

## Study of ethmoid sinus involvement in multibacillary leprosy

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### Abstract

The nasal mucosal involvement in lepromatous leprosy is well recognized. Currently interest has centred around the involvement of paranasal sinuses in leprosy. They act as a reservoir and constant source of re-infection to the nasal mucosa. In the present prospective study 25 untreated patients with multi-bacillary leprosy were included. Clinical examination, computed tomography (CT) scan of paranasal sinuses, ethmoid sinus endoscopy and biopsy were carried out in all patients, to investigate the involvement of the paranasal sinuses in leprosy.

Ethmoid sinus involvement was noted in 20 patients on CT scan. Bilateral involvement was more common (65 per cent). Anterior ethmoids were more commonly affected (65 per cent). On ethmoid sinus endoscopy abnormal mucosa was noted in 17 patients (68 per cent). Ethmoid sinus biopsy was confirmative in 16 patients (64 per cent). Statistically significant correlation was found between CT findings, sinus endoscopy and sinus biopsy findings.

**Key words:** Ethmoid sinus; Leprosy, lepromatous; Leprosy, borderline

### Introduction

Leprosy is a chronic infectious disease caused by *Mycobacterium leprae* affecting the skin, peripheral nerves and mucous membranes. It is also known to affect multiple organ systems in the body. Nasal mucosal involvement in leprosy is well documented. The importance of upper respiratory tract involvement, lies in its highly bacilliferous discharge which plays an important role in the transmission of disease. Once the nasal mucosa is involved, the disease is likely to affect the paranasal sinuses, that may then act as a reservoir and constant source of re-infection. Mucosal continuity and bacillaemia are proposed theories for involvement of the paranasal sinuses in leprosy.

CT scan and sinus endoscopy are current tools for the diagnosis of paranasal sinus pathology. The ethmoid sinuses are considered as a key area in patients with chronic sinusitis. Survey of the English literature shows few planned studies regarding paranasal sinus involvement in leprosy and the ethmoid sinus has rarely been studied. This study was planned in view of the immense epidemiological significance of leprosy.

### Materials and methods

Twenty-five consecutive untreated patients of multibacillary leprosy (lepromatous and borderline

lepromatous) attending the leprosy clinic in the Department of Dermatology attached to Nehru Hospital, PGIMER, Chandigarh were included in the study. Slit skin smear (SSS) and skin biopsy was carried out on all patients to confirm the diagnosis. The Ridley and Jopling classification (1966) of leprosy was followed.

All patients were asked about sinonasal symptoms such as crusting, nasal obstruction, epistaxis, hyposmia, postnasal drip and headache. Detailed nasal examination (anterior and posterior rhinoscopy) was performed on all the patients. A nasal smear and nasal biopsy from the anterior end of the inferior turbinate was carried out to look for nasal involvement (staining by modified Ziehl-Neelsen technique).

For CT scan of paranasal sinuses, 5 mm contiguous axial and coronal sections were taken to look for mucosal abnormalities as well as bony outlines. Subsequently all patients were subjected to nasal and sinus endoscopy under local anaesthesia after obtaining a written consent. Nasal septum, turbinates and meati were systematically examined. After visualizing and opening the bulla ethmoidalis, a biopsy was taken from ethmoidal air cells using Blakesley forceps. The ethmoid sinus mucosa was examined for mucosal thickening and polypoid proliferation. The biopsy material was subjected to histopathological examination by haematoxylin and eosin staining and staining for leprae bacilli (mod-

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Accepted for publication: 4 September 1998.

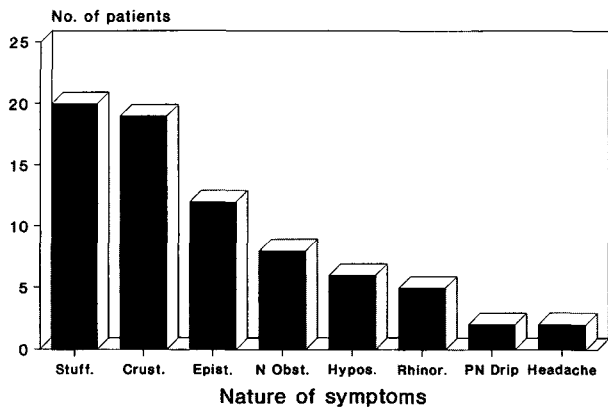


FIG. 1  
Nasal and sinus symptoms.

ified Ziehl-Neelsen technique). In cases of bilateral involvement the biopsy was taken on only one side.

The data were analysed using Chi-square and Fisher's exact test.

**Results and analysis**

The study group included 19 males and six females. The age of the patients ranged between 13 and 72 years. Thirteen patients were clinically diagnosed as lepromatous leprosy (LL) and 12 patients as borderline lepromatous leprosy (BL). The average duration of symptoms was 3.4 years. In the lepromatous group 12 out of 13 patients had a positive nasal smear and six out of 12 borderline lepromatous patients showed smear positivity. The mean BI and MI of the skin smear exceeded that of the nasal smear.

