ORIGINAL ARTICLE

Lund-Mackay Scoring of Incidental Paranasal Sinus Collection on Computed Tomography Scan of Head and Neck in the University of Benin Teaching Hospital, Nigeria

Ighodaro O. Emmanuel, Ehigiamusoe O. Festus

ABSTRACT

Background: Many a times during computed tomography scan of the head and neck, incidental density is noted in the paranasal sinuses in patients who are asymptomatic and there is need to document the degree of such opacification.

Objectives: To document the opacification and generate a numerical scoring system described as Lund Mackay Score which eases communication between the Radiologist and the referring Ear, Nose and Throat Surgeon in describing sinusitis.

Methods: This is a prospective study done in the Radiology Department of University of Benin Teaching Hospital, Benin, Edo, Nigeria. A total of 150 patients were enrolled for this study with 62% being male and 38% being females. They were patients who had cranial and neck computed tomography scans for pathologies other than that related to the sinuses.

Results: The mean age of the study population was 52.70±18.71years. Cerebro-vascular accident was the commonest indication for computed tomography scan in this study (49.3%). The total Lund Mackay Score was 0.803±2.90 for all sinuses being 0.417±1.47 for the right sinuses and 0.386±1.43 for the left sinuses. For the right, the maxillary sinus had the highest Lund Mackay Score with a value of 0.210±0.46 while the posterior ethmoidal sinus had the least Lund Mackay Score with a value of 0.027±0.16. For the left sinuses, the maxillary sinus also had the highest Lund Mackay Score value of 0.173±0.40.The posterior ethmoidal sinus also had least Lund Mackay Score value of 0.033±0.18. The Lund Mackay Score of the osteomeatal complex was 0.013±0.12 and 0.007±0.08 for the right and left respectively.

Conclusion: This study has documented the Lund Mackay score for incidental paranasal sinus opacification as seen on computed tomography scan in our environment.

Key words: CT scan, Lund-Mackay score, sinusitis

[1]Department of Radiology, School of Medicine, University of Benin, Benin City.

Corresponding Author:
Dr. Ighodaro Osaigbovo Emmanuel
Department of Radiology,
School of Medicine,
University of Benin,
Benin City.
E-mail: daroresearch@yahoo.com

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Introduction

The paranasal sinuses are paired air-filled spaces which are situated around and drain into the nasal cavity[1]. The intrinsic functions of the paranasal sinuses are hypothetical and they include humidifying and warming inspired air, regulation of intranasal pressure and lightening of the skull weight amongst others[2]. Sinusitis is the commonest pathology that affects the sinuses and can be quite discomforting.

Various imaging modalities are used in the imaging of the paranasal sinuses including conventional radiography, magnetic resonance imaging, scintigraphy, etc but computed tomography (CT) scan is regarded as the gold standard due to its high sensitivity in detecting --

-opacification of the paranasal sinuses and its ability to demonstrate bony details of the sinuses and the draining pathways of the osteomeatal complex (OMC)[3,4]. In this era of functional endoscopic sinus surgery (FESS), CT scan of the paranasal sinuses is mandatory and it is a medico-legal requirement prior to such surgeries[5]. However, in resource poor countries Computed tomography scan is not readily available and when available it is expensive to afford.

Various attempts have been made over the years to translate the findings of paranasal sinus opacification on CT scan to numbers and these resulted in different scoring methods such as Levine and May staging, Harvard staging method, Kennedy staging method and Lund-Mackay Scoring method amongst others[3,6]. However, after due analysis and comparison the American Academy of Otorhinolaryngology and Head & Neck Surgery recommended the Lund-Mackay Scoring (LMS) system as the best of all[4]. This rhinological scoring system has proven to be effective and easy to use[7]. It is an acceptable means of assessing and communicating among clinicians the severity of rhinosinusitis[7]. The LMS consists of scoring 0 to 2 points for each cavity (maxillary, frontal, sphenoidal, anterior ethmoidal and posterior ethmoidal sinuses) and for the OMC. Zero means a normal sinus, 1 partial opacification, and 2 complete opacification of the paranasal sinus. The right and left are calculated separately and are summed up to give a total score of 0 to 24. Ashraf et al [8]opined that LMS of 3 or less was most likely normal, 4 to 5 is indeterminate while 6 and above was most likely pathological.

This study attempts to define the Lund Mackay Score for patients who had cranial CT scan for other pathologies but had incidental findings in their paranasal sinuses.

Materials and Methods

This was a prospective study done in the Department of Radiology of the University of Benin Teaching Hospital, Benin City, Nigeria between January 2016 and December 2016. Approval for the study was obtained from the Ethics and Research Committee of the Hospital and informed consent was also obtained from the patients. Consecutive patients who came for cranial CT scans were recruited into the study. Patients with clinical diagnosis of sinusitis or any sinus pathology were excluded from the study. Images were acquired using a General Electric (GE) Bright speed 4-slice helical CT scan machine in axial planes. The axial images as well as reformatted sagittal and coronal images were then reviewed by either one or both researchers.

