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ROLE OF CT SIALOGRAM IN THE DIAGNOSIS OF PAROTID REGION SWELLINGS

By

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Background: ***Parotid diseases are treated either by surgery or by conservative measures. Parotid surgery however carries the risk of facial nerve injury, which results in permanent functional and esthetic deficit. Therefore, every effort should be made to avoid unnecessary parotid operations.***

Objectives: The present study was conducted to evaluate the use of CT and CT sialography for patients with lesions in the parotid region.

Patients and Methods: ***Patients (N=30) were subjected to thorough clinical assessment, ultrasonographic examination, computerized tomography (CT) of the parotid region, parotid CT sialography, and fine needle aspiration cytology (FNAC). Excised specimens were then sent for histopathological examination.***

Results: ***There were 17 males and 13 females. Their ages ranged from 3 to 60 years (mean 35.95± 14.13). Ten patients had regional lymphadenopathy, with associated facial nerve affection in two. CT diagnosed the nine lesions of extra-parotid origin and the nine patients with chronic sialectasis. It could identify the mass lesion in the remaining patients. It also suspected the malignant nature of the lesion in two patients (sensitivity 100%). CT sialogram was tried in all patients, but was successfully performed in only 20. It demonstrated normal, yet compressed duct system in the nine patients with benign tumours. It also showed displacement and distortion of the duct system in the one case of adenocarcinoma (sensitivity 57.14%, specificity 100%).***

Conclusions: ***Computerized tomography is a valuable and effective technique in confirming or excluding parotid gland mass lesions, as well as extra-parotid masses. It can suspect the malignant nature of the mass. CT sialography was found to be difficult technique to apply. In this study, it did not offer additional benefit over CT in the diagnosis of parotid masses.***

Key Words: Parotid gland, computerized tomography, Sialography, CT-sialography

INTRODUCTION

The traditional imaging modality used for visualization of the parotid gland is the sialography. It was designed mainly to examine the duct system rather than the gland parenchyma. Hence, it is not suitable for detection of masses(1). Computerized tomography (CT) on the other hand seems to be more suitable for this purpose. It can outline the salivary gland and capture many mass lesions originating in it. It can also diagnose extra glandular extension of these masses. The normal salivary tissue shows with relatively low attenuation on the CT scan (-30 to 0 Mounsfield Units). This radio-density value lies in between the value of the normal adipose tissue and that of the muscle. Masses within the gland are similarly discriminated by their higher radio-density (+30 to +55 Mounsfield Units)(2).

The use of intravenous contrast enhancement for CT of the parotid did not seem to improve its diagnostic yield. An interesting finding, however, was that the salivary gland parenchyma showed characteristic alteration on the CT scans done for patients who had had sialography in the previous two weeks(3). Based on this observation, it would be possible to explore the potential of combining the CT and sialography for the imaging of the parotid gland(4).

The present study was therefore conducted to evaluate the role of CT and CT sialography in the diagnosis of parotid region swellings.

PATIENTS AND METHODS

Study Population:

The present study included 30 consecutive patients who presented with a swelling in the parotid region and were admitted to the head and neck surgery unit of the Alexandria Main University Hospital during the year 2001. There were 17 males (56.67%) and 13 females (43.33). Their ages ranged from 3 to 60 years with a mean of 35.95±14.13 years.

Imaging Studies:

In addition to thorough clinical assessment and general laboratory investigations, all patients were subjected to the following imaging studies:

Ultrasonographic examination of the parotid region, using real-time gray scale Doppler sonography with spectral wave analysis (Echocci-Toshiba).

Computerized tomography (CT) of the parotid region: Patients were scanned in the axial and coronal planes at 3-5 mm contagious slides with the use of helical CT (Somatom plus 4, Semines). For the display of soft tissue, a window level of 40 HU and a window width between 300 and 600 HU were selected. A window level between 40 and 300 HU and a window depth between 2400 and 320 HU were selected for imaging of bony structures.

