International Journal of Psychosocial Rehabilitation, Vol. 24, Issue 01, 2020
ISSN: 1475-7192

AN OVERVIEW OF COMMONLY DIAGNOSED PAROTID GLAND

[1]Kausalyah Krishna Malay, [2]Saravanan, [3]Revathy Duraisawamy, *[4]Dhanraj Ganapathy

ABSTRACT

The parotid gland is a major salivary gland in humans. It is a bilateral structure, and the largest of the three major salivary glands. It is wrapped around the mandibular ramus, and secretes saliva through Stensens duct (or parotid duct) into the oral cavity, to facilitate mastication and swallowing and to begin the digestion of starches. Additionally, the mucosa of the upper aero digestive tract is lined by hundreds of small, minor salivary glands. The major function of the salivary glands is to secrete saliva, which plays a significant role in lubrication, digestion, immunity, and the overall maintenance of homeostasis within the human body. The duct pierces the buccinator muscles, then opening up into the oral cavity on the inner surface of the cheek, usually opposite the maxillary second molar. The parotid papilla is a small elevation of tissue that marks the opening of the parotid duct on the inner surface of the cheek.

KEYWORDS: *Parotid gland; major salivary gland; Stensen duct; Frey's syndrome; parotidectomy*

I. INTRODUCTION

Salivary gland begins to develop during the sixth and eighth embryonic week when oral ectodermal outpunching extend into the adjacent mesoderm and serve as the site of origin for major salivary gland growth. The development of major salivary glands is thought to consist of three main stages.[1]

The first stage is marked by the presence of a primordial anlage and the formation of branched duct buds. The second stage is the early appearance of lobules and duct canalization, while the third stage is marked by maturation of the acini and intercalated ducts, as well as the diminishing prominence of interstitial connective tissue. [2] The first of the glands to appear, during the sixth gestational week, is the primordial parotid gland. It develops from the posterior stomodeum, which laterally elongates into solid cords across the developing masseter muscle.

[1]Graduate Student, Department of Prosthodontics, Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences, Chennai,India.
[2]Assistant professor, Department of Anatomy, Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences, Chennai,India.
[3]Senior Lecturer, Department of Prosthodontics, Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences, Chennai,India.
[4]Professor and Head Department of Prosthodontics, Saveetha Dental College and Hospitals, Saveetha Institute of Medical And Technical Sciences, Chennai – 600077 Tamil Nadu, India.

Cords will be canalized to form ducts and acini at the distal end. A capsule will form from the ambient mesenchyme surrounding the gland and associates with lymph nodes.

Small buds appear in the floor of the mouth lateral to the tongue during the sixth week of embryonic life. The capsule from the surrounding mesenchyme will fully be developed around the gland in the third month of gestation. [3] Upper respiratory ectoderm gives rise to simple tubuloacinar units. They develop into the minor salivary glands during the 12th week of intrauterine period. [4]

PAROTID GLAND

Parotid glands are the largest of the major salivary glands and located along the posterior surface of the mandible. The parotid duct, also known as Stensen's duct, secretes serous saliva into the vestibule of the oral cavity [5]. Anterior border of the gland, it travels parallel to the zygoma, approximately 1 cm below it, in an anterior direction across the masseter muscle. This will turn sharply to pierce the buccinator muscle and enters the oral cavity. This process takes place at the opposite of second upper molar tooth. Each parotid gland is divided by the facial nerve into a superficial and a deep lobe. [6]

The superficial lobe, overlying the lateral surface of the the facial nerve (Figure 4) and located between the mastoid process of the temporal bone and the ramus of the mandible. Boundaries of parotid gland are superiorly by the zygomatic arch and it is inferior to anteromedial margin of sternocleidomastoid muscle. Tail of the parotid gland extends posteriorly over the superior border of the sternocleidomastoid muscle toward the mastoid tip. The deep lobe of the parotid lies within the parapharyngeal space.[7]

