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Efficacy of Strain Sonoelastography in Inflammatory and Benign Swellings of Parotid and Submandibular Glands

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ABSTRACT

Aim: To evaluate the efficacy of strain sonoelastography in inflammatorylesions and benign tumours of parotid and submandibular glands.

Materials and Method: Twenty five patients with parotid and/or submandibular gland swellings were incorporated in the study. Ultrasonography and sonoelastography was carried out in all the patients. In inflammatory lesions, medicinal treatment protocol was followed after imaging, whereas in benign lesions histopathological correlation was done for the final diagnosis.

Results: Sonoelastography showed significant correlation between the clinical palpation of the lesion and significant difference between the mean strain ratio and elastographic score between inflammatory and benign lesions.

Conclusion: Sonoelastography can be used along with gray scale ultrasonography as a primary investigative modality in diagnosising parotid and submandibular gland swellings.

Keywords: Sonoelastography, inflammatory lesions, parotid and submandibular glands

INTRODUCTION

Swellings of parotid and submandibular gland represent heterogeneous pathologies such as infectious, inflammatory, and neoplastic disorders.[1] Parotid and submandibular gland tumours are uncommon and its prevalence is about 2-4% in the head and neck neoplasms. Mostly the neoplasms are positioned in parotid (80%) and submandibular gland (14%).[1-2] Though they are superficial, but are difficult to diagnose accurately. Imaging by various modalities is more important for the accurate diagnosis and better prognosis.[3]Ultrasound is a primary and powerful imaging investigation used to identify pathologies in

parotid and submandibular gland swellings and is helpful in the differential diagnosis of the palpable lesions.[4]

Recently, Sonoelastography (SE) has been introduced in the field of ultrasonography. Its development was started about 20 years ago with the aim of getting more accurate clinical and imaging findings of a tissue base on the factor of tissue elasticity.[5]It can together be portrayed by investigating the stress in the tissue or by the imaging of shear waves, mechanical waves, theirtransmission can bewell-ordered by the stiffness of tissue than by its bulk modulus.[6]The characteristic features of stiffness of the tissue is that it has almost similar values on clinical palpation and on imaging values of clinical palpation, and has relevant diagnostic value also shows difference between various biological tissues which makes it asupreme imaging modality.It has been widely used in biological tissues like liver, breast and prostate.[5,6]The malignant lesions are more stiffer than the benign lesions and inflammatory lesions.[3]The real time sonoelastography has become an interesting imaging modality because of its non-invasive nature, ability to detect the stiffness of the tissue and the surrounding structures of diffused lesions. Therefore, the current study was conducted with the objective of evaluating the overall efficacy of sonoelastographyin the parotid and submandibular gland swellings.

AIM: - To evaluate the efficacy of Strain sonoelastography in parotid and submandibular gland swellings.

OBJECTIVES: -

1. To evaluate parotid and submandibular gland swellings by ultrasonography.
2. To evaluate parotid and submandibular gland swellings by sonoelastography.
3. To compare and evaluate swellings involving parotid and submandibular glands byultrasonography and Sonoelastograph.
4. To differentiate between inflammatory and neoplastic lesions involving parotid andsubmandibular glands.
5. To assess the overall efficacy of elastography (Sonoelastography) indiagnosising parotid and submandibular gland swellings.

SUBJECTS AND METHODs:-

For the presentstudy 25patients (14 males and 11 females) with clinical symptoms, extraoral swellings over parotid and/or submandibular region wereincluded in the study.The written consent from the subjects weresought, two experienced Radiologist performed Ultrasonography and Elastography in the soft light room. The patients were instructed to lie in supine position and a small amount of water based gel was applied to the skin on the area of interest to eliminate the thin layer of air that would reflect sound, preventing its entrance into body. All the subjects were evaluated initially by gray-scaleultrasound,colour doppler, and then by real-time sono-elastography. An ultrasound machine with a 13- 16 MHz 3-cm-aperture linear probe (Hitachi Aloka Arietta S70) was used for ultrasound and Sonoelastography. Ultrasonographic evaluation was done on the criteria of size, shape, margins and echogenicity of the pathology. Color Doppler was also performed in every case for the evaluation of the vascularity of the lesion, Sonoelastography was also carried out on the same machine. It was a real time procedure and compression type of sonoelastography i.e. strains sonoelastography. For the sonoelastography procedure, the system was changed into sonoelastography software after the gray scale ultrasonography. The elastogram was displayed in a continuum of colours from red to green to blueassigning soft (high strain) intermediate (equal strain) and hard (no strain) according to the stiffness of the tissue, The grading for the masses was given according to the colour scale and 4-point score of elastography was obtained from the breast elastography score depicted by Itohet al.[3]

Score 1- Mass similar in elasticity to adjacent parenchyma of gland, with a combination of green, yellow, and red regions.

