Role Of Ultrasonography In Diagnosis Of Salivary Gland Diseases –A Review

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INTRODUCTION:

The parotid gland is the most affected major salivary gland, accounting for 85% of cases. Pleomorphic adenoma (PA), which accounts for 70–80 percent of benign salivary tumours, is the most frequent benign parotid neoplasm. However, this tumour may occasionally recur and develop into a malignant tumour.[1]

The deep lobe of the parotid gland is difficult to visualize with US (Ultrasonography) because it is obscured by the mandible.[2]

Clinical signs and symptoms of the salivary gland diseases generally tend to be nonspecific. A complete physical examination along with a full medical history frequently suffices to provide enough information for a clinical diagnosis due to the superficial placement of these glands, which is easily accessible for inspection and palpation.
However, confirmation of this diagnosis

and further evaluation are frequently necessary, and imaging procedures play an important role in this respect.[3]

The parotid, submandibular, and sublingual glands can be scanned with high-resolution transducers because of their superficial positions.[4] When a tumour is suspected, US is utilised to direct fine-needle aspiration biopsy (FNAB) or core-biopsy.[5]

In patients with salivary gland lesions, ultrasound (US) is the conventional and most used imaging technique.[6] Ultrasound also plays an important role in the diagnosis of space-occupying lesions.[7]

The basis for using ultrasonography for diagnostic purposes is the transmission of an ultrasonic beam into the area to be scanned and the reflection or echo of the sound waves that take place when these waves reach an interface between tissues of different density or impedance.[3]

In comparison with other imaging procedures such as sialography and CT, ultrasonography has some distinct advantages: It is inexpensive, widely available, easy to perform, painless, and, most important, non-invasive, without any known harmful effects on the patient. Furthermore, the tomographic plane can be easily manipulated at the time of imaging, and thereby the amount of diagnostic information obtained can be increased. The main application of ultrasonography in the diagnosis of major salivary gland disease is the differentiation of cystic or fluid-containing lesions from solid masses.[3]

The reported ability of ultrasonography (US) to differentiate benign from malignant tumors ranges from 80% to 87%.[2]

The sonographic characteristics of parotid masses including shape, margin, echogenicity, echotexture and vascularization between benign and malignant lesions had no significant difference, which indicated that it is hard to distinguish malignant parotid masses from benign masses using sonography and that this method is unable to distinguish between different benign or malignant lesions because some tumours and lesions have similar characteristics.[7]

US examination of the salivary glands should be performed using a high-frequency linear array transducer, typically 7 to 12 MHz or greater. Lower frequencies may be useful in the assessment of large tumors and lesions located in the deep aspects of the glands.[8]

The salivary glands and all lesions within them should be evaluated in at least two perpendicular planes. During the US examination, the actual transducer orientation may need to be tilted slightly off true transverse or sagittal to navigate around the mandible and mastoid. The patient's head position can be turned and extended to improve visualization of the deep portion of the gland. The bilateral glands should always be examined for comparison and identification of individual differences, unilateral diseases, and systemic processes.[8]

Procedure of ultrasonography:[2]

US was performed according to a standard protocol by the radiologist assigned.

For each tumor the following imaging features were noted:

1) echogenicity,
2) homogeneity,
3) presence of cystic areas,
4) smooth or ragged outline of the margin,
5) distinct or ill-defined demarcation from normal parotid tissue,
6) multiplicity,
7) presence of enlarged lymph nodes (>5 mm short axis, or clustered >4 mm),
8) hypo- or hyper-vascularity with respect to the surrounding tissue, and
9) presumed histologic diagnosis (pleomorphic adenoma, Warthin's tumor, malignancy, cyst, other benign tumor).

