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Role of Ultrasound and Computed Tomography in Evaluation of Salivary Glands Lesions

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ABSRACT

Background: The most typical reason for salivary gland swellings is mumps, one of the viral diseases of the salivary gland. Another reason for swelling is a tumor. The parotid glands are the primary source of around 70% of salivary gland tumors. The initial imaging technique for swollen salivary glands is ultrasound. Examining the deep lobe of the parotid with ultrasound (U/S) is challenging.

Objective: The aim of the current work was to evaluate the role of ultrasound and computed tomography (CT) in the differentiation between benign and malignant salivary glands lesions.

Patients and Methods: A cross sectional analytic study was conducted on 46 patients with swellings in the head and neck of either gender referred from the outpatient clinics of ENT, head and neck surgery and dentists to Radiology Department, Faculty of Medicine, Menoufia university, Sheikh Zayed Specialized Hospital, and some private center during the period from November 2021 to November 2022.

Results: showed that, primary and final diagnoses of salivary gland lesions by ultrasound and computed tomography were the same, that (39.1%) of patients suffered from sialadenitis, followed by both of sialolithiasis and benign tumor (21.7%), followed by malignant tumors (8.7%), and abscess and cystic lesion (4.3%). Inflammatory lymph nodes was significantly higher in ultrasound than computed tomography versus pathological lymph nodes, it was significantly higher in CT than U/S (p=0.032).

Conclusions: It could be concluded that CT and ultrasonography can be used to diagnose abnormalities of the salivary glands accurately. It is a helpful imaging technique for evaluating salivary gland masses. It could assist in distinguishing between benign and malignant tumors and reduce the range of possible diagnosis.

Keywords: Computed tomography, Salivary glands lesions, Parotid gland, US.

INTRODUCTION

Saliva is produced, modified, and secreted into the oral cavity by the salivary glands, which are exocrine glands. Salivary glands are divided into two main types: the major salivary glands, which include the parotid, submandibular and sublingu al glands, and the minor salivary gland tissue, which is made up of 800-1000 tiny salivary glands, and are morphologically split into two basic categories. Although minor salivary gland tissue may be found throughout the aerodigestive tract, it is most abundant around the soft/hard palate, the floor of the mouth, the labial mucosa, and the buccal mucosa [1].

The biggest of the three primary salivary glands is the parotid gland (PG). It runs from the tip of the mastoid to just below the angle of the mandible, and it is situated between the masseter and the sternocleidomastoid muscle. The second-largest gland, the submandibular gland (SMG), is located between the anterior and posterior bellies of the digastric muscle, inferior to the jaw, and weighs around half as much as the parotid. The mylohyoid muscle and the sublingual gland (SLG) are located above the mucosa of the mouth's floor (between the mandible and genioglossus muscles). In the middle, between the sublingual gland and the base of the tongue [2]. The three principal pairs of salivary glands in the body that contribute to the first stage of digestion are the parotid, submandibular, and sublingual glands. Pain and edema are the most frequent clinical indicators of salivary gland imaging [3].

Pathology of the salivary glands is separated into neoplastic and nonneoplastic illness. Sialolithiasis and inflammatory or infectious diseases are other categories of neoplastic illness. Nonneoplastic disorders of the salivary glands most usually occur in the main salivary glands (i.e., parotid, submandibular, sublingual) [4].

The pathology most frequently affecting the salivary glands is inflammation. The most common ailment affecting the salivary glands in the past was mumps. Sialolithiasis and obstructive sialadenitis, infectious sialadenitis, granulomatous disorders, Sjögren's syndrome, sialosis, human immunodeficiency virus (HIV) sialopathy, recurrent sialadenitis of childhood, and radiation-induced sialadenitis are among the inflammatory conditions of the salivary glands [5]. The neoplasms of the salivary glands are uncommon and comprise a diverse set of benign and malignant tumors with a range of behavioral traits. As the aggressivity grade of these lesions relies on their histological kinds, a proper pathologic diagnosis is essential [6].

Imaging is helpful in distinguishing salivary gland masses from masses or diseases in nearby cervical spaces, particularly in the parapharyngeal, masticator, and submental spaces and mandibular lesions [7].

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The goal of this study was to evaluate role of ultrasound and computed tomography in differentiation between benign and malignant salivary glands lesions.

PATIENTS AND METHODS

This cross-sectional analytic study included a total of 46 patients with swellings in the head and neck, of either gender referred from the outpatient clinics of ENT, head and neck surgery and dentists to Radiology Department, Faculty of Medicine, Menoufia university, Sheikh Zayed Specialized Hospital, and some private center during the period from November 2021 to November 2022.

Inclusion criteria: Included patient complaining of swelling in the head and neck, mouth dryness, discomfort and/or pain in mastication, feeling of hard object in the oral cavity near the orifices of the gland ducts or feeling of passage of stones from the duct's orifices.

Exclusion criteria: Included patients who are contraindicated for CT and intravenous contrast injection (pregnant patient, allergic patients with known allergy to contrast media and patients with renal impairment).

All patients were subjected to:

Full history taking including: name, age, residence, family history of any disease.

Clinical examination: including **physical examination:** measurement of height, weight, blood pressure and **local examination:** Inspection and palpation at the site of the swelling.

Ultrasound Technique: Grayscale and Doppler US (color or power Doppler) employing high-frequency linear transducers, traditionally 5 MHz to 12 MHz ultrasound to salivary gland lesions and its features (best method for examining the main salivary glands).

Computed tomography protocol:

After injecting 90 mL of contrast material into an antecubital vein using a power injector at a rate of 3 mL/sec, a two-phase helical head and neck CT was performed. Then, with a scanning delay of 120 seconds, early and delayed phase scans were acquired. Using the following settings, scanning starts at the base of the skull and moves up towards the thoracic inlet level. Contiguous transverse images were rebuilt at 5-mm intervals using the volumetric data at a 35-second acquisition time, 5-mm collimation, and 5-mm/second table speed.

Study outcomes:

Primary outcomes as assessment the lesion size and its relation to clinical signs and its nature.

Secondary outcomes as assess invasion to surrounding and lymph node involvement.

Ethical consideration:

The Menoufia University Faculty of Medicine Ethics Committee gave its approval to the study. After a brief and concise description of the study's goals, either the patient or the patient's legal guardian provided a signed informed consent. The study was conducted out in line with the Helsinki Declaration.

