



AN ANALYTICAL STUDY OF PAROTID GLAND PATHOLOGIES AS DETECTED BY SILOGRAPHY (WITH PICTORIAL ESSAY)

Medical Science

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ABSTRACT

A variety of clinical disorders such as obstructive, inflammatory, infectious, malignancies affect the parotid gland and its duct (Stenson's duct). An imaging modality which serves as an immediate and preliminary choice of investigation is Sialography. Sialography is considered the gold standard technique for studying the ductal morphology. It is very useful in evaluation of parotid duct, its branching and acini.

This article illustrates the role of sialography in evaluating various pathologies of parotid gland and its duct. A pictorial essay evaluating different morphological variants of pathologies of parotid gland is provided at the end of the article.

KEYWORDS

Parotid gland, Parotid duct, Pathologies, Sialography.

Introduction

The sialography is a radiological technique in which contrast agent is introduced into the salivary gland ducts. It is one of the main diagnostic methods for detection of salivary gland pathologies. Parotid Sialography is a simple, OPD based, economical, noninvasive method for evaluation of parotid duct and its branching. It is the most sensitive examination for assessment of the ductal systems.

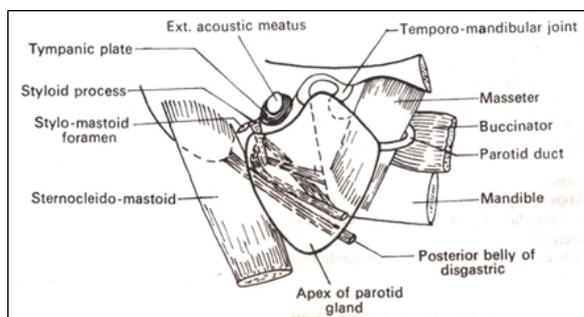
With the introduction of sialoendoscopy, sialography has gained an important role in the assessment of salivary gland status. It has proved to be very important study in mapping salivary gland obstructions before performing interventional sialoendoscopy. It will disclose important anatomic and pathologic information about the gland. This technique has ability to reveal the presence of internal duct strictures, which sometimes escape detection with radiography and ultrasonography.

We describe the technique and illustrate common pathologies affecting the parotid gland and its duct (Stenson's duct).
synonyms – Ptyalography, Sialogram

Normal anatomy of parotid gland⁽¹⁾ (Fig. No.1)

There are three pairs of major salivary glands namely parotid, submandibular and sublingual. The largest amongst three is the parotid gland weighing about 25gms. The gland is shaped like an inverted pyramid, with apex directed below. The base of the gland is concave and is related to the external acoustic meatus and posterior part of TM joint. The facial nerve after emerging from stylomastoid foramen of skull, enters the gland piercing the upper part of postero-medial surface. Within the gland the nerve runs forward for another 1cm superficial to the retromandibular vein and external carotid artery and then divides into five terminal branches namely temporal, zygomatic, buccal, marginal mandibular and cervical. These branches of the facial nerve divide the parotid gland into superficial and deep parts or lobes. The lobes are connected by isthmus of glandular tissue.

Figure No.1 : Showing normal anatomy of parotid gland and its duct.



It is a compound tubulo-alveolar gland, and the acini are lined mostly by the seromucous cells. The smaller collecting ducts unite to form two vertical ducts, upper and lower. The vertical ducts join at the middle of the posterior border of mandibular ramus and form the parotid duct.

Parotid duct (Stensen's duct)⁽²⁾ (Fig. No.2) – It is about 5cm in length and 3mm in width. The duct emerges through the anterior border of the gland and passes at first forward on the masseter muscle between the upper and lower buccal nerves. At the anterior border of the masseter it abruptly turns medially through the buccal pad of fat, and pierces the bucco-pharyngeal fascia and buccinator muscle. Finally the duct passes obliquely forward between the buccinator and the mucous membrane of the cheek, and opens in the vestibule of the mouth on a papilla opposite the crown of upper second molar tooth.

