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PAROTIDECTOMY FOR PAROTID CANCER

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SYNOPSIS

Parotidectomy for parotid cancer included management of primary salivary cancer, metastatic cancer to lymph nodes and direct extension from surrounding structures or cutaneous malignancies. Preoperative evaluation should provide the surgeon with enough information to plan a sound operation, reconstruction when needed and adequately counsel the patient. Facial nerve sacrifice is sometimes required but in preoperative functioning nerves, effort should be taken to preserve function. While nerve involvement predicts poor outcome, with a sound oncologic procedure and adjuvant therapy survival of around 50% has been reported for primary parotid malignancy. Metastatic cutaneous squamous cell carcinoma is often a high grade aggressive histology where local control for palliation with an extended parotidectomy can be achieved however overall survival remains poor most often secondary to distant metastasis.

Keywords

Parotid Cancer; Parotidectomy; Facial nerve; Accessory Parotid Gland Carcinoma

Introduction

Malignancy of the parotid gland requiring surgical management can be considered in three groups. First include primary parotid salivary malignancies. While this group represents a small minority of head and neck tumors overall, parotid cancers represent a high percentage of salivary malignancies. Next, when working up a parotid malignancy metastatic disease must be considered. This second group most commonly includes cutaneous malignancies (melanoma and non-melanoma) however may rarely involve metastatic disease from a distant site. A third less common but encountered situation that requires surgical management is direct extension of tumor into the parotid gland. This can be seen in cutaneous malignances such as in neglected basal cell carcinoma or extension from an

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advanced oral cavity tumor. For all three categories, local control goals and the anatomy encountered maybe similar. However, long term outcomes may vary greatly and therefore overall goals of surgery should be considered when deciding extent of surgery, degree of radicality and preservation/sacrifice of structure and function. As already discussed in a separate chapter, the histology of primary salivary malignancies is vast and outcomes vary. For metastatic disease to the parotid gland, this often represents a biologically aggressive tumor which may harbor features of perineural invasion and a propensity for distant spread. In the current chapter we will discuss Parotidectomy for Parotid Cancer: preoperative evaluation, technique, adjunct tools and the controversies.

Preoperative Evaluation

Preoperative approach to malignant disease in parotid tumors focuses on having adequate knowledge to plan the surgery as well as counsel the patient and manage expectations. As discussed, most parotid tumors are benign and other than a detailed history and physical exam additional diagnostic testing rarely alters surgical planning in the majority of cases with well circumscribed, mobile, slowly growing masses. However, when the history is atypical, the mass is ill-defined, or facial nerve (FN) involvement is present, or there is skin involvement, additional testing may offer information that defines anatomic boundaries when planning the extent of surgery as well as be useful with patient consulting. Additionally, if preoperative evaluation suggests FN sacrifice is likely, acquiring a team that can address facial reanimation at the time of surgery is beneficial. We will discuss the history and physical exam with emphasis on findings associated with malignancy, radiographic assessment, and tissue diagnosis.

History and Physical Exam

Stigmata of Parotid Malignancy

- Rapid Growth-Fixed Mass
- Pain
- FN paralysis
- Skin Involvement
- Nodal Metastasis

Rapid growth, pain, and FN paralysis represent the stigmata of parotid malignancy however in three quarters of cases[1], patients will present with an asymptomatic preauricular mass. Pain while can sometimes point to infection or inflammatory disease is present in 44% of patients with carcinoma [2]. Facial palsy should always raise suspicion for malignancy, and is present in 12 to 19% of patients with a malignant parotid mass independent of tumor size [1–3].

Importantly, in patients diagnosed with “Bell’s Palsy,” that does not improve or worsens, parotid carcinoma should remain high on the differential. In these patients the deep lobe parotid gland can harbor an occult cancer and therefore attention should be given to the oral cavity as patients can present with swelling of the lateral oropharyngeal wall or soft palate in

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these cases. Other findings consistent with malignancy include skin involvement and cervical lymph node metastasis. While skin involvement is a late and alarming sign of parotid malignancy cervical metastasis is more dictated by the biology of the tumor. For example in salivary ductal carcinoma and high grade mucoepidermoid carcinoma, metastatic lymph nodes at presentation are quite high.

Tissue Diagnosis

Indications for Preoperative Biopsy of Parotid Lesions

- Is it something other than a salivary gland tumor?
- Will a histologic diagnosis change the management?
- Is the FN dissection likely to be tedious or is FN sacrifice likely?