Statistical Analysis:

Findings were tabulated and statistically evaluated using industry-standard software for Microsoft Windows 10 (MICROSOFT EXCEL 2019 and SPSS V.25). There were two distinct statistical analyses: Descriptive statistics, which include the test below: For quantitative data, the data were described using the mean, standard deviation (SD), and frequency and percentage for qualitative data. Analytical statistics: these comprise the tests below. Mann-Whitney test, Chi-Square test, and standard student t-test Cutoff values, sensitivity, specificity, positive predictive value, negative predictive value, and P value 0.05 are all included on the ROC (receiver operating characteristic) curves.

RESULTS

Our study showed that, the mean age and BMI of the included patients were 34.78± 20.99 years and 31.48±6.00 (kg/m^2), respectively. Concerning their gender, the majority of studied patients were females (52.2%). Also, most of the studied patients suffered from swelling and pain (91.30%). Also, patients who suffered from fever were (26.1%) and malaise were (13.0%). Submandibular gland was affected in 52.2% of the patients, followed by parotid gland in 39.1%, buccal minor salivary glands in 4.3% and submandibular & parotid in 4.3%.

With the mean duration of the disease was 28.50±44.92, **(Table 1).**

Table (1): Socio-demographic and clinical data of the studied patients (n= 46)

Socio-demographic characteristics		Distribution	
		No	%
Age (years):			
Mean ± SD		34.78±20.99	
Median		32.00	
Range		5.00-70.00	
Sex:			
Male		22	47.8
Female		24	52.2
BMI (kg/ m^2):			
Mean ± SD		31.48±6.00	
Range		18.70-39.40	
Complaint	**Swelling:**		
	Yes	42	91.30
	No	4	8.7
	Pain:		
	Yes	42	91.30
	No	4	8.7
	Fever:		
	Yes	12	26.1
	No	34	73.9
	Malaise:		
	Yes	6	13.0
	No	40	87.0
Disease duration (months):			
Mean ± SD		28.50±44.92	
Range		1.00-120.00	
Affected gland:			
Parotid		18	39.1
Submandibular		24	52.2
Buccal minor salivary gland		2	4.3
Submandibular & parotid		2	4.3
Side:			
Right		26	56.5
Both		8	17.4
Left		12	26.1

The mean size of focal lesions of ultrasound was 5.41±3.72 **cm**. Concerning, the echogenicity of ultrasound, each of increased and normal echogenicity was found in 43.5%, followed by decreased echogenicity in 4.3%. Heterogeneous of lesion was found in 43.5%. Well defined cystic lesion with homogenous echogenic content shape of lesion was reported in 34.8%. Regarding associated cervical lymph node, the majority of lesion (52.2%) was inflammatory lymph nodes, followed by pathological lymph nodes (4.3%).

Concerning, the nature of lesion, each of stone, mixed solid and cystic and solid was (13.0%) and (47.8%) has average vascularity. Moreover, the mean size of focal lesions of computed tomography was 7.33±6.37. Concerning, the density of computed tomography, normal was found in 30.4%, followed by increased density in 4.3%. Heterogeneous of lesion was found in 8.7%. Regarding shape, well circumscribed cystic nature with no peripheral enhancement, well defined heterogeneous cystic lesion, well defined homogenous soft tissue mass lesion, well defined multiloculated partially cystic partially solid lesion in right buccal region and well defined submandibular soft tissue mass lesion with bony extensions was (4.3%).

Regarding associated cervical lymph node, pathological lymph nodes was (13.0%). Concerning, the nature of lesion, each of mixed solid and cystic and solid was (8.7%). Computed Tomography normally enhanced gland by ratio (42.1%), **(Table 2).**

Table (2): Characters of lesion by US and CT (N=46).

US & CT		Distribution	
		No	%
US features of lesion	**Echogenicity:** Increased Normal Decreased	 20 20 2	 43.5 43.5 4.3
	Homogeneity: Heterogeneous Homogenous	 20 22	 43.5 47.8
	Shape: Well defined cystic lesion with homogenous echogenic content	 16	 34.8
	Size of focal lesions (cm) Mean ± SD Range	5.41±3.72 0.30-10.50	
	Associated cervical lymph node: Inflammatory lymph nodes Pathological lymph nodes	 24 2	 52.2 4.3
US nature of lesion	**Nature:** Stone Cystic Solid Mixed solid and cystic	 6 4 6 6	 13.0 8.7 13.0 13.0
	Vascularity: Average Increased	 22 18	 47.8 39.1
CT features of lesion	**Density:** Normal Increased	 14 2	 30.4 4.3
	Homogeneity: Heterogeneous Homogenous	 4 12	 8.7 26.1
	Shape: Well circumscribed cystic nature with no peripheral enhancement Well defined heterogeneous cystic lesion Well defined homogenous soft tissue mass lesion Well defined multiloculated partially cystic partially solid lesion in right buccal region Well defined submandibular soft tissue mass lesion with bony extensions	2 2 2 2 2	4.3 4.3 4.3 4.3 4.3
	Size of focal lesions (cm) Mean ± SD Range	7.33±6.37 0.60-20.00	
	Associated cervical lymph node: Pathological lymph nodes	6	13.0
CT nature of lesion	**Nature:** Cystic Solid Mixed solid and cystic	 2 4 4	 4.3 8.7 8.7
	CT effect of contrast: Normally enhanced gland Non enhanced lesion Heterogeneous enhanced lesion Marginally enhanced	 8 2 2 4	 17.4 4.3 4.3 8.7

Primary and final diagnosis of salivary gland lesions by ultrasound and computed tomography were the same, that patients were presented with sialadenitis (39.1%), followed by each of sialolithiasis and benign tumor (21.7%), followed by malignant tumors (8.7%). (4.3%) suffered from abscess and cystic lesion **(Table 3).**

Table (3): Primary and final diagnosis of salivary gland lesions by US& CT (n= 46).

	Distribution	
	No	**%**
Primary diagnosis of salivary gland lesions:		
Abscess	2	4.3
Sialadenitis	18	39.1
Sialolithiasis	10	21.7
Cystic lesion	2	4.3
Benign tumor	10	21.7
Malignant tumor	4	8.7
Final diagnosis of salivary gland lesions:		
Abscess	2	4.3
Sialadenitis	18	39.1
Sialolithiasis	10	21.7
Cystic lesion	2	4.3
Benign tumor	10	21.7
Malignant tumor	4	8.7

Inflammatory lymph nodes was significantly higher in ultrasound than computed tomography versus pathological lymph nodes, that was significantly higher in CT than U/S (p=0.032). On the other hand, there was nonsignificant difference between computed tomography and ultrasound in terms of shape, size of focal lesions and nature of salivary gland lesion (p>0.05) **(Table 4).**

Table (4): Comparison between US and CT in diagnosis of salivary gland lesion (n= 46).