NORMAL ULTRASONOGRAPHIC APPEARANCE OF PAROTID GLAND

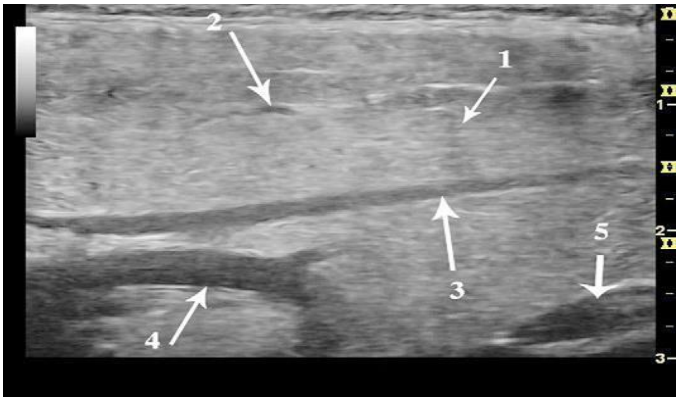


Fig-1: Longitudinal sonogram of a normal parotid gland.
1: parenchyma, 2: small duct,
3: retromandibular vein, 4 and 5: external carotid artery.

Salivary gland diseases and ultrasonographic findings:

Acute sialadenitis

Sonographically, the glands are enlarged with a more rounded shape, with a convex lateral surface and a hypoechoeic structure. Color Doppler demonstrates hyperemia.

The main task of sonography in inflammatory diseases is to exclude ductal obstructions. In gray-scale sonography meticulous investigations are necessary in order to visualize moving debris in an abscess. An abscess can be punctured under US guidance.[4]

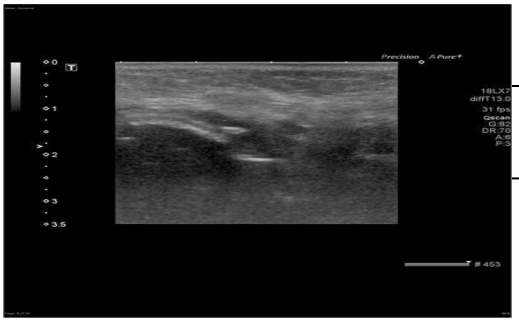


Fig-2: Acute sialadenitis

Chronic sialadenitis

In chronic inflammations the sonographic changes are often less prominent than in acute diseases.

An atrophic hypoechogenic gland may be seen, but the size of the glands is variable. Sometimes ductal ectasia is found. Sialography is superior to sonography in visualization of ductal chronic inflammatory obstructions.[4]

Sjogren's syndrome

Sjogren's syndrome (SS) is a systemic autoimmune disease whose main target is the exocrine glands, mainly the salivary and tear glands. Ultrasound findings of hypoechoic, multiple, circumscribed or confluent areas and/or multiple cysts correspond to a histological pattern of ductal ectasia surrounded by lymphocyte infiltrate or dilated glandular lobes surrounded by lymphocyte aggregates.[9]

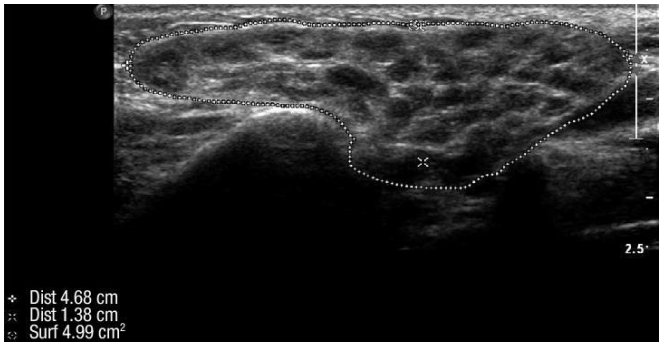


Fig-3: Mottled appearance of parotid gland in Sjogren's syndrome

Sialoadinosis:

Sonography shows enlarged glands with a hyperechogenic structure and no focal lesions. Due to the high echogenicity, the deep portions of the parotid glands are usually not visualized.[4]

Sialolithiasis:

