AFRICAN JOURNAL OF CLINICAL & EXPERIMENTAL MICROBIOLOGY JULY. 2003 ISSN1595-689 Vol 4 No 2
AJCEM/2002070/2323

BACTERIOLOGY OF CHRONIC SINUSITIS IN ILORIN, NIGERIA

[1]Ologe, F.E., [2]Nwabuisi, C.
[1]Departments of Otorhinolaryngology and [2]Medical Microbiology, Faculty of Health Sciences, University of Ilorin, P.M.B. 1515, Ilorin, Nigeria.
Correspondence to: Dr. F.E. Ologe (E-mail: feologe@unilorin.edu.ng.)

A prospective study of the bacteriology of 120 patients with chronic sinusitis and 55 control subjects seen between January 1995 and December 1998 in the Ear, Nose and Throat (ENT) Diseases Clinic of University of Ilorin Teaching Hospital, Ilorin, Nigeria was made. Whereas all cultures from the control group yielded only Staphylococcus (63.6% Coagulase positive and 36.4% Coagulase negative), cultures of patients with chronic sinusitis yielded *Staphylococcus aureus* (48.1%), *Escherichia coli* (20.4%), *Klebsiella spp.* (20.4%), Streptococci (7.4%) and *Streptococcus pneumoniae* (3.7%). The isolates were 100% sensitive to Ofloxacin, while penicillin was the least effective antimicrobial agent across board.

It was concluded that because of the difficulty in differentiating pathogenic organisms from commensals, the result of nasal swabs should be interpreted with caution. However, non-otolaryngologists involved in the management of the vast majority of patients with chronic sinusitis should request a carefully obtained posterior nasal mucosal swab.

INTRODUCTION

Chronic sinusitis is a common otolaryngologic disease worldwide, and particularly so in developing countries (1-7). The aetiology of sinusitis is often multifactorial with considerable overlap of clinical manifestations (8). Purulent nasal discharge may not necessarily signify infection. Nasal discharge with very high eosinophil count associated with allergic rhinitis may appear yellow or green (8). Also, clear nasal discharge may not always be of allergic origin.

There are multiple problems associated with management of chronic sinusitis. The difficulty in interpreting nasal mucosal swab cultures as opposed to sinus cavity samples is the main reason for preferring the latter in the management of infective chronic sinusitis as they yield mainly pathogens. Review of several studies show that the normal commensal flora of the nasal vestibule include *Staphylococcus epidermidis,* Micrococcus, *Staphylococcus aureus,* Diphtheroids and Gram negative bacteria, while that of the posterior nasal fossa include *Streptococcus pneumoniae, Haemophilus influenzae,. Streptococcus pyogenes, Staphylococcus aureus, Neisseria meningitidis* and Gram negative bacteria (8). These results raise doubts on the usefulness of nasal swab bacteriology in the treatment of infective rhinosinusitis (8-11). Apart from sampling technique, inappropriate transport method

could also interfere with optimal conditions thereby inhibiting the growth of fastidious organisms, while promoting the overgrowth of commensal flora.

As a result of failure to establish causative pathogens before starting treatment, there is a tendency to over prescribe antibiotics and hence the development of drug resistant organisms (12,13). Inspite of awareness of these potential problems, most cases of chronic sinusitis are being managed by general practitioners, with no access to obtaining specimens of sinus cavity. Therefore, this study was undertaken to establish the reliability of results of nasal culture in the management of chronic sinusitis and to recommend precautions which when taken, will maximize the effectiveness of treatment of chronic sinusitis.

MATERIALS AND METHODS

A prospective study of 120 consecutive patients with chronic sinusitis seen between January 1995 and December 1998 in the Ear, Nose and Throat (ENT) diseases clinic of the University of Ilorin Teaching Hospital, Ilorin Nigeria was made.

Fifty-five control subjects, not known to be chronic sinusitis patients, and who had no symptoms of sinusitis over the preceding month before sampling, were enrolled into the study. A provisional diagnosis of chronic sinusitis was made if there were at least two of the following signs and symptoms for duration of at least two months (14); nasal blockage, nasal discharge (mucoid, mucopurulent or purulent), postnasal drip, excessive sneezing and halitosis. Allergic, vasomotor and infective processes were not differentiated since these may co-exist or one may lead to the other.

Nasal swab specimens were carefully obtained from patients by ENT surgeons on first clinic attendance after thorough physical examination with the documentation of their relevant biodata, (e.g. age, sex) and drug history. Very slender nasal swabs were used to collect the exudate from the posterior nasal mucosa. In cases where the nasal cavity was filled with pus, this was initially suctioned to allow access to the posterior nasal mucosa. Patients on antimicrobial therapy within 72 hours of presentation were excluded from the study. The same procedure was followed for the control group.

Specimens so collected were immediately sent to the University of Ilorin Teaching Hospital laboratory (within a short distance) where streaking on Chocolate, MacConkey and Saborauds Dextrose Agar plates, were carried

out and incubated aerobically at 37°C for 18-24 hours. Isolates were identified by standard methods (15).