Salivary gland lesion		**US**		**CT**		**Test of sig. (X^2)**	**P-value**
		No	**%**	**No**	**%**		
Features of lesion	**Shape:**	16	34.8	0	0	2.136	^{FE}P= 0.0850
	Well defined cystic lesion with homogenous echogenic content.	0	0.0	2	4.3		
	Well circumscribed cystic nature with no peripheral enhancement.	0	0.0	2	4.3		
	Well defined heterogeneous cystic lesion.	0	0.0	2	4.3		
	Well defined homogenous soft tissue mass lesion.	0	0.0	2	4.3		
	Well defined multiloculated partially cystic partially solid lesion in right buccal region.	0	0.0	2	4.3		
	Well defined submandibular soft tissue mass lesion with bony extensions.						
	Homogeneity:					2.92	0.067
	Heterogeneous	20	43.5	4	8.7		
	Homogenous	22	47.8	12	26.1		
	Size of focal lesions (cm)					U= 1.47	0.150
	Mean ± SD	5.41±3.72		7.33±6.37			
	Range	0.30-10.50		0.60-20.00			
	Associated cervical lymph node:					3.88	^{FE}P= **0.032***
	Inflammatory lymph nodes	24	52.2	0	0.0		
	Pathological lymph nodes	2	4.3	6	13.0		
Nature of lesion	**Nature:**					1.011	^{FE}P=0.254
	Stone	6	13.0	0	0.0		
	Cystic	4	8.7	2	4.3		
	Solid	6	13.0	4	8.7		
	Mixed solid and cystic	6	13.0	4	8.7		

X^2: Chi square test, U: Mann-Whitney test, *Significant (P-value <0.05)

There was nonsignificant difference between primary and final diagnosis of salivary gland lesion by US and CT in term of Salivary gland lesion ($p< 0.05$) **(Table 5).**

Table (5): Difference between primary and final diagnosis of salivary gland lesion by US and CT in (n= 46).

Salivary gland lesion	Primary diagnosis		Final diagnosis		Test of sig. (X^2)	P-value
	No	%	No	%		
Abscess	2	4.3	2	4.3	1.16	$^{FE}P=0.785$
Sialadenitis	18	39.1	18	39.1		
Sialolithiasis	10	21.7	10	21.7		
Cystic lesion	2	4.3	2	4.3		
Benign tumor	10	21.7	10	21.7		
Malignant tumor	4	8.7	4	8.7		

The sensitivity of computed tomography for diagnosis of salivary gland lesions in homogenous and heterogeneous groups was 83.3%, specificity was 64.7%, and accuracy was 72.4%. Also, computed tomography showed sensitivity, specificity, accuracy, for diagnosis of salivary gland lesions in focal shape and diffuse shape groups were 84%, 46.7%, 67.8%, respectively. The sensitivity of ultrasound for diagnosis of salivary gland lesions in associated cervical lymph node was 65%, specificity was 0.42%, and positive predictive value was 89.3%, **(Table 6).**

Table (6): Accuracy of US against CT for diagnosis of salivary gland lesions (n= 46)

US	CT homogeneity				Sensitivity	Specificity	Accuracy
	Heterogenous		Homogenous				
	No	%	No	%			
Heterogenous	2	16.67	6	35.29	83.3	64.7	72.4
Homogenous	10	83.33	11	64.70			
Shape							
US	**Diffuse**		**focal**		**Sensitivity**	**Specificity**	**Accuracy**
	No	**%**	**No**	**%**			
Diffuse	2	16.67	7	46.67	84.0	46.7	67.8
Focal	10	83.33	8	53.33			
Associated cervical lymph node							
US	**Yes**		**No**		**Sensitivity**	**Specificity**	**Accuracy**
	No	**%**	**No**	**%**			
Yes	3		0		65	0.42	89.3
No	13		12				

CASE PRESENTATION

CASE (1)

