Multislice CT of Jaw Swelling

Abd Alraheem Husein Ali [a]* , Mohammed Tharwat Solyman[b], Mustafa Mohamed Mustafa[a] , Kamal Abdelaal Mohamed[a]

[a]Department of Radio-diagnosis, Faculty of Medicine, Sohag University, Sohag, Egypt.
[b]Department of Radio-diagnosis, Faculty of Medicine, Assuit University, Assiut, Egypt.

Abstract

Background: Multi-detector line CT (MDCT) has converted CT from the cross-sectional into a fully three-dimensional image. MDCT scans quickly acquire multiple thin axial images, as well as more precise images of rebuilding.

Objectives: To assess the task of multislice CT diagnosis in jaw lesions with various software programs.

Patients and methods: A prospective cohort study included 50 patients with jaw swelling had been examined by multislice CT Radiodiagnosis Department, Sohag University.

Results: ROC curve showed that the area under the curve of multislice CT for diagnosis of jaw swelling is 0.835, sensitivity 92.2%, specificity 89%, PPV 69.8%, NPV 87%, and accuracy is 94.5%.

Conclusion: MDCT has a key role in giving an appropriate diagnosis, rating it and then directing care decisions being far superior to traditional radiography of mandible

Keywords : Multislice CT; Jaw Swelling; Mandibular lesions.

***Correspondence**: dr_abdo1976@yahoo.com

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Introduction

Mandibular tumors arise from both odontogenic and non-odontogenic sources and differ in levels. Commonly benign cystic tumors involve periapical cysts, follicular cysts, and odontogenic keratocysts. These are commonly used as benign cysts. Benign solid tumours display a wide range of disorders from ameloblastic, ossifying, and periapical cement dysplastic diseases. Sometimes involving the lower jaw cancerous tumors include scamic cell carcinomas, osteosarcomas and metastatic tumours **(Brian et al., 2006).**

Multi-detector line CT (MDCT) has converted CT from the cross-sectional into a fully three-dimensional image. The images are collected in thinner and good resolution parts as volume data which results in a multiplane reform and nearly isotropic image acquisition at a high rate, the main benefits of MDCT compared the single detector CT line is the rising in performance and versatility in the usage of contrast media **(Mupparapu and Nadeau, 2016).**

So, MDCT is widely used for different types of maxillary tumors due to their sensitivity and diagnostic performance. MDCT scans quickly acquire multiple thin axial images, as well as more precise images of rebuilding. MDCT scan offers accurate information for maxilla a and jaw assessments in the height, width and three-dimensional (3D) area and details on the position of typical anatomical structures **(Abrahams, 2001)**. The aim of this research is to assess the task of multislice CT diagnosis in jaw lesions with various software programs.

Patients and methods

A prospective cohort study involved 50 subjects with jaw swelling had been examined by multislice CT Radiodiagnosis Department, Sohag University.

All participants had prior informed approval and the research procedure approved by the Institutional Research and Medical Ethics Committees of Sohag University.

Nontraumatic clinically suspected mandibular lesions, referral patients for CT Scan because of unclear diagnosis in dents, and patients with OPG or X rays have been included in the study. Mandible trauma and metal prothesis patients were excluded.

Methods

All participants subjected to full history, examination and CT mandible.

CT mandible technique

All participants received a General Electric Light Speed Ultra CT01-OCO CT scan (8 slice). Axial cut with a thickness of 1,25 mm was performed on each patient and sagittal and coronal frames were then multiplanar reformatted.

Any software programs have made volumes, projection of full strength, shaded surface display, panoramic view, CT (vascular invasion) angiography performed. For certain patients, IV contrast substance was performed.

Statistical analysis

Patients' data were presented as frequency and percentage for categorical variables, mean and SD for numerical variables. Groups were compared by independent samples Student t-test and $\chi 2$-test for numerical and categorical data, respectively. All data and statistical analyses were handled by statistical package for the social sciences (SPSS, IBM, SPSS Inc. Chicago, USA) computer package version 18.

Results

Our result involved 50 patients with jaw swelling, 22% of them had maxillary lesions;10% had lesions in Anterior and posterior region, 8% in the Posterior region, 4% had anterior maxillary lesion, on the other hand, 78% had mandibular lesions; 34% in posterior region, 28% in the anterior and posterior region, and 16% in anterior region (**Table.1**).

