



Subperiosteal Mastoid Abscess in the Otolaryngology Practice in Sokoto

Stanley Baba Amutta^{1*} and Mohammed Abdullahi¹

¹*Department of Otorhinolaryngology, Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria.*

Authors' contributions

This work was carried out in collaboration between both authors. Author SBA designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author MA managed the analyses of the study and the literature searches. Both authors read and approved the final manuscript.

Article Information

DOI: 10.9734/IJTDH/2018/44787

Editor(s):

- (1) Dr. Thomas I. Nathaniel, Department of Biomedical Sciences, School of Medicine -Greenville, University of South Carolina, Greenville, USA.
(2) Dr. Triveni Krishnan, Division of Virology, National Institute of Cholera and Enteric Diseases, Kolkata, India.

Reviewers:

- (1) Vinaya Manchaiah, Lamar University, USA.
(2) Ioannis Vlastos, Greece.
(3) Danijela Dragičević, University of Novi Sad, Serbia.
(4) Henrique Furlan Pauna, University of Campinas / UNICAMP, Brazil.
Complete Peer review History: <http://www.sciencedomain.org/review-history/26932>

Original Research Article

Received 19 August 2018
Accepted 24 October 2018
Published 31 October 2018

ABSTRACT

Aims: Audit intent and review of the management.

Study Design: Retrospective descriptive cross-sectional study.

Place and Duration of Study: Ear, Nose and Throat Department of Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria between August 2006 and September 2018.

Methodology: The case files of the patients managed for subperiosteal mastoid abscess were retrieved and reviewed. Data extracted from the case files were biodata, symptoms including duration of otorrhoea, signs elicited, radiological findings of the petromastoid bone and brain, microbial isolates, treatment, operative findings, follow-up, and the outcome. The data analysed with IBM SPSS version 21.0.

Results: A total of 11 patients comprising 5 (45.5%) male and 6 (54.5%) female, with a male to female ratio of 1:1.2, had subperiosteal mastoid abscess during the 12 years under review. Mean

*Corresponding author: Email: samutta14@gmail.com;

age was 13 years, and the mean duration of otorrhoea was 8 years. Eight (72.7%) patients had mucopurulent otorrhoea and fluctuant posterior auricular mass which yielded thick pus on tap aspiration. Three patients (27.3%) had a tympanocutaneous fistula. Two of the patients had cholesteatoma. The most common bacteria isolate was *Pseudomonas aeruginosa*. Six (54.5%) of the patients had initial incision and drainage before the definitive surgery. The definitive surgical intervention was cortical mastoidectomy 6 (54.5%) and modified radical mastoidectomy 5(37.5%). The treatment outcome was the resolution of abscess in 8 (72.7%) and persistent discharging mastoid cavity in 3 (27.3%) patients. The average length of hospitalisation was 12.6 days, and the mean follows up period was 19 months.

Conclusion: Subperiosteal mastoid abscess usually occurs as a complication of chronic suppurative otitis media in children and adults with very long history of otorrhoea. It requires cortical or modified radical mastoidectomy. Early diagnosis and treatment of chronic suppurative otitis media may prevent the development of a subperiosteal mastoid abscess.

Keywords: Mastoid; subperiosteal; abscess; management; Sokoto.

1. INTRODUCTION

The Subperiosteal mastoid abscess is the most common complication of acute or coalescent mastoiditis which usually occurs in acute otitis media [1-3] in young Caucasians children. However, in developing countries such as Nigeria and India, it is encountered as an extracranial complication of chronic suppurative otitis media with or without cholesteatoma [4-6]. The incidence of acute mastoiditis has declined since the introduction of the era of antibiotic therapy [1,7] for otitis media. Nevertheless, complications from otitis media still abound due to inadequate or absence of antibiotic therapy [7]. This report aims at an audit intent and review of the management of subperiosteal mastoid abscess in our tertiary health institution.

2. MATERIALS AND METHODS

This study was a retrospective descriptive cross-sectional review of all subperiosteal mastoid abscesses at the Ear, Nose, and Throat (ENT) Department of the Usmanu Danfodiyo University Teaching Hospital (UDUTH), Sokoto, Northwestern Nigeria from August 2006 to September 2018. The case files of the patients managed for subperiosteal mastoid abscess were retrieved from the Hospital Medical Record Department. Data extracted from the case files were biodata, symptoms including duration of ear discharge prior subperiosteal mastoid abscess, signs elicited, radiological findings of the petromastoid bone and brain, microbial isolates, medical treatment, types of surgery (incision and drainage, cortical mastoidectomy or modified radical mastoidectomy), findings at mastoid surgery, follow-up and the outcome. The data analyzed with IBM SPSS version 21.0.