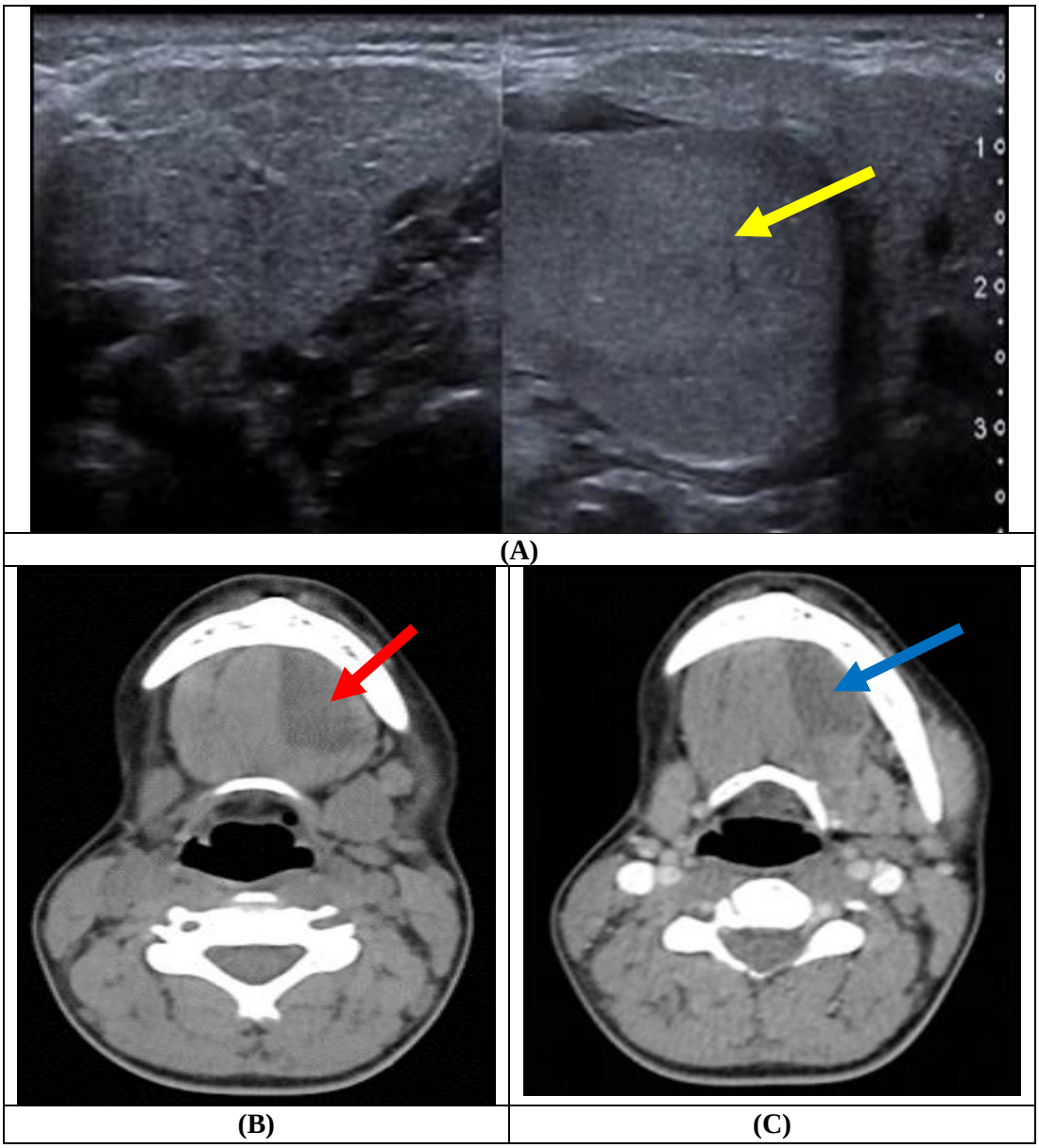

Figure (1): 21 years female patient complained of progressive painless swelling in left submandibular region 4 months ago, neck ultrasound done showing well-defined left submandibular cystic mass with thin wall and homogenous echogenic content, posteromedial to the ipsilateral sub mandibular gland which appear of normal size and echotexture but displaced anterolaterally. The right submandibular is of normal size and echo texture. (A yellow arrow), CT neck with IV contrast showing mass is well-circumscribed, of cystic nature with no peripheral enhancement, located in left submandibular space and intersecting the left mylohyoid and genioglossus muscles. (B without contrast red arrow) (C with contrast blue arrow), diagnosed as left submandibular and floor of the mouth cystic ranula

CASE (2)

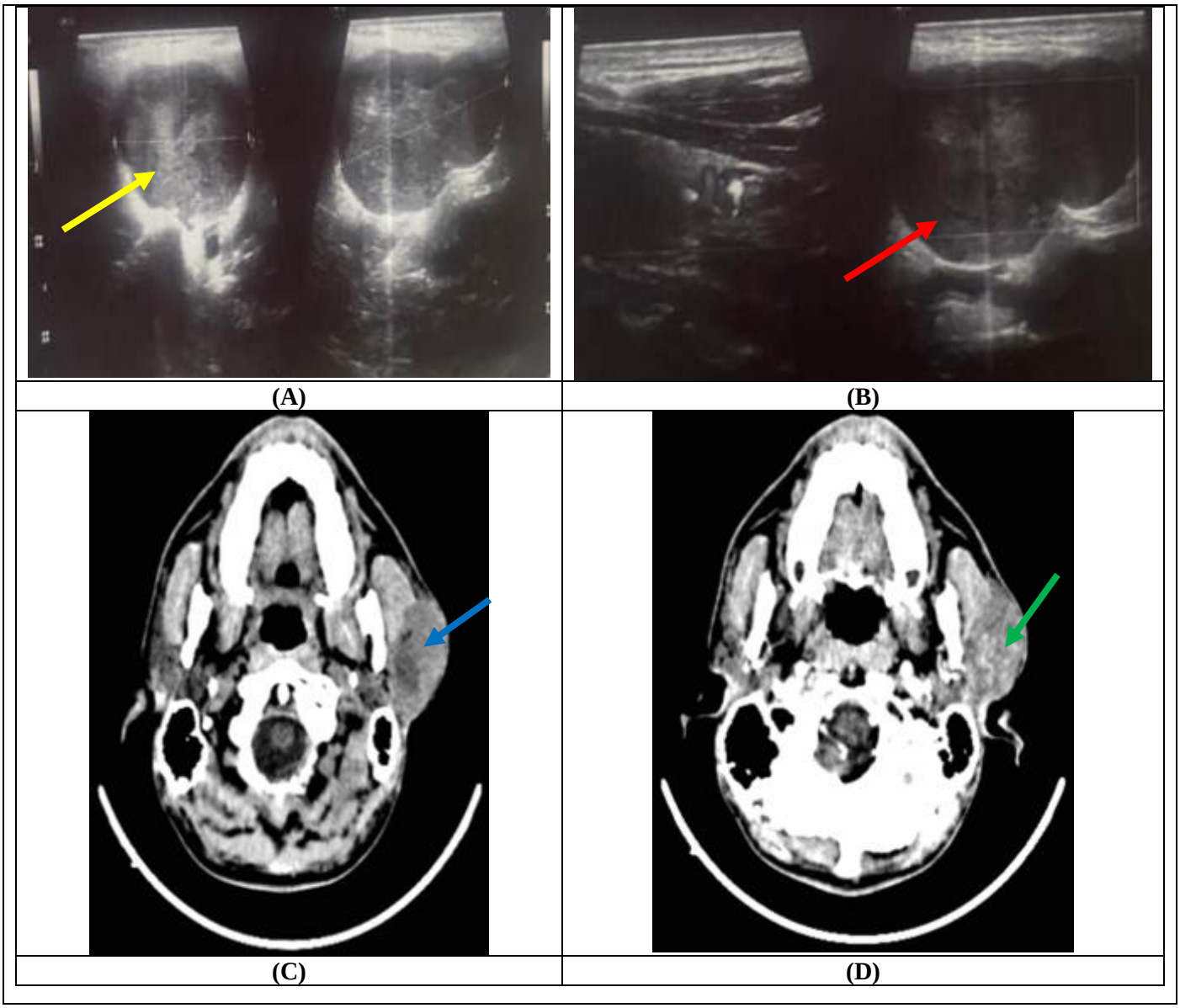

Figure (2): 55 years male patient complained of painless swelling in left parotid region 5 years ago, neck ultrasound done showing well-defined soft tissue mass lesion seen within left parotid with rim of parotid tissue surrounding it circumferentially (A yellow arrow) with faint internal vascularity on color Doppler study (B red arrow), CT neck with IV contrast showing diffuse swelling of the left parotid gland with solid lesion showing heterogeneous contrast enhancement (C without contrast blue arrow) (D with contrast green arrow).diagnosed as left parotid gland pleomorphic adenoma and final diagnosis was left parotid gland pleomorphic adenoma (Mixed salivary gland tumor).

