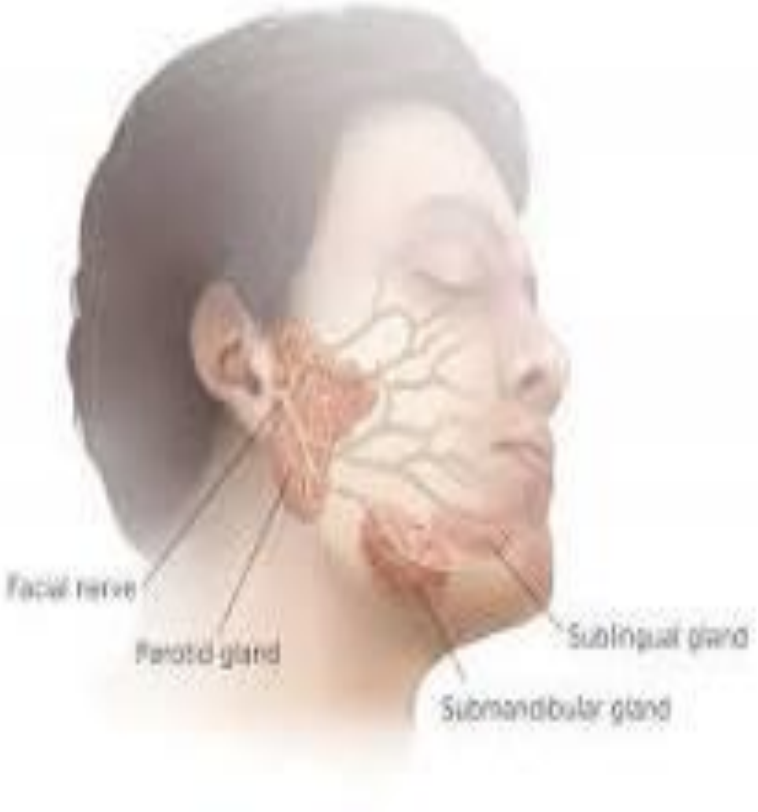
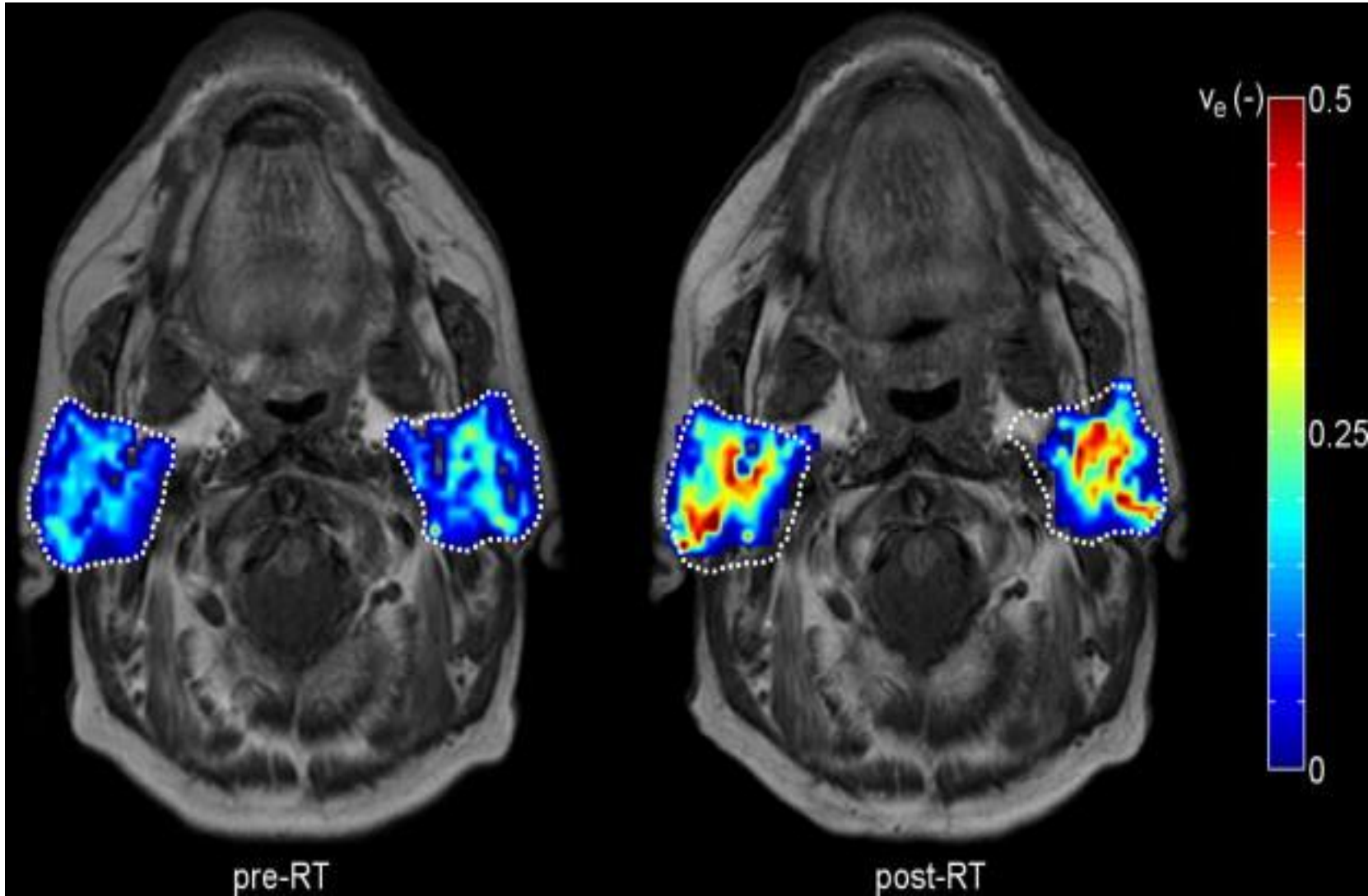
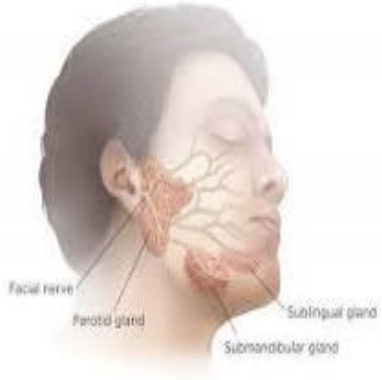
Salivary Gland Diseases