Parotid CT sialography: The Stenson duct was canulated, whenever possible, by a blunt 21-gauge needle. Contrast medium (Ethidiol) was injected under fluoroscopic control. Injection was continued until the duct system of the parotid gland was completely filled with contrast and the patient felt pressure in his parotid gland.

Histopathological Study:

Fine needle aspiration cytology (FNAC) was used for pathological identification of the lesions pre-operatively. Excised specimens were preserved in 10% formalin, sectioned at 5 microns and stained with hematoxylin and eosin for histopathological examination.

RESULTS

As may be seen in (Table 1), all patients presented with a swelling in the parotid region that was rather fixed in five (16.67%). Ten patients (33.3%) had associated regional lymphadenopathy. Two of these patients had facial nerve affection as well. The swelling was associated with pain in eight patients (26.67%).

(Table 2) shows the sonographic findings of the study group. The sonographer could not comment on the deep lobe of the parotid gland in any of the studied patients. Moreover, a definite sonographic diagnosis could not be reached in five patients, all of whom had a parotid gland swelling (22.7%, 5/22).

(Table 3) summarizes the radiological diagnosis of the 30 patients by CT. Nine cases were diagnosed to be of non-salivary origin. Of the remaining 21 patients, nine were diagnosed to have chronic sialectasis (Fig. 1a) and only two to have malignancy (Fig. 2a). CT sialogram was tried in all 30 patients. It was successfully performed for 20 patients (66.67%). The technique was abandoned for the remaining 10 patients due to technical difficulties. The duct was compressed in nine patients (Figs. 1b, 2b) and displaced in only one as shown in (Table 4).

(Table 5) shows the results of FNAC of the patients. Nine patients (30%) had lesions of non-salivary origin. For the remaining 21 patients with parotid gland swellings, FNAC was inclusive in 16 patients and was positive for malignancy in only one. Histopathological diagnosis of the resected specimens was used as the gold standard (Table 6). Nine cases (30%) out of the 30 were of extra-parotid origin and 21 (70%) proved to be of parotid gland origin. Nine of these (42.86%) were chronic sialectasis and eight (38.10%) were pleomorphic adenomas. Malignancy was documented in two patients; one with adenocarcinoma and the other with infantile rhabdomyosarcoma. .

(Table 7) summarizes the diagnostic yield of the four diagnostic modalities plotted against the corresponding histopathological diagnosis. It demonstrates the clear superiority of the CT over ultrasound and FNAC.

Table (1)*: Clinical presentation of the studied patients.*

Clinical presentation	*No.*	*Percent*
Swelling in the parotid region:	30	100
• Mobile	25	83.33
• Fixed	5	16.67
Lymph nodes	10	33.33
Pain	8	26.67
Facial nerve affection	2	6.67
Discharging sinus	1	3.33

Table (2): ***Results of ultrasonography.***

Ultrasound Diagnosis	*No.*	*Percent*
Parotid: (n=23)		
• Pleomorphic adenoma	8	26.67
• Chronic sialectasis	7	23.34
• Adenolymphoma	1	3.33
• Malignant mass	1	3.33
• Inconclusive diagnosis	5	16.67
• No mass detected	1	3.33
Extra-parotid: (n=7)		
• Enlarged lymph node	3	10.00
• Sebaceous cyst	2	6.67
• Lipoma	1	3.33
• Dermoid cyst	1	3.33
Total	30	100

Table (3): ***Results of computerized tomography (CT).***

CT Diagnosis	**No.**	**Percent**
Parotid: (n=21)		
• Chronic sialectasis	9	42.86
• Pleomorphic adenoma	9	42.86
• Malignant mass	2	9.52
• Adenolymphoma	1	4.76
Extra-parotid: (n=9)		
• Enlarged lymph node	3	33.33
• Sebaceous cyst	3	33.33
• Lipoma	2	22.22
• Dermoid cyst	1	11.11
Total	30	100

Table (4): ***Results of CT sialography.***

Duct system	*No.*	*Percent*
- Intact	10	33.33
- Compressed	9	30.00
- Displaced	1	3.33
- Failed cannulation	10	33.33
Total	30	100