Options for Preoperative Tissue Diagnosis

- Fine Needle Aspiration
- Ultrasound Guided Core Biopsy
- Open Biopsy

There is much debate surrounding need for tissue diagnosis before proceeding to the operating room for parotidectomy. Those that disagree with tissue diagnosis before surgery, suggest surgery remains the primary treatment independent of tissue diagnosis. Alternatively, others note tissue diagnosis offers the surgeon the ability to risk-stratify patients, to counsel them appropriately and to avoid surgery in those cases where it is not appropriate or unnecessary. We consider fine needle aspiration (FNA) beneficial in evaluating poorly defined salivary gland masses and to confirm clinical suspicion of malignant disease. This can be particularly useful if FN paralysis/paresis is present in order to counsel patients before surgery. FNA is also useful in the scenario of metastatic disease in order to restage, and direct adjuvant therapy. Finally, if the patient is a poor surgical patient, a benign FNA can justify an observation protocol.

Alternatively, if the FNA shows lymphoma, surgery is generally not indicated and therefore can be avoided. In general FNA has a relatively low sensitivity in malignant disease however is fairly specific. The reported numbers are broad. It could be hypothesized this is secondary to the technique used (image guided vs. without imaging), the experience of the person taking the sample (surgeon vs. pathologist), the broad range of pathologies associated with salivary malignancies as well as the expertise of the cytopathologist. Mallon et al. reported, for malignant disease, FNA has a sensitivity and specificity of 52% and 92%, respectively[4]. In our practice where FNA is used selectively, we have reported that FNA in the diagnosis of malignant or suspicious lesion had positive and negative predictive values of 84% and 77%, respectively [5]. A large number of our false negative FNAs (10/20) were identified as low grade lymphoma on final histology, therefore cytologic findings of a lymphocyte-predominant lesion should prompt further workup to rule out lymphoma. This may involve a core biopsy. Ultrasound guided core needle biopsy has been reported to be safe with a higher sensitivity and specificity than FNA in management of parotid lesions [6–8]. If FNA is non diagnostic and a more definitive diagnosis is required or findings are

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concentrated with lymphocytes, ultrasound core biopsy should be considered to further clarify before proceeding to parotidectomy. Importantly, the predictive value of a negative FNA finding is low, and should not take the place of clinical suspicion of malignancy. Additionally, FNA diagnosis is not used to make a critical intraoperative decisions regarding FN management or if the nerve is to be sacrificed. The management of FN in the OR depends on the intraoperative findings.

Open biopsy of a discrete parotid lesion as a preoperative assessment before definitive surgery is rarely indicated. This is secondary to the risk of FN palsy when the nerve is not defined intraoperatively such as in a formal parotidectomy. Additionally, biopsy of a discrete lesion may result in tumor spillage and may predispose to tumor dissemination into surrounding skin and soft tissues. Open biopsy may be warranted in a very select group including patients with a high suspicion of malignancy with likely FN sacrifice or in patients with suspected lymphoma and diagnosis cannot be made on FNA or core needle biopsy.

Imaging in Parotid Gland Malignancy

Indications for Imaging in Parotid Malignancy

- Uncertain extent of disease
- Fixation to surrounding structures
- Parapharyngeal Location
- Recurrent Tumour
- Facial paresis or paralysis
- Cervical nodal involvement
- Patient under observation to document change in growth

While imaging of parotid lesions can accurately predict malignant histology (MRI alone sensitivity 88% and specificity 77%) [9], the role of imaging in parotid gland malignancy is often to define extent of disease. This includes local invasion into surrounding structures, perineural invasion, regional involvement such as in cervical metastasis, and evaluation of distant dissemination in the case of metastatic disease to the parotid or advanced primary salivary malignancies. Detailed discussion of parotid gland imaging is presented in another chapter of this publication. Briefly, for preoperative evaluation of parotid gland malignancies CT is utilized for tumors extending into bony structures for instance into the mandible or temporal bone such as when an extended lateral temporal bone resection is planned to resect a locally invasive cutaneous malignancy or primary/metastatic lesion of the gland. MRI is useful in evaluating deep lobe versus parapharyngeal space tumors, base of skull extension, and cranial nerve involvement. Neurotrophic tumors such as adenoid cystic carcinoma or cutaneous squamous cell carcinoma (cSSC) can often spread to via cranial nerves centrally. Identifying these characteristics may change surgical approach and in some cases classifies the patient unresectable. Often both MRI and CT are complementary and contributory studies in advanced malignant tumors of the parotid gland.