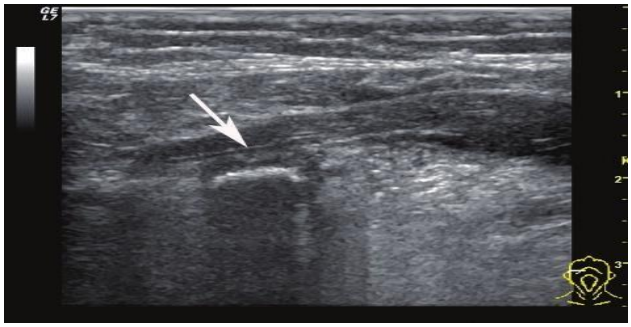
Sialoliths are calcified structures developing in salivary glands.US can detect almost all intraparenchymal stones in the parotid and submandibular salivary gland.[10]

Sonographically, concrements have a typical appearance as bright curvilinear echo complexes with posterior shadowing. In concrements smaller than 2 mm this shadow may be missing. Color Doppler shows hypervascularization. The accuracy of sonography in assessment of sialolithiasis is approximately 90%.[4]

Fig-4: Salivary gland calculi on ultrasonography – right submandibular gland

It is estimated that its sensitivity ranges from 59.1 to 93.7% whereas its specificity varies from 86.7 to 100%.[11]

It is possible to differentiate calcified lymph nodes and phleboliths in facial veins from concrements.[4]



Salivary gland tumours:

Pleomorphic adenoma:

Sonographically, the tumor is well circumscribed and usually shows a homogeneous hypoechogenic echogenicity. When calcifications are found in parotid tumors histology reveals a pleomorphic adenoma in most case.1 It Is a usually a slowly growing lesion.

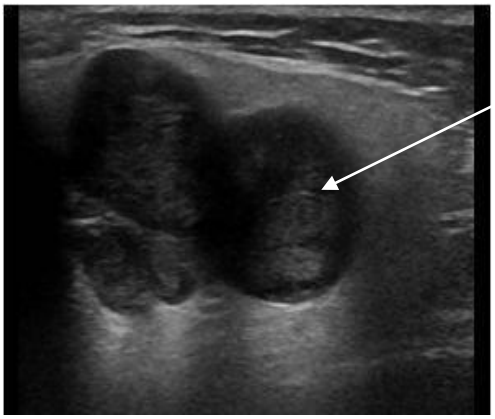


Fig-5: Pleomorphic adenoma

Warthin's tumor:

Warthin's tumors are sharply bordered masses. On sonograms the lesion is usually more inhomogeneous than the pleomorphic adenoma.[4]

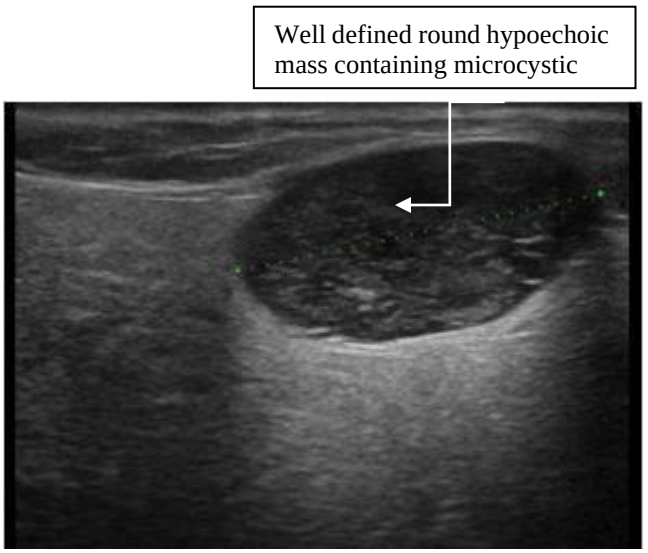


Fig-6: Warthin's tumor

Lipomas:

These relatively soft, fat-containing tumors typically have an ovoid shape and are outlined sharply.

Sonographically, they are moderately compressible.

pure fat-containing lipomas are moderately hypoechogenic lesions.