3. RESULTS

A total of 1,374 patients were managed for chronic suppurative otitis media during the 12 year under review. Of this total, 11 patients comprising 5 (45.5%) male and 6 (54.5%) female, with a male to female ratio of 1:1.2, had subperiosteal mastoid abscess and an incidence of 0.8%. Mean age was 13 years (Range 2-42 years), mode ten years, and the mean duration of otorrhoea was eight years (Range 1.5-33 years) and three years respectively. All the patients in this study had chronic suppurative otitis media. In addition, two of the patients had cholesteatoma. Distribution of the subperiosteal mastoid abscess by age group is illustrated in Fig. 1.

Eight (72.7%) patients had mucopurulent otorrhoea and fluctuant posterior auricular mass which yielded thick pus on tap aspiration. Also, three patients (27.3%) had a tympanocutaneous fistula (Fig. 2).

Seven (63.6%) of the patients had CT petromastoid bone which showed opacification of the mastoid air cells and erosion of the outer cortex, while 4 (36.4%) patients demonstrated mastoid sclerosis, swelling of the overlying soft tissue with foci of lucency (Fig. 3).

The types of tympanic membrane perforation and the microbial isolates from the subperiosteal mastoid abscess are tabulated in Table 1.

Six (54.5%) of the patients had initial incision and drainage before the definitive surgery. The definitive surgical intervention was 6 (54.5%) cortical mastoidectomy and 5 (37.5%) modified radical mastoidectomy. The operative findings are summarised in Table 1. The mean duration

of hospitalisation before the definitive surgery was 5.7 days (Range 2-11 days). Observed facial nerve palsy (Table 1) resolved on the follow-up visit.

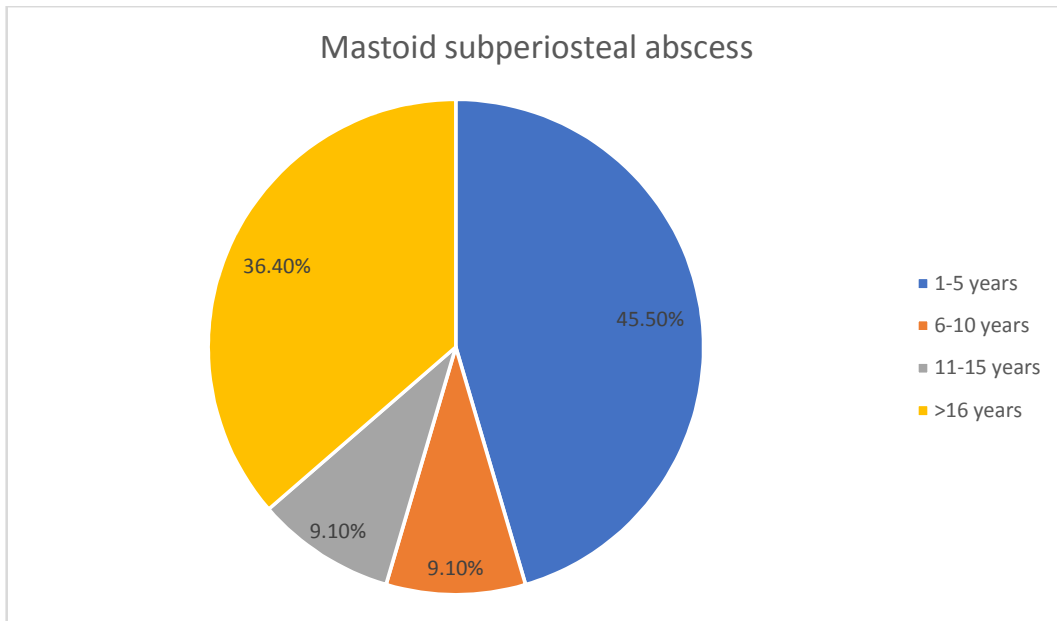


Fig. 1. Distribution of the subperiosteal mastoid abscess by age group



Fig. 2. Clinical photograph of a 10-year old boy with a left subperiosteal mastoid abscess (Tympanocutaneous fistula shown by the blue arrow)