The sinonasal spectrum of symptoms was noted in 21 (84 per cent) patients. Stuffiness, crusting and epistaxis were the most common symptoms noted (Figure 1). Crusting was the most common finding followed by mucosal ulceration and mucosal congestion (Figure 2). The majority of the patients (92 per cent) had the intermediate and late stages of intranasal disease. The external nasal pyramid was deformed in six patients and three patients had septal perforation.

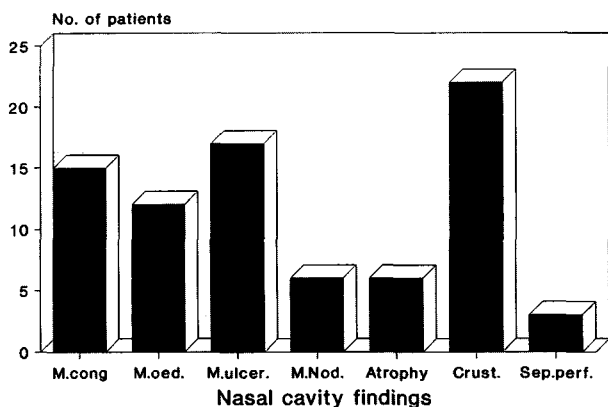


FIG. 2  
Nasal cavity findings.

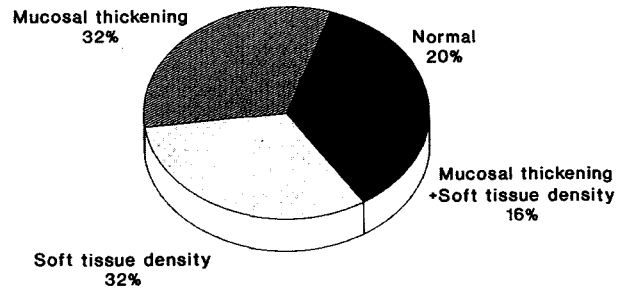


FIG. 3  
CT scan observations.

Radiological (CT) involvement of the ethmoid sinus was noted in 20 patients (80 per cent). Bilateral involvement (65 per cent) was more common. Anterior ethmoid cells (65 per cent) were more commonly affected than posterior ethmoid cells (35 per cent). The types of mucosal pathology noted on CT include mucosal thickening, soft tissue density or a combination of both (Figure 3).

On ethmoid sinus endoscopy, the sinus mucosa was abnormal in 17 (68 per cent) patients. A uniform increase in thickness of mucosa without any evidence of oedema was seen in eight patients whereas in nine patients the mucosa was diffusely oedematous with areas of actual prolapse. The former was categorized as thickened mucosa and latter as polypoid mucosa (Figure 4).

Ethmoid sinus biopsy showed that 16 (64 per cent) patients were positive for acid-fast leprae bacilli. The involvement of the ethmoid sinus was more common in the lepromatous group (77 per cent) (Table I). Eleven patients with lepromatous leprosy and five patients with borderline lepromatous leprosy had a positive nasal mucosal biopsy. Lymphocytic and foamy macrophage infiltration was the most common finding in the sinus and nasal biopsy histopathology (Figure 5).

Table II shows correlation between CT and sinus endoscopy findings. A statistically significant correlation was found ( $p < 0.05$ ). Abnormal sinus mucosa was significantly associated with positive sinus biopsy on histopathology ( $p < 0.05$ ) (Table III).

Thirteen out of 16 patients with a positive biopsy from the ethmoid sinus were positive on nasal biopsy as well. Indeed, correlation between sinus biopsy and nasal biopsy was statistically significant ( $p < 0.05$ ). There was no statistically significant correlation of

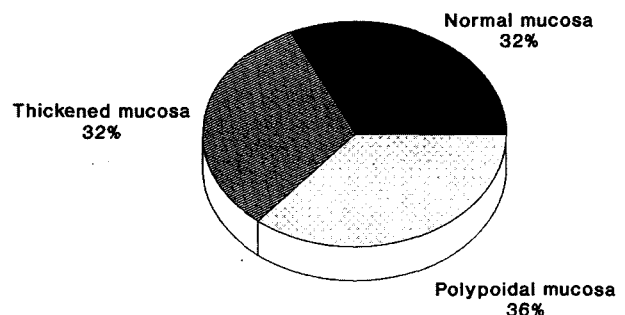


FIG. 4  
Ethmoid sinus endoscopy findings

TABLE I  
ETHMOID SINUS BIOPSY FINDINGS

Type of leprosy	No. of patients	Sinus mucosal biopsy	
		Positive	Negative
Lepromatous	13	10 (77%)	3 (33%)
Borderline lepromatous	12	6 (50%)	6 (50%)
Total	25	16	9

age, sex, duration of disease, intranasal staging, smear findings (BI and MI) with the findings encountered on CT scan, sinus endoscopy or sinus biopsy ( $p>0.05$ ).