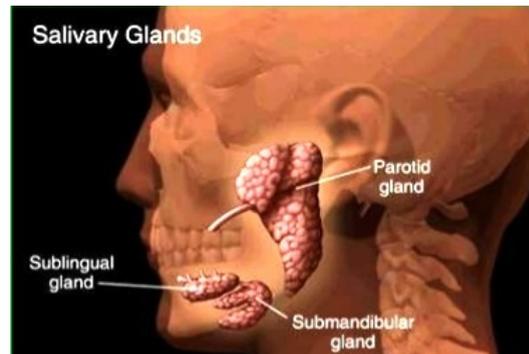


Fig. No. 2 – All major salivary gland ducts

Material and Method

The radiographic sialography demonstrates the ducts, ductules and parenchyma of the salivary glands by the introduction of a non-ionic and water soluble radiopaque contrast medium into their excretory ducts.⁽³⁾

Sialography was first performed by Arcelin in 1913. He used bismuth as the contrast media and demonstrated submandibular gland calculus. Parotid sialography is a simple procedure which does not need special preparation of the patient.

Patient was asked to remove dentures if he/she have any (if possible), If patient can not remove them, this can be negotiated by taking x-ray film with open mouth. Before starting the procedure, jewelry or other opaque items must be removed. Plain x-ray films of parotid region with the patient supine in antero-posterior view and lateral view were taken to assess for radio opaque calculi in gland or in parotid duct. Then 2-3 drops of fresh lemon juice were squeezed over tip of tongue of patient as a secretory stimulant before sialography. This will make the parotid duct puncta conspicuous for cannulation. The puncta is located adjacent

to the crown of upper second molar tooth in the buccal mucosa in the vestibule of mouth.

The 21 gauge polythene catheter or 21 to 23 No Jelco catheter was placed in the ductal opening. This catheter was connected to a contrast laden syringe. The contrast medium used was water soluble, non-ionic (omnipaque 300). This contrast media is preferred due to its low viscosity, lowest incidence of allergic reactions in patients and it shows no tendency to break into globules.

After fluoroscopically verifying the position of the canula, the 2 ml of contrast media was slowly injected and care is taken not to introduce air into the salivary duct, as it can mimic a ductal calculus on sialography. One antero-posterior and 2-3 lateral view x-ray films were taken immediately followed by injection of contrast. This contrast was injected slowly and films were taken simultaneously to obtain segmental visualization of Stenson's duct, its branches and acini. This procedure is usually completed within 20-30 minutes. This study does not require any local anaesthesia.

At the end of the procedure, the catheter was removed. No post-procedure medication was required but sometimes we gave sour testing toffee (lemon drops) to chew, which will except residual contrast from collecting system of the gland. No major complications were observed during procedure except patient may feel some discomfort or pressure when the contrast media is injected into the duct. The contrast media may taste sour /bitter. The radiation exposure to the patient is kept minimum by calumniating the x-ray films to produce the image. While performing this technique care should be taken to avoid iatrogenic perforation of parotid duct as it curves around the anterior border of masseter muscle. This complication is more of a theoretical possibility since for the procedure polythene cannulas are used which are non-traumatic and extremely flexible.

Sialography indications:

- Any swelling / enlargement of parotid gland.
- To evaluate functional integrity of salivary gland.
- To rule out salivary gland pathologies.
- It case of obstruction, to evaluate ductal anatomy.

Contraindications of the procedure:

- An allergy to contrast media.
- Acute infections of salivary gland.
- Exaggerated gag reflex.

The complications include:

- Pain during injection of contrast agent
- Post procedural infection
- Iatrogenic ductal rupture
- Extravasation of contrast media

However, none of the above listed complications were observed in present study.

