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Otogenic intracranial complications: a 10-year retrospective review in KwaZulu-Natal, South Africa

Z B Khuzwayo[1,2] and B Enicker[3]

Departments of [1]Ear, Nose and Throat Surgery, [2]Head and Neck Surgery and [3]Neurosurgery, Inkosi Albert Luthuli Central Hospital, Durban, South Africa

Review Article

Dr Z B Khuzwayo takes responsibility for the integrity of the content of the paper

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Author for correspondence:
Dr Z B Khuzwayo, Department of Otorhinolaryngology, Head and Neck Surgery, Nelson R Mandela School of Medicine, University of KwaZulu-Natal, Private Bag x07, Congella, Durban 4004, South Africa
E-mail: zkhuzwayo@hotmail.com
Fax: +27 866 12 6633

Abstract

Objectives. To analyse the data for patients with otogenic intracranial complications during the study period and draw a comparison with internationally published literature.
Method. A retrospective, observational study was conducted, covering a 10-year period between 1 January 2002 and 31 December 2012.
Results. The study comprised 108 patients (66 males (61.1 per cent) and 42 females (38.9 per cent)), of which 75 per cent were aged less than 20 years. Post-auricular swelling, otorrhoea and a decreased level of consciousness were the most frequently reported symptoms in patients with otogenic intracranial complications. Patients with human immunodeficiency virus did not show any different patterns in terms of presentation and outcome.
Conclusion. A triad of post-auricular swelling, otorrhoea and a decreased level of consciousness should make the clinician more heedful of otogenic intracranial complications. Patients with human immunodeficiency virus and human immunodeficiency virus negative patients were equally affected and had similar presentations. Early surgical management of patients was associated with shorter hospital stays and better outcomes.

Introduction

The incidence of chronic otitis media with or without complications is generally on the decline in developed countries.[1] In some countries, the incidence of chronic otitis media with complications has decreased due to: (1) better understanding and early treatment of chronic ear infection; (2) earlier diagnosis of complications, aided by easy availability of computed tomography (CT) and magnetic resonance imaging modalities; and (3) earlier referral to tertiary centres. Newer antibiotics have also contributed to better management.[1] In developed countries,[2] the use of antibiotics and of more sophisticated surgery in chronic otitis media has greatly diminished the incidence of complications and has reduced mortality to a rarity.

In developed countries, otogenic meningitis is the most common form of intracranial complication of chronic otitis media, seldom occurring in children and young adults, and has an overall mortality rate of 14 per cent.[3,4] Some authors have reported an increasing rate of acute mastoiditis caused by antibiotic-resistant strains of *Streptococcus pneumoniae*,[5,6] the most common micro-organism causing otogenic meningitis.[7,8] There is also evidence of changes in symptomatology, mainly because of the improper use of antibiotics.[9]

In developing countries, however, complications of chronic otitis media remain frequent.[3] This condition continues to be a common ear disease in these countries,[10] where the incidence of human immunodeficiency virus (HIV) also continues to be on the increase.[10] Patients infected with HIV have a high risk of chronic otitis media, with or without complications.[10] The complications of chronic otitis media have a unique set of clinical signs and symptoms, and carry high morbidity and mortality rates. Therefore, it is important to identify, at an early stage, cases where infected ears are at risk of complications, and try to prevent this occurrence.

Study aims

This study aimed to: (1) analyse the data for patients with otogenic intracranial complications within the study period and draw a comparison with internationally published literature; (2) compare HIV-positive and HIV-negative individuals in cases with otogenic intracranial complications; (3) ascertain a trend for the presentation of otogenic intracranial complications in HIV-positive patients; and (4) determine what can be done to prevent such complications in the early disease stage.

Materials and methods

A descriptive, retrospective chart review was conducted, based on patient files from Inkosi Albert Luthuli Central Hospital database in Durban, South Africa. The study period selected was 1 January 2002 to 31 December 2012.

The study sample included all patients with confirmed otogenic intracranial complications seen at Inkosi Albert Luthuli Central Hospital between 1 January 2002 and 31 December 2012. All patients who met the study criteria were selected. Inclusion criteria for the study were as follows: (1) patients seen during the study period with documented otogenic intracranial complications; (2) patients scheduled for surgical and/or medical management at Inkosi Albert Luthuli Central Hospital during the specified period; and (3) patients scheduled to be co-managed with neurosurgeons.