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Extent of Surgery for Parotid Malignancy

Variations in the Extent of Parotidectomy for Malignancy

- Partial parotidectomy – limited, wide excision
- Superficial parotidectomy
- Total parotidectomy
- Radical parotidectomy
- Extended radical parotidectomy

Certainly parotidectomy using the technique of FN identification and parotid tissue resected is reasonably well standardized, however, the extent of parotid tissue needed to be excised to adequately address a malignant parotid neoplasm is a point of debate. Historically, surgical enucleation of parotid tumors resulted in high rates of FN palsy and tumor recurrence. Evolution of a “less than superficial parotidectomy” has been reported. This discussion mostly pertains to benign lesions [10, 11]. For primary parotid cancers, if a partial parotidectomy is oncologically equivalent to a superficial or total parotidectomy is difficult to assess given the rarity of the tumors, vast number of histologies and the long time interval for recurrence. There is little evidence that more extensive operations result in better outcomes. Retrospectively, “conservative parotidectomy” defined as any procedure that is less than a superficial parotidectomy where less than a full FN is dissected, has been reported in a small series [12] with comparable results to superficial parotidectomy. Importantly, about one quarter of the patients in this series received adjuvant radiation, there was a median follow up less than 5 year, and only 43 patients were reported. Partial FN paralysis or paresis was 12% comparable to Bron and O’Brien reported rates of 34% facial weakness for malignant tumors treated with complete superficial parotidectomy, compared to 13% of those treated with a conservative parotidectomy[13]. It seems reasonable, for small tumors where an adequate margin can be achieved while limiting FN dissection, a more conservative approach may result in improved postoperative FN function without compromising oncologic outcomes.

Total parotidectomy involves removal of all parotid tissue superficial to the FN as well as tissue deep to the FN. A discussion of indications for a deep “lobe” parotidectomy must first begin with an understanding of the concept that the division between the superficial and deep portions of the parotid is iatrogenic, not embryologic. Removal of the parotid tissue deep to the FN, representing 20% of the parotid glandular tissue, can be considered as two entities. The first group includes primary malignant parotid tumors originating from the deep lobe. In this case removal of the primary tumor with a cuff of margin will require a total parotidectomy including a superficial parotidectomy for nerve identification and access and deep lobe of the parotid gland to excise the tumor. It should be noted that some deep lobe parotid tumors, located mostly in the parapharyngeal space may be amenable to an isolated cervical approach and therefore a superficial parotidectomy may not be required. These represent a small minority of tumors and are often benign plemorphic adenomas. These can generally be easily removed through a stylohyoid window.

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The second scenario is considered in metastatic disease and requires an understanding of the parotid gland as a lymphatic basin. The parotid gland is the first draining site for cutaneous malignancies on the cheek, pinna, forehead, and temple[14]. Anatomic studies have reported seven lymph nodes in the superficial lobe (range, 3–19) and two in the deep lobe (range, 0–9)[15–17]. While there are fewer lymph nodes that reside within the tissue deep to the FN, this is consistent with less volume of glandular tissue in the deep lobe. Sites including conjunctiva, oropharynx, middle ear can also involve parotid lymph nodes [16, 18, 19]. Deep lobe lymph node metastasis can also arise from primary salivary gland malignances arising from the superficial gland. Controversy exists if total parotidectomy (extending the operation to clear tissue deep to the FN) is required when managing metastatic lesions to the parotid gland.

Certainly, there is prognostic value to identification of involved lymph nodes in the deep lobe tissue. Work by Thom et al. showed that deep lobe metastasis from cSCC was a significant risk factor of distant metastatic disease, disease recurrence, death from disease and overall survival[20]. However does extending radicality to involve the tissue deep to the FN alter outcomes? While this question has not been answered in a randomized prospective fashion, analysis of retrospective studies indicate there may be benefit to total parotidectomy in some select cases. When considering increasing radicality locally, local recurrence rates without this maneuver should be recognized. In a large series from Australia of 87 patients with clinical metastasis to the parotid gland, 82% had a superficial parotidectomy, 86% had adjuvant radiation[21]. Of the series, a local recurrence rate of 20 %, with two thirds in the deep bed of the parotid lobe was observed. It is unclear if the recurrences were isolated to the group that underwent radical parotidectomy that were more likely to have a positive margin or if leaving tissue deep to the FN was a source of recurrence. Others have reported parotid bed recurrences ranging from 11–44% [22–25]. Mayo clinic has published on their experience with use of total parotidectomy for primary salivary and metastatic disease involving the parotid gland [20, 26]. Local parotid control rates of 93% (median follow up 36.4 months) with metastatic cutaneous SCC and melanoma of 100% (median follow up 30.6 months) was reported with the routine use of total parotidectomy for metastatic cutaneous malignancies [20]. While local control in the parotid bed was superior to other series, overall survival remained poor. With the goal of improving local control, deep lobe parotidectomy can be considered when metastasis to the deep lymph nodes is likely. These cases include patients with metastasis to any intraparotid lymph nodes, high-grade primary parotid cancers, and primary parotid cancer with metastasis to lymph nodes of the parotid gland or neck nodes.

