Evaluation of Obstructive Salivary Gland Conditions by CBCT Sialography

Nermien Ali Mohamed Fathy[1] and Maha Eshak Amer[2]

[1]Assistant Lecture, Oral and Maxillofacial Radiology Department, Faculty of Dentistry, Minia University, Egypt
[2]Head of Oral and Maxillofacial Radiology Department, Faculty of Dentistry, Minia University, Egypt
nermien.aly87@gmail.com

Abstract: **Objective**: Evaluate the radiographic finding of CBCT sialography in obstructive conditions of major salivary gland. **Study design:** Twenty patients of both sexes and varying ages were selected complaining of obstruction of salivary gland diagnosed by patient history and clinical examination, were undergone conventional sialography followed by CBCT scanning. Then all images were analyzed and scored, the radiographs were evaluated by three radiologists independently of each other. **Results**: There is statistically significance relation between CBCT finding and plain imaging with respect to the abnormality of the main duct (p = 0.03) and detection of sialectasia (p0.001). However, plain imaging and CBCT were the same for the identification of strictures (p=0.09) **Conclusion**: Cone beam computerized tomography (CBCT) sialography is superior to conventional sialography for evaluation of obstructive condition of major salivary gland.
[Nermien Ali Mohamed Fathyand Maha Eshak Amer. **Evaluation of Obstructive Salivary Gland Conditions by CBCT Sialography.** *J Am Sci* 2019;15(2):1-4]. ISSN 1545-1003 (print); ISSN 2375-7264 (online). http://www.jofamericanscience.org. 1. doi:10.7537/marsjas150219.01.

Keywords: Evaluation; Obstructive; Salivary; Gland; Condition; CBCT sialography

1. Introduction

Pathologic conditions of the salivary glands are many but they are broadly categorized into inflammatory conditions, non-inflammatory conditions, and space occupying masses ***(Som and Brandwein-Gensler, 2011).*** Inflammatory conditions are the most common abnormalities to affect the salivary glands, and may involve the parenchyma of the gland (sialadenitis) (***Abdel Razek and Mukherji, 2017***), or the ductal structures (sialodochitis), or both an array of causes result in inflammation of the salivary glands but infections (bacterial or viral) are the most common cause of acute inflammation ***(Som and Brandwein-Gensler,2011)***

Non-inflammatory conditions of the salivary glands include any non-inflammatory, non-neoplastic condition of the salivary glands, Most of these conditions result in secretory abnormalities, namely xerostomia. Xerostomia is the subjective feeling of dry mouth that results from a decrease in the quantity of saliva***. (Guggenheimer and Moore,2003).***

Sialography is a functional examination of the parotid and submandibular salivary glands that was first performed in 1902 **(*Abdel-Wahed; et al 2013)***. It depicts the delicate ductal structures of the salivary glands following the introduction of an iodinated contrast agent through the orifice of the gland duct. The gland is then imaged with ionizing radiation (plain film, CT, fluoroscopy, cone beam CT***) (Hatcher DC, 2010),*** the procedure is indicated to assess the extent and severity of the resultant changes to the gland***. (Scarfe and Farman,2006).***

CBCT sialography has been reported by numerous authors as a highly sensitive and cost-effective technique for depicting changes in the delicate ductal anatomy because of its relatively high spatial resolution and relatively low radiation dose (compared with MDCT) ***(Abdullah et al. 2013 & Abdel-Wahed et al. 2013).***

2. Patients and Methods

Twenty patients (Adults over 18 years of age) were selected from the outpatients of dental clinics of Minia University dental hospital, The research proposal was submitted to Research Ethics Committee (REC) of faculty of Dentistry Minia University for its approval, Informed consent of REC of faculty of Dentistry Minia University was used in this study, all cases were asked to sign a written consent explaining the nature and the procedures of the study protocol, only those who agree to sign the consent was included in this study.

Inclusion criteria in this study were having signs and symptoms related to obstructive salivary gland disease, based on the presence of the symptoms of pain, xerostomia and swelling of the parotid or submandibular salivary gland, while exclusion criteria were the presence of acute stages of inflammation affecting the salivary glands, detailed history taking and clinical examination of the patients were performed.

Sialography was performed by probing and cannulation of ducts for affected salivary gland and followed by injection of approximately 1.5-1.7 mL Urografin contrast media until the patient felt fullness.

The gland of interest was imaged by panoramic imaging "Orthoslice panoramic machine" (Trophy, France), In addition, CBCT examination was performed using Scanora® 3D with Auto- SwitchTM (Soredex, Helsinki, Finland) with 85 kVp, 15 mA, and a field of view (FOV) of 4 cm for the submandibular gland and 5 cm for the parotid gland. OnDemand 3DTM software (Cybermed Inc., Seoul, Korea) was used to manipulate the CBCT images in multiplanar slices as well as three dimensional images to examine the lesions.