Full ethical approval was obtained from the KwaZulu-Natal Department of Health and the University of KwaZulu-Natal Biomedical Research Ethics Committee, prior to study commencement.

The following variables were collected from patient records: demographic information such as age, gender, ethnic group and geographical origin; clinical information including HIV status; clinical presentation; symptom duration; complications noted on CT scans; and complication management (medical and/or surgical). Patient outcome and the duration of hospital stay were also noted.

Statistics

The data were captured and subsequently analysed using SPSS® software version 21. Descriptive statistics, such as frequency, percentage, mean and standard deviation, were used to summarise the data. Pearson's chi-square test or Fisher's exact test was used to determine the association between HIV status and otogenic intracranial complications. The one-way analysis of variance (Kruskal–Wallis) test was used to assess the relationship between age and type of intracranial complication. The level of significance was set at 0.05.

Results

Between 1 January 2002 and 31 December 2012, the Departments of Ear, Nose and Throat Surgery, and Head and Neck Surgery, at Inkosi Albert Luthuli Central Hospital, saw 21 150 patients. Of these, 3154 patients (14.9 per cent) were diagnosed with mastoiditis. During the study period, 108 patients (3.4 per cent) were diagnosed with otogenic intracranial complications.

Gender

There were 66 males (61.1 per cent) and 42 females (38.9 per cent) included in the study.

Ethnicity

The patients' ethnic origin was mainly black ($n = 100$; 92.6 per cent), followed by Asian ($n = 5$; 4.6 per cent) and white ($n = 3$; 2.8 per cent).

Demographic variables

Thirty-two patients (29.6 per cent) were from rural areas of KwaZulu-Natal and 76 patients (70.4 per cent) were from urban areas in the same province.

Age distribution

The youngest participant was 2 years old and the eldest was 74 years old. The median age was 17 years. Fifty per cent of the participants were within the age range of 11–17 years, 25 per cent were between 2 and 11 years, and the remaining 25 per cent ranged from 30 to 74 years.

Primary symptoms at presentation

Otorrhoea

All the patients ($n = 108$) presented with otorrhoea; 82 (75.9 per cent) had otorrhoea associated with pain, while 26 (24.1 per cent) presented with painless otorrhoea.

Post-auricular swelling

All patients ($n = 108$) had post-auricular swelling at the time of presentation.

Additional symptoms

Of all 108 patients, 59 (54.6 per cent) presented with severe headaches, and 17 (15.7 per cent) had headaches and neck stiffness. Eleven patients (10.2 per cent) were noted to have convulsions, either at the base hospital where they were admitted or at home prior to being referred to the unit. Nine patients (8.3 per cent) complained of hearing loss. Seven patients (6.4 per cent) reported confusion. Three patients (2.8 per cent) had diplopia. Two patients (1.8 per cent) had loss of consciousness (with low Glasgow Coma Scale scores of 3 and 5 respectively) (Figure 1).

HIV status

Only 14 patients (12.9 per cent) tested HIV-positive and 42 (38.9 per cent) tested negative. The HIV test was not carried out for 52 patients (48.2 per cent) and thus their status was unknown.

Primary complications (abscesses)

Of all 108 patients, 54 (50 per cent) were noted to have posterior cranial fossa collection only, as the main complication; 24 patients (22.2 per cent) had posterior cranial fossa collection and sigmoid sinus thrombosis, and 30 (27.8 per cent) had middle cranial fossa collection (Figure 2).

Secondary complications

In addition to the three main complications (posterior cranial fossa collection, middle cranial fossa collection and sigmoid sinus thrombosis), 17 patients (15.7 per cent) were diagnosed with meningitis, 5 (4.6 per cent) with otitic hydrocephalus, 3 (2.8 per cent) with petrositis, 3 (2.8 per cent) with internal jugular vein (IJV) thrombosis, 3 (2.8 per cent) with VIIth cranial nerve palsy, and only 1 patient (0.9 per cent) with cavernous sinus thrombosis (Figure 3).