FASCIA

The deep cervical fascia runs superiorly to form the parotid fascia. It will split into two major layers which is superficial and deep layer to enclose the parotid gland. The thicker superficial fascia is extended superiorly from the masseter and sternocleidomastoid muscles to the zygomatic arch. The deep layer extends to the stylomandibular ligament, which separates the superficial and deep lobes of the parotid gland. The stylomandibular ligament is an important surgical landmark when considering the resection of deep lobe tumours. Generally, parotid fascia is characterized as dense inelastic capsule because of its role to cover the masseter muscle deeply. This may also sometimes be referred to as the parotid masseteric fascia.[8]

BLOOD SUPPLY

ARTERIAL SUPPLY

Blood supply of a parotid gland branches from the external carotid artery. It is superior to the carotid bifurcation and also parallel to the mandible beneath the posterior belly of the digastric muscle [9]. The artery then travels medial to the parotid gland and splits into two terminal branches which is superficial temporal artery runs superiorly from the superior portion of the parotid gland to the scalp within the superior pretragal region. And the maxillary artery, leaves the medial portion of the parotid and supplies the infratemporal fossa and the pterygopalatine fossa.

During radical parotidectomy, this vessel must be controlled especially when marginal or segmental mandibulectomy is required.[10] The transverse facial artery branches off the superficial temporal artery and runs anteriorly between the zygoma and parotid duct to supply

the parotid gland, parotid duct, and the masseter muscle.[11].

VENOUS DRAINAGE

The union of the maxillary vein and the superficial temporal vein gives rise to retromandibular vein. This vein runs through the parotid gland deep to the facial nerve to join with the external jugular vein [12]. There is substantial variation in the surgical anatomy of the retromandibular vein, which may bifurcate into an anterior and posterior branch. The anterior branch unites with the posterior facial vein, forming the common facial vein

The posterior facial vein lies immediately deep to the marginal mandibular branch of the facial nerve and is often used as a landmark for identification of the nerve branch, especially at the antegonial notch of the mandible where the nerve dips inferiorly. [13] The posterior branch of the retromandibular vein may combine with the post auricular vein above the sternocleidomastoid muscle and drain into the external jugular vein [14].

LYMPHATIC DRAINAGE

The pathway to the lymphatic drainage of the other salivary glands is highly sensitive due to the heavy density of lymph nodes within and around the parotid gland. Parotid glands are the only salivary gland with two nodular layers. It drains into superficial and deep cervical lymphatic systems. About 90% of the nodes are located in the superficial layer between the glandular tissue and its capsule of this gland.[15] The parotid gland, pinna, external auditory canal, scalp, lacrimal glands and eyelids are all drained by these superficial nodes. The deep layer of nodes drains the gland, middle ear, external auditory canal, soft palate and nasopharynx. [16]

AUTONOMIC NERVE INNERVATION

Glossopharyngeal nerve provides visceral secretory innervation to the parotid gland. The nerve carries preganglionic parasympathetic fibers from the inferior salivatory nucleus in the medulla through the jugular foramen.[17] Inferior ganglion the small branch of glossopharyngeal nerve re-enters the skull through the inferior tympanic canaliculus and into the middle ear to form the tympanic plexus. Postganglionic parasympathetic fibers exit the otic ganglion beneath the mandibular nerve to join the auriculotemporal nerve in the infratemporal fossa. [18] These fibers innervate the parotid gland for the secretion of saliva. Postganglionic sympathetic fibers innervate salivary glands, sweat glands, and cutaneous blood vessels through the external carotid plexus from the superior cervical ganglion. [19]

Physiologic coincidence allows for the development of “gustatory sweating” is known as Frey’s syndrome. In such case, patient will develop with sweating and flushing of the skin overlying the parotid region during eating. This symptom is due to aberrant of autonomic reinnervation in the sweat glands from the regeneration of parasympathetic fibres in any residual parotid gland. Frey’s syndrome is common in occurring for 25–60% of patients

postoperatively. [20] The initial risk reductions of Frey's syndrome are by complete and meticulous superficial parotidectomy. Then, by developing skin flaps of appropriate thickness, exposed apocrine glands of the skin are protected from ingrowth and stimulation by the severed branches of the auriculotemporal nerve and their parasympathetic stimulation during meals. There are few nonsurgical and surgical treatments for persistent Frey's syndrome following parotidectomy. [21]