Table (5): ***Results of fine needle aspiration cytology (FNAC).***

Result of FNAC	*No.*	*Percent*
Parotid: (n=21)		
• Inconclusive	16	76.19
• Pleomorphic adenoma	2	9.52
• Chronic sialadenitis	2	9.52
• Positive for malignancy	1	4.76
Extra-parotid: (n=9)		
• Sebaceous cyst	3	33.33
• Enlarged lymph node	3	33.33
• Lipoma	2	22.22
• Dermoid cyst	1	11.11
Total	30	100

Table (6): ***Results of Histopathology.***

Histopathological Diagnosis	*No.*	*Percent*
Parotid: (n=21)		
• Chronic sialadenitis	9	42.86
• Pleomorphic adenoma	8	38.10
• Monomorphic adenoma	1	4.76
• Adenolymphoma	1	4.76
• Adenocarcinoma	1	4.76
• Infantile rhabdomyosarcoma	1	4.76
Extra-parotid: (n=9)		
• Enlarged lymph node	3	33.33
• Sebaceous cyst	3	33.33
• Lipoma	2	22.22
• Dermoid cyst	1	11.11
Total	30	100

Table (7)*: Diagnostic yield of the different modalities plotted against the final histopathological diagnosis.*

Histopathological diagnosis	*No*	*FNAC*	*Sonography*	*CT*	*CT sialography*
- Chronic sialadenitis	9	2/9	7/9	9/9	1/9
- Pleomorphic adenoma	8	2/8	8/8	9/8#	8/9
- Monomorphic adenoma	1	0/1	0/1	0/1#	0/1
- Adenolymphoma	1	0/1	1/1	1/1	1/1
- Adenocarcinoma	1	1/1*	1/1*	1/1*	1/1*
- Rhabdomyosarcoma	1	0/1	0/1	1/1	0/1
- Extra-parotid	9	9/9	7/9	9/9	8/9
Total	30	14/30¥	24/30‡	30/30	19/30$

* Diagnosed as "malignant".

‡ The remaining 6 patients had the comment of "inconclusive".

$ One patient was diagnosed as parotid mass of obscure origin. The technique failed in 10/30 patients.

A patient with monomorphic adenoma was misdiagnosed by CT as pleomorphic adenoma.

¥ Sixteen cases were inconclusive by FNAC.

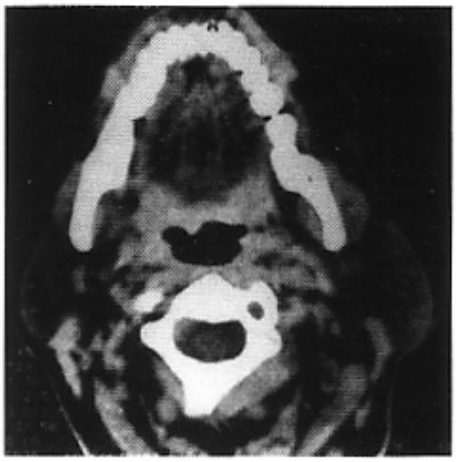
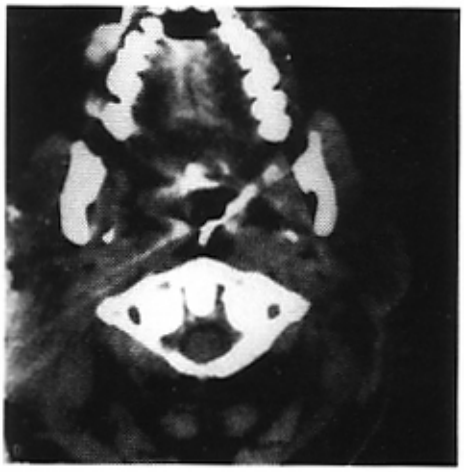
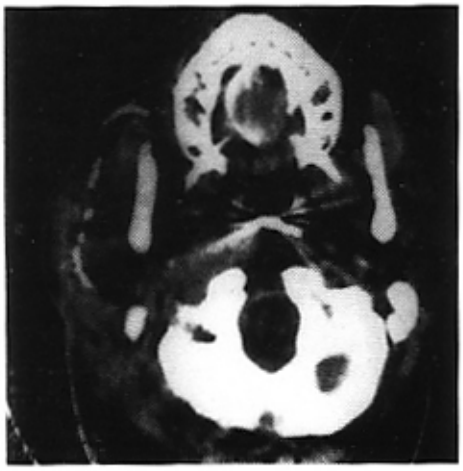