HIV status and complications

HIV-positive group

There were 14 patients (12.9 per cent) in the HIV-positive group. The distribution of their complications was as follows: two patients (14.3 per cent) had meningitis, one (7.1 per cent) had cavernous sinus thrombosis, one (7.1 per cent) had IJV thrombosis, one (7.1 per cent) had otitic hydrocephalus and one (7.1 per cent) had petrositis. Eight patients (57.1 per cent) in this HIV-positive group had primary complications (Figure 4).

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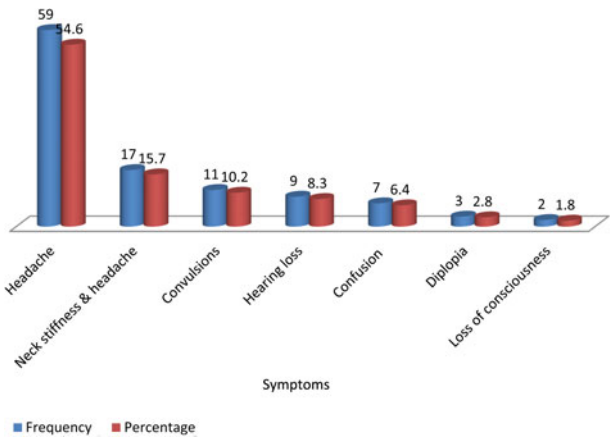

Fig. 1. Symptoms at the time of presentation.

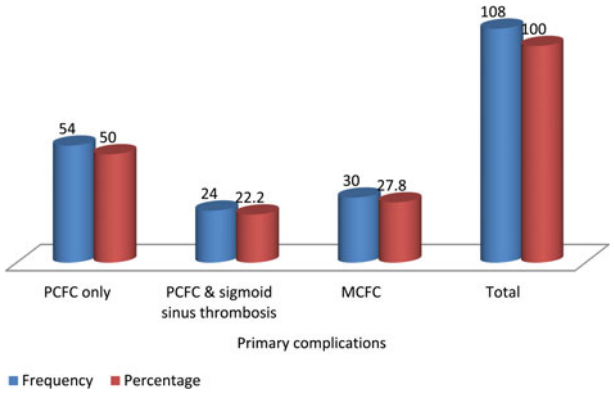

Fig. 2. List of primary complications (abscesses). PCFC = posterior cranial fossa collection; MCFC = middle cranial fossa collection

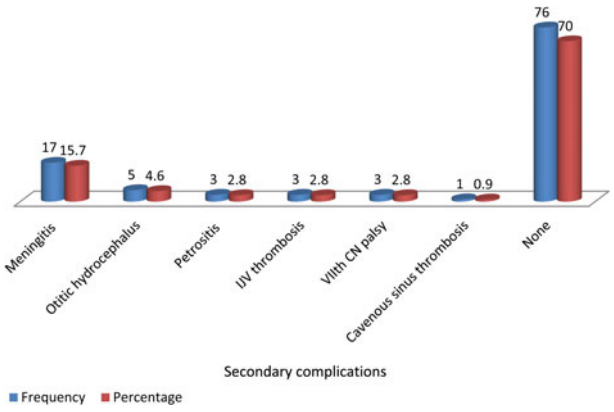

Fig. 3. List of secondary complications. IJV = internal jugular vein; CN = cranial nerve

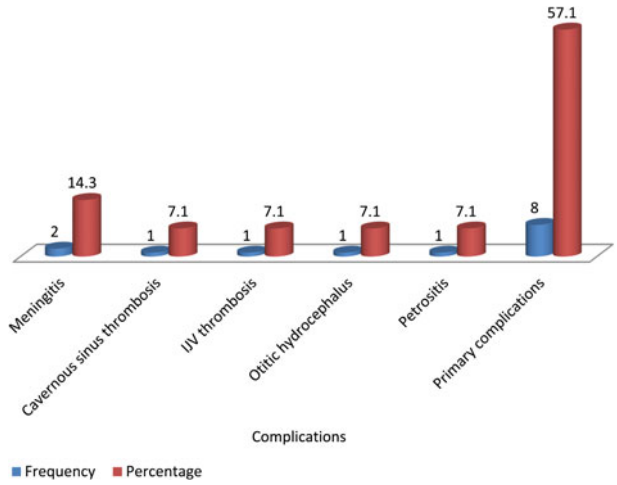

Fig. 4. Complications in human immunodeficiency virus positive group. IJV = internal jugular vein otitic hydrocephalous