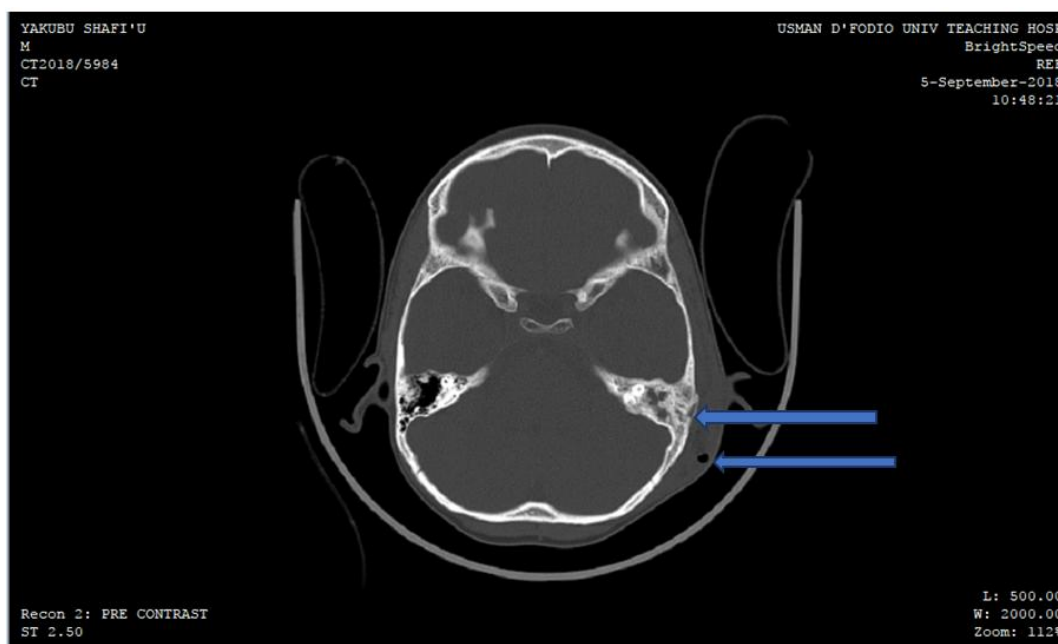


Fig. 3. CT scan of a 10-year old boy showing opacification of the left mastoid air cells with associated swelling of the overlying soft tissue with the focus of lucency and bony erosion shown by blue arrows

Table 1. Clinical features of patients with the subperiosteal mastoid abscess

Tympanic membrane perforation	Number (%)
Subtotal	5 (45.5)
Central perforation	6 (54.5)
Total	11 (100)
Microbial isolates	Number (%)
<i>Pseudomonas aeruginosa</i>	4 (36.4)
<i>Proteus mirabilis</i>	1 (9.1)
<i>Staphylococcus aureus</i>	2 (18.2)
No growth	2 (18.2)
Not available	2 (18.2)
Total	11 (100)
Operative findings	Number (%)
Pus, bony defect and granulation tissue in the mastoid air cells and antrum	6 (54.5)
Pus, granulation tissue in the mastoid air cells, aditus ad antrum	3 (27.3)
Cheesy material(cholesteatoma) in the antrum, aditus ad antrum, and middle ear	2 (18.2)
Total	11 (100)
Facial nerve palsy (Grade)	Number (%)
Pre-operative (House-Brackmann Grade III)	1 (9.1)
Post-operative (House-Brackmann Grade III)	1 (9.1)
No facial nerve palsy	9 (81.8)
Total	11 (100)
Hearing impairment	Number (%)
Mild conductive hearing loss	5 (45.5%)
Moderate conductive hearing loss	2 (18.2%)
Mild mixed hearing loss	1 (9.1%)
Not available	3 (27.3%)
Total	11 (100)
Medical treatment	Number (%)
Amoxicillin Clavulanic Acid + Metronidazole + Nasopharyngeal decongestant	3 (27.3)
3 rd generation cephalosporin + Nasopharyngeal decongestant	8 (72.7%)
Total	11 (100)

The treatment outcome was the resolution of abscess in 8 (72.7%) and persistent discharging mastoid cavity in 3 (27.3%) patients. The average length of hospitalisation was 12.6 days (Range 9-16 days), and the mean follow-up period was 19 months (Range 1 month – 4 years).