Radical parotidectomy involves removal of all parotid tissue as well as sacrifice of the FN. This is done in cases where the FN has been invaded by tumor or if preoperative FN function was impaired in the presence of malignant disease. Further discussion of indications and outcomes will be included in the management of FN section.

Extended radical parotidectomy is carried out when the parotid tumor (primary salivary, metastatic disease, or through direct extension from a cutaneous malignancy) invades adjacent structures such as the temporal bone, the mandibular bone or the skin. These cases may require the performance of an extended total parotidectomy, which can include adjunct

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procedures such as mandibulectomy, skin resection, infratemporal fossa dissection, and skull base or temporal bone resection. Prognosis for these patients is poor. Mehra et al. reported on 12 patients that underwent LTBR as part of an extended parotidectomy as part of management of primary parotid malignancies[27]. In addition to LTBR, 58% had partial mandibulectomy and 83% had FN sacrifice. Aggressive management of the primary site resulted in locoregional control of 75%. However, 5 year survival was 22%. These data would support the inclusion of LTBR as an adjunctive procedure in extended radical parotidectomy achieves reasonable rates of locoregional control and palliates local symptoms however overall survival remains poor secondary to distant failure. Of note, extending the parotidectomy may be needed in order to provide a FN segment with negative margins in order to graft. Overall, temporal bone surgery is an important adjunct to the management of advanced, recurrent and metastatic parotid malignancies.

Extent of Surgery for Accessory Parotid Gland Carcinoma

Sometimes, primary salivary malignancies can arise in the accessory salivary tissue. This tissue follows Stensen's duct and therefore can present as a cheek mass. In general, surgery for accessory parotid tumor involves identification of the FN by first completing a superficial parotidectomy and then tracing out the branches until distally. However, in some cases if the tumor is discrete and separate from the parotid gland, superficial parotidectomy can be avoided as there is no oncologic justification for removal the superficial parotid tissue in this scenario if total excision with negative margins can be achieved. This involves identification of the buccal and zygomatic branches distally at the anterior edge after elevation of the anterior skin flap. The branches are then meticulously dissected and preserved.

Intraoperative Considerations

Role of Frozen Sections in Parotidectomy for Malignancy

- Jugulodigastric node
- Periparotid node
- Confirm Benign vs Malignant or Carcinoma vs Lymphoma in primary salivary tumor
- Prior to sacrificing functioning nerve
- Tissue surrounding FN

As discussed, preoperative FNA is limited by its high false-negative rate and the extent of the operation can often be dependent of pathology. Frozen section may provide an opportunity to refine the presurgical diagnosis intraoperatively among patients who are undergoing parotidectomy for presumed malignancy. Frozen section maybe useful in 3 scenarios : (1) confirmation/clarification of preoperative diagnosis, (2) assessment of surgical margins, and (3) determine whether nerve or neck involvement is present. Intraoperative frozen section has been shown to be useful in distinguishing benign from malignant [28, 29], however this may not add much when deciding how to manage FN involvement, extending the operation to address the deep lobe or cervical lymph nodes or

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terminating surgery in the case of lymphoma. Olson et al. reported on use of intraoperative frozen section in stratifying lymphoma or carcinoma, low-grade or high-grade malignant tumor, status of the intraparotid nodes in a high volume setting. While this group found frozen section useful as an intraoperative discussion tool, it must be considered that the variation in sensitivity and specificity will exist depending on the experience of the institution with salivary malignancies. Margin assessment is a tool unique to frozen section which can be especially useful in the management of a resected FN. First it can be used to ensure proximal and distal control of the perineural spread before primary neural reconstruction. Additionally, for tumors that are located adjacent to the styloidmastoid foramen and involve the FN, frozen section may be helpful in determining if an extended radical parotidectomy or dissection into the facial canal is required to control the proximal FN margin.

