The Journal of Laryngology and Otology
February 1989. Vol. **103.** pp. 175–177

Tonsillar microflora—superficial surface vs deep

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Introduction

Tonsillitis has been an enigma to the treating physician. Although treated every day, the controversy regarding the treatment still remains. In the past, chronic tonsillitis was largely a clinical concept but today bacteriological and patho-anatomical considerations too are taken into account.

Throat culture has been an integral part of the diagnostic criteria for tonsillitis and more often than not, the treatment is dependent upon it. Our intention in this study is to highlight the erroneous results of the throat culture carried out in case of chronic tonsillitis. The aetiological pathogen is quite often not reflected since it may be concealed within the tonsillar crypts or parenchyma. Moreover, there is a marked discrepancy in the external and internal pathogenic microflora of the tonsil.

Material and methods

This study was carried out on 64 patients with chronic tonsillitis, selected randomly from the outdoor department of Smt. Sucheta Kriplani and Kalawati Saran Hospitals, New Delhi.

TABLE I
MICROBIAL FLORA FROM THE FIRST THROAT SWAB

	%
Beta haemolytic Streptococcus	39.06
Staph. aureus	35.93
Klebsiella	10.90
E. coli	6.25
Total	92.18

TABLE II
MICROBIAL FLORA FROM THE POST ANTIBIOTIC SWAB

	%
Beta haemolytic Streptococcus	7.89
Staph. aureus	17.18
Klebsiella	4.68
E. coli	1.56
Total	31.92

TABLE III
MICROBIAL FLORA CULTURED FROM THE DEEP CUT SURFACE OF EXTIRPATED TONSILS

	%
Beta haemolytic Streptococcus	34.38
Staph. aureus	51.56
Klebsiella	12.80
E. coli	4.68
Total	103.42*

* The total percentage exceeds 100% due to the presence of more than 1 organism in some swab cultures.

A complete physical and ENT check up was carried out. Routine investigations including haemogram and urine were done.

Throat swab, which was cultured on blood agar and Maconkey media was taken when the patient presented with an acute attack. The patients were divided into three groups and were given either oral penicillin, cotrimoxazole or erythromycin.

A second swab was cultured from the superficial surface of the tonsil, after a 7–10 day course of antibiotic. A third swab was taken from the cut surface of the extirpated tonsil following tonsillectomy. A small piece from the deep surface of tonsil was immersed into Todd Hewit broth and the organism identified. When Beta haemolytic Streptococcus was found, it was subjected to further tests e.g. grouping, T typing and ADNase B.

Observations

All the figures given below are in percentages (see Tables I–VI).

Discussion

The present study was conducted on 64 patients with chronic tonsillitis. A swab was taken from the superficial surface of the tonsil, at the time of initial presentation with acute tonsillitis in the ENT outpatient department. The routine culture showed Beta haemolytic streptococcus in 39 per cent and Staphylococcus aureus in 35.6 per cent of cases. A similar incidence (50 per cent) of streptococcal infection was observed in a study done at Chicago (Illinois) in 1944. In contrast, Poluogt and Crowe (1929) recorded a much higher (91 per cent) incidence of streptococcal infection and only 8 per cent incidence of Staphylococcus aureus. Ozek *et al.* (1962) identified Beta haemolytic streptococcus in 30 per cent and Staphylococcus in 33 per cent cases. On comparing our study with those done previously, it is clear that the