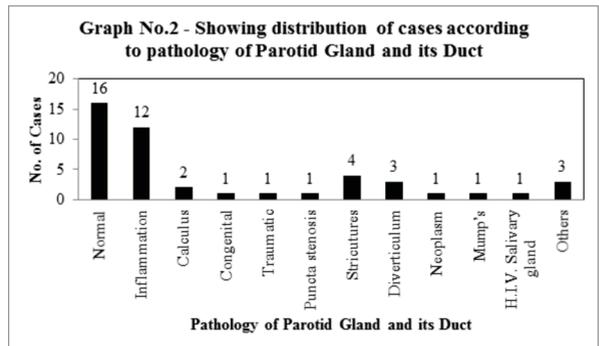
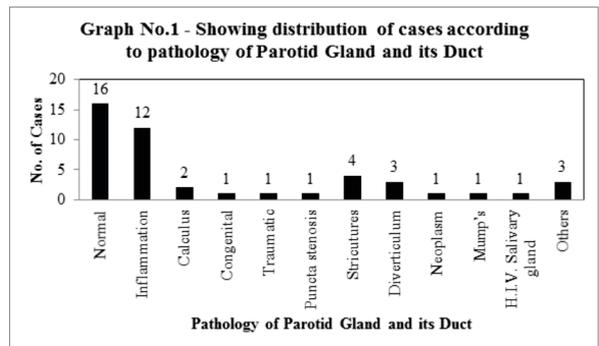
Observations -

Total 46 patients were referred to radiology department for parotid sialography during Jan. 2018 to Jan.2019. In 3 patients the study could not be performed due to technical errors. These errors include ductal punctal fibrosis in chronic tobacco chewers, exaggerated gag reflex in patient. All the sialographies were reported by experienced same radiologist. In 16 patients, the study was normal, In 27 cases, various pathologies of parotid gland and stenson's duct were noted. They are as follows –

The presenting symptom of majority of cases was pain and swelling of parotid gland. These symptoms enhanced after food stimulation. The age of the patients ranged from 12 to 60 years. However, we have not given emphasis on age consideration as the paratoid pathologies did not show statistically significant gender discrimination in present study. Out of 46 cases, the inflammatory etiology causing irregularity of lumen, partial stricture, subpunctal fibrosis was seen in majority of the cases (12 cases – 26%). The calculus formation was a sequel of chronic stasis and was seen in two (4%) cases. Please refer to technique from imaging gallery. Congenital cyst was seen in one case (2.1%). Traumatic lesion following stab injury was noted in one patient (2.1%). Stricture was considered partial when it reduced diameter of duct by less than 50% and was seen in 4 cases (8.7%). In three cases (6.5%), diverticuli were observed which developed secondary to strictures.

The lesions in the gland due to neoplasm, mump's and H.I.V. infection were not seen in significant number in present study. Punctal stenosis can occur as a complication of carries or broken tooth.

Pathology (Duct)	No. of Cases	Percentage (%)
Normal	16	34.78
Others (Test not done)	3	6.52
Inflammation	12	26.09
Calculus	2	4.35
Congenital	1	2.17
Traumatic	1	2.17
Puncta stenosis	1	2.17
Strictures	4	8.70
Diverticulum	3	6.52
Pathology (Gland)		0.00
Neoplasm	1	2.17
Mump's	1	2.17
H.I.V. Salivary gland	1	2.17
Total	46	100%



Discussion:

The multiple pathologies like obstructive, inflammatory, infectious, malignancy affecting parotid gland and it duct can be diagnosed by sialography. The formation of stones or calculi within the salivary glands is referred to as sialolithiasis.⁽⁴⁾ In majority of the cases (approximately 80%), the calculi develop in the submandibular gland, with the second largest percentage (approximately 10%) found in the parotid gland. In 25% of the cases multiple calculi were noted, which usually develop secondary to infection or stasis. Calculi themselves can cause stasis leading to recurrent infection and further calculus formation. The condition is characterized by a calcified mass that develops in the ducts of a salivary gland. In the affected gland, as the flow of saliva from the duct is obstructed, there occurs pain in the glandular region. If the obstruction in the duct is incomplete, edema and pain in the region arise occasionally and persist for few days. Recurring infections may further lead to an abscess formation in the gland. Frequently patients with sialolithiasis are asymptomatic and the calculi are an incidental finding through a radiography taken for some different reason. The calculi that have developed in the parotid glands tend to be radiolucent so a simple x-ray (only 10% are visible on plain x-rays) may not depict them.

Oral & maxillofacial surgeons have been increasingly involved in the diagnosis and treatment of different types of salivary gland obstructions.⁽⁵⁾

Sialography has proved to be an important radiographic study in

mapping salivary gland obstructions before performing interventional sialoendoscopy.⁽⁶⁾ It also provides important anatomical and pathological information about the gland to surgeon.⁽⁷⁾

Katz⁽⁸⁾, Hasson⁽⁹⁾ have reported that sialography is the choice of investigation for assessment of salivary gland.