PARAPHARYNGEAL SPACE

Tumours in deep parotid lobes frequently extend medially into the parapharyngeal space. This space situated posterior to the infratemporal fossa which is shaped like an inverted pyramid. The greater cornu of the hyoid bone functions as the apex and the petrous bone of the skull base which known as the pyramidal base. [22] The parapharyngeal space is bound medially by the lateral pharyngeal wall, which consists of the superior constrictor muscles, the buccopharyngeal fascia and the tensor veli palatine. The ramus of the mandible and the medial pterygoid muscle make up the lateral border. [23] The parapharyngeal space is bordered anteriorly by the pterygoid fascia and the pterygomandibular raphe. A line from the styloid process to the medial portion of the medial pterygoid plate divides the parapharyngeal space into two compartments which is prestyloid compartment and poststyloid compartment. Neurogenic tumors or paragangliomas from the cervical sympathetics or cranial nerves can thus arise in this compartment. [24]

PAROTID TUMORS

Tumours can be benign or malignant and develops anywhere in salivary glands, majorly in parotid glands. The most common benign parotid tumours are Pleomorphic Adenomas. Imaging of the salivary glands has two purposes: first, to establish the precise extent and site of a salivary lesion, and second, to provide some indication of its pathologic nature. It is of major importance to determine whether a salivary gland tumor is benign or malignant and to assess its extent and relationship to adjacent structures preoperatively, because this information will strongly influence the choice of surgical procedure.

Local excision or superficial parotidectomy is performed for benign tumors, whereas total parotidectomy, with or without facial nerve removal, is performed for malignant tumors. The pathologic diagnosis is typically determined by fine needle aspiration cytology. Although fine needle aspiration cytology is the most cost-effective and minimally invasive way to determine the histologic character of a parotid tumor, fine needle aspiration cytology is not always conclusive because specimen material from a small or deep mass may be insufficient. Thus, although there seems to be an important role for preoperative imaging, in reality its clinical significance is relatively little.

PLEOMORPHIC ADENOMA This type of benign tumour accounts for the vast majority of all parotid tumours. Pleomorphic adenoma tends to grow over in time and may become cancerous with long term. Therefore they require immediate medical attention. The tumor is usually solitary and presents as a slow growing, painless, firm single nodular mass. Isolated nodules are generally outgrowths of the main nodule rather than a multinodular presentation. It is usually mobile unless found in the palate and can cause atrophy of the mandibular ramus when located in the parotid gland. When found in the parotid tail, it may present as an eversion of the ear lobe.

Though it is classified as a benign tumor, pleomorphic adenomas have the capacity to grow to large proportions and may undergo malignant transformation, to form carcinoma ex-pleomorphic adenoma, a risk that increases with time (9.5% chance to convert into malignancy in 15 years). Although it is "benign" the tumor is aneuploid, it can recur after resection, it invades normal adjacent tissue and distant metastases have been reported after long (+10 years) time intervals.Thistumour most often presents in the lower pole of the superficial lobe of the gland, about 10% of the tumours arise in the deeper portions of the gland.it occurs more frequently in females than in males, the ratio approximating 6:4. The majority of the lesion are found in patients in the fourth to sixth decades with an average age of occurrences of about 43 years, but these are relatively common in young adults and have been known to occur in children.

Treatment Overall, the mainstay of the treatment for salivary gland tumor is surgical resection. Needle biopsy is highly recommended prior to surgery to confirm the diagnosis. More detailed surgical technique and the support for additional adjuvant radiotherapy depends on whether the tumor is malignant or benign.

Surgical treatment of parotid gland tumors is sometimes difficult, partly because of the anatomical relationship of the facial nerve and the parotid lodge, but also through the increased potential for postoperative relapse. Thus, detection of early stages of a tumor of the parotid gland is extremely important in terms of prognosis after surgery.[6]

Generally, benign tumors of the parotid gland are treated with superficial(Patey's operation) or total parotidectomy with the latter being the more commonly practiced due to high incidence of recurrence.[7] The facial nerve should be preserved whenever possible. The benign tumors of the submandibular gland is treated by simple excision with preservation of mandibular branch of the trigeminal nerve, the hypoglossal nerve, and the lingual nerve.[8] Other benign tumors of minor salivary glands are treated similarly.