Abbas AY Taher

Salivary glands :



Salivary glands and their secretions play a significant role in preserving the overall health of oral structures. Accordingly, conditions that affect the salivary glands and their function directly affect the teeth and mucosa. These conditions often drive patients to seek care from their dentists. Therefore it is of paramount importance that dentists understand the pathophysiology of salivary glands and be aware of the various diagnostic and management methods in order to provide optimal care for their patients.

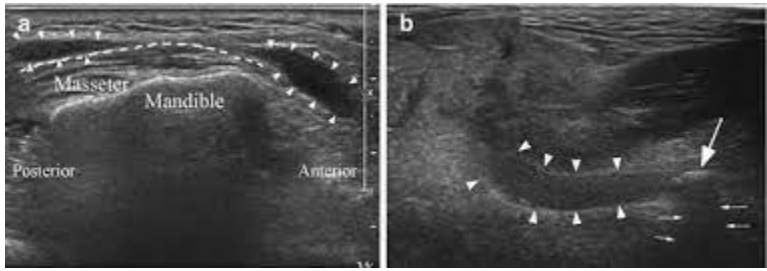
Salivary Gland Disease:

The salivary glands are the exocrine glands that produce and secrete saliva.
There are three pairs of major salivary glands located outside the oral cavity and numerous minor salivary glands scattered throughout the oral submucosa .
Both the major and minor salivary glands can be affected by a variety of conditions that span several pathophysiologies. However, conditions affecting the salivary glands are usually divided into **three major disease processes:**
inflammatory, **noninflammatory**, and space-occupying masses.
Imaging plays a major role in the **diagnosis**, **management**, and **follow-ups of these conditions**

