

Paranasal sinus computed tomography findings in patients treated for lepromatous leprosy

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Abstract

Aim: Nasal and paranasal sinus involvement is common in lepromatous leprosy and is of considerable epidemiological significance. The aim of this study was to investigate paranasal sinus abnormalities in treated lepromatous leprosy cases and to evaluate the findings in comparison with those of previous studies.

Materials and methods: Thirty-eight patients who had been treated for lepromatous leprosy were included. All patients had been treated with dapsone and rifampicine for six months, and followed with dapsone, rifampicine and clofamizine for a minimum of two years. All patients received a clinical examination, a coronal computed tomography (CT) examination of the paranasal sinuses and ethmoidal sinus endoscopy, in order to investigate the involvement of the paranasal sinuses in the leprosy. Ethmoidal sinus biopsies were taken in 18 of the 21 cases of ethmoidal sinus involvement noted on CT scan.

Results: Twenty-three patients had sino-nasal symptoms. Endoscopic examination showed different pathologies in 21 of these patients. Abnormalities in the paranasal CT images were observed in 27 patients. The ethmoidal, maxillary, frontal and sphenoid sinuses were affected in 21, 18, three and two patients, respectively. Various degrees of nasal septum perforation were noted in 18 cases. In six of the 18 patients biopsied, the biopsy specimen showed involvement by lepromatous leprosy.

Conclusion: These findings suggest that although these lepromatous leprosy patients had been treated, persistent infection was still commonly encountered. Paranasal sinus CT examination is a useful method for the evaluation of patient response to treatment and follow up; however, a CT scan alone cannot determine whether the leprosy is active.

Key words: Leprosy, Lepromatous; Paranasal Sinuses; Endoscopy; Computed Tomography

Introduction

Leprosy is a chronic granulomatous infection caused by *Mycobacterium leprae*. Skin, peripheral nerves and the upper respiratory tract are the most common sites attacked by the disease. The nasal mucosa is crucial, as it is the entrance and the spreading site for the leprae bacilli.¹ The paranasal sinuses play an important role in the deposition and reactivation of the bacilli due to their continuity with the nasal mucosa. The paranasal sinuses may also be involved as a result of haematogenous spread of the bacilli.²

Several radiological studies have reviewed paranasal sinus pathologies in leprosy patients.^{2–5} In most previous studies, untreated leprosy cases were included. In our study, we investigated paranasal sinus abnormalities in patients who had been treated for lepromatous leprosy over an extended period of time. We evaluated our results in comparison with those of previous studies.

Materials and methods

We included in the study 38 patients with lepromatous leprosy who had been treated and invited to attend (for control) the leprosy clinic of the Leprosy Hospital of Elazig, Turkey. The treatment of these patients had been completed three to 18 years previously. Patients who were currently being treated and those who had not been regularly treated were excluded from this study.

All patients had been treated with dapsone and rifampicine for six months, and followed with dapsone, rifampicine and clofamizine for a minimum of two years. Informed consent was obtained from all participants. Patients were questioned about sino-nasal symptoms and underwent anterior rhinoscopic and endoscopic examinations.

Patients then underwent computed tomography (CT) scans of the nasal cavity and the paranasal sinuses, performed with 2 mm thickness in the

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coronal plane at 120 kV, 230 mA, using a Toshiba Xpress SX spiral CT scanner (Toshiba, Tokyo, Japan). The images were recorded as two windows in order to evaluate both soft tissue and bony structures. The images were evaluated by two separate radiologists and a common decision then made. The radiologists were blinded to clinical and endoscopic findings. Each sinus was evaluated for mucosal abnormalities, including focal or diffuse mucosal thickenings, as well as abnormalities of the bony structures surrounding the paranasal sinus and the nasal septal cartilage. Focal mucosal thickening was defined as a partial increase in the soft tissue thickness along the walls of a sinus containing air, and diffuse mucosal thickening was defined as a complete increase in thickness. Each patient's paranasal sinuses were evaluated separately.

In 18 of the 21 cases of ethmoidal sinus involvement noted on CT scan, punch biopsies of the mucous membrane of the ethmoid air cells were taken with Blakesley forceps, using local anaesthetic. The biopsy material was subjected to histopathological examination by haematoxylin and eosin staining and staining for leprae bacilli (modified Ziehl-Neelsen technique). In cases of bilateral involvement, the biopsy was taken from only one side.

Results

Of the 38 patients, 32 were male and six were female, between the ages of 28 and 88 years (mean 59.8 years). The time elapsed since treatment completion ranged from three to 18 years (mean eight \pm 3.4 years).