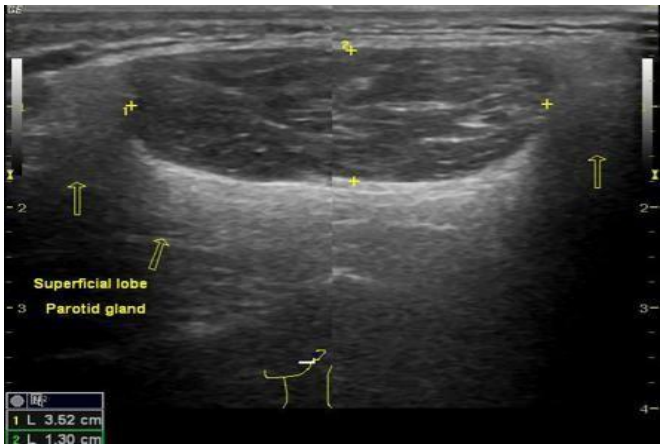


Fig-7: Parotid Lipoma

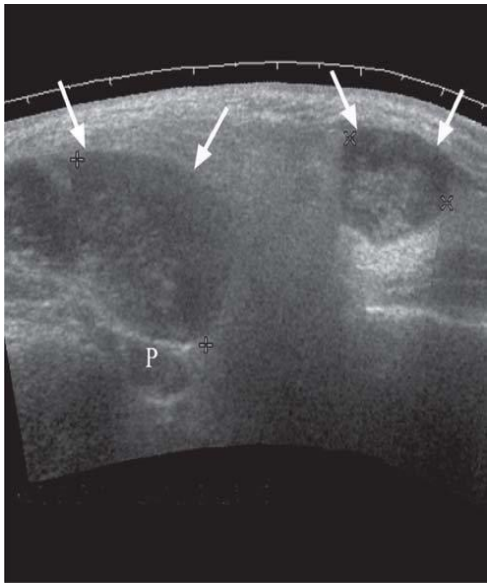
Malignant tumors

Mucoepidermoid carcinoma

Mucoepidermoid carcinoma is the most frequent malignant tumor of the salivary gland.

Malignant tumors of less than 2 cm diameter usually have a homogeneous structure and present with smooth borders;

High malignant tumurs and larger lesions mostly show irregular borders and a typical heterogeneous echo pattern.



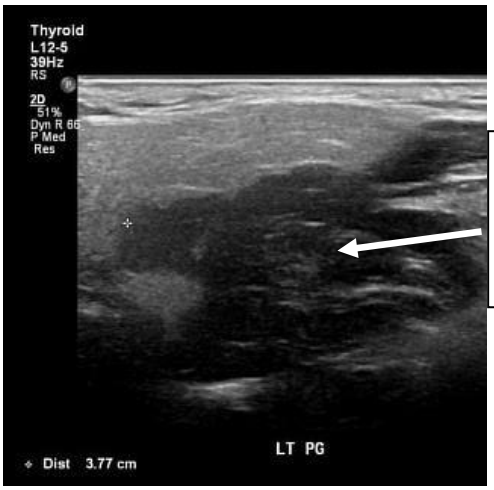
Well circumscribed hypoechoic lesion with partial or complete cystic appearance

Fig-8: Mucoepidermoid carcinoma

Adenoid cystic carcinoma:

Adenoid cystic carcinoma is a relatively rare form of cancer that most commonly develops in the salivary glands or other region of the head and neck.

The typical perineural infiltrations are usually not detected by sonography.



Heterogenous hypoechoic lesion within deep parotid

Fig-9: Adenoid cystic carcinoma of parotid gland

CONCLUSION:

Ultrasound examination of the salivary glands contributes significantly to the diagnosis of salivary gland diseases. In addition, all major salivary glands can be easily studied in a single examination, and it is also possible to identify a proportion of subjects at greater risk of extra-glandular complications.

ultrasound is highly valuable, useful and reliable in differential diagnosis of salivary gland diseases.

It enables precise localization, measurement, and assessment of the structure of lesions.it may be the first and the last imaging method needed to formulate the final diagnosis, or it may guide fine-needle aspiration biopsy. In many cases US may also suggest the nature of the tumour.

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