Malignant salivary tumors usually require wide local resection of the primary tumor. However, if complete resection cannot be achieved, adjuvant radiotherapy should be added to improve local control.[9][10] This surgical treatment has many sequellae such as cranial nerve damage, Frey's syndrome, cosmetic problems, etc.

Usually about 44% of the patients have a complete histologic removal of the tumor and this refers to the most significant survival rate.

WARTHIN'S TUMOR It is a benign tumour of the salivary glands. Warthin's Tumourcharacterised as a painless mass, slow-growing, and primarily affects older individuals. This type of tumours usually affects both sides of the face [25]. Warthin's tumor primarily affects older individuals (age 60–70 years). There is a slight male predilection according to recent studies. The tumor is slow growing, painless, and usually appears in the tail of the parotid gland near the angle of the mandible. In 5–14% of cases, Warthin's tumor is bilateral, but the two masses usually are at different times. Warthin's tumor is highly unlikely to become malignant. The gland most likely affected is the parotid gland. In fact, it is the only tumor virtually restricted to the parotid gland

Though much less likely to occur than pleomorphic adenoma, Warthin's tumor is the second most common benign parotid tumor. Its cause is unknown, but there is a strong association with cigarette smoking. Smokers are at

8 times greater risk of developing Warthin's tumor than the general population. The appearance of this tumor under the microscope is unique. There are cystic spaces surrounded by two uniform rows of epithelial cells with centrally placed pyknotic nuclei. The cystic spaces have epithelium referred to as papillary infoldings that protrude into them. Additionally, the epithelium has lymphoid stroma with germinal center formation. Most of these tumors are treated with surgical removal. It is non recurrent.

II. PAROTID GLAND COMPLICATIONS ASSOCIATED WITH DENTISTRY

PAROTITIS

It is a commonly known as an inflammation of the parotid gland. Common causes of parotitis are infections, autoimmune diseases, blockages, poor oral hygienes, a tumour, or radiation cancer treatment of the head and neck. Symptoms of parotitis are dry mouth, fever, facial swellings and chills. This is a serious condition which requires early medical attention because it can cause worsening pain and permanent damage to the parotid glands. The initial treatment will be identification and treating of the cause of your inflammation, then often followed by antibiotics, surgery or the removal of the parotid glands [26].

TREATMENT OF PAROTITIS

Initially, patients will be prescribed for antibiotics to treat any bacterial infections and patient will be advised for keep hydrated. However if it is a caused by a cysts or tumours or salivary stones, an surgical removal of the blockage or parotid gland may be carried out as further management. Parotid stones will develop with debris accumulation, chemical and calcium build up in the salivary and parotid glands which blocks the duct and causing swelling or inflammation and infection[27] In case of parotid stone, patient will undergo for a sialendoscopy to remove the stone. Sialendoscopy has a swift recovery period which results in no damage to the surrounding tissues, therefore it is one of the best methods of parotitis treatment available.

SIALADENITIS

Sialadenitis is a painful bacterial infection that most commonly occur in older adult. These condition usually affect the parotid gland and it occurs when the duct in the mouth becomes blocked, creating a painful lump and the drainage of foul-tasting pus into the mouth. It can acute, chronic or recurrent.

Depending on its condition (acute, chronic or recurrent), the treatment will be planned.

- Acute sialadenitis, require antibiotics and other treatment measures. Common symptoms include swelling, reddened skin, low-grade fever, malaise, leucocytosis, oedema of the cheek and drainage from the affected duct.

- Chronic sialadenitis, pain and swelling occur after eating, due to the patient's saliva backing up into the gland. In this case, surgical removal of the gland through a superficial parotidectomy or submandibular gland incision will be suggested [28].