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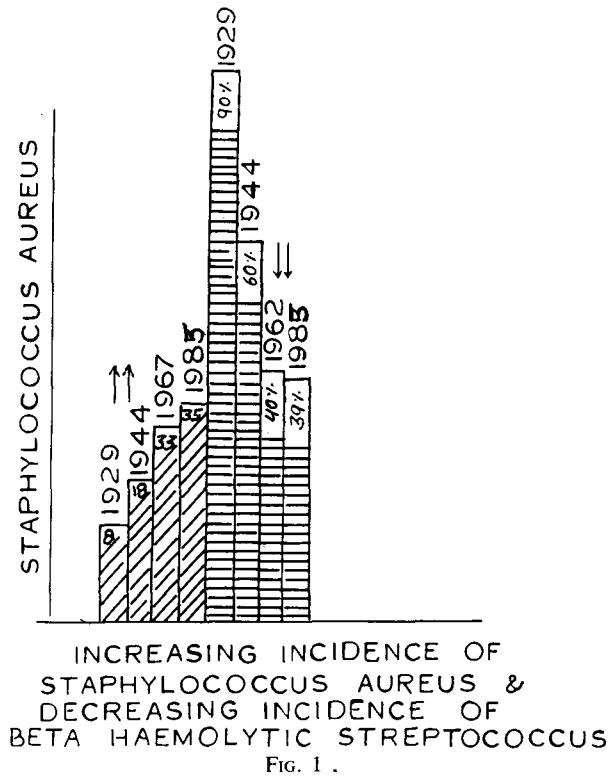


FIG. 1.

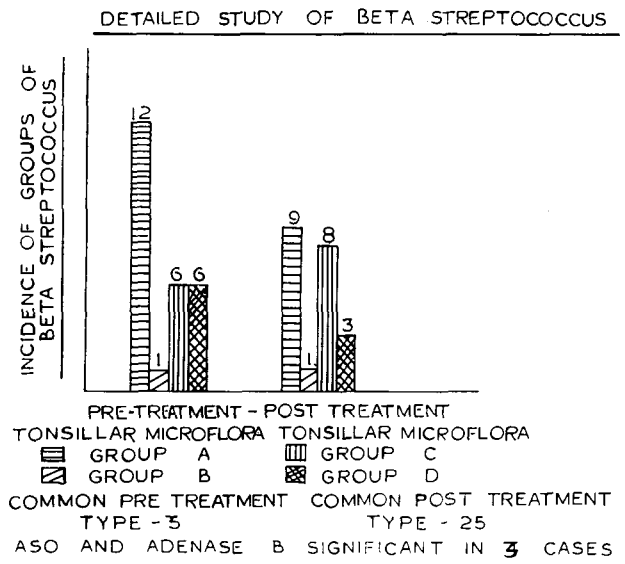


FIG. 2

aetiological picture of chronic tonsillitis is changing. The incidence of Beta haemolytic Streptococcus as the organism responsible for chronic tonsillitis is steadily decreasing over the years, from 91 per cent as in 1929 to 39 per cent in 1985 (present study), whereas that of Staphylococcus aureus is on gradual increase (Fig. 1).

A second swab was taken after the 7–10 day antibiotic administration and similarly cultured. We observed that out of 39 per cent of positive cultures of Beta haemolytic Streptococcus 7.81 per cent persisted after the antibiotic treatment (Tables I-IV).

On the other hand, of 35.9 per cent of positive routine cultures of staphylococcus aureus, 17 per cent persisted after antibiotic administration (Details with individual antibiotic therapy, are shown in Table IV). Thus, the second point that our study highlights is, the inefficacy of the routinely used conventional antibiotics, in cases of chronic tonsillitis. The antibiotics, especially penicillin, are unable to eliminate infection even from the superficial surface of the tonsils. The failure can be attributed to a change to L form of streptococci and due to coexistence of beta lactamase producing Staphylococcus in cases of staphylococcal infection, both of which are penicillin resistant (Simon and Sakai, 1963). The percentage of persistence of staphylococcus in our study is consistent with that of Green *et al.* (1969) and Veltri *et al.*, (1972). Moreover, as pointed out earlier, the gradual increase in the incidence of Staphylococcus aureus as the cause of tonsillitis is probably increasing due to the rapidly growing resistance of this organism to the common antibiotics.

After tonsillectomy, a culture swab taken from the deep cut surface of the extirpated tonsil revealed that Staphylococcus aureus was present in clear excess of others (51 per cent as compared to 34.3 per cent of Beta haemolytic Streptococci (Table III). In a few instances, more than one species of organism was found in a single sample. (King, 1969) found similar results.