### Discussion

The role of nasal infection in the transmission of disease has been extensively investigated (Barton, 1974; Davey, 1974; McDougall *et al.*, 1975; Chacko *et al.*, 1979). Current interest has centred around the involvement of the paranasal sinuses in leprosy. Few studies have reported maxillary antrum involvement in bacillus positive patients (Barton, 1979; Soni, 1988; Soni, 1989; Hauhner *et al.*, 1992).

Lepromatous tissue is a vascular granulation tissue. Changes in olfaction, epistaxis and atrophic rhinitis are described in leprosy patients with nasal involvement. The nasal mucosa is also one of the important sites involved in reactional states in

TABLE II  
CORRELATION BETWEEN CT PNS AND SINUS ENDOSCOPY

Ethmoids on CT scan	Total	Ethmoid sinus endoscopy	
		Abnormal sinus mucosa	Normal sinus mucosa
Involved	20	16	4
Not involved	5	1	4
Total	25	17	8

$\chi^2$  value = 4.1475;  $p<0.05$ .

leprosy. Nasal myiasis, facial cellulitis, nasal and palatal fistula may be seen in these patients. Bacillus concentration, in the nasal mucosa and failure of the immune response can give rise to skeletal manifestations described as 'facies leprosa'.

Barton (1974) reports that 94 per cent of his patients had nasal symptoms. In the present study 84 per cent of our patients had sino-nasal symptoms. Stiffness and the abnormal dryness of the nasal mucosa seen in the majority of our patients could be due to damage to the secretomotor parasympathetic nerves. Barton suggests that intranasal change in leprosy commences anteriorly and spreads posteriorly as the disease progresses.

Histopathological study of nasal involvement in mice showed the nasal submucosa as a site of multiplication of bacilli. The above studies along with bacteriological studies of nasal secretions in