THE EVOLUTION OF THE PAROTIDECTOMY

During the consultation surgeons will thoroughly examines the patient, and perform a needle biopsy of the tumour to determine whether the tumour is benign or malignant. Once they have determined what type of tumour the patient has, they will determine which parotid removalsurgery is best. The most common parotid tumour is a pleomorphic adenoma, which is a benign tumour. It has a little finger-like projection around it that need to be removed or it will be risk of its growth or recurrent. Moreover, pleomorphic adenoma is potentially has the risk of turning into an malignant tumour aggressively. So it has to be removed without any let over, because if any its left behind, in time it will regrow and can become a cancer. The only treatment for pleomorphic adenoma is surgery[29].

The minimally invasive micro-parotidectomy is the most cutting edge parotid removal technique available today. Most surgeons strive to use this advanced approach whenever possible, in some cases other more extensive parotid removal techniques may be required. Because of the variety of cell types, there are many different types of tumours and cancers that can develop in the parotid gland. Therefore, these types of parotid surgery will give a best results for the patient which dependent on the size, location, and severity of the tumour or disease.

In the micro-parotidectomy (minimally invasive parotid surgery) procedure surgeon removes all or a portion of the parotid gland through a very small incision near the ear(figure6). This approach results in reduction of pain, minimal scarring, and a quicker recovery. Facial nerve has to be monitored to ensure its safety and reduces the risk of surgical complications [30].

After the parotid tumour is located and removed the surgeon will continue with reconstructive procedure to fill in the defects left behind by the removing the portion of the gland. Restoration of facial symmetry provides an additional protective layer for tissue on top of the facial nerve, which helps in prevention of Frey's Syndrome. Muscle flaps, grafts or a combination of these will be used. This helps to achieve a positive aesthetic results and ensures the patient experience minimal scarring process. Micro-parotidectomyare usually a one day procedure as the patient does not need to be hospitalized.

III. CONCLUSION

Parotid glands are one of the major salivary glands which everyone should be aware of its abnormalities. Most of the patients least bother about the swelling of the parotid gland as it is asymptomatic in almost every case. Parotid gland swellings should be treated as soon as possible to avoid complications. Saliva reflects the physiologic state of the body. Salivary gland diseases may be inflammatory, non-inflammatory, non-neoplastic or neoplastic lesions. Only when a definitive diagnosis is established, treatment depends upon the lesion size, cause, severity, extent and other clinical considerations of the disease. However, a thorough knowledge of the subject including their recent advancements together with a team of associated medical and dental specialists, it is possible to detect the diseases of salivary glands in their early stage and manage them more efficiently. Salivaomics, the future of saliva-based techniques for early diagnosis of dental diseases is promising. Saliva being readily available can be used as a diagnostic tool to help the clinicians for early detection of oral diseases like caries, periodontal disease, oral cancer, salivary gland disorders and non-oral diseases by adapting the advance noninvasive technique and technologies.

REFERENCES

1. Arey LB (1974) Developmental anatomy; a textbook and laboratory manual of embryology. Revised 7th ed. W.B. Saunders, Inc., Philadelphia

2. Bernfield M, Banerjee S, Cohn R (1972) Dependence ofsalivary epithelial morphology and branching morphogenesis upon acid mucopolysaccharide-protein (proteoglycan) at the epithelial surface. J Cell Biol 52:674–689

3. Bhattacharyya N, Varvares M (1999) Anomalous relationship of the facial nerve and the retromandibular vein: a case report. J Oral MaxillofacSurg 57:75–76

4. Carrau RL, Johnson JT, Myers EN (1997) Management of tumors of the parapharyngeal space. Oncology (Williston Park) 11:633–640; discussion 640, 642

5. Davis RA, Anson BJ, Budinger JM, et al. (1956) Surgical anatomy of the facial nerve and parotid gland based upon a study of 350 cervicofacial halves. SurgGynecolObstet 102: 385–412

6. Frommer J (1977) The human accessory parotid gland: its incidence, nature, and significance. Oral Surg Oral Med Oral Pathol 43: 671–676