For the purpose of this study the paranasal sinuses were divided into six portions; maxillary sinus, anterior ethmoidal, posterior ethmoidal, sphenoidal, frontal, and osteomeatal complex for the right and left sides. Each sinus was given a numerical score as follows: Sinuses which are clear from any form of opacification were given a score of 0, partial opacification was 1 and total opacification was 2. The osteomeatal complex was also assessed and given a score of 0 when not obstructed and a score of 2 when obstructed. These scores were summed up for the right and left respectively for each patients given a total Lund Mackay score ranging from 0 (complete lucency of all sinuses) to 24 (total opacification of all sinuses).

Data were analyzed using Statistical Package for Social Sciences; (SPSS) for Window® version 22 (SPSS Inc; IL, USA). Test of significance was done with Chi-squared test and correlation was assessed with Pearson correlation test. Confidence interval of 95% was used. P value less than or equal to 0.05 was considered statistically significant.

RESULTS

A total of 150 patients were enrolled for this study with 62% being male and 38% being females. The mean age of the study population is 52.70±18.71years with 52.94±18.71 years being that of the males and 52.29±17.40 being that of the females. Most of the patients were between the age group of 21 to 80 years with age group 61- 70 years predominating. Those in extreme of age were few.

Table 3: Mean value of Lund-Mackay Score (LMS) for each sinus

	RIGHT		LEFT	
		P-VALUE		P-VALUE
Frontal sinus	0.047±0.27	0.034	0.073±0.33	0.007
Maxillary sinus	0.210±0.46	0.000	0.173±0.40	0.000
Anterior ethmoidal sinus	0.033±0.18	0.025	0.040±0.20	0.014
Posterior ethmoidal sinus	0.027±0.16	0.045	0.033±0.18	0.025
Sphenoidal sinus	0.087±0.28	0.000	0.060±0.24	0.002
Osteomeatal complex	0.013±0.12	0.158	0.007±0.08	0.319
Unilateral total score	0.417±1.47		0.386±1.43	

For the left sinuses, the maxillary sinus also had the highest LMS value of 0.173±0.40 (p=0.000). The posterior et hmoidal sinus also had least LMS value of 0.033±0.18 and was statistically significant (p=0.025). The LMS of the osteomeatal complex was least on the left with a value of 0.007±0.08 while that of the right was 0.013±0.12. These scores were not statistically significant as shown in table 3.

The right posterior ethmoidal sinus (97.3%) had the highest incidence of those with normal lucency (score of 0) while the least was the right maxillary sinus (80.7%).

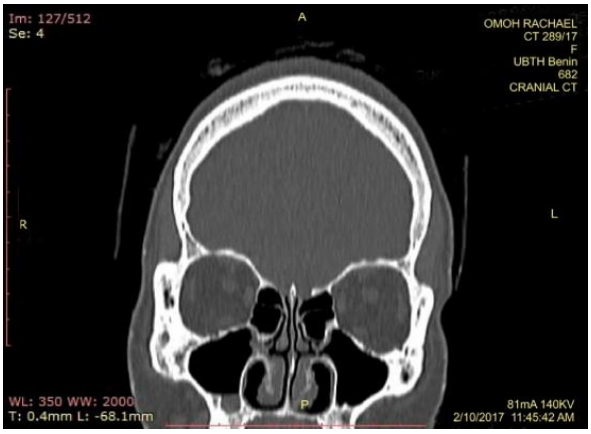

Fig. 1: Cranial CT Coronal section (Bone Window) showing normal maxillary sinuses LMS 0

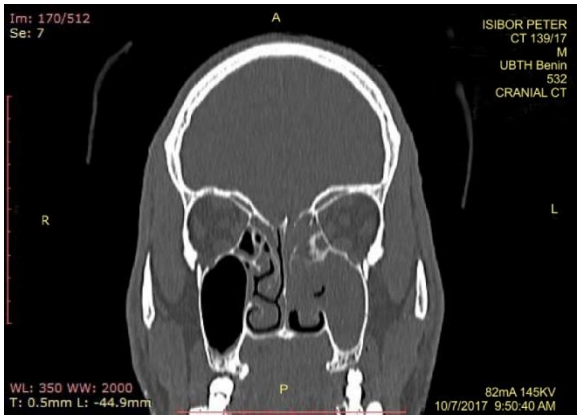

Fig.2: Cranial CT Coronal section (Bone Window) showing complete hyperdense left maxillary sinuse LMS 2

The least with the partially lucent sinuses was the right frontal sinus (2.0%). Only five cases of total opacification of sinuses (score of 2) were seen on the right with the maxillary sinus accounting for 3 (2.0%) and frontal sinus accounting for 2 (1.3%).