Score 2- Mass chiefly soft compared with surrounding parenchyma, with presence of some regions of stiffness, indicating < 50% of tumour region.

Score 3- Mass largely stiff, but still areas of elasticitypresent; stiffness over > 50% of tumour

Score 4- Mass completely stiff (elastogram showing the range from light blue - dark blue)

Following clinical and ultrasonographic diagnosis, appropriate further investigations like incisional or excisional biopsy and Fine needle aspiration were performed. In cases of inflammatory swellings,

histopathological examination was not indicated, hence a successful non-surgical i.e. antibiotics and anti-inflammatory treatment was given. The clinical data thereafter was correlated with sonoelastogaphic findings and histopathological findings by students unpaired t test and chi square test.

Ethical Consent

The proposal for the present study was approved by the Ethical Committee of Datta Meghe Institute of Medical Sciences DMIMS (DU)/IEC/2016-17/5078.

RESULTS

Out of 25 subjects, 14 (56%) males were and 11(44%) females and a mean age of 32.08±14.55 years. Out of 25 masses, 14 (56%) masses were located in parotid region whereas 11(44%) masses were located in the submandibular region. Twenty (80%) masses were clinically diagnosed as inflammatory and 04 (20%) were diagnosed as benign. The mean clinical size of the swelling was 3.24±0.67 whereas the size on ultrasonography imaging was 3.66±0.82 (p=0.68, Not significant). Eight (32%) lesions were oval in shape, 06(24%) lesions were round whereas, 11(44%) swellings had irregular shape on ultrasonography, 18(68%) lesions had well-defined margins, 07(32%) had irregular margins. Twenty-two lesions (88%) showed hypoechogeneity, 01 (04%) lesions showed hyperechogeneity. Whereas, 01 (04%) lesion showed floating type of echogeneity. Five (20%) lesions showed posterior enhancement. On color Doppler, 22 (88%) lesions were highly vascular, whereas, 03(12%)lesions showed poor vascularity. The mean elastographic score for inflammatory was 1.36 and for benign was 2.03 (p=0.04, Significant) (Table 1). Out of 05 benign tumors, 03 tumours on histopathological evaluation came out to be pleomorphic adenoma, 01 was Warthins tumour whereas 01 was heamangioma of parotid gland.

TABLE 1:- Ultrasonographic and Elastographic Features of the lesions

Lesion type	No. of nodules	Mean size	location	Echogeneity	Vascularity	Mean Elastographic score
Inflammatory	20	3.69±0.87	P = 11 S = 09	Hypo = 19	HV- 20	1.36
Benign	5	3.50±0.57	P = 05	Hypo = 04 Floating = 01	HV – 02 PV - 03	2.03

No. – Number, P – Parotid, S – Submandibular, Hypo –Hypoechoic, HV- Highly Vascular, PV- Poorly Vascular.

DISCUSSION

Ultrasonography is useful, reliable and frequently employed method in diagnosis of diseases of salivary glands. It provides the comprehensive information pertaining to the exact location size, shape, and echogenicity of conditions, including the acoustic effects and association with adjacent tissue.[7,8] Sonoelastography is a recent imaging modality in the world of ultrasonography which deals with the elasticity of the lesion after giving compression.[5]

The mean age in this study was 32.08±14.55 years. The youngest patient was 06 years old while, the eldest was of 55 years. Fourteen (56%) patients had swelling in parotid gland region and 11 (44%) patients had swelling in the submandibular gland region as bacterial parotitis is more common. On sonoelastography, all the inflammatory lesions showed elastographic score 1 or 2 i.e. soft in consistency and the mean strain ratio for inflammatory lesions were 1.36. This might be because maximum patients in this study presented with the acute swelling which most commonly presents as a soft swellings.

The pleomorphic adenoma was firm on clinical examination, lobulated, floating (mixture of hypoechoic and hyperechoic) echogeneity on ultrasonography and poorly vascularized on colour doppler and elastographic score was ES 2 (Figure 1)