The antimicrobial susceptibility patterns of isolates were determined by standard disc diffusion methods (15), on Mueller-Hinton agar employing Habdisc multidiscs with the following antibiotics: penicillin 1 mu, gentamycin 10µg, colistin 25µg, cloxacillin 5µg, clotrimazole 25µg, tetracycline 10µg, erythromycin 5µg and chloramphenicol 10µg. Single disc of ofloxacin 10µg and cefuroxime 30µg were added where applicable. Growth inhibition zone diameter was measured in millimeters with a calibrated ruler after 18-24 hours incubation at 37°C. Results were interpreted as susceptible or resistant, while *Staphylococcus aureus* (NCTC 6571) and Escherichia coli (NCTC 10413), served as control organisms. Facilities for retrieving and culturing anaerobic bacteria were lacking in the centre during the period of the study.

RESULTS

A total of 120 posterior nasal swabs from 58 males and 62 females were examined. The age range was 5-70 years. Less than 5% of patients were in the paediatric age group.

Fifty-four patients (45%) had pathogenic isolate. *Staphylococcus aureus* (48.1%), *Escherichia coli* (20.4%), *Klebsiella spp.* (20.4%), Streptococci (7.8%); and Streptococcus pneumoniae (3.7%) (Table I). Of the 55 control subjects studied (16 females and 39 males between ages of 18 and 55years), 22 (40%) were culture positive. Their isolates were exclusively Staphylococci (63.6% coagulase positive and 36.4% coagulase negative).

As shown in Table II, all the isolates were susceptible to ofloxacin, while penicillin was the least effective antimicrobial agent across board.

Table 1: Significant isolates from patients with Chronic Sinusitis in Ilorin, Nigeria.

Organism	Frequency (%) (N=54)
Staph. aureus	26(48.1)
E.coli	11(20.4)
Kebsiella spp	11(20.4)
Streptococci	4(7.4)
Strept. pneumoniae	2(3.7)
Total	54(100)

Table II: Antimicrobial Susceptibility Patterns of bacterial isolate

Antimicrobial Agent (Disk Concentration)	**S.aureus n=26**	**S.pyogenes n=4**	**S.pneumoniae n=2**	**E.coli n=11**	**K.pneumoniae n=11**
Ampicillin (25ug)	3(11.5)	2(50.0)	1(50.0)	2(18.2)	0(0)
Penicillin 1ug	0(0)	3(75.0)	1(50.0)	0(0)	0(0)
Erythromycin (5ug)	21(80.8)	4(100.0)	2(100)	-	-
Tetracycline 10ug	5(19.2)	3(75.0)	2(100)	8(72.3)	6(54.5)
Cloxacillin (10ug)	23(88.5)	4(100)	2(100)	-	-
Gentamycin (10ug)	16(61.5)	2(50.0)	1(50.0)	10(90.1)	8(72.8)
Cotrimoxazole (25ug)	6(23.1)	3(75.0)	1(50.0)	8(72.8)	8(72.8)
Chloramphenicol (10ug)	12(46.2)	3(75.0)	1(50.0)	-	-
Colistin (25ug)	-	-		11(100)	11(100)
Ofloxacin (10ug)	26(100)	4(100)	2(100)	11(100)	11(100)
Cefuroxime (30ug)	20(77.0)	4(100)	2(100)	10(90.1)	10(90.1)

Note:- - - Not tested.

DISCUSSION

Although a few studies suggest that paranasal sinuses are normally sterile, both aerobic and anaerobic bacteria have been recovered from sinus aspirates of presumably normal human subjects (10,16,17). It is however, generally agreed that the knowledge

of the bacteriology of secretions obtained directly from maxillary sinus by needle aspiration (with careful avoidance of contamination from mucosa surfaces), provides a more reliable information essential to the planning of anti microbial therapy (8,10,11). Thus in decreasing order of reliability, sample sites can be arranged in the following sequence; sinus cavity, sinus ostium, posterior nasal mucosa and anterior nasal mucosa (8-11). For the majority of non-otolaryngologists involved in the management of chronic sinusitis the posterior nasal fossa is recommended for obtaining specimens but contamination should be avoided and the limitations in interpreting reports of such culture recognized.

As reported else where (18-21), *Staphylococcus aureus* was the commonest pathogen associated with chronic sinusitis in this study. However, there are recent reports of increasing prevalence of enteric Gram-negative bacilli in this condition (17). Although, due to lack of facilities, anaerobic organisms were not cultured in this study. It has been documented that anaerobic organisms play a major role in chronic sinusitis (8,9,19,22). Fungal sinusitis is rare, and its presence should raise the suspicion of an immune deficiency disorder (12).