Sialography is also a minimally invasive / non invasive and relatively painless technique if performed carefully. Kalk et al⁽¹⁰⁾ study has reported the minimal morbidity of the procedure.

Sialography can demonstrate anatomy of the duct, revealing its diameter, presence of accessory glands, details of the salivary calculus such as its dimensions, number, position etc.

This technique can reveal the presence of internal duct strictures also; which can be sometimes remain undetected by plain x-ray or sonography.

Enlargement of parotid gland is often a clinical dilemma for differential diagnosis. The inflammatory or obstructive diseases are painful while painless masses of glands could be of neoplasms, cysts or lymphnodes. Lymphnode masses, Masseteric hypertrophy,⁽¹¹⁾

Peripheral nerve schwannomas may mimic tumors of salivary glands clinically. Other manifestations of malignant parotid masses are infiltration of overlying skin, salivary gland adenopathy and facial nerve palsy. Which will help in delineating the extent of the lesion and its invasion in adjacent structures like skull base, cervical spaces, mandible, nerves, meninges.

Majority of benign lesions of salivary glands are pleomorphic adenoma⁽¹²⁾ with Warthin's tumor (adenolymphoma), oncocytoma, lipoma, haemangioma, myoepithelioma, monomorphic adenoma. Oncocytoma and Warthin's tumor⁽¹³⁾ are predominantly noted in parotid gland. Pleomorphic salivary adenoma is the most common tumour of the salivary gland. 70% of these occur in the parotid gland. It commonly affects the superficial lobe of the gland and is poorly encapsulated. They arise from duct and myoepithelial cells. Most common malignant lesion occurring in parotid gland is mucoepidermoid carcinoma. Other malignant lesions include adenocarcinoma, squamous cell carcinoma, adenoid cyst carcinoma, mucoepidermoid carcinoma.

The congenital lesions noted in parotid gland are cysts, lipomas, haemangiomas, sarcoma, sialolipoma, lymphangioma. In 2015, we have reported a case of Accessory parotid gland situated anterior to main parotid gland, with a calculus in left stenson's duct. As unusual ungenital cause in this case was, this left accessory parotid gland was having a well defined prominent duct of its own⁽¹⁴⁾ emptying into main stenson's duct. Thus, occurrence of accessory parotid gland its own duct should be kept in mind while considering congenital causes of parotid gland pathologies.

Sialadenitis manifests as moderate to severely enhancing, diffusely enlarged salivary gland with or without abscess formation, associated with intraparenchymal / regional lymphadenopathy. Chronic sialadenitis usually present as reduction in parenchymal volume of gland associated with multifocal intraglandular calcifications and rarely a solitary large ductal calculus.

Acute bacterial sialadenitis (inflammation of a salivary gland) usually affects parotid gland. Frequently it occurs in postoperative dehydrated patients and is more common in debilitated, dehydrated older patients. The parotid gland will become swollen, erythematous, and painful. Pus may be discharging from the puncta. Later on, abscess may form there. The common organism found on pus culture is staphylococcus aureus, streptococci and other anaerobic bacteria are also noted.

Strictures are more common in the parotid gland ducts. The etiological factors responsible for strictures are trauma, cheek biting, calculi, infections.

Sialectasis is the dilatation and stasis of the salivary gland ducts. It develops in sialadenitis secondary to obstruction or infection.

Papillary ductal obstruction occurs due to trauma to the papillae of the stenson's duct. Trauma can be caused by ill-fitting dentures in older patients, in young adults during eruption of molars or due to poor oral hygiene. Once the inflammation settles down, then it may lead to fibrosis, stenosis and later obstruction.

Once the patient recovers from the acute phase, a sialography is done to rule out any underlying abnormality. The procedure has therapeutic value too, as it mechanically irrigates and flushes the ductal system with the contrast media.

Mumps is a viral infection, where there occurs acute swelling of the salivary glands. In 70% cases, parotid glands are involved. Though immunity is lifelong, it can cause secondary orchitis in 20% cases, resulting in sterility in 1%.