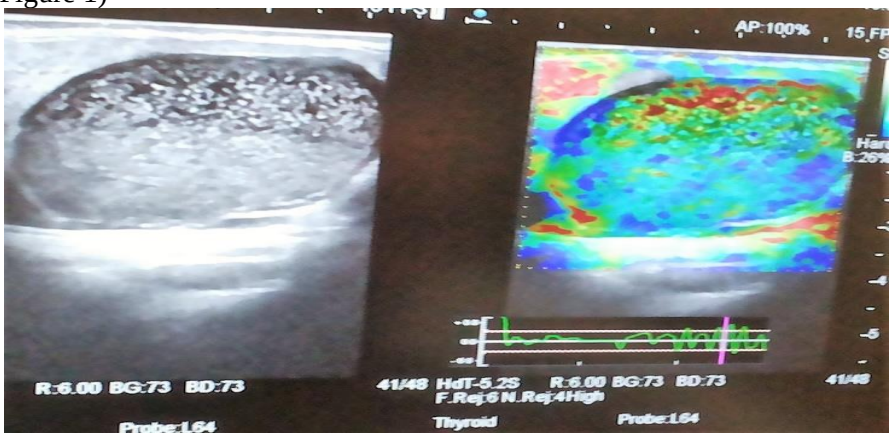

Fig 1 - Ultrasonography and Elastography images showing floating echogeneity on ultrasound and Elastographic Score 2 on Elastography.

Whereas Warthinstumor appeared as a soft lesion, the elastographic score for Warthinstumor was ES1 (Figure 2)

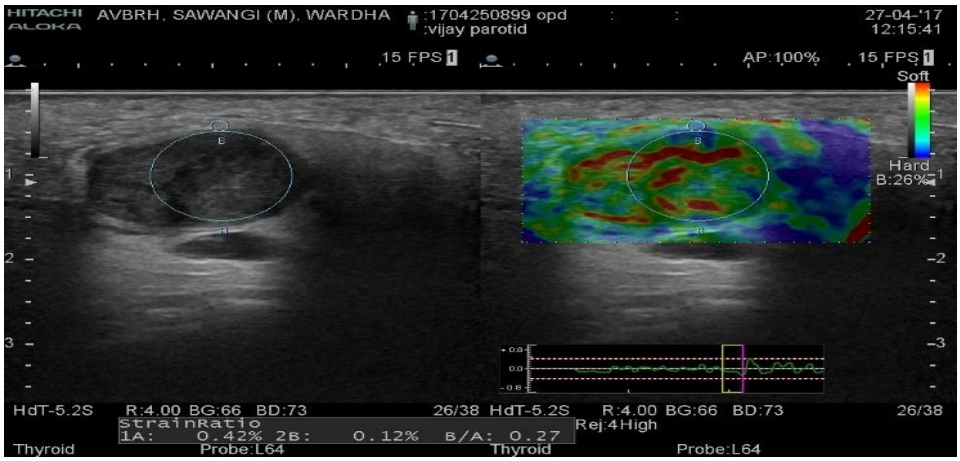

Figure 2: Ultrasonography and Elastography images showing hypoechoicechogeneity on ultrasound and Elastographic Score (ES) 1 on Elastography.

And on histopathological correlation it revealed the features of Warthinstumor (Fig 3).

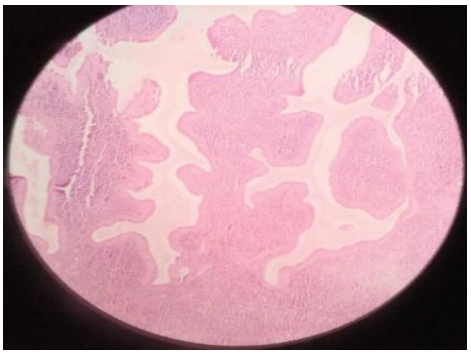

Fig 3 - H&E 10x view showing histopathology of Warthin's tumor

Warthinstumor are generally well-defined tumours with fluid filled internal echogeniety and hypervascularized. The pleomorphic adenoma may be vascularized.[9]
Inflammatory lesions may be well-defined or ill-defined with internal fluid filled echogeneity, hypervascularized and acute lesions may show elastographic score of 1 and 2, whereas in chronic inflammatory lesions it may vary. On imaging of benign lesions, they are well-defined, hypoechoic, may be hypervascularized and may show elastographic sore of 1, 2 or 3 depending on the chronicity of the lesion. [10, 11, 12, 13]

CONCLUSION

From results of the present study, it can be concluded that sonoelastographycan be used along with gray scale ultrasonography as a primary investigative modality in the diagnosis of submandibular and parotid gland swellings. However Sonoelastographic evaluation cannot replace clinical and histopathological procedure in evaluation of the salivary gland pathologies.

CLINICAL RELEVANCE: -

The score of elastography defines the elasticity of the lesion, and thus are correlated with clinical palpatory findings and is helpful in selecting the biopsy site.

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CONFLICT OF INTEREST:

The authors declare that they have no conflict of interest.

CORPORATE SCOPE: -

All the ultrasonography machines should be equipped with elastography software for more accurate diagnosis.

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