Fig.3: Cranial CT Sagital section (Bone window) showing complete hyperdense frontal sinuses LMS 2

Table 4: Percentage LMS for each sinus.

	Right			Left		
	Normal(0)	**Partial(1)**	**Total(2)**	**Normal(0)**	**Partial(1)**	**Total(2)**
Frontal sinus	145(96.7%)	3(2.0%)	2(1.3%)	142(94.7%)	5(3.3%)	3(2.0%)
Maxillary sinus	121(80.7%)	26(17.3%)	3(2%)	125(83.3%)	24(16%)	1(0.7%)
Anterior ethmoidal sinus	145(96.7%)	5(3.3%)	nil	144(96.0%)	6(4%)	Nil
Posterior ethmoidal sinus	146(97.3%)	4(2.7%)	nil	145(96.7%)	5(3.3%)	Nil
Sphenoidal sinus	137(91.3%)	13(8.7%)	nil	141(94.0%)	9(6.0%0	Nil
Osteomeatal complex	148(98.7%)		2(1.3%)	149(99.3%)		1(0.7%)

There were no cases of total opacification of the sinus (score of 2) involving the right ethmoidal and sphenoidal sinuses. Unobstructed osteomeatal complex (score of 0) was seen in 148 cases (98.7%) on the right while only 2 cases (1.3%) of obstructed osteomeatal complex were seen on same side. Similar findings as described above for the right were also observed for the left but with a little variation as shown in table 4.

Discussion

Statistics on the burden of sinusitis in Nigeria is not known but Itseh *et al*[9]in a study done in Sokoto, North West Nigeria opined that it constituted 11.7% of all ENT cases seen within the period of their study. In another study, Fasunla *et al*[10] expressed that sinusitis constituted 78% of cases seen in ENT clinic in West Africa. The aforementioned scenarios are clinical based studies mostly in patients who are symptomatic. However, other studies have also attempted to define the prevalence of incidental opacification of paranasal sinus on CT and MR imaging in patients without initial clinical symptoms. Our study falls under this latter scenario. Havas *et al*[11] reported paranasal sinus pathology in 42.5% of MRI and CT scans in asymptomatic patients while Lim *et al*[12] reported 32.3% sinus abnormalities on MRI in asymptomatic children below 16 years of age.

The mean age of our study population was 52.70±18.71years which is almost similar to the study by Havas *et al*[11]in which the average age was 55 years and that of Nazri *et al* [13]in which the average age was 52.3±22.4 years. However, in a study done by Ashraf *et al*[8] the mean age of the study population was 47.1 years.

In our study the total LMS for all sinuses was 0.803±2.90. This is slightly less than that documented by Chen *et al*[7] in Taiwanese population where total LMS was documented as 0.96±1.91. Ashraf *et al*[8] reported total LMS of 4.26 for both those with 'total' and 'near total' opacification of sinuses discovered incidentally. Nazri *et al*[13] reported a mean LMS value of 2.2 in normal population and a mean value of 6.2 in those who were clinically diagnosed as sinusitis. Our study and others above are in consonant with the proposition of Ashraf *et al*[8]. Rathor *et al*[14] documented a contrary mean LMS value of 3.2±2.2 (which is normal) in patients who were clinically diagnosed with chronic sinusitis. This apparently normal value in Rathor's study may be due to the small number of patients used for the study; where only 34 patients were used. In another study done in patients with cystic fibrosis which predisposes to sinusitis, a high value of LMS measuring 17.3±3.1 and 11.5±6.2 for those surgically and medically treated respectively[15].

The reason for this high value is not farfetched as patients had chronic sinusitis.

Furthermore, our study showed the total LMS of the right sinuses as 0.417±1.47 while that of the left was 0.386±1.43. This is in tandem with the study of Chen *et al*[7] who documented total unilateral right LMS as 0.46±1.28 and total unilateral left LMS as 0.50±1.41 for patients who had cranial and neck CT scan with incidental findings in the sinuses. In the same study, patients who had CT scan for sinusitis were used as control and their LMS was much higher, being documented as 4.35 ±3.84 and 4.37±3.98 for the right and left respectively and a total of 8.72±7.18. These high values are expected as these patients had clear cut sinusitis. A trend of decreasing frequency of sinus opacification as the Lund-Mackay Score increases from 0 to 2 was observed in previous studies[7, 8, 13]. Similar trend was also observed in this study.

One limitation in this study was the 4-slice CT scan used as the image quality was not optimal. Therefore, some paranasal sinus abnormalities may have been missed. Alternatively, a 64-slice (or higher slice configuration) CT scanner will be most appropriate for a better image quality.

Conclusion: This study has documented the mean LMS values for incidental paranasal sinus collection in our environment and comparison made with what obtains in other climes.

Recommendation: We recommend that more study on this area in our environment should be undertaken when a 64-slice CT scanner becomes available. We also recommend that a multi-centre study be done to further validate the values for LMS in Nigeria.

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