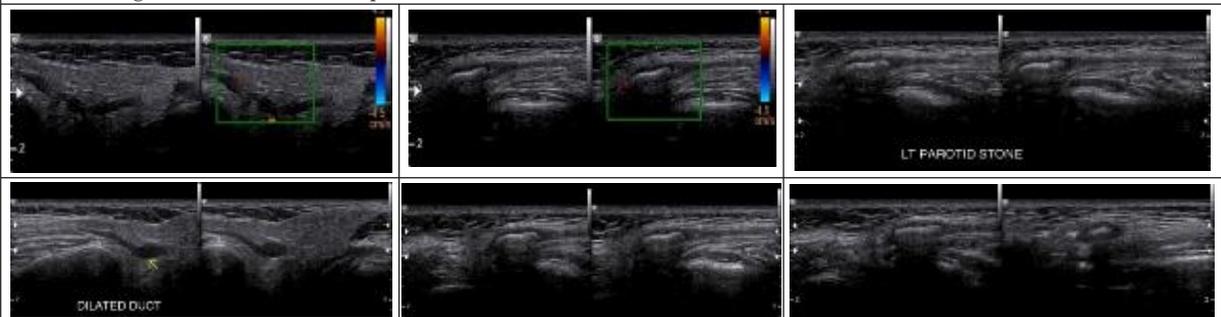
Conclusion:

Sialography is a simple, economical, non-invasive, OPD based technique and an important investigation for the assessment of parotid gland pathologies. Especially, it remains one of the most valuable and commonly used technique in the diagnosis of salivary duct and ductal inflammatory diseases and pathologies like partial obstruction as its high spatial resolution allows detailed view of the glandular duct and its parenchymal branching. This will enable detection, diagnosis and differentiation of subtle pathological changes in these structures and also holds significant importance in the treatment planning, surgeries and sialoendoscopy.

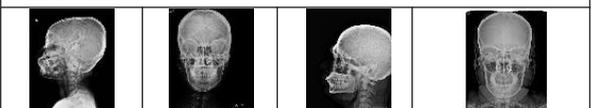
The parotid sialography also gives excellent road map for endoscopic surgeon by giving him detail idea about severity of strictures and obstructive causes like calculi.

Pictorial essay

Ultrasonography - whenever there is difficulty in canulation of puncta and there is stasis in post sialogague film, sonography is indicated at same time with contrast filled duct – this will often show a small calculus which is obscured due to its radio opaque nature. **This is our original and modified technique.**