Fig. (1): Axial CT cuts at the level of the mandible:

a) CT showing a diffuse swelling with smooth outlines in the left parotid gland with poorly defined areas of breaking down.

b) CT sialogram at the same level showing ectatic and distorted intra-glandular component of the ductal system.





a) CT axial cut without contrast at the level of the lower margin of the upper jaw showing a soft tissue swelling, which involves the superficial and deep lobes of the gland. There is infiltration of the surrounding soft tissue planes with enlarged deep cervical lymph nodes.

b) CT Sialogram at the level of the upper jaw showing a heterogeneous soft tissue swelling with infiltration to the surrounding facial planes and subcutaneous tissues. The ductal component of the gland is compressed and distorted due to the mass effect.

DISCUSSION

It is known that CT can demonstrate focal lesions within solid organs. It can also show extra-organ invasion in many instances. When CT was used to assess masses in the parotid region, the scans diagnosed all nine cases of extra-parotid origin, eliminating any suspicion of parotid gland affection. Those patients could then be scheduled to minor operative lists. For patients with parotid gland pathology, CT was successful in excluding focal lesions in all the nine patients with chronic sialadenitis (Fig. 1a). This had dual impact: it made patients and treating physicians markedly less alarmed and opened the prospect of conservative treatment when appropriate. Moreover, CT was able to differentiate between malignant and benign masses in all examined patients with a sensitivity and specificity of 100%. Such high accuracy is, however, not commonly reported. In published studies, CT was found to have an overall accuracy of 75%. This reflected the difficulty to distinguish between low-grade malignancy from benign tumors[5-7]. The higher value reported in this study is probably because all malignant cases presented at a late stage of their disease with obvious signs of invasion and lymph node metastases (Fig. 2a).

CT sialogram was found to be a rather difficult technique to perform for all patients. It proved impossible to employ for children, irritable patients and those with a narrow or scarred parotid duct. When it was successfully performed ((Fig. 1b, 2b), it offered little additional help in diagnosing extra-parotid lesions. For those with masses of the parotid gland, the sialography demonstrated normal, yet compressed duct system in the nine patients with benign tumors. It also showed displacement and distortion of the duct system in the one case of adenocarcinoma. It could exclude the presence of invasion of the ducts in this particular case. The overall sensitivity of the CT sialography was found to be 57.14% with a specificity of 100%. Similar results could be seen in published series [8]. On the other hand, CT sialography was reported to give precise mapping of mass lesions within and adjacent to the parotid gland owing to the small difference in soft tissue attenuation that was observed following sialography [9-11]. Such difference was not found with intravenous contrast-enhanced CT. Though FNAC, in the present study, was positive for malignancy in only one case, post-operative histopathology confirmed the diagnosis of CT of two cases of malignancy and showed their histological nature.

Based on the data presented it may be concluded that, computerized tomography is a valuable and effective technique in diagnosing parotid gland mass lesions as well as extra-parotid masses and lymph nodes. It is also reliable in excluding them, leaving the chance for other probable diagnoses to be adopted. CT can also effectively differentiate between malignant and benign tumors of the parotid, though early or low-grade malignancies may be misdiagnosed as benign. CT sialography was found to be a difficult technique to perform in certain situations. It did not offer additional benefit in the diagnosis of parotid masses. Furthermore, it did not induce the difference in parotid tissue attenuation that was supposed to map out the mass lesion in concern.

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