



Research Article

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## ***Diagnostic Accuracy of Two Softwares for Detection of Intra-Bony Lesions in Multi-Detector Computed Tomography***

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### **ABSTRACT**

*Background: Bony jaw lesions have varied radiographic appearance and may pose difficulty in establishing radiographic differential diagnosis. Computed tomography is a useful tool to facilitate the correct diagnosis of these bony lesions. Objectives: To compare the volumetric measurement of bony lesions of the jaw using two commercially available softwares for the evaluation of CT imaging. Material and Methods: All patients were subjected for multi-slice CT scanning. The volumetric measurements were performed using two softwares; Myrian and Siemens. Results: This study was conducted on 15 patients of both genders; males (66.7%) and females (33.3%), where 21 diagnosed lesions with an intra-bony space affecting one or both of the jaws were included in the measurements. Myrian software showed statistically lower mean of volumetric measurement than Somatom (P-value <0.001). Conclusion: Although, Myrian software showed statistically lower mean of volumetric measurement than Somatom. The clinical relevance of these finding still needs to be determined in future studies. Thus, both softwares can still be useful diagnostic tool for volumetric measurements.*

**Key words:** Intra-bony lesions, Multi-detector computed tomography, software.

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### **INTRODUCTION**

Jaw lesions generally have a cyst-like radiographic appearance and often pose a difficulty in differentiating them based on radiographic features. They can either be odontogenic or non-odontogenic in origin. Radiographic features can help in the differential diagnosis as odontogenic lesions without signs of calcification can appear as well-defined, unilocular, well-corticated, radiolucent lesions that are frequently associated with the impacted or unerupted teeth [1, 2]. Intraoral radiography, conventional or digital modalities and traditional imaging technique provide two dimensional images of teeth and surrounding structures such as lamina dura and alveolar bone. They can be useful in imaging small bony lesions. However, advanced imaging modalities like Computed Tomography (CT), may be an additional diagnostic tool in evaluation of large bony lesions and diseases. Scanning any desired section by Multi-Detector CT scanners may be of high quality with comparable patient dose [3].

CT imaging can provide details for both hard and soft tissues definition. It is among the most efficient

techniques for this regard [4]. Also, it can determine the location and extent of oral and maxillofacial cysts and tumors. Examination in coronal, axial, and sagittal planes provides high resolution quality images that can help in useful surgical procedure planning [5, 6]. CT scan is also able to detect the cause of issue [7]. Furthermore, it can reveal soft tissue masses and size, aiding in defining malignant lesion, and evaluating their invasion possibility [8-10].

Resolution algorithm and quantitative accuracy of CT images can play an important role in diagnosis of bony lesions. Different softwares used can show variations in volume rendering and resolution of the images. With this view in mind, the aim of the present study was to compare the volumetric measurement of bony lesions of jaw using two commercially available softwares for the evaluation of CT imaging.

## MATERIALS AND METHODS

All the patients were examined by panoramic radiography and lesions were noticed; the images were obtained using the panoramic machine (Trophy Orthoslice 1000, France) at the Radiology department, Faculty of Dentistry, King Abdulaziz University, Jeddah, Saudi Arabia. All patients were referred to the Radiology department for multi-detector CT scanning. The examinations were performed using multi-section CT scanner SOMATOM sensation 16 (Siemens, Erlangen, Germany) and two softwares (Siemens and Myrian) to assess the intra-bony lesions. Patients did not need any preparation prior to the examination. All images were taken while patients in supine position.

Multi-detector computed tomography assessment was performed by using 16-row multi-section CT scanner (Somatom 16; Siemens, Erlangen, Germany). Volume measurements were done using two softwares, the first is the commercially available software (CT volume; Siemens Medical Systems, Erlangen, Germany) in which the intraosseous lesion was determined on each axial slice using free hand method with the computer mouse cursor. Then, after selecting all the slices, the software calculates the volume automatically.

The second software was Myrian (Myrian; Intrasure, Paris, France) in which the borders of the lesion were determined on the first and the last axial slices to allow the software to detect and calculate the volume of the lesion automatically. Two calibrated dental radiology consultants evaluated all images for the measurements of intra-bony lesions. Comparison of both methods was made and statistical analysis was performed.

A written consent was obtained from all participated study patients approving using their data for this study. This project was approved by the research ethical committee review board from King Abdulaziz University, Faculty of Dentistry (KAUFD). This project was in full accordance with the World Medical Association Declaration of Helsinki.