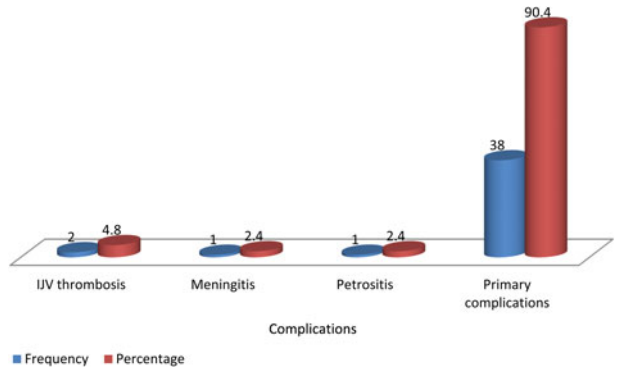

Fig. 5. Complications in human immunodeficiency virus negative group. IJV = internal jugular vein

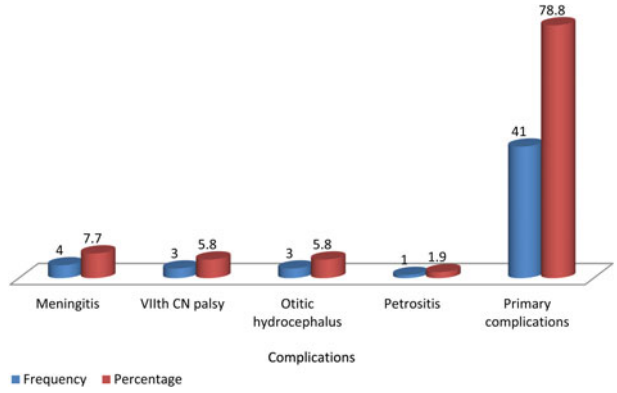

Fig. 6. Complications in unknown human immunodeficiency virus status group. CN = cranial nerve

HIV-negative group

There were 42 patients (38.9 per cent) in the HIV-negative group. Two patients (4.8 per cent) had IJV thrombosis, 1 (2.4 per cent) had meningitis, 1 (2.4 per cent) had petrositis and 38 (90.4 per cent) had primary complications (Figure 5).

Unknown HIV status group

Of the 52 patients (48.1 per cent) in whom HIV status was unknown, 4 (7.7 per cent) had meningitis, 3 (5.8 per cent) had VIIth cranial nerve palsy, 3 (5.8 per cent) had otitic hydrocephalus, 1 (1.9 per cent) had petrositis and 41 (78.8 per cent) had primary complications (Figure 6).

Choice of management

ENT management

Of the 108 patients selected for inclusion, the ENT department managed 1 patient (0.9 per cent) medically and 105 patients (97.2 per cent) surgically; 2 patients (1.9 per cent) died at the pre-operative stage (Table 1).

Neurosurgeon management

Of all 108 patients, neurosurgeons managed 33 (30.6 per cent) medically and 73 (67.6 per cent) surgically; 2 patients (1.9 per cent) died at the pre-operative stage (Table 2).

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Table 1. ENT management

Management	Cases (*n* (%))
Medical	1 (0.9)
Surgical	105 (97.2)
Nil	2 (1.9)
Total	108 (100)

Table 2. Neurosurgeon management

Management	Cases (*n* (%))
Medical	33 (30.6)
Surgical	73 (67.6)
Nil	2 (1.9)
Total	108 (100)

Duration of hospitalisation

The minimum hospital stay was 1 day (for those patients who died on arrival) and the maximum was 90 days. The median duration of hospital stay was 11 days. Fifty per cent of the patients spent 20.5 days in hospital, 25 per cent spent 7–11 days in hospital, and the remaining 25 per cent had stays ranging between 11 and 20.5 days.

Outcome

Of the total patients in the study, 96 (88.9 per cent) were discharged back to the base hospitals or home; 2 patients (1.9 per cent) died at the pre-operative stage and 10 (9.2 per cent) died at the post-operative stage (Table 3).