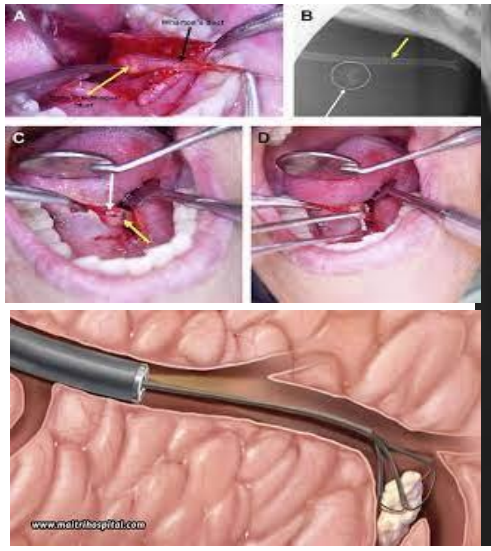
Diagnostic Imaging

Imaging is often used to **diagnose** and to **plan management** and **follow-up of patients with salivary gland disorders**. It provides crucial information regarding. the nature of the disease affecting the salivary glands, the extent and severity of **glandular involvement**, and the effect on the surrounding structures. Many of the available imaging modalities have been used to image the salivary glands including **projection radiography**, **high-resolution ultrasonography (HRUS)**, **multidetector computed tomography (MDCT),** magnetic resonance imaging (MRI), **nuclear medicine**, **sialography**, and **most recently sialendoscopy**