Regarding pathological characters, there are 17 (34%) cases had lesion with cystic density, 6 (12%) cases with sclerotic swelling, 8 (16%) cases with lytic swellings, and 9 (18%) cases with mixed lytic and sclerotic, as regard matrix; 31 (62%) cases with homogenous matrix, while, 19 (38%) cases with heterogeneous matrix, then as regard margins; 11 (22%) cases were with well-defined margin, 27 (54%) cases with ill-defined margin, 7 (14%) cases had sclerotic margin and 5 (10%) cases had non-sclerotic margin, then as regard cortex, 9 (18%) cases had thin cortex, 13 (26%) cases had no cortex, 15 (30%) cases with intact cortex, and 13 (26%) cases with thick cortex, 12 (24%) cases with regional lymph nodes (**Table.2**).

Distribution of diagnosed pathology by multislice CT revealed that 40% of cases had Ameloblastoma, 16% had Keratocystic odontogenic tumor (KCOT), 12% had Periapical cyst, 8% had Odontoma, 4% were Dentigerous cyst, 6% Osteomyelitis, 2% had Cementoblastoma, 2% with Fibrous Dysplasia, 2% were Arteriovenous Malformation, 2% of swelling were Osteogenic Sarcoma, and 2% were Osteochondroma (**Table.3**).

ROC curve showed that the area under the curve of multislice CT for diagnosis of jaw swelling is 0.835, sensitivity 92.2%, specificity 89%, PPV 69.8%, NPV 87%, and accuracy is 94.5% (**Fig.1**).

Table 1. Distribution of jaw swelling according to site of implication

Variables	Cases (n = 50)		Total
	NO	%	No (%)
Maxilla			
▪ **Anterior region**	2	4%	11 (22%)
▪ **Posterior region**	4	8%	
▪ **Anterior and posterior region**	5	10%	
Mandible			
▪ **Anterior region**	8	16%	39 (78%)
▪ **Posterior region**	17	34%	
▪ **Anterior and posterior region**	14	28%	

Table 2. Distribution of patients according to MDCT pathological characters

Variables	Cases (n = 50)	
	NO	%
Density:		
▪ **Cystic**	17	34%
▪ **Sclerotic**	6	12%
▪ **Mixed lytic and sclerotic**	19	38%
▪ **Lytic**	8	16%
Matrix:		
▪ **Homogenous**	31	62%
▪ **Heterogeneous**	19	38%
Margin:		
▪ **Well defined**	11	22%
▪ **Ill-defined**	27	54%
▪ **Sclerotic**	7	14%
▪ **Non sclerotic**	5	10%

Cortex:		
▪ **Thin**	9	18%
▪ **Absent**	13	26%
▪ **Intact**	15	30%
▪ **Thick**	13	26%
Post contrast:		
▪ **Intense**	10	20%
▪ **Moderate**	8	16%
▪ **Mild**	14	28%
▪ **Homogenous**	12	24%
▪ **Heterogeneous**	9	18%
▪ **No**	7	14%
Relation to teeth:		
▪ **Root resorption**	15	30%
▪ **Root divergence**	9	18%
▪ **Unerupted**	12	24%
▪ **Impacted**	4	8%
▪ **No**	10	20%
Regional LN:	12	
▪ **Present**	38	24%
▪ **Absent**		76%

Table 3. Distribution of diagnosed pathology by multislice CT

Variables	Cases (n = 50)	
	NO	**%**
Ameloblastoma	20	40%
Keratocystic odontogenic tumor (KCOT)	8	16%
Periapical cyst	6	12%
Odontoma	4	8%
Dentigerous cyst	2	4%
Osteomyelitis	3	6%
Cementoblastoma	1	2%
Fibrous Dysplasia	1	2%
Arteriovenous Malformation	1	2%
Osteogenic Sarcoma	1	2%
Osteochondroma	1	2%