Three radiologists evaluated the images separately and scores were given for the interpretation of the images according to the following scoring systems.

A scoring system was performed to evaluate the visualization of the duct: Not visualized:0, Visualization:1.

The width and contour of Duct system: (main duct, and intra glandular branches): Normal: 0, Narrow with or without irregularity: 1 Dilated with or without irregularity:2 and, Destroyed: 3.

The sialectasis: based on the accepted criteria proposed by Rubin and Holt According to the size of contrast material collections in the gland: Stage-0: Nosialectasis., Stage-I: Punctate;<1 mmin diameter., Stage-II: Globular; 1–2 mm in diameter.

Stage-III: Cavitary; >2 mm in diameter. Stage-IV: Destructive; severe irregular dilatation of the main duct and destruction of the parenchyma with pooling of contrast medium giving a bizarre pattern.

The above mentioned scoring system for evaluation was used by each radiologist to assess the interpretation separately.

3. Results

Twenty patients in this study 8 cases (40%) were male while the remaining 12 cases (60%) were females. The ages of the patients ranged between 20 to 60 years with a mean age of 40 years, (4 cases, 20%) were healthy with non-contributory medical histories. 10 subjects (50%) reported rheumatoid. Two subjects had received previous anti hyper-tensive treatment. In total, 17 parotid glands and 3 submandibular glands were examined.

All subjects were symptomatic, and xerostomia was the most common chief complaint of 15 subjects (75%). 5 subjects (25%) experienced only a Swelling at meal time. Most subjects (80%) reported pain. 14 subjects (80%) reported dull pain and 4 subjects (20.0%) reported sharp pain. 1 another subjects (5%) reported ‘‘discomfort’’ and 5 subjects (25%) could relate their symptoms of swelling and/or pain to meal time.

There is statistically significant relation between conventional sialography and CBCT sialography as, The abnormal findings were identified by the observers more frequently on CBCT images than on plain images, CBCT sialography was superior to conventional sialography in revealing the abnormality of the main duct as p value~ 0.03 (table 1).

Table (1): This table shows that: there was moderate agreement between CBCT and conventional radiography in detection of abnormality in the main duct, and this agreement is statistically significant.

CBCT	**Conventional**		**Total**
	Abnormal	**Normal**	
Abnormal	8 (57.1%)	6 (42.9%)	14
Normal	0 (0%)	6 (100%)	6
Total	8	12	20
Kappa (95% CI)	0.44 (0.001–0.063)	**P**	0.03*

There was no significance between two modalities related to the number of strictures as identified on both the plain images and CBCT radiograph. The most common location for strictures was the main duct. (Table 2).

Table (2):This table shows that, there was low agreement between CBCT and conventional radiography in detection of stricture, and this agreement is not statistically significant.

CBCT	**Conventional**		**Total**
	Detected	**Not detected**	
Detected	2 (22.2%)	7 (77.8%)	9
Not detected	0 (0%)	11 (100%)	11
Total	2	18	20
Kappa (95% CI)	0.239 (0.26–0.19)	**P**	0.09

There was statistically significant relation between conventional sialography and CBCT sialography regarding to the presence of sialectasiatable (3).

Table (3): This table shows that there was moderate agreement between CBCT and conventional radiography in detection of sialectasia, and this agreement is of high statistical significance.

CBCT	Conventional		Total
	Present	Absent	
Present	8 (80%)	2 (20%)	10
Absent	1 (10%)	9 (90%)	10
Total	9	11	20
Kappa (95% CI)	0.7 (0.001–0.03)	**P**	< 0.001**

There was agreement among the three radiologists in interpreting the lesions of the salivary glands with both techniques. The detection of salivary gland lesions was 100% for both conventional sialography and CBCT sialography.

4. Discussion

In this study the cases were diagnosed as non-tumor salivary gland diseases and were suffered from pain and the most common symptom was xerostomia which suggest obstructive condition.

There was high inter observer agreement in visualization of the normal gland structures and in identifying abnormal findings as the three observers were all certified specialists in oral and maxillofacial radiology with extensive training in sialography and advanced imaging interpretation.

Oscar 2010 reported that sialography is not time-consuming, and the refinement of intravenous catheters has made the procedure painless and easy to perform, Sialography can demonstrate important and interesting pathologic features of the involved salivary glands. The anatomy of the duct can be displayed, revealing its form as narrow or large, the presence of secondary branches leaving the main duct, and reveal the presence of internal duct strictures, especially in the parotid gland.