Twenty-three (60.5 per cent) patients had sino-nasal symptoms. The most common symptom was crusting (in 22 of 23 cases). Patients also complained of epistaxis (16 patients, 42.1 per cent), hyposmia or anosmia (13 patients, 34.2 per cent), postnasal discharge (12 patients, 31.5 per cent), nasal obstruction (seven patients, 18.4 per cent) and headache (six patients, 15.7 per cent). Fifteen patients were symptom free.

Twenty-one patients (55.2 per cent) had various pathological findings on nasal endoscopy. The most commonly encountered findings were perforation of the nasal septum (18 patients, 47.3 per cent), nasal mucosa ulceration (15 patients, 39.4 per cent) and saddle-nose deformity (12 patients, 31.5 per cent) (Table I).

Abnormalities in the paranasal CT images were evident in 27 (71 per cent) patients. In 10 (26.3 per cent) patients, the maxillary and ethmoidal sinuses were involved together, and in three (7.8 per cent) patients the maxillary, ethmoidal and frontal sinuses were involved. The patients' CT findings are shown in Table II. In all patients, the mucosal thickenings were focal. In eight (21 per cent) patients in whom the ethmoidal and maxillary sinuses were jointly involved, parts of the neighbouring maxillary sinus ostium were very noticeably affected. In 18 (47.3 per cent) patients, the nasal septum was perforated. In 14 (36.8 per cent) patients, nasal septum perforation was associated with maxillary (10 cases)

TABLE I
NASAL ENDOSCOPIC FINDINGS IN LEPROSY PATIENTS*

Finding	Patients	
	<i>n</i>	%
Septum perforation	18	47.3
Mucosal ulceration	15	39.4
Saddle nose deformity	12	31.5
Granulation tissue	9	23.6
Inferior turbinate atrophy or absence	8	21.0
Unilateral	5	13.1
Bilateral	3	7.8
Middle turbinate atrophy or absence	3	7.8
Unilateral	2	5.2
Bilateral	1	2.6
Nasal cavity diffuse mucosal atrophy	4	10.5
Alar cartilage destruction	4	10.5
Maxillary sinus medial wall erosion	2	5.2

**n* = 38

and ethmoidal (nine cases) focal mucosal thickenings. In three patients, perforation was not associated with any pathology. In the coronal plane, the lengths of the nasal perforations were about 7 to 35 mm continuously; this corresponded with at least four and at most 18 cross-sectional images (Figures 1 and 2).

A biopsy was performed on 18 of the 21 patients showing ethmoidal sinus involvement in the CT scan (the other three patients refused paranasal sinus biopsy). Acid-fast bacilli were histopathologically detected in the ethmoidal sinus biopsies of six (33.3 per cent) of these 18 patients. Patients in whom acid-fast bacilli were detected in the ethmoidal sinus biopsy were referred to the leprosy clinic.

Discussion

Although there has been an obvious world-wide decrease in the incidence of leprosy following the introduction of modern chemotherapeutic treatments, approximately 1 000 000 patients are still affected by leprosy in endemic regions.^{6,7}

The nasal cavity and paranasal sinuses are very important in the reactivation and spread of leprosy, as they are the sites where the leprosy bacilli enter the body and are deposited. The large mucosal surface and continuous secretion within the paranasal sinus are the most important factors facilitating

TABLE II
PARANASAL SINUS CT ABNORMALITIES IN LEPROSY PATIENTS*

Finding	Patients	
	<i>n</i>	%
Mucosal thickening		
Ethmoidal sinuses	21	55.2
Maxillary sinuses	18	47.3
Frontal sinuses	3	7.8
Sphenoid sinuses	2	5.2
Septal perforation	18	47.3
Maxillary sinus medial wall defect	3	5.2
Inferior turbinate atrophy or absence	8	21.0
Middle turbinate atrophy or absence	3	7.8