### Statistical Analysis

Data were represented as mean, standard deviation (SD), median, range and 95% confidence interval (95% CI) values. The significance level was set at  $P \leq 0.05$ . The interobserver and intraobserver agreement values were calculated using Cohen's kappa test. Wilcoxon signed-rank test was used to compare between the two softwares. Statistical analysis was performed with IBM® SPSS® Statistics Version 20 for Windows.

## RESULTS

The present study was conducted on 15 patients of both genders; males (66.7%) and females (33.3%), where 21 lesions were diagnosed with an intra-bony space occupying lesion affecting one or both of the jaws. The mean age was  $23.2 \pm 15.8$  years. The Cohen's kappa scores for agreement for both inter-observer and intra-observer agreement values, all varied from 0.86-0.97.

Demographic data of the study are presented in Table 1. Wilcoxon signed-rank test results for the comparison between volume measurements performed using the two softwares are presented in Table 2. There was a statistically significant difference between volume measurements by the two softwares ( $P$ -value  $< 0.001$ ). Myrian software showed statistically lower mean of volumetric measurement than Somatom.

## DISCUSSION

The literature provided very few supportive data for volumetric evaluation of maxillofacial pathology evaluated by CT softwares. It is an established fact that CT has advantage over conventional radiography in the diagnosis of lesions of the jaws. It clearly exhibits clear picture of the lesion, both soft and hard tissue mass. It also helps in determining lesion extension into adjacent structures [11]. CT imaging has also changed and volumetric spiral

(helical) CT has replaced conventional CT, allowing rapid acquisition of high-quality images of the head and neck region with a single breath-hold, thus decreasing artifacts resulting from respiratory and swallowing motions. This imaging tool has given 3D accuracy measurements of neoplastic lesions [5, 12].

**Table 1:** Demographic data

| Variable                         | Frequency | Percentage |
|----------------------------------|-----------|------------|
| Females                          | 5         | 33.3%      |
| Males                            | 10        | 66.7%      |
| Dentigerous cyst                 | 6         | 28.6%      |
| Radicular cyst                   | 7         | 33.3%      |
| Odontogenic Fibroma              | 1         | 4.8%       |
| Florid Cemento-osseous Dysplasia | 2         | 9.5%       |
| Central Giant cell Tumor         | 2         | 9.5%       |
| Ameloblastoma                    | 3         | 14.3%      |

**Table 2:** Descriptive statistics and results of Wilcoxon signed-rank test for comparison between volume measurements performed using the two softwares

| Software | Mean  | SD   | Median | Minimum | Maximum | 95% CI      |             | P-value |
|----------|-------|------|--------|---------|---------|-------------|-------------|---------|
|          |       |      |        |         |         | Lower bound | Upper bound |         |
| Myrian   | 10.35 | 9.39 | 7.52   | 1.35    | 45.10   | 6.07        | 14.62       | <0.001* |
| Somatom  | 10.72 | 9.63 | 7.80   | 1.46    | 46.20   | 6.34        | 15.10       |         |

\*: Significant at  $P \leq 0.05$

CT with Multiplanar Reconstruction Program software which was initially intended to be used for implant dentistry treatment planning, has demonstrated the usefulness in the evaluation of jaw lesions and surrounding anatomic structures [13]. There are compatible softwares available for computed tomography in order to improve image quality and identify pathological lesions without increasing radiation exposure to the patient [14]. Cavalcanti et al. found that volumetric measurements from 3D reconstructed CT are accurate and reliable methods in both in vitro and in vivo settings [5]. This method is potentially useful for the management of oral neoplasms [5]. Furthermore, Gadodia et al. observed that volume-rendered technique accurately illustrates the extent of jaw bony lesions and are highly appreciated for diagnosis, surgical planning and management of jaw lesions [15].

Although CT examination is not a routine technique for diagnosis of the cyst and tumors, however, it helps to evaluate the relationship of the lesion with the surrounding structures and should be included in treatment planning when indicated [16, 17].

To our knowledge, few studies evaluated the volumetric measurement of the two studied softwares and none compared both. Frauenfelder et al. found that volumetric measurement of MPM on CT using Myrian software is a reproducible, reliable, and sensitive method to measure tumor volume [18]. Chaosuwanakit et al. found that "MDCT Somatom Sensation 16" would perform measurement with MDCT during coronary CT angiography very accurately, and had comparable measures of those taken from biplane cine left ventriculography [19]. Our study has shown that both softwares has comparable results, however, Myrian software showed statistically lower mean of volumetric measurement than Somatom. Whether this can be clinically relevant or not is something still needs to be determined in future studies.

## CONCLUSION

Although, Myrian software showed statistically lower mean volume measurement than Somatom. The clinically relevant of this finding still needs to be determined in future studies. Thus, both softwares can still be useful diagnostic tool for volumetric measurements.

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