MRI

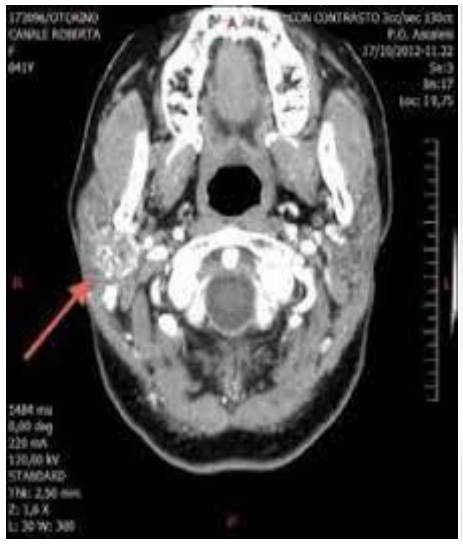


high-resolution ultrasonography (HRUS),

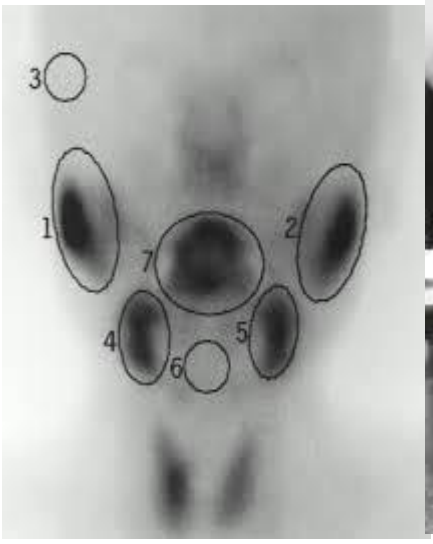


SIALAENDOSCOPY

SIALOGRAPHY



CT SCAN



SCINTIGRAPHY

PLAIN –XARY

PLAIN RADIOGRAPHY AND SIALOGTRAPG

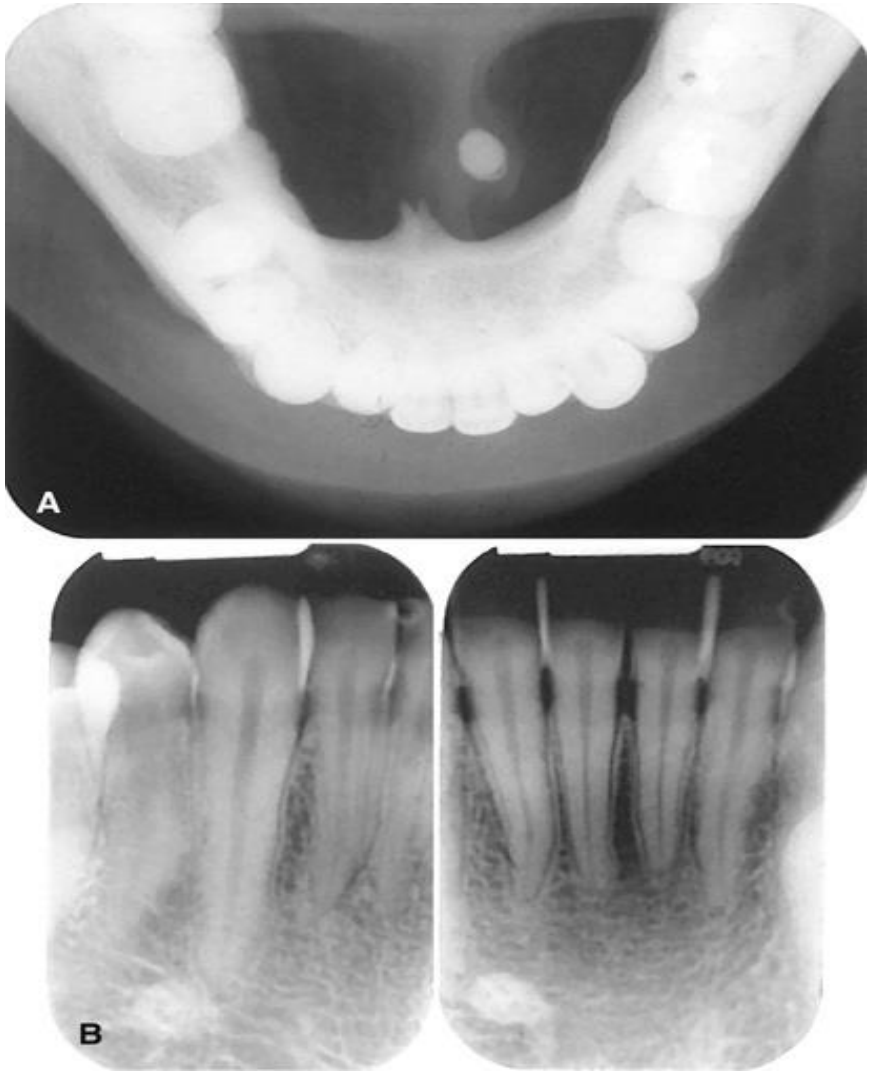
Sialography and plain radiography are still the most widely used radiographic methods for examination of the salivary glands. Nevertheless, once characterized sialography as the neglected stepchild of roentgen diagnosis. Throughout the years, this diagnostic procedure has **remained controversial**, being considered worthless by some and indispensable by others. However, the usefulness of **sialography largely depends on the type** of **disorder under investigation**.
Overrating its diagnostic information may lead to indiscriminate use of sialography.
Subsequently, sialography could lead to **disappointing results**, **particularly in tumor diagnosis**, and this is probably the main reason **why some clinicians are dissatisfied with the method**.

Furthermore, negative experiences may reflect **unfavorably on the value of the procedure**. Consequently, its use might be **avoided altogether**, even when it could provide useful information.
It is therefore important to recognize the appropriate indications for **sialography**; only then can **unrewarding examinations be avoided**

Projection Imaging:

Projection images, whether **intraoral occlusal images** or **extraoral panoramic images**, are helpful in identifying **calcified sialoliths**. Cross-sectional mandibular occlusal images are best used to identify submandibular duct sialoliths whereas panoramic images may be used to demonstrate both parotid and submandibular sialoliths.

Parotid sialoliths appear superimposed over the mandibular rami superior to the occlusal plane, whereas **submandibular sialoliths appear superior to the hyoid bone near the antegonial notch of the mandible** Therefore these images should be considered first when the patient presents with signs and symptoms suggestive of a sialolith such as swelling and pain just prior to or during mealtime. Some of the advantages of projection images are that they are readily available, are inexpensive, and subject the patient to a relatively low dose of radiation. In addition, they allow examination of osseous structures adjacent to the salivary glands. However, projection images do fail at identifying noncalcified sialoliths, which are estimated to account for 40% of all parotid sialoliths and 20% of all submandibular **sialoialoliths**.



(A) Standard mandibular occlusal and (B) periapical images demonstrating an oval-shaped radiopaque sialolith in a Wharton duct

High Resolution Ultrasonography

This technique may be used for the initial assessment of the parotid and submandibular glands, especially when an abnormality is located superficially. It may also be used to guide biopsies and further imaging choices. HRUS is helpful at differentiating cysts from neoplasms, and benign from malignant lesions .