7. Garatea-Crelgo J, Gay-Escoda C, Bermejo B, et al. (1993) Morphological study of the parotid lymph nodes. J CraniomaxillofacSurg 21:207–209

8. Gibson MH (1983) The prenatal human submandibular gland: a histological, histochemical and ultrastructural study. AnatAnz 153:91–105

9. Graamans K, von der Akker HP (1991) History and physical examination. In: Graamans AK (ed) Diagnosis of Salivary Gland Disorders. Kluwer Academic Publishers, Dordrecht, Germany, pp 1-3

10. Grant J (1972) An Atlas of Anatomy, Sixth edn. Williams & Wilkins, Baltimore

11. Hollinshead WH (1982) Anatomy for Surgeons: Volume I, The Head and Neck, Third ed. J.B. Lippincott Company, Philadelphia

12. Jaskoll T, Melnick M (1999) Submandibular gland morphogenesis: stage-specific expression of TGF-alpha/EGF, IGF, TGF-beta, TNF, and IL-6 signal transduction in normal embryonic mice and the phenotypic effects of TGFbeta2, TGF-beta3, and EGF-r null mutations. Anat Rec 256:252–268

13. Jaskoll T, Leo T, Witcher D, et al. (2004) Sonic hedgehog signaling plays an essential role during embryonic salivary gland epithelial branching morphogenesis. Dev Dyn 229:722–732

14. Johns M (1977) The salivary glands: anatomy & embryology. OtolaryngolClin North Am 10:261

15. Johnson LR (ed) (2003) Secretion. Elsevier, Amsterdam

16. Junqueria L, Carneiro J (2003) Basic Histology: Text & Atlas., Tenth edn. McGraw-Hill, New York

17. Kontis TC, Johns ME (2001) Anatomy and Physiology of the Salivary Glands. In: Bailey BJ (ed) Head and Neck Surgery – Otolaryngology. Lippincott Williams & Wilkins, Philadelphia

18. Mason D, Chisholm D (1975) Salivary Glands in Health and Disease. WB Saunders, London

19. Myers EN, Conley J (1970) Gustatory sweating after radical neck dissection. Arch Otolaryngol 91:534–542

20. Nahlieli O, BaruchinAM (1997) Sialoendoscopy: three years' experience as a diagnostic and treatment modality. J Oral MaxillofacSurg 55:912–918; discussion 919–920

21. Nahlieli O, BaruchinAM (2000) Long-term experience with endoscopic diagnosis and treatment of salivary gland inflammatory diseases. Laryngoscope 110:988–993

22. Orabi AA, Riad MA, O'Regan MB (2002) Stylomandibulartenotomy in the transcervical removal of large benign parapharyngealtumours. Br J Oral MaxillofacSurg 40: 313–316

23. Pogrel M, Schmidt B, Ammar A (1996) The relationship of the buccal branch of the facial nerve to the parotid duct. J Oral MaxillofacSurg 54:71–73

24. Quinn HJ Jr. (1976) Symposium: management of tumors of the parotid gland. II. Diagnosis of parotid gland swelling. Laryngoscope 86:22–24

25. Nash, L., and Morrison, L. F.: Asymptomatic chronic enlargement of the parotid glands; review and report of a case. *Ann. Otol., Rhin. Laryng.*58: 646–664, 1949.

26. Plaut, J. A.: Adenolymphoma of the parotid gland. *Ann. Surg.* 116: 43–53, 1942.

27. Swinton, N. W., and Warren, S.: Salivary gland tumors. *Surg., Gynec.&Obst.*67: 424–435, 1938.

28. Kayembe MK, Kalengayi MM. Salivary gland tumors in Congo (Zaire). OdontoStomatolTropicale. 2002;25:19–22.

29. Otoh EC, Johnson NW, Olasoji H, et al. Salivary gland neoplasms in Maiduguri, north-eastern Nigeria. Oral Dis. 2005;11:386–91.

30. Lima SS, Soares AF, de Amorim RF, et al. Epidemiologic profile of salivary gland neoplasms: analysis of 245 cases. Braz J Otorhinolaryngol. 2005;71:335–40.