Frozen section assessment of the jugulodigastric lymph node (important for cutaneous malignancy) or periparotid lymph nodes may eliminate need for a staged neck dissection if confirmed positive for metastatic disease during the primary surgery. This may avoid in some cases need to stage the neck dissection for high grade lesions with high likelihood of regional cervical lymph node involvement.

Facial Nerve Management

“In seventh nerve paralysis, joy, happiness, sorrow, shock, surprise, all the emotions have for their common expression the same blank stare.” Sterling Burnell, 1927

A discussion of parotidectomy does not come without significant attention to FN management. This topic has been the subject of many sections of this publication. FN sacrifice is sometimes inevitable however protecting the nerve in cases where FN sacrifice does not add to an oncologic resection, when to take the FN versus when to peel the tumor off the nerve, and what tools are useful in helping make these intraopertive decisions are subjects of debate and represent an area for which a significant body of literature exists, sometimes with conflicting findings. In general many would approach FN sacrifice with the philosophy of if the FN is functioning normally preoperatively, and not invading the nerve intraoperativly, then effort should be made to preserve it. This approach is based on the feeling that sacrifice of the nerve may add little to the surgical margin, however results in significant morbidity to the patient. Additionally, sacrifice of the FN does not avoid the need for adjuvant therapy in most cases. These statements however should not undervalue that every attempt should be made to achieve a clear surgical margin.

In patients with confirmed carcinoma and a nonfunctioning FN at the time of surgery, management of FN is more straight forward including excision of involved portion, conformation of proximal and distal margin and FN repair/reanimation procedure when appropriate. However, this scenario represents a small portion of patients presenting with parotid malignancy. Therefore emphasis should be on patients presenting with carcinoma and a functioning FN. Tumor location as it relates to proximity of the FN and extent of tumor infiltration should be considered before sacrifice of a preoperatively functioning FN.

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If direct infiltration is seen at the time of the operation FN sacrifice would be indicated. Larger tumors that are aggressive and infiltrative will often necessitate FN sacrifice.

FN involvement is a poor prognostic indicator [30–32], however it is unclear if increasing radically with FN sacrifice improves outcomes. In a comparison of patients treated with radical surgery vs conservative surgery O'Brien et al. in a cohort of patients with metastatic cSCC did not report a survival benefit (62% vs 54% at 5 years). While Renehan et al. reported 10-year survival for patients having nerve sacrifice of 45% compared with 74% among those case which the nerve was spared[33]. It is difficult to compare these 2 studies as the majority of the cases in the later study were primary salivary malignancies. Additionally, more aggressive, infiltrative tumors with FN involvement requiring sacrifice are more likely to have poor survival outcomes. While positive margins predict for local recurrence and poor outcomes [21], FN sacrifice did not reduce the positive margin rate (FN sacrifice vs preservation O'Brien 53% vs 12%; Renehan 57% vs 53%) and local recurrences were equivalent for preservation vs. sacrifice of the FN (FN sacrifice vs preservation O'Brien 40% vs 24%) for cSCC. In the Renehan cohort where primary parotid histology dominated, FN sacrifice vs. preservation resulted in local recurrence rates of 21% vs 12%, however as mentioned previously, 10 year survival was not significantly different.

Summary

Parotidectomy for parotid cancer represents 3 entities including management for primary salivary cancer, metastatic cancer to lymph nodes and direct extension from surrounding structures or cutaneous malignancies. Preoperative evaluation should provide the surgeon with enough information to plan an oncologically sound operation, reconstruction when needed and adequately counsel the patient. FN sacrifice is sometimes required but in preoperative functioning nerves, effort should be taken to preserve function. While nerve involvement predicts poor outcome, with a sound oncologic procedure and adjuvant therapy survival of around 50% has been reported for primary parotid malignancy. Metastatic cSSC is often a high grade aggressive histology where local control for palliation with an extended parotidectomy can be achieved however overall survival remains poor most often secondary to distant metastasis.

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KEY POINTS

- Adequate excision of tumor based on extent of the primary tumor
- Every attempt should be made to remove all gross tumor. Radiation therapy does not compensate for inadequate surgery.
- The extent of parotidectomy depends more upon the extent and location of the tumor than the histology of the tumor.
- The anatomic relationship of the tumor to the nerve dictates the extent of surgery, not the histologic classification of the neoplasm.