HRUS has become more specific at detecting Sjögren syndrome, but it is still lacking in its ability to detect sialoliths. The major disadvantage of HRUS lies in its inability to detect deep salivary gland lesions, whereas its major advantage is its relative safety because it does not use ionizing radiation

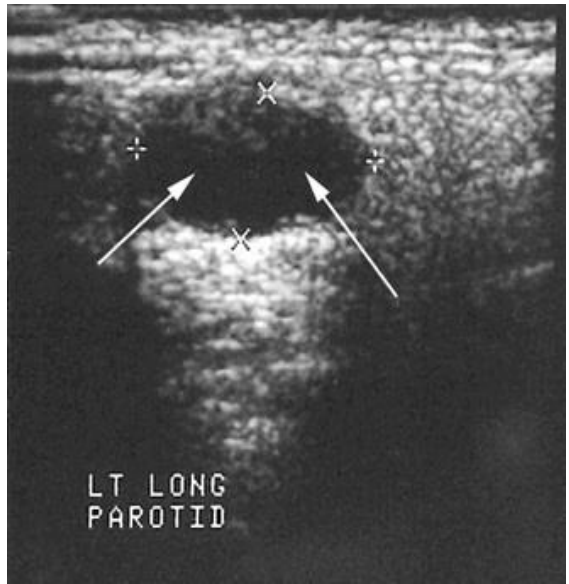
Cropped Panoramic Images. (A) Parotid sialolith superimposed over condylar neck *(arrow)* superior to the plane of occlusion. (B) Submandibular sialolith near the antegonial notch of the mandible. Note the concentric lamellar pattern characteristic of sialoliths

Multidetector Computed Tomography

MDCT, displayed in both hard- and soft-tissue windows, is useful in evaluating not only the salivary glands but also the structures surrounding them

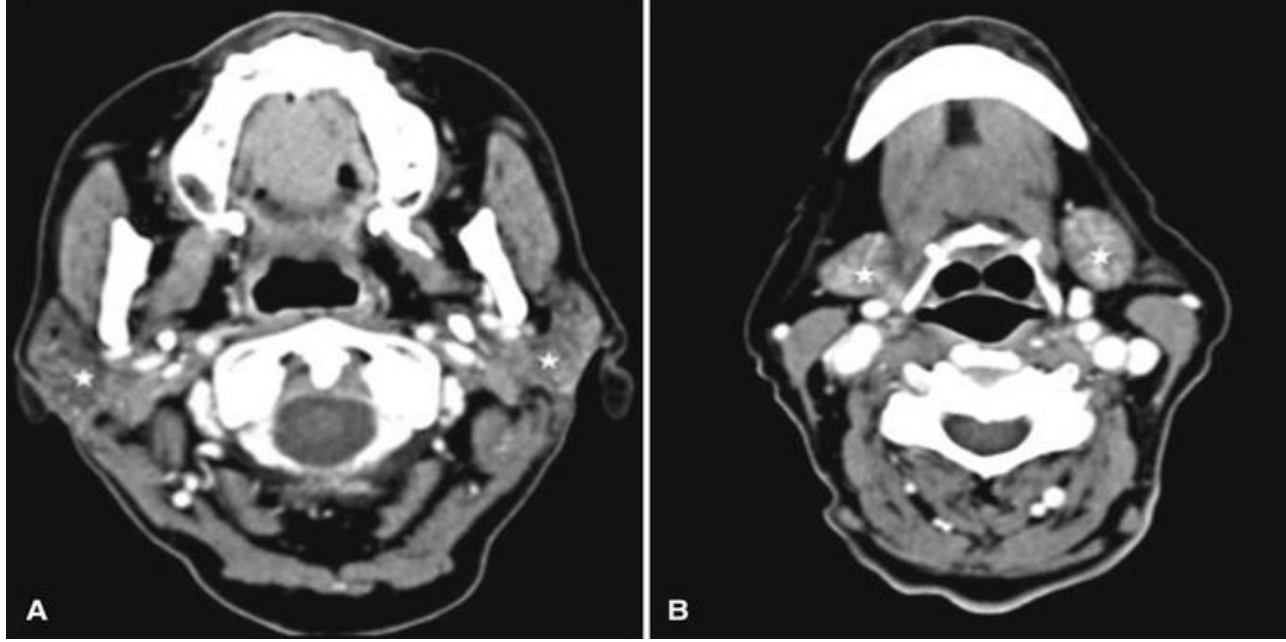
This is especially true when the images are acquired after intravenous administration of a contrast agent that renders glandular tissues hyperdense relative to the surrounding fat and muscle.