4. DISCUSSION

In this study, the subperiosteal mastoid abscess was predominant in children who had chronic suppurative otitis media and were \leq 15-year-old (Fig. 1). The age incidence of the subperiosteal mastoid abscess in this study is similar to the earlier report from eastern Nigeria [4]. Additionally, it was associated with chronic suppurative otitis media with or without cholesteatoma (cholesteatoma was encountered in two patients as detailed in Table 1), and this finding agrees with earlier reports from Nigeria [4,5] and India [6]. In contrast, the subperiosteal mastoid abscess was reported as a suppurative complication of acute otitis media in Philadelphia, USA [8].

The preponderance of gram-negative organisms isolated in this study correlates well with the finding by Ibekwe et al. [9], in Tabuk, Saudi Arabia where *Pseudomonas aeruginosa* was the most common cultured bacteria. Besides, common bacteria documented to be associated with chronic suppurative otitis media in Ghana [10] were *Proteus* species, followed by *Pseudomonas aeruginosa*. In contrast, *Staphylococcus aureus* which was dominant in the report from Zambia [11] reported in another study to be a causative organism in the pre-suppurative and acute suppurative otitis media up to five days after the tympanic membrane perforation [10]. In this study, the specimen for microscopy, culture, and sensitivity was taken from the subperiosteal mastoid abscess. Anaerobes and fungi cultures were conspicuously missing in this study. The anaerobic culture was not performed due to lack of an appropriate culture medium. Another limitation of the bacteriology in this study is the absence of the specimen from the external auditory canal or middle ear for comparison with the specimen from the subperiosteal mastoid abscess.

Empirical intravenous antibiotic treatment with Amoxicillin + Clavulanic Acid and metronidazole or a third-generation cephalosporin for 10-14 days. The choice of these drugs was based on

(a) regional bacteriologic profile [10]; and (b) the financial ability of the patients, guardians or parents of the patients to buy the drug. Metronidazole inclusion aims to eradicate anaerobes which often complicate the inflammatory process in chronic suppurative otitis media [9]. Oral Actifed or chlorpheniramine used as a nasopharyngeal decongestant to improve middle ear ventilation via the eustachian tube.

The initial incision and drainage of the subperiosteal mastoid abscess in six of the patients in this study were done to relieve severe pain in the ear and mastoid region. Secondly, to prevent the intracranial spread of the suppurative complication. Thirdly, helps the patients, parents/guardians to source for money for radiological investigation and the operation fee for the definitive cortical or modified radical mastoidectomy. The initial incision and drainage were necessary because the National Health Insurance Scheme does not cover the majority of the patients in our institution. Thus, the mean duration of hospitalisation before the definitive surgery was 5.7 days (Range 2-11 days). Some authors documented incision and drainage of subperiosteal mastoid abscess, insertion of ventilation tube and administration of antibiotics as first-line treatment [2,12], and mastoidectomy for non-responders.

Cortical mastoidectomy was the definitive surgery in six patients because the operative findings of pus and granulation tissue were restricted to the mastoid air cells and the antrum. The cortical mastoidectomy in this study is similar to the earlier report [2,13-15]. However, previous publications from eastern Nigeria [4,5] recommended modified radical mastoidectomy for all subperiosteal mastoid abscess where there is bony erosion because of the poor follow-up attitude exhibited by patients in developing countries including Nigeria. Modified radical mastoidectomy was the preferred definitive surgery in five patients who demonstrated granulation tissues extension to the aditus ad antrum and cholesteatoma. This agrees with other reports [2,4,5,14,15].

The treatment outcome was good. There is no record of recurrence of the subperiosteal mastoid abscess in all the patients in this study. However, three patients who had canal wall down modified radical mastoidectomy had trouble with some persistent discharge in mastoidectomy cavity. The facial nerve paralysis recorded in two of the patients resolved in the post-operative period to

House-Brackmann grade II. It is sad to note that all the patients had significant permanent tympanic membrane perforation but did not come back for myringoplasty or tympanoplasty most probably due to poverty and the paucity of otological practice in Nigeria. Similarly, the hindrance to effective otological surgery in Nigeria was highlighted in earlier reports [16,17].

