

BACTEREMIA DURING CANAL WALL UP MASTOIDECTOMY IN CASES OF CHOLESTEATOMA

By

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ABSTRACT

Background: Otitis media refers to a group of complex infectious and inflammatory diseases affecting the middle ear. Bacteremia is the presence of viable bacteria in the circulating blood. It has been reported that it is associated with some surgical procedures.

Objective: To investigate the risk of bacteremia development during surgery in patients who underwent mastoidectomy for chronic otitis media.

Patients and Methods: This was a prospective study carried out at Hearing and Speech Institute, Egypt during the period between March and December 2019. The study included 30 patients with chronic otitis media (17 males and 13 females) who were scheduled for mastoidectomy. Preoperative routine ENT examination and microscopic examination were done. Blood samples were taken before and after the operation for the evaluation of microorganisms. Smear cultures were obtained, and the growing microorganisms were identified with the traditional method.

Results: Cholesteatoma was the major complaint among all patients, 27 cases (90.0%) complained of intermittent ear discharge, 16 cases (53.3%) complained of hearing loss and only 3 cases (10.0%) complained of tinnitus. The results showed that 19 cases (63.3%) developed bacteremia postoperatively. Streptococcus spp was the main organism found in 6 cases (20.0%) in preoperative external ear canal and in 7 cases (23.3%) in postoperative dressing smear cultures, followed by Pseudomonas aeruginosa in 5 cases (16.7%) and 4 cases (13.3%), Diptheroid bacilli in 4 cases (13.3%) and 2 cases (6.7%), Coagulase staphylococcus in 4 cases (13.3%) and 2 cases (6.7%), also, Klebsiella spp was found in 2 cases (6.7%) and 2 cases (6.7%) for preoperative external ear canal and postoperative dressing smear cultures, respectively. Regarding type and number of bacteria growing in blood culture immediately after surgery, the results showed that Streptococcus spp was presented in 11 cases (58.0%). Both Coagulase (-) staphylococcus and Bacillus spp with spores were found in 4 cases (21.0%).

Conclusion: The risk of bacteremia should be considered in the preoperative period for the patients undergoing mastoidectomy. Postoperative use of antibiotics prevents several undesired complications and increases the success rate of the surgical procedure.

Keywords: Bacteremia, mastoidectomy and cholesteatoma.

INTRODUCTION

Otitis media (OM) refers to a group of complex infectious and inflammatory diseases affecting the middle ear. OM in general is very common as some studies

show that around 80 % of children should have experienced at least one episode by their third birthday (*Dickson, 2014*). OM has been broadly classified into two main types, i.e. acute and chronic. Chronic otitis

media (COM) continues to be an important health problem across the world as it has been since the beginning of humanity. The disease is defined as the perforation of and the discharge from the tympanic membrane together with the infection of the middle ear and the mastoid bone (*Mittal et al., 2015*). Chronic otitis media is often associated with fussiness, otalgia, and fever, but these signs and symptoms are nonspecific and are associated with other childhood infections (*Yawman et al., 2010*). In surgical treatment of COM, it is not possible to eliminate cholesteatoma and infections by preserving normal anatomic structures and to regain hearing function in each and every patient (*Allen et al., 2014*). Although restoration of the hearing loss and the preservation of anatomy are important aspects, eradication of the disease should be the main principle in the surgical procedures (*Luers and Hüttenbrink, 2016*).

Bacteriemia is the presence of viable bacteria in the circulating blood, the clinical picture caused by the spread of the bacteria to the circulation characterized by fever and chills (*Dagasso et al., 2018*). Bacteremia can have several important health consequences. The immune response to the bacteria can cause sepsis and septic shock, which has a high mortality rate (*Munro et al., 2018*). Although its incidence depends on the type of performed surgery, bacteriemia is one of the most important complications of the postoperative period (*Dagasso et al., 2018*).

The objective of this study was to investigate the risk of bacteriemia development during surgery in patients

who underwent mastoidectomy for chronic otitis media.

PATIENTS AND METHODS

This was a prospective study that carried out at Hearing and Speech Institute, Egypt during the period between March and December 2019 after the approval of the Ethical committee. The study included 30 patients with chronic otitis media (17 males and 13 females) who were scheduled for mastoidectomy. Patients had not received any antibiotics for at least 1