High-resolution ultrasonography image of the parotid gland demonstrating an echo-free mass with well-defined margins, which is typical of a cystic mass *(arrows)*



MDCT imaging is used in cases when inflammation of the salivary glands is suspected because it demonstrates characteristic features such as peripheral enhancement, thickening of the subcutaneous tissue, and lymph node involvement, some or all of which can be seen in inflammation or neoplasia.

Sialoliths are well depicted on MDCT images but only if they are relatively large and significantly calcified. Smaller, **less-calcified sialoliths** and **ductal strictures are not well depicted on MDCT images**. With regards to cysts and neoplasms, MDCT imaging is excellent at detecting these lesions but may not be reliable at distinguishing benign from malignant lesions



Axial soft-tissue algorithm multidetector computed tomography images (A) at the level of the parotid glands *(stars)* and (B) at the level of the submandibular glands *(stars)*. Because the salivary glands have more fatty stroma than muscles, they appear less dense than adjacent muscles

Magnetic Resonance Imaging

Although indications for MRI occasionally overlap with those of MDCT, MRI is the imaging method of choice for assessment of space-occupying lesions (cyst and neoplasms) of the salivary glands because of its superior soft-tissue contrast

In addition, the use of intravenous gadolinium as a contrast agent makes MRI the imaging modality of choice for evaluation of intracranial and perineural spread of disease.

Detection of **sialoliths**, particularly when calcified, is problematic in MRI because these calcific entities result in signal voids.

Other disadvantages of MRI include long acquisition times, relatively poor spatial resolution, cost, and accessibility

Magnetic Resonance Imaging

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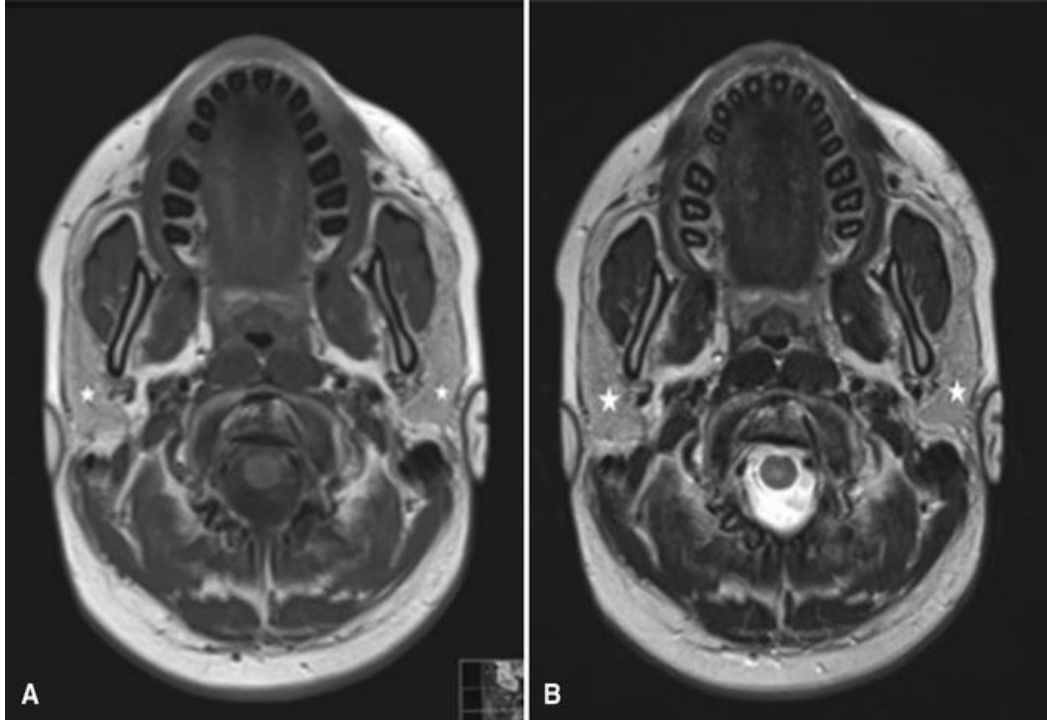
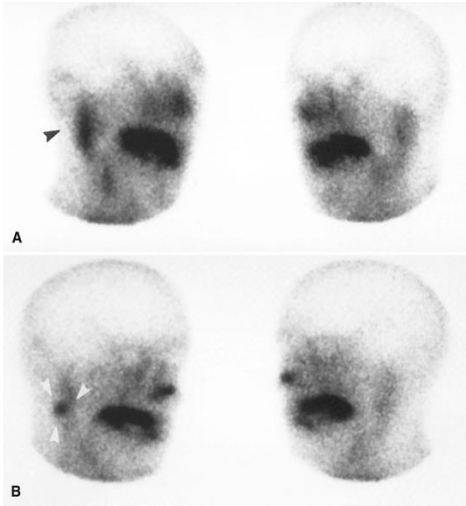