4.1 Take Away Points

Subperiosteal mastoid abscess occurred in children and adults with chronic suppurative otitis media with or without cholesteatoma and there was a preponderance of gram-negative organisms. Prior definitive cortical or modified radical mastoidectomy, incision and drainage may prevent intracranial spread of the suppurative complication in resource challenged countries. Early management of chronic suppurative otitis media may prevent subperiosteal mastoid abscess.

5. CONCLUSION

In developing countries including Nigeria, Subperiosteal mastoid abscess usually occurs as a complication of chronic suppurative otitis media with or without cholesteatoma in children and adults with very long history of otorrhea. It requires cortical or modified radical mastoidectomy. Early diagnosis and treatment of chronic suppurative otitis media may prevent the development of a subperiosteal mastoid abscess.

CONSENT

As per international standard or university standard written patient consent has been collected and preserved by the authors.

ETHICAL ISSUE

Permission was obtained for the use of clinical Photograph.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Budenz CL, El-Kashlan HK, Aygun N, JK N. Complications of temporal bone

- infection. In: W. FP, editor. Cummings otolaryngology head and neck surgery. 6th ed. Philadelphia: Elsevier Saunders. 2015; 2156-77.
2. Psarommatis I, Giannakopoulos P, Theodorou E, Voudouris C, Carabino C, Tsakanikos M. Mastoid subperiosteal abscess in children: Drainage or mastoidectomy? The Journal of Laryngology & Otology. 2012;126(12): 1204-8.
3. Rea PA, N R. Acute otitis media. In: Watkinson JC, Clark RW, editors. Scott-Brown's Otorhinolaryngology Head and Neck Surgery. 2. 8th ed. Boca Raton: CRC Press. 2018;137-52.
4. Ibekwe AO, Okoye BC. Subperiosteal mastoid abscesses in chronic suppurative otitis media. Annals of Otology, Rhinology & Laryngology. 1988;97(4):373-5.
5. Okafor B. The chronic discharging ear in Nigeria. The Journal of Laryngology & Otology. 1984;98(2):113-20.
6. Sharma N, Jaiswal AA, Banerjee PK, Garg AK. Complications of chronic suppurative otitis media and their management: a single institution 12 years experience. Indian Journal of Otolaryngology and Head & Neck Surgery. 2015;67(4):353-60.
7. Hawkins DB, Dru D. Mastoid subperiosteal abscess. Archives of Otolaryngology. 1983;109(6):369-71.
8. Thorne MC, Chewaproug L, Elden LM. Suppurative complications of acute otitis media: Changes in frequency over time. Archives of Otolaryngology-Head & Neck Surgery. 2009;135(7):638-41.
9. Ibekwe AO, Shareef ZA, Benayam A. Anaerobes and fungi in chronic suppurative otitis media. Annals of Otology, Rhinology & Laryngology. 1997; 106(8):649-52.
10. Brobby G. The discharging ear in the tropics: A guide to diagnosis and management in the district hospital. Tropical Doctor. 1992;22(1):10-3.
11. Matundwelo N, Mwansasu C. Bacteriology of chronic suppurative otitis media among children at the Arthur Davidson Children's Hospital, Ndola, Zambia. Medical Journal of Zambia. 2016;43(1):36-40.
12. Migirov L, Kronenberg J. Bacteriology of mastoid subperiosteal abscess in children. Acta Oto-Laryngologica. 2004;124(1):23-5.
13. Hathorn I, Hussain S. Bilateral acute mastoiditis and subperiosteal abscesses in a child managed by simultaneous bilateral

- mastoid surgery. *The Journal of Laryngology & Otology*. 2012;126(8): 825-9.
14. Migirov L, Yakirevitch A, Kronenberg J. Mastoid subperiosteal abscess: A review of 51 cases. *International Journal of Pediatric Otorhinolaryngology*. 2005; 69(11):1529-33.
 15. Zanetti D, Nassif N. Indications for surgery in acute mastoiditis and their complications in children. *International Journal of Pediatric Otorhinolaryngology*. 2006;70(7): 1175-82.
 16. Lasisi A. The chronic discharging ear in the Subsaharan Africa-Need for improved management. *The Internet Journal of Otorhinolaryngology*. 2008;7(2).
 17. Salisu A. Otology practice in a Nigerian tertiary health institution: A 10-year review. *Annals of African Medicine*. 2010;9(4).

© 2018 *Amutta and Abdullahi*; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:
The peer review history for this paper can be accessed here:
<http://www.sciencedomain.org/review-history/26932>