Table 3. Outcome analysis

Outcome	Cases (*n* (%))
Discharged	96 (88.9)
Pre-op deaths	2 (1.9)
Post-op deaths	10 (9.3)
Total	108 (100)

Pre-op = pre-operative; post-op = post-operative

Discussion

In developing countries, complications of chronic otitis media remain frequent.[3] In the Western world, the intracranial complications of chronic otitis media, of which otogenic meningitis is the most common form, seldom occur in children and young adults, with an overall mortality rate of 14 per cent.[4] In our study, the majority of patients (75 per cent) were children or young adults (50 per cent were aged 11–17 years and 25 per cent were 2–11 years).

The study findings highlight a symptom triad of postauricular swelling, otorrhoea and a decreased level of consciousness as the danger signs of complicated chronic otitis media. This was irrespective of the usage of antibiotics in the pre-operative stage.

Our study did not show HIV as being the sole predisposing factor for chronic otitis media. Both the HIV-positive and HIV-negative groups were equally affected, and the HIV-positive group had fewer intracranial complications as compared to the HIV-negative group.

Complications of chronic otitis media are particularly common in developing countries, especially in rural areas with low socioeconomic status and low literacy rates. Other contributing socioeconomic factors are ignorance, poverty, overcrowding, poor personal hygiene and lack of access to medical facilities.[11] Hence, illiterate patients in rural areas are particularly vulnerable to chronic otitis media complications. Yet another problem in rural areas is the late reporting of cases at an advanced stage of disease, often with multiple, simultaneous complications due to a lack of health awareness.[11]

Our study showed that patients from rural areas, where there were no imaging facilities and with limited resources, were referred early and the diagnosis was appropriate. In contrast, patients in peri-urban areas, within the reach of tertiary and district hospitals, were referred late and were inappropriately referred to the wrong hospital departments. The study also showed that doctors in northern KwaZulu-Natal had a high index of suspicion for acute mastoiditis. This is a region where there are no ENT specialist services.

In South Africa, especially in the rural regions of the KwaZulu-Natal province where chronic otitis media is often neglected because of inadequate primary medical services, these complications are very prevalent, as noted by Samuel *et al.* (1986).[12] For unknown reasons, otogenic intracranial complications predominantly occur in males,[13] and peak in the first and second decades of life.[13] This is also the critical stage when vertically transmitted HIV manifestation occurs.

Otitis media is a common disease in childhood, and it is the most frequent acute disease seen by paediatricians. The prevalence of otitis media in HIV-positive children may reach as high as 80 per cent, and the seropositive child is more prone to have the disease (and to a higher degree of severity) when compared to the immunocompetent child.[14] Moreover, for the HIV-immunocompromised child, the ENT specialist or clinician should consider potential complications secondary to the disease affecting the middle ear, such as otomastoiditis and central nervous system involvement.[15]

Otitis media, both chronic and acute, is a potentially severe disease that makes a patient susceptible to serious complications. In the chronic form, progressive and extensive bone erosion frequently causes complications that increase the risk of damage to the facial nerve, labyrinth and dura. In the acute form, complications occur earlier because anatomical barriers are destroyed.[16] The three main modes of infection dissemination are thrombophlebitic, haematogenic and via direct extension along classic pathways.[17] Thrombophlebitis may take place in any of the diploic veins in and around the temporal bone.[18] Another cause of acute mastoiditis with intracranial complications (other than cholesteatoma-related) was noted in our previous study to be extra-pulmonary tuberculosis.[19]

Our department preferred the surgical option as the primary modality of treatment for most of the cases seen. In the neurosurgical department, however, medical management was favoured over surgical management in some cases. Medical management increased the duration of the hospital stay, as repeated imaging of medical patients was needed to assess the clinical progress of the disease.

In this study, the mortality rate was 11.1 per cent over a 10-year period, which is less than the international quoted rate of 14 per cent. The study did not investigate the

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intra-operative findings (cholesteatoma), morbidity and/or the quality of life associated with the management plan chosen by the concerned departments; therefore, the authors recommend that a follow-up study be conducted.

Conclusion

The triad of symptoms of post-auricular swelling, otorrhoea and a decreased level of consciousness should make a clinician more aware of the potential for otogenic intracranial complications. In addition, both HIV-positive and HIV-negative patients were shown to be equally affected and have similar presentations. Importantly, the study showed that the early surgical management of patients shortened hospital stay and resulted in better patient outcomes.

Competing interests. None declared

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