CASE (3)

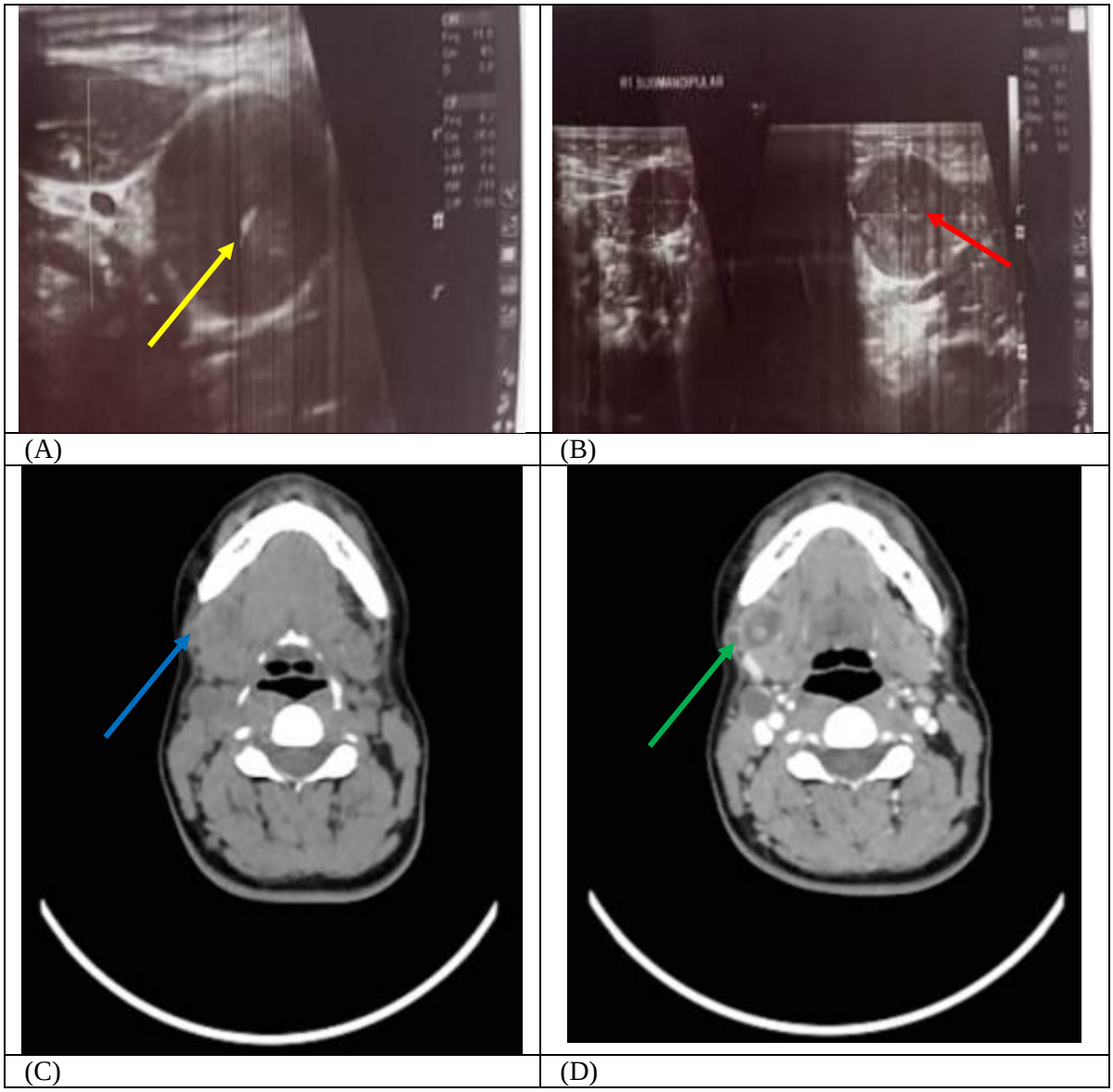

Figure (3): 48 years female patient complained of painless swelling in right buccal region 1 year ago, neck ultrasound done showing multiple well defined hypoechoic pathologically enlarged lymph nodes all are losing the fatty hilum and rounded seen upper deep cervical, intraparotid (A yellow arrow) and submandibular region(B red arrow), CT neck with IV contrast showing a rather well-defined multiloculated partially cystic partially solid dense marginally enhanced soft tissue mass lesion seen within lateral aspect of right buccal mucosa causing localized skin contour bulge and seen separable from the tongue.(B without contrast blue arrow), (D with contrast green arrow), diagnosed as right buccal minor salivary gland malignant lesion and final diagnosis was buccal minor salivary gland squamous cell carcinoma.

CASE (4)