All isolates in this study were 100% susceptible to ofloxacin (cefuroxime was second) while penicillin was the least effective anti microbial agent across board. Although, the gram-negative organisms were susceptible to colistin, it is no longer in common use because it is ototoxic. This study suggests that ofloxacin is the drug of choice for the management of chronic sinusitis in our environment. But where it is contraindicated as in children, cefuroxime may be employed, as it is the second most effective antibiotic in this study. Although, some earlier studies recommended gentamicin and colistin, which are ototoxic, most recent studies also recommend newer drugs such as ofloxacin and amoxicillin-clavulanate as the drugs of first choice (13,16,22). Due to the high frequency, of anaerobic organism as recorded in literature, an empirical trial of metronidazole is warranted by clinical suspicion, in cases not responding to the recommended regimen (8,22).

This study confirms that one must be careful in interpreting the result of nasal swabs because of the difficulty in differentiating pathogens from commensals. The establishment of Ear, Nose, Throat Disease and Laboratory Centers with full compliment and facilities

for reliable diagnosis and treatment of chronic sinusitis is recommended.

ACKNOWLEDGEMENT

We gratefully acknowledge the input of Prof. L.D. Edungbola who reviewed the manuscript.

REFERENCES

1. Scadding G. Rhinitis: Common, debilitating and treatable. *The Practitioner.* 1996 ; **240** : 48-53.

2. Burhholter D, Schiffe P. The epidemiology of atopic disease in Europe-A review. *Allergy Clin. Immunol. News.* 1995 ; **7** : 113-25.

3. Al-Samarrae SM. Treatment of "vasomotor rhinitis" by the local application of Silver Nitrate. *J. Laryngol. Otol.* 1991 ; **105** : 285-287.

4. Okafor BC. Otolaryngology in South Eastern Nigeria II: Pattern of Disease of the Nose *Nig. Med. Pract.* 1983 ; **13** :21-29.

5. Obiakor MN. Cattarrh. *Nig. Med. Pract.* 1987 ; **14 (5/6)** : 87-93.

6. Bhatia PC, Varughese R. Pattern of Otolarygological Disease in Jos community. *Nig. Med. J.* 1987 ; **17** : 67-93.

7. Ezeanolue BC, Aneke EC, Nwagbo DFE. Correlation of plain radiological diagnostic features with antral lavage results in chronic maxillary sinusitis. *WAJM.* 2000 ; **19 (1)** : 16-18.

8. Weir N, Golding-Wood DG. Infective rhinitis and sinusitis. In: Kerr AG, Mackay IS, Bull TR (eds.) Scott Browns Otolaryngology. 6thed.Butterworth/Heineman: Oxford. 1997 : 4/3/1-4/3/22.

9. Verschraegen G, Mione S. Difficulties in interpretation of culture results in sinusitis. *Rhinology.* 1998 ; **36 (2)** : 55-58.

10. Wald ER. Sinusitis in infants and children. *Ann. Otol. Rhino. Laryngol.* 1992 ; **101** : 37-41.

11. Jiang RS, Hsu CY, Jang JW. Bacteriology of the maxillary and ethmoid sinuses in chronic sinusitis. *J. Laryngol. Otol.* 1998 ; **112 (9)** : 845-8.

12. Slack RA Realistic view of sinusitis. *ThePractitioner.* 1996 ; **240** :54-57.

13. Ijaduola G T A, Anyiwo C E. Microbiological study of chronic maxillary sinusitis in Nigerian adults. *Nig. J. Microbiol.* 1984 ; **4(1-2)** : 49 – 54.

14. Richtsmeier W J. Medical and surgical management of sinusitis in adults. *Ann. Otol. Rhinol.* 1992 ; **101** : 46-50.

15. Barrow GL, Feithan RKA. Cowan and Steel's manual for the identification of medical bacteria. 3rd edition, Cambridge University Press 1993 : 106-108.

16. Klossek JM, Dubreuil L, Richet H, *et al.* Bacteriology of chronic purulent secretions in chronic rhinosinusitis. *J. Larngol. Otol.* 1998 ; **112(12)** : 1162-66.

17. Brook I. Aerobic and anaerobic bacterial flora of normal maxillary sinuses. *Laryngoscope.* 1981 ; **91** :372-76.

18. Rhamadan HH. What is the bacteriology of chronic sinusitis in adults? *Am. J. Otolaryngol.* 1995 ; **16 (5)** : 303-306.

19. Hsu J, Lanza DC, Kennedy DW. Anti microbial resistance in bacterial chronic sinusitis. *Am. J. Rhinol.* 1998 ; **12 (4)** : 243-48.

20. Busaba NY, Siegel N, Salman SD. Bacteriology of non-traumatic maxillary sinus mucoceles versus chronic sinusitis. *Laryngoscope.* 2000 ; **110 (6)** : 969-71.

21. Erkan M, Asian T, Ozcan M, Koc N. Bacteriology of antrum in adults with chronic maxillary sinusitis. *Laryngoscope.* 1994 ; **104 (3pt1)** : 321-24.

22. Gehanno P, Cohen B. Effectiveness and safety of ofloxacin in chronic otitis media and chronic sinusitis in adult out-patients. *Eur. Arch. Otorhinolaryngology.* 1993 ; **250 (1)** : 513-514.