Marked differences were observed between the superficial and deep microflora (Table V). From the same patient the superificial and deep surface cultures revealed different organisms. Few cases (14.6 per cent) did not reveal any pathogen on the superficial surface but the deeper tissue culture revealed the hidden organisms. Saslow *et al.* (1959) put forward the view that the frequency of organisms (beta streptococcus) discovered, increased with the increase in frequency of the number of swabs taken simultaneously. Approximately 30 per cent of cultures would have been lost if single or duplicate swabs were taken. Even in cases where beta haemolytic Streptococcus was discovered both in the superficial and deep surface, different pathogenic groups were identified (Table VI). Several other authors have reported discrepancies between external and internal surface pathogens (King, 1964; Ozek, *et al.*, 1967; Veltri *et al.*, 1972; Rosen, *et al.*, 1977).

Thus, this study indicates that a superficial throat swab is a very poor indicator of the type of infection, since the pathogenic flora inside the tonsil is different from that on the surface. A surface throat swab fails to reveal the organism in a large number of cases especially where the pathogen lies deep inside. Antibiotics are unable to cross the effective barrier formed by the fibrous capsule (Skoog, 1941). Our study is at variance with Poluogt and Crowe, who stated that superficial swab was a reliable index of the predominant organism in the crypts. Thus routine laboratory procedures provide an inadequate support to the clinician in diagnosing tonsillitis. The commonly used throat swab culture in clinical practice is not sophisticated enough to determine the aetiologic agent in many cases as a large number of acute attacks may be of viral origin as evidenced by the tissue culture techniques for virological and immunological studies. Further, there may be a bacterial-viral relationship (Sprinkle and Veltri, 1974) which further complicates the issue and must be remembered.

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TABLE IV

EFFECT OF ANTIBIOTICS ON DIFFERENT BACTERIAL INFECTIONS

Group	Pathogenic organism	Postitive bacterial pretreatment swab	Postitive bacterial post treatment swab	Postitive bacterial cut surface of tonsil
		%	%	%
Group I	(a) Beta haemolytic Streptoccus	12.50	3.12	14.06
(penicillin)	(b) Staphylococcus aureus	15.62	9.37	21.87
	(c) Klebsiella	3.12	1.56	1.56
	(d) E. coli	3.12	1.56	1.56
Group II	(a) Beta haemolytic Streptoccus	10.93	1.56	12.50
(cotrimoxazole)	(b) Staphylococcus aureus	9.37	9.12	12.50
	(c) Klebsiella	6.25	3.12	3.12
	(d) E. coli	1.56	0	3.12
Group III	(a) Beta haemolytic Streptoccus	15.62	3.12	7.81
(erythromycin)	(b) Staphylococcus aureus	10.93	4.68	17.19
	(c) Klebsiella	1.56	0	1.56
	(d) E. coli	1.56	0	0

TABLE V

COMPARISON OF PATHOGENIC FLORA FOUND IN THE SUPERFICIAL AND DEEP SURFACE OF TONSIL

Pathogenic organism	Identical external and internal microbial flora	Different external and internal microbial flora	Pathogen found only in the internal surface
	%	%	%
Beta haemolytic Streptococcus	14	26.5	3.12
Staphylococcus aureus	1.56	20.3	9.3
Klebsiella	1.56	6.25	1.56
E. coli	1.56	4.68	0
Total	32.81	64	14.6

TABLE VI

BETA HAEMOLYTIC STRPTOCOCCUS GROUPS FOUND IN DIFFERENT SWABS

	Pretreatment swab +ve post treatment swab −ve cut surface swab culture −ve	Pretreatment swab +ve post treatment swab −ve cut surface swab culture +ve	Pretreatment swab +ve post treatment swab +ve cut surface swab culture −ve	Pretreatment swab +ve post treatment swab +ve cut surface swab culture +ve	Pretreatment swab −ve post treatment swab +ve cut surface swab culture +ve	Pretreatment swab −ve post treatment swab −ve cut surface swab culture +ve
Group A	10	2	0	0	0	7
Group B	1	0	0	0	0	1
Group C	4	1	1	0	0	8
Group G	3	0	3	0	0	3

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