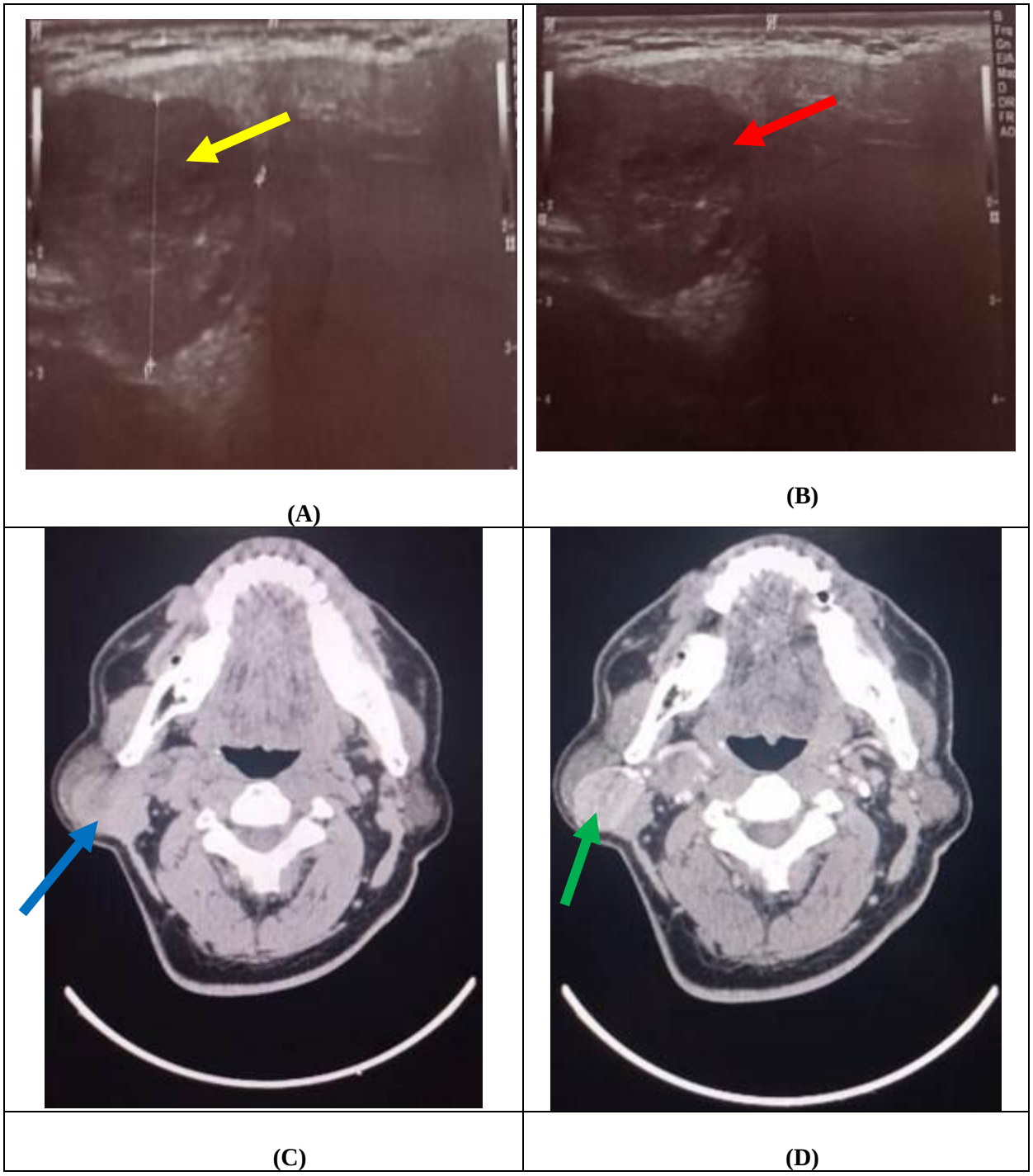

Figure (4): 60 years male patient complained of painless swelling in right parotid region 1 year ago, neck ultrasound done showing well-defined hypoechoic soft tissue mass lesion seen within right parotid (A yellow arrow) with faint internal vascularity on color Doppler study (B red arrow), CT neck with IV contrast showing diffuse swelling of the right parotid gland with solid lesion showing homogenous intensely contrast enhancement (C without contrast blue arrow), (D with contrast green arrow). Diagnosed as right parotid gland pleomorphic adenoma and final diagnosis was right parotid gland pleomorphic adenoma (Mixed salivary gland tumor).

CASE (5)

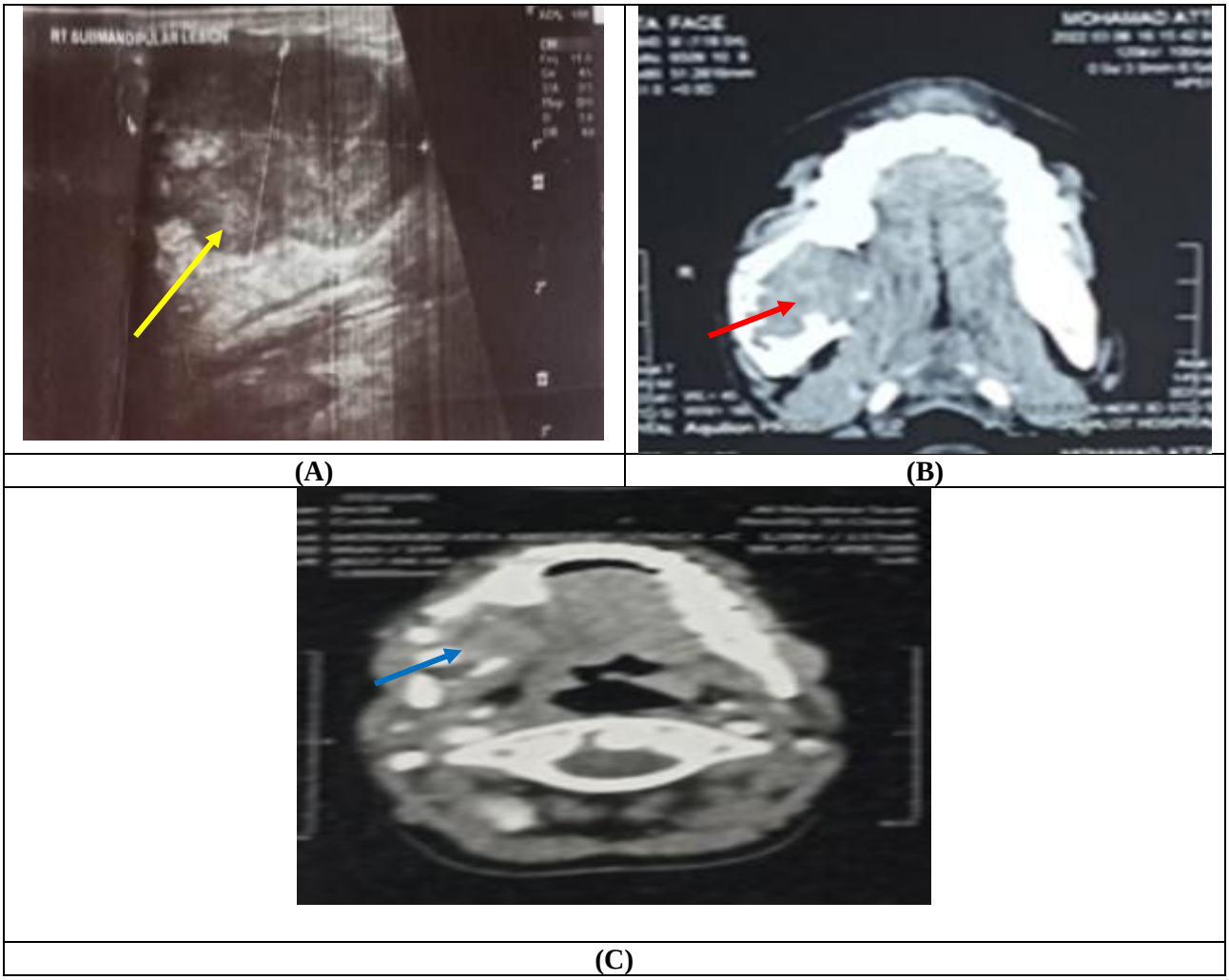

Figure (5): 14 years male patient complained of painless swelling in right mandibular region 2 years ago, neck ultrasound done showing multiple well defined hypoechoic pathologically enlarged lymph nodes all are losing the fatty hulium and rounded seen upper deep cervical, sub mental and sub mandibular region (A yellow arrow), CT neck with IV contrast showing well defined right submandibular soft tissue mass lesion with bony extensions seen involving the right submandibular gland and right ramus of the mandible seen reaching the alveolar process with erosions of related cortex, mainly the medial cortex with intraoral extensions with post contrast heterogeneous enhancement. (B without contrast red arrow) (C with contrast blue arrow), diagnosed as right sub mandibular malignant lesion and final diagnosis was right sub mandibular lesion keeping with low grade mucoepidermoid associated with fibro epithelial polyp.