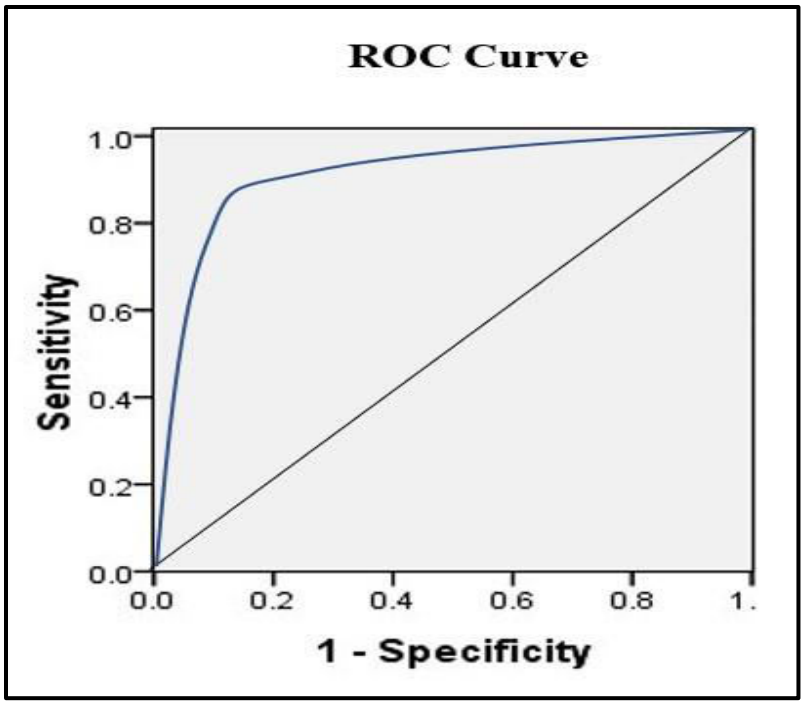

Fig.1. ROC curve of multislice CT for diagnosis of jaw swelling

Discussion

In the mandible or maxilla, jaw lesions can happen. Even though there is currently no specific description of the jaw pathologies, different categories have been tried. One is the MIND rating, which classifies the jaws into metabolic, infectious, neoplastic and developmental. The idiopathic designation for pathologies which cannot be covered by the four previous types is another category (**Lasisi et al., 2013).**

In the present study, 22% of cases had maxillary lesions;10% had lesions in Anterior and posterior region, 8% in the Posterior region, 4% had anterior maxillary lesion, on the other hand, 78% had mandibular lesions; 34% in posterior region, 28% in the anterior and posterior region, and 16% in anterior region.

In agreement with our findings, the study of **Odai and Ogbeide, (2017)** revealed that the mandible was the location of 1,182 (78.1%) of these lesions while 331 (21.9%) were situated in the maxilla/mid face. The posterior mandible was the commonest site, with 505 (33.4%) of the lesions and the anterior maxilla with 68 (4.5%) of all the lesions was the least common. There were 358 (25.5%) lesions spanning through the anterior and posterior aspects of the mandible.

With the introduction of multi–detector computed tomography (MDCT), the imaging evaluation of patients with mandibular lesions has changed, in the current study, we found that 17 cases had lesion with cystic density, 6 cases with sclerotic swelling, 8 cases with lytic swellings, and 9 cases with mixed lytic and sclerotic, as regard matrix; 31 cases with homogenous matrix, while, 19 cases with heterogeneous matrix, then as regard margins; 11 cases were with well-defined margin, 27 cases with ill-defined margin, 7 cases had sclerotic margin and 5 cases had non-sclerotic margin, then as regard cortex, 9 cases had thin cortex, 13 cases had no cortex, 15 cases with intact cortex, and 13 cases with thick cortex, 12 cases with regional lymph nodes.

In comparison to the results of the study of **Odai and Ogbeide, (2017)** in which Radiolucent pathologies were the

most common radiologic type, representing 1067 (70.5%) of all the lesions. The next were mixed radiolucent-radiopaque swellings 228 (15.1%) and the least were radiopaque swellings 218 (14.4%) almost equaling the radiolucent radiopaque swellings.

Considering radiolucent lesions loculation, 390 (36.6%) were unilocular while 677 (63.4%) were multilocular. Regarding radiolucent lesions margin, 317 (29.7%) were well defined whereas while 750 (70.3%) were poorly defined. Whereas 207 (90.8%) of radiopaque swellings had well-defined margins, 21 (9.2%) margins that were not well defined. The mixed radiolucent-radiopaque swellings showed 212 (97.2%) poorly defined margins and only 6 (9.2%) have well-defined margins.

In the study of **Pereira et al., (2010)** large majority of cases (n=38; 54.2%), the radiological features were not reported in the clinical reports. In fifteen cases (21.4%), a multilocular radiolucent presence was found and two cases had a soap bubble or honeycomb-like presence. Unilocular radiolucent swellings were found in seventeen cases (24.2%).

The area under the curve of MDCT for diagnosis of jaw swelling is 0.835, sensitivity 92.2%, specificity 89%, PPV 69.8%, NPV 87%, and accuracy is 94.5%.

In the recent study of **Farida et al., (2020)**, reported that MDCT had sensitivity of 85%, specificity of 87.5%, positive predictive value of 94.4% and negative predictive value of 70% for prediction of simple Maxillofacial lesions. In complex lesions, they had sensitivity of 50%, specificity of 93.8%, and positive predictive value of 85.7% and negative predictive value of 71.4%.

Conclusion

MDCT has a key role in giving an appropriate diagnosis, rating it and then directing care decisions being far superior to traditional radiography of mandible in all aspects but the cost and where metal prosthesis caused artefacts.

Conflict of Interests

The authors reported no conflict of interest.

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