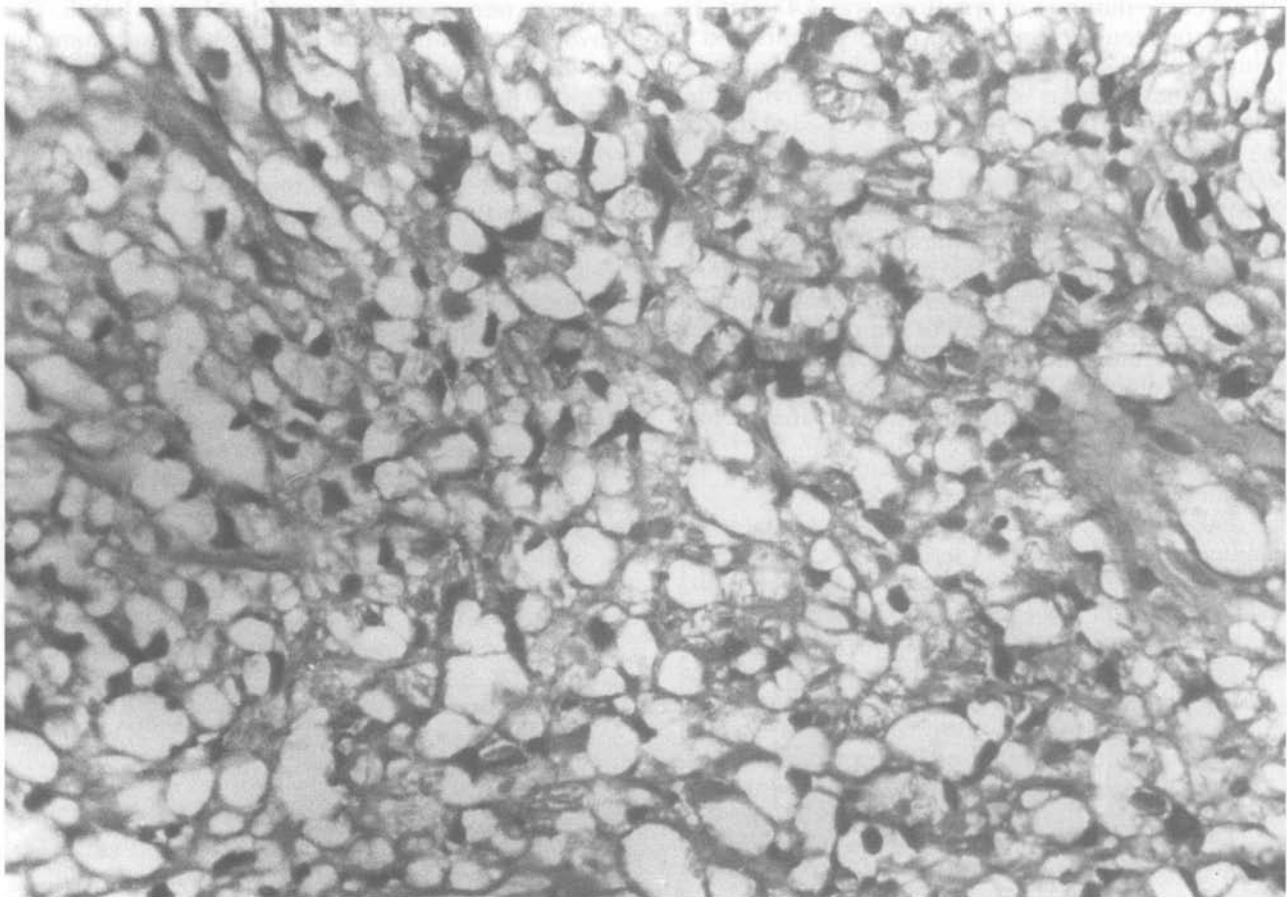


FIG. 5

Ethmoid sinus biopsy showing foam cells filled with globi (modified Ziehl-Neelsen  $\times 1100$ ).

TABLE III  
CORRELATION BETWEEN SINUS ENDOSCOPY FINDING AND BIOPSY REPORT

Sinus endoscopy finding	No. of patients (%)	Biopsy report	
		Positive	Negative
Normal mucosa	8 (32%)	2	6
Thickened mucosa	8 (32%)	7	1
Polypoidal mucosa	9 (36%)	7	2
Total	25 (100%)	16	9

$X^2$  value = 7.9403;  $p < 0.02$ .

Normal vs thickened mucosa:  $p < 0.05$ .

Normal vs polypoidal mucosa:  $p = 0.04$  (Fisher's exact test).

man led us to study the histopathological involvement of the nose and paranasal sinuses in leprosy. Leptrae bacilli can be released from the nasal and sinus mucosa in one of the following ways.

- (i) Destruction of the epithelium by pressure and infiltration of the expanding granuloma.
- (ii) Leucocytes migrating through the epithelium carrying bacilli in their cytoplasm.
- (iii) Dilated capillaries rise high into epithelium and rupture with release of blood and bacilli.
- (iv) The bacilli seen in secretory glands and ducts can be released via duct openings.

The frequency of highly contaminated nasal discharge in patients with lepromatous leprosy is significant. In contrast, the nasal involvement is less in borderline lepromatous leprosy. We have noticed a similar pattern in the present study. Intranasal staging of disease may be early, intermediate or late. The majority of our patients had intermediate and late intranasal disease.

Barton (1979) noted involvement of paranasal sinuses in 100 per cent of his patients on plain radiology. Soni (1988) in his radiological study of the paranasal sinuses in lepromatous leprosy noted a 33 per cent involvement of the ethmoidal sinus group on plain radiographs. In the present study we have found a high incidence (80 per cent) of ethmoid sinus involvement as noted from CT scans. This can be attributed to the fact that the ethmoid sinuses can be best visualized by CT scanning. Review of the English literature did not reveal any comparable study regarding ethmoid sinus involvement shown by sinus endoscopy and histopathology.

Thickened mucosa and polypoidal mucosa on sinus endoscopy were significantly associated with leprosy infiltration on histopathology. It is also apparent that sinus involvement and nasal mucosal infiltration are significantly associated. The response to chemotherapy (MDT) needs to be studied to evaluate whether the infection persists in the paranasal sinuses after treatment of these patients.

The nose and sinuses serve both as a portal of entry as well as exit of lepra bacilli that may persist in paranasal sinuses in these patients even after completion of multi-drug therapy. Such patients are called as persisters. The slit skin smear may be negative in persisters. Although more planned

studies are necessary, a routine sinonasal endoscopy and biopsy would appear, at this time, a reasonable recommendation in all patients of multibacillary leprosy scheduled for investigation. Our concerns in the developing world are further heightened in this regard because control of leprosy is still a high priority area in community health. The epidemiological data generated by such a search would be useful, if not critical, for the success of leprosy control programmes.

## Conclusion

Ethmoid sinus involvement in multibacillary leprosy is significant. It is more common in the lepromatous variety. CT scanning, sinus endoscopy and histopathological examination are excellent tools for demonstrating paranasal sinus involvement in leprosy. Although changes noted on CT can be mimicked by nonspecific chronic sinusitis it is a useful guide for sinus endoscopy to delineate abnormal areas. Biopsy remains the gold standard for confirming the involvement of the paranasal sinuses. Evaluation of nasal and paranasal sinus involvement forms part of a complete work-up of bacillus-positive leprosy patients.

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