CASE (6)

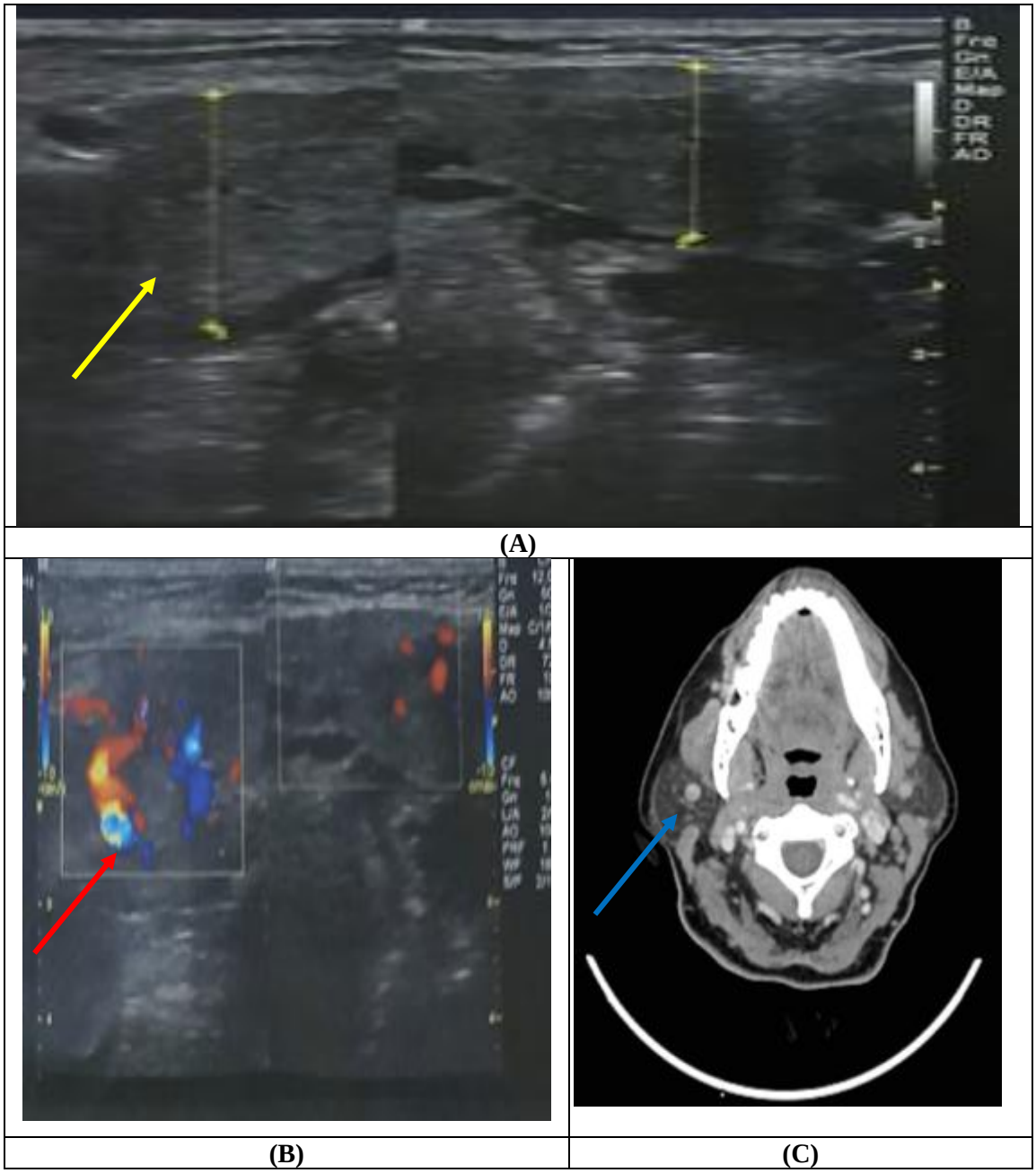

Figure (6): 40 years female patient complained of painful swelling in right parotid and sub mandibular region 1 week ago, neck ultrasound done showing enlarged right sub mandibular and parotid gland compared with the left glands (A yellow arrow) with hypoechoic heterogeneous pattern associated with increased vascularity and multiple intraglandular inflammatory lymph nodes. (B red arrow), CT neck with IV contrast showing prominent enlargement of right submandibular and right parotid gland with homogenous post contrast enhancement. (C blue arrow), diagnosed as right sub mandibular and parotid glands sialadenitis.

DISCUSSION

The three principal pairs of salivary glands in the body that contribute to the first stage of digestion are the parotid, submandibular, and sublingual glands. Pain and edema are the most frequent clinical indicators of salivary gland imaging [8]. People of all ages frequently experience issues with their salivary glands. As these lesions are not apparent to the unaided eye, a clinical examination alone is unable to distinguish between their genuine form, location, magnitude, and precise source [9]. The best method currently available for visualizing salivary glands is ultrasound. The size, shape, echogenicity, and propensity for localized lesions of the glands are all regularly assessed [10]. Computed tomography (CT) imaging is useful in evaluating structures in adjacent to the salivary glands [11].