**n* = 38. CT = computed tomography

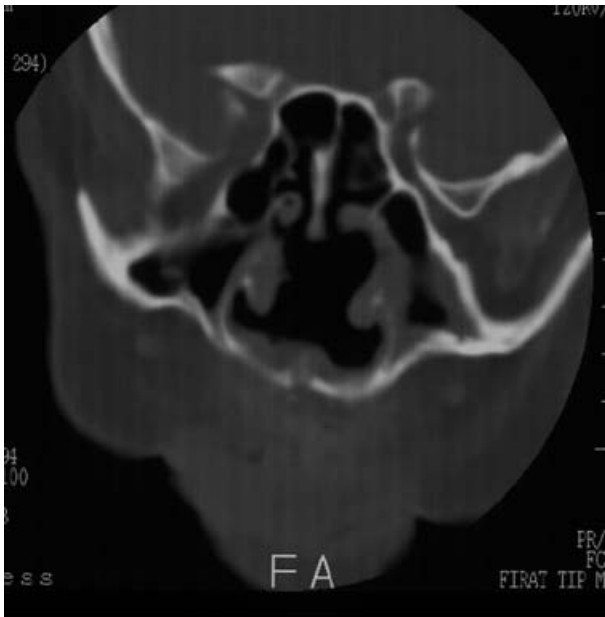


FIG. 1

Paranasal sinus computed tomography scan showing soft tissue density in the right maxillary sinus and marked nasal septum defect.

deposition and infection by a large number of bacilli.^{1,8} Therefore, evaluation of the nasal mucosa and paranasal sinuses is very important in routine examination and follow up of leprosy patients.¹

In previous studies of leprosy involving the paranasal sinuses, the study population was composed of patients who had not taken specific leprosy treatment, or of a combination of treated and untreated



FIG. 2

Paranasal sinus coronal computed tomography scan showing focal mucosal thickening extending from right maxillary sinus to nasal ostium, and marked nasal septal and hard palate defects.

patients.³⁻⁵ We did not find any English literature studies reporting on paranasal sinus evaluation following therapy. The evaluation of nasal discharge for this purpose may be misleading in the case of persistent infection as it may give negative results.^{2,3} For this reason, sino-nasal endoscopy and biopsy have been advised in order to evaluate the efficacy of leprosy treatment.³ In addition, Srinivasan *et al.* have recommended CT scanning in order to evaluate response to medical treatment.⁷

Barton⁹ reported that the paranasal sinus was affected in all leprosy patients who participated in studies performed with sinus radiographs. Soni¹⁰ reported that maxillary sinuses were affected in 55 per cent of the patients, ethmoidal sinuses in 33 per cent and frontal sinuses in 30 per cent. These authors did not report any comparable studies regarding paranasal sinus and nasal cavity involvement detected by radiologic and histopathologic examination.^{9,10} In subsequent studies, involving CT scanning, it has been reported that the ethmoidal sinuses are affected in 55–80 per cent of patients, the maxillary sinuses in 48–55 per cent, the sphenoid sinuses in 12–20 per cent and the frontal sinuses in 5–16 per cent.²⁻⁴ The increase in the percentage of sinus involvement detected, particularly ethmoidal and sphenoid sinuses, may be due to the fact that these sinuses are better visualized by CT.

- **Nasal and paranasal sinus involvement is common in lepromatous leprosy**
- **In this study of 38 leprosy sufferers, all patients underwent clinical examination, coronal computed tomography (CT) of the paranasal sinuses and ethmoidal sinus endoscopy**
- **The findings suggest that, despite previous treatment, persistent infection is commonly present in lepromatous leprosy patients. Paranasal sinus CT examination is a useful method of evaluating patient response to treatment and follow up**

In our study, focal mucosal thickening was seen in a total of 27 (71 per cent) patients; the ethmoidal sinuses were affected in 55 per cent, the maxillary sinuses in 47.3 per cent, the frontal sinuses in 7.8 per cent and the sphenoid sinuses in 5.2 per cent.

Septum perforation has been reported in 1.2–20 per cent of lepromatous leprosy patients.²⁻⁴ We observed septum perforation in 18 (43.7 per cent) patients. In our study, we observed more defects in the anterior nasal septum, supporting the theory that spread of the bacilli is from anterior to posterior.¹ Although all of our patients had been treated for the disease, septum perforation was more common than noted by previous reports. These results suggest that, in cases with persistent infection, cartilage destruction may continue even after the treatment of leprosy. Such a high proportion of mucosal thickening and cartilage destruction observed in the paranasal sinus CT scans of treated

lepomatous leprosy patients is an indicator that persistent infection, perhaps due to insufficient treatment, has occurred. This is a very important public health problem, considering the highly contagious character of the leprosy bacilli. For this reason, more comprehensive studies, in which histological and radiological findings are evaluated together, may be useful.

In conclusion, CT is a feasible method of showing extensive soft tissue and bony changes in the paranasal sinuses of leprosy patients. Patients with long-standing disease, even if previously treated, may have extensive changes, easily demonstrable on CT, and may also have persistent disease on biopsy. A preparatory CT scan of the paranasal sinuses may facilitate endoscopic evaluation and biopsy in such patients.

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