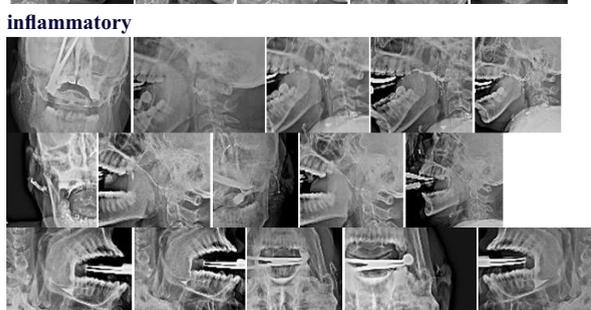
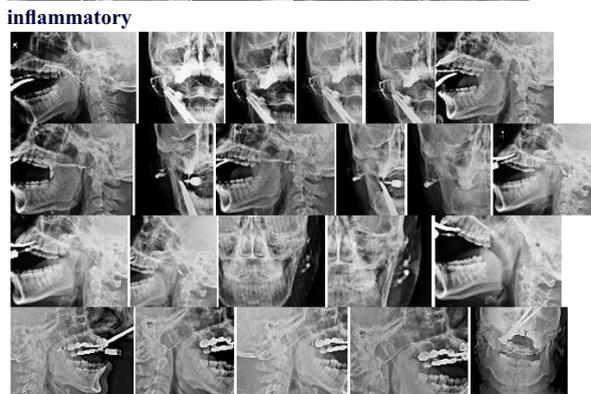
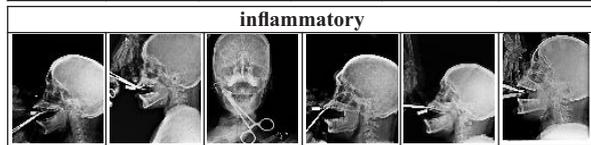
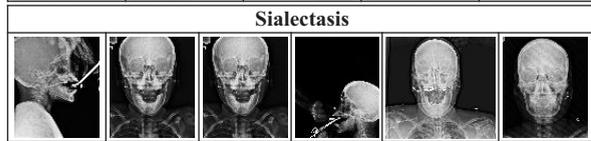
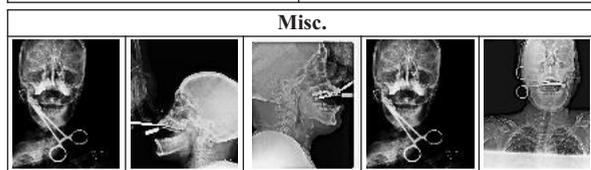
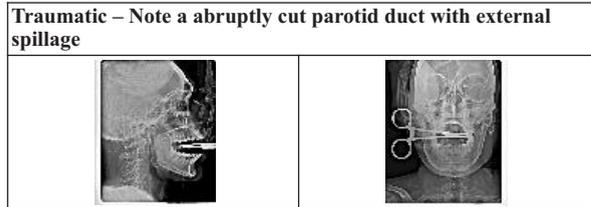
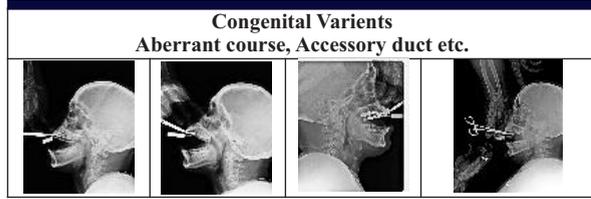


Nomarl Duct and its branching appearance in plain and in contrast films.



Nomarl Duct and its branching appearance in plain and in contrast films.





inflammatory



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* Conflicts of interest - Nil

REFERENCES

- 1 Datta A. K.: Essentials of Human Anatomy – Head and Neck. Current Books International, Calcutta. 2nd Edition, Nov. 1994, Page 148-150.
- 2 Datta A. K.: Essentials of Human Anatomy – Head and Neck. Current Books International, Calcutta. 2nd Edition, Nov. 1994, Page 151.
- 3 Liyanage SH, Spencer SP et al.: Imaging of salivary glands. Imaging 2007; 19:14-27.
- 4 Marchal, F., Dulguerov, P.: Sialolithiasis Management Arch Otolaryngol Head Neck Surg., 2003; 129:951.
- 5 Nahlieli O, Baruchin A: Three years' experience as a diagnostic and treatment modality. J Oral Maxillofac Surg 55:912, 1997
- 6 Hasson O, Nahlieli O: Endoscopy of salivary glands (sialoendoscopy): A new technique for the removal of the sialolithiasis. Rev Assoc Paul Dent 52:277, 1998
- 7 Hasson O: Sialoendoscopy and sialography: Strategies for assessment and treatment of salivary gland obstruction. J Oral Maxillofac Surg 65:300, 2007
- 8 Katz P: Endoscopy of salivary glands. Ann Radiol (Paris) 34:110, 1991
- 9 Hasson O: Endoscopy of salivary glands, what have we learned? J Oral Maxillofac Surg 63:137, 2005 (suppl)
- 10 Kalk WWI, Vissink A, Spijkervet FKL, et al: Morbidity from parotid sialography. J Oral Surg 92:572, 2001
- 11 Dr. saraswathi Gopal et al.: Benign unilateral masseteric hypertrophy: A rare case report. Indian journal of medical and health research. 2017; 03:49-53.
- 12 S. Magalhães et al, Role of conventional sialography in the diagnosis of benign salivary diseases, European Society of radiology , Page 1 of 16.
- 13 Patel ND, Van Zante A et al.: Oncocytoma: The Vanishing Parotoid Mass. AJNR AM J Neuroradiol. 2011; 32:1703-6.
- 14 Joshi Anil, Joshi Rajani: As unusual case of prominent duct of accessory parotid gland. International journal of Recent trends in Science and Technology. May 2015; 15(1): 128-1312.