Magnetic resonance imaging of normal parotid glands. (A) T1-weighted image and (B) T2-weighted image displaying the hyperintense signal of the parotid glands *(stars)* relative to the adjacent muscle

Nuclear Medicine:

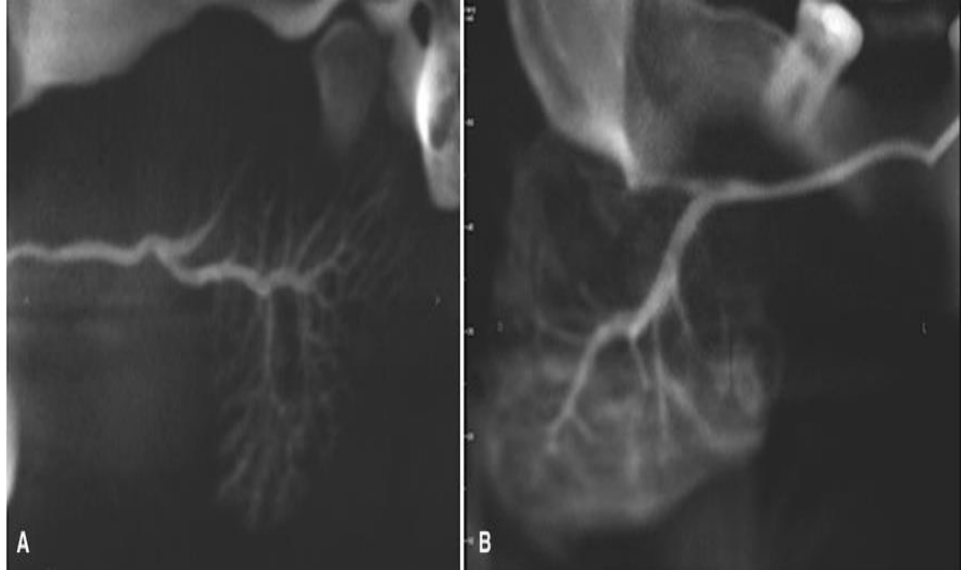
Nuclear medicine examinations are functional examinations of the salivary glands. This modality takes advantage of the selective uptake of specific radiopharmaceuticals such as technetium 99m (99mTc)-pertechnetate (TPT) by the salivary glands when injected intravenously. This is followed by administration of a sialagogue to evaluate the secretory capacity of the salivary glands. Pathosis may be determined on the basis of variations in the rate of TPT uptake or clearance. For example, Warthin tumor distinctively demonstrates reduced TPT clearance



Nuclear Medicine. (A) Technetium 99m (99mTc)-pertechnetate (TPT) scan of the salivary glands (right and left anterior oblique views) demonstrates increased uptake in the right parotid gland *(black arrowhead)*. (B) Nuclear medicine image obtained after administration of a sialagogue (lemon juice) demonstrates retention of TPT in the right parotid gland *(white arrowheads)*. This is a typical presentation of a Warthin neoplasm.

Sialography:

First performed in 1902, sialography is an imaging technique exclusively used for the parotid and submandibular salivary glands. The technique involves infusion of the gland ductal system with an **iodinated contrast agent**, and then imaging the gland with **projection imaging**, **fluoroscopy**, **MDCT**, or **cone beam computed tomography (CBCT).** **Sialography** is the only imaging technique that can assess both the morphology of the parotid and submandibular glands in addition their function. **The rate of clearance of the contrast agent from the gland**, especially when prolonged, is used as an indirect indicator of reduced secretory function. **MRI may be combined with sialography**, but in these cases the patients' own saliva is used as a contrast agent and the imaging is done using heavily **weighted T2 protocols**.



