deep lobe. Therefore, ultrasound might underestimate the tumor size in the depth. In addition, ultrasound does not show the extratemporal facial nerve and its branches. Ultrasound is not suited to evaluate a tumor infiltration of the skull base or of the mandible.

From the point of view of the ultrasound examiner, it is important to know that the parotid gland is located in the retromandibular fossa, anterior to the ear and sternocleidomastoid muscle. Extended parotid tumors can infiltrate or displace the sternocleidomastoid muscle. Parts of the superficial lobe cover the mandible and the posterior part of the masseter muscle. Extended parotid tumors can also infiltrate or displace the masseter muscle. The intraparotid facial plexus of the facial nerve is normally not visible with standard sonography. The retromandibular vein is the landmark to separate approximately superficial and deep lobe of the gland. The deep parotid lobe can only partially be visualized. Parts are hidden behind the mandible. Therefore, parts of an extended parotid tumor reaching the deep lobe can also be hidden behind the mandible. Stenson's duct, lying on the masseter muscle, is seldom visible with standard ultrasonography unless dilated by obstruction. Normal parotid lymph nodes have a hyperechoic hilum, a short axis of <5 to 6 mm, and central vessels may be seen with Doppler ultrasound.

The parotid gland has high acoustic impedance and a homogeneous echotexture. Therefore a parotid tumor is easily detected within a normal echogenic parotid gland [12]. Ultrasound is not able to differentiate a benign from a malignant tumor. It only can give indirect hints for a malignant disease: Malignant tumors generally have a hypoechoic texture and irregular shape and have poorly defined borders. The presence of metastatic-appearing lymph nodes accompanying the tumor in the parotid gland is another hint for a malignant disease. However, malignant tumors may look just the same as benign tumors on ultrasound. Skull base involvement in malignant tumors cannot be proven. In case of secondary inflammation, the demarcation of the tumor from the surrounding inflamed parotid tissue might be impaired.

10.6 Fine-Needle Aspiration Cytology

FNAC is an important and reliable tool in the diagnostic workup of parotid tumors [13, 14]. However FNAC continues to be a matter of debate among some head and neck surgeons. It is not available in all centers dealing with salivary gland diseases. One major problem is that the accuracy of FNAC stands or falls with the availability of adequately trained cytopathologists with the requisite skills and experience. The aim of FNAC and the subsequent cytological examination is to determine whether the parotid tumor process is inflammatory and/or reactive, benign, or malignant and if possible to give a specific diagnosis. Knowing beforehand whether the parotid tumor is malignant might aid in surgical planning, may expedite or delay the decision in favor of surgery, and is important for patient counseling. If the lesion is small or is localized deep in the parotid tissue, it can be helpful to perform FNAC under sonographic control. If initial FNAC did not reveal a clear diagnosis, it might be necessary to repeat the procedure.

10.7 Parotid Biopsy

A parotid biopsy allowing a histological examination of the tissue is possible by core-needle biopsy or by open biopsy [15]. Core-needle biopsy may offer an additional effective diagnostic tool in cases in which FNAC has failed to provide a definitive diagnosis and the aim is to avoid open biopsy. In order to avoid accidental puncture of large blood vessels, core-needle biopsy should always be carried out under ultrasound control. Local anesthesia is needed. In the hands of an experienced pathologist, the accuracy of ultrasound-guided core-needle biopsies is comparably high as final histological findings. An open parotid biopsy is only indicated when the likely diagnosis of a pleomorphic adenoma has been excluded to avoid cell spreading of the pleomorphic adenoma. In cases of extended parotid tumors, especially with skin infiltration, an open tissue biopsy is a fast way to assure a malignant disease.

10.8 Magnetic Resonance Imaging and Computed Tomography

In extended parotid tumors, often the situation will occur that ultrasound does not allow visualizing the parotid tumor completely, due to its location in the deep lobe. In such a situation, or if FNAC or a biopsy argues for a malignant disease, further imaging with computed tomography (CT) or magnetic resonance imaging (MRI) is indicated [16, 17]. These methods are presented in detail in Chap. 11. If ultrasound is not available or does not demonstrate a clear tumor margin or capsule, MRI is the first choice [18]. If a malignant parotid tumor is suspected, MRI and CT scanning are important for the tumor staging of the primary tumor and the neck.

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