The mean age and BMI of the included 46 patients were 34.78± 20.99 years and 31.48±6.00 (kg/m^2) respectively. Concerning their gender, the majority of studied patients were females (52.2%). Our results agreed with the study by **El-Rasheedy *et al.*** [12] who reported that, the age of patients was 36.3 ± 12.4 and the most gender was female (60%). The patients' ages in the earlier study by **Liu *et al.*** [13] varied from 42 to 63 years, with a mean age of 52.4±7.9 years. **Bryan *et al.*** [14] stated that 48 individuals with known diseases of the salivary glands had their CT scans analyzed. The patients' ages ranged from 6-76 years. Most studied patients were males (30 female and 46 male). **Thakkar *et al.*** [15] stated that the age range in his study was 41-60 years, followed by 61-80 years and 21-40 years, with incidence rates of 20% and 16%, respectively. Males are more likely to have salivary gland tumors (66.6%) than females (33.3%), with ratio of 2:1. Additionally, **Asteria *et al.*** [16] found that, of the 51 lesions (21 in females and 30 in males) mean age of subject's 39.3±12.9 years.

In the current study, the majority of the studied patients presented with swelling and pain (91.30%). Also, patients who suffered from fever were (26.1%) and malaise were (13.0%). Submandibular gland was affected in 52.2% of the patients, followed by parotid gland in 39.1%, buccal minor salivary glands in 4.3% and submandibular & parotid in 4.3%. With the mean duration of the disease was 28.50±44.92. Our results were partially compatible with the recent reported literature. According to **Thakkar *et al.*** [15] study, swelling (100%) and odynophagia (43.3%) were the most frequent presenting complaints, followed by lymphadenopathy (26.6%), limited mouth opening (20%), fever (16.6%), facial muscle weakness (13.3%), and skin numbness (6.6%). The parotid gland (80%), submandibular gland (16.6%), and minor salivary glands (3%) were the sites of salivary gland cancers most often, with no cases affecting the sublingual gland. Just 11.2% of the Pleomorphic adenomas were found in the submandibular gland, whereas 88.8% were found in the Parotid gland.

In the present study, the mean size of focal lesions of ultrasound was 5.41±3.72. Concerning, the echogenicity of ultrasound, each of increased and normal echogenicity was found in 43.5%, followed by decreased echogenicity in 4.3%. Heterogeneous of lesion was found in 43.5%. Well defined cystic lesion with homogenous echogenic content shape of lesion was reported in 34.8%. Regarding associated cervical lymph node, the majority of lesion (52.2%) was Inflammatory, lymph nodes, followed by pathological lymph nodes (4.3%). Concerning, the nature of lesion, each of stone, mixed solid and cystic and solid was (13.0%) and (47.8%) has average vascularity. In the same vein, **Bradley** [17] found that intraglandular mass lesions were hypoechoic in comparison to the normal gland parenchyma's uniform echogenicity surrounding them. Solid tumors frequently mimic cystic lesions by having an internal complexity that varies and by transmitting sound. Malignant lesions often have a complex internal structure and an uneven contour, whereas benign lesions are typically modest (3 cm), well-defined, and not linked with enlarged cervical nodes. Even in the greatest hands, it is only able to anticipate actual malignancy in 80-89% of instances. The salivary gland hemangioma contradicts this trait as it seems badly defined.

Primary and final diagnosis of salivary gland lesions by ultrasound and computed tomography were the same, that patients were presented with sialadenitis (39.1%), followed by each of sialolithiasis and benign tumor (21.7%), followed by malignant tumors (8.7%). (4.3%) suffered from abscess and cystic lesion. In the same line, the study by **Grazioli *et al.*** [18] found that, ten mistakes were made about the lesion's type while utilising US (8.3%), four when using CT (6.1%), and five when using MRI (5.5%). There were 3 cases in which both the US and MRI diagnosis was incorrect. These cases included 2 non-tumoral masses that were diagnosed by US as likely benign neoplasms but in which the MRI diagnosis was also unclear, as well as a well-differentiated adenoid cystic carcinoma (about 1.5 cm in diameter) that was classified as a benign lesion by both imaging modalities. Another 2 cases—2 mucoepidermoid carcinomas, each with a diameter of less than 2 cm—were misdiagnosed as pleomorphic adenoma or inflammatory node because US and CT were unable to determine their malignancy.

Our study showed that, there was nonsignificant difference between primary and final diagnosis of salivary gland lesion by US and CT in term of Salivary gland lesion. In the same line, **Bryan *et al.*** [14]**, stated that** the key to diagnosing salivary gland lesions was to distinguish between a localized sialadenitis without calculi and a malignant tumor. Differentiation was aided by the clinical history of abrupt swelling, fever, and discomfort. Expansion of the illness outside the gland's capsule denotes neoplasia rather than an inflammatory condition. Clinically, it was frequently crucial to distinguish an enlarged lymph node from a

primary salivary gland illness. The diagnosis is easily established by CT in situations when swollen nodes are not intrinsic to the salivary gland. As there were no lymph nodes inside the submandibular gland, primary salivary lesions in this area grow the gland itself, whereas lymph node illness is seen as an external mass. Nonetheless, the parotid glands do include lymph nodes.

Our study showed that, the sensitivity of computed tomography for diagnosis of salivary gland lesions in homogenous and heterogeneous groups was 83.3%, specificity was 64.7%, and accuracy was 72.4%. Also, computed tomography showed sensitivity, specificity, accuracy, for diagnosis of salivary gland lesions in focal shape and diffuse shape groups were 84%, 46.7%, 67.8%, respectively. The sensitivity of ultrasound for diagnosis of salivary gland lesions in associated cervical lymph node was 65%, specificity was 0.42%, and positive predictive value was 89.3%.

In a similar vein, **Rudack *et al.*** [19] stated that ultrasonography had an 88% sensitivity, a 54% specificity, and a 79% accuracy rate. For the main salivary glands, it was the best first-line investigative imaging modality. Investigating the diseases that are both intrinsic and extrinsic to the salivary glands is important. It is a suitable chairside approach to identify the existence of salivary glandular pathology because it doesn't require ionizing radiation. Another research by **Hausegger *et al.*** [20] stated that the US had an accuracy rate of 82.3%. Because to its higher contrast resolution and multiplanar capability, CT examinations had a sensitivity of 98%, a specificity of 52%, and an accuracy of 84%. Moreover, **Takashima *et al.*** [21] study found that CT had a sensitivity of 60%, specificity of 88%, and accuracy of 81% for determining the malignancy of tumors. MRI was marginally superior to US in their investigation, but there was no statistically significant difference between US and CT.

CONCLUSION

It could be concluded that CT and ultrasonography can be used to diagnose abnormalities of the salivary glands accurately. It is a helpful imaging technique for evaluating salivary gland masses. It might aid in differentiating benign from malignant tumors and reducing the range of possible diagnosis. When fine-needle aspiration biopsy is difficult to conduct due to a unique tumor site or the patient's reluctance, imaging exams are particularly helpful for clinical diagnosis.

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