Sialography coupled with cone beam computed tomography.(A) Corrected sagittal image of a normal left parotid gland illustrating the branching pattern of the ductal structures. (B) Corrected sagittal image of a normal right submandibular gland also illustrating the branching ducts. The outline of the gland body is displayed here due to filling of the acini with contrast material

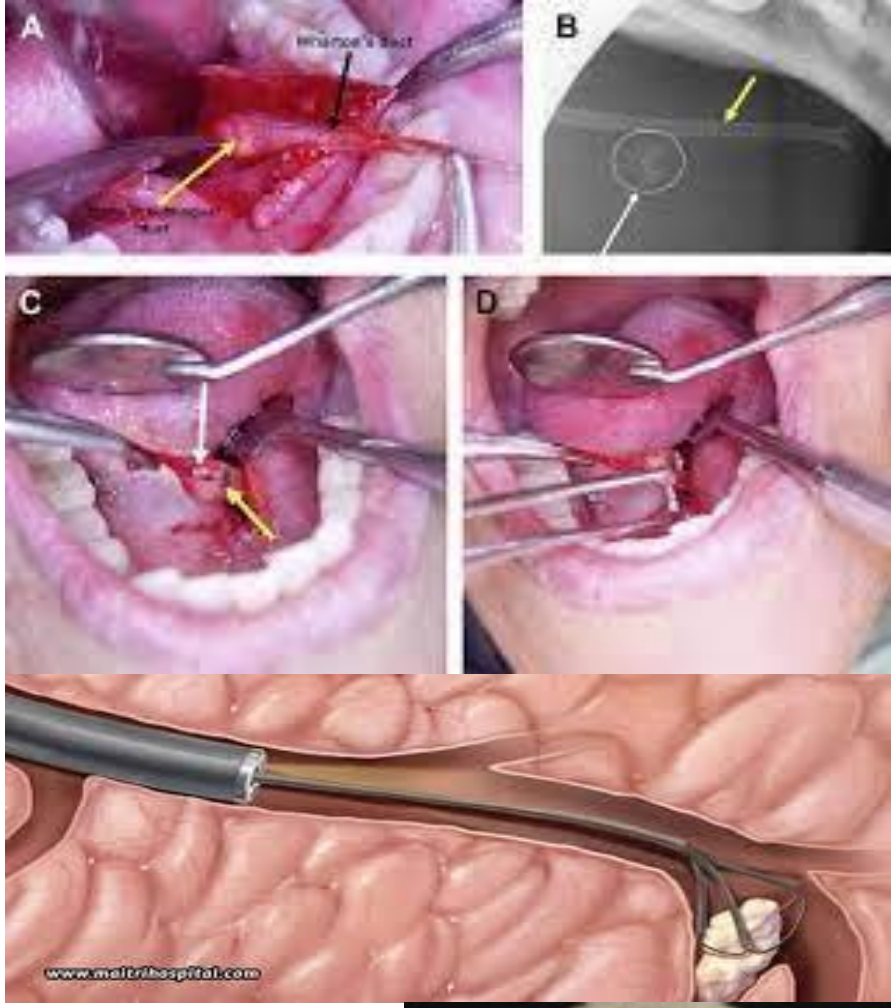
The primary indication for sialography is chronic inflammatory conditions, especially when obstruction is suspected.

There are two contraindications for sialography. **The first** of these is acute infection because injection of the contrast agent may disperse the infection into otherwise unaffected regions within the gland and cause further pain for the patient. **The second contraindication** is an immediately anticipated thyroid function test because **the iodine in the contrast agent** may concentrate in the thyroid gland and interfere with the results of the test.

Recently, sialography has been coupled with CBCT, and this coupling has resulted in three-dimensional images with submillimeter resolution and multiplanar capabilities that have revolutionized the visualization of the parotid and submandibular glands

Sialendoscopy:

Since its first use in the 1990s, this examination that involves direct visualization of the parotid and submandibular major ducts .has transformed the diagnosis and management of obstructive conditions of these glands. The minimally invasive technique can be equipped with sialolith retrieval and stricture dilation tools that have enabled management of these common conditions with reported success rates greater than 95%. Acute inflammation is the only known contraindication for this relatively new technique because of the possible pain that may be elicited



Sialendoscopy allows direct visualization of the salivary gland ducts. This particular image demonstrates a sialolith *(arrow)* in one of the branching ducts


Thank You!