For the current study, the visualization of the main duct by both modalities were the same moreover, there was moderate agreement between CBCT and conventional radiography in detection of abnormality in the main duct as in the case that conventional sialography reported 60% of the visualized main duct was normal, cone beam sialography reported only30% of the cases were normal.

Jadu et al 2013 reported that Strictures are most often single and more commonly found in the primary duct. In the current study, the CBCT results support these findings, more strictures were identified in the main duct and more identified than was found on plain images, however they were reported that plain images more often described as multiple strictures than CBCT imaging which dis agree with this study as more than one strictures were identified in CBCT image that not found in the plain image.

Som and Brandwei in 2011 suggested that sialectasia of the ductal structures is the most prominent feature that demonstrated on imaging of the affected gland.

In this study there was moderate agreement between CBCT and conventional radiography in detection of sialectasia, and this agreement is of high statistical significance as conventional sialography detected that 45% of the studied cases had sialectasia as well as CBCT sialography detected sialectasia in 50% of cases but with differentiation in different degrees of the entire glandular area, which was in agree with***jadu,2014***who explained the ‘‘fair to moderate’’ agreement for visualization of the parenchyma that was not surprising since the parenchymal appearance can vary depending on many factors such as the degree of damage of the terminal acini, the amount of contrast injected and the amount of pressure used during injection.

Sialographic abnormalities that have been reported in Sjogren's syndrome by a number of workers (Rubin et al. 1955; Blatt et al. 1956; Rubin and Holt 1957; Blatt 1964; Bloch et al. 1965; Ericson 1968), in this study all cases of rheumatoid arthritis reported radiographic abnormalities as ductal changes in all cases and variety of sialectasia as, 2 (20%) cases had puncutatesialectasia, 2 (20%) had globular,1 (10%) had cavitatory and 4 (40%) had destructive parynchema, and the results of Ericson (1968) who found abnormal sialograms in 11 per cent of 91 patients with rheumatoid arthritis are closely similar to our results. In both the present study and the study of Ericson (1968) the prevalence of sialographic abnormalities is higher in the rheumatoid arthritis patients.

Regarding for interpretation, the inter-observer agreement was greater for CBCT images than for plain images as plain images suffer from anatomical structures that overlap glandular ductal anatomy while CBCT sialography highly sensitive for depicting changes in the delicate ductal anatomy because of its relatively high spatial resolution.

Case:73 years old femalehad rheumatoid arthritis and suffered from xerostomia.

CBCT finding：

Fig (1): (a) Reformatted sagittal view show destructive distribution of contrast media with the parynchema (b) Reformatted lateral oblique view of sagittal cut for demonstrating the duct that show irregular dilation of the main duct with multiple constrictions.

Conclusion

CBCT sialography is superior than conventional sialography in interpretation and the modality of choice in mapping the ductal system and parynchema of the gland in demonstration of stricture and filling defects of ductal system of the gland as well as differentiating normal salivary glands from those with secondary inflammatory changes.

References

1. Abdel Razek AAK, Mukherji S. Imaging of sialadenitis. Neuroradiol J 2017;30(3):205–15.
2. Abdel-Wahed N, Amer ME, Abo-Taleb NS. Assessment of the role of cone beam computed sialography in diagnosing salivary gland lesions. Imaging Sci Dent. 2013;43:17-23.
3. Abdullah A, Rivas FF, Srinivasan A. Imaging of the salivary glands. Semin Roentgenol 2013;48(1): 65–74.
4. Guggenheimer J, Moore PA. Xerostomia: etiology, recognition and treatment. J Am Dent Assoc 2003;134:61-9; quiz 118-119.
5. Hasson Oscar: Sialoendoscopy and sialography: Strategies for assessment and treatment of salivary gland obstruction. J Oral Maxillofac Surg 65:300, 2007.
6. Hatcher DC. Operational principles for cone-beam computed tomography. J Am Dent Assoc 2010;141Suppl 3:3S-6S.
7. Jadu FM, Lam EW. A comparative study of the diagnostic capabilities of 2 D plain radiograph and 3 D cone beam CT sialography. Dentomaxillofac Radiol. 2013;42:20110319.
8. Rubin P, Holt JF. Secretary sialography in disease of the major salivary glands. AJR 1957;77:575–98.
9. Scarfe Wc, Farman AG, Cone-beam Computed tomography. in: White SC, Pharoah MJ. Oral Radiology: principles and interpretation. St. Louis, MO: Mosby/Elsevier, 2009, pp 225-243.
10. Som PC, Brandwein-Gensler MS. Anatomy and Pathology of the Salivary Glands. In: Som PC, Curtin HD (ed). Head and Neck Imaging. St. Louis, MO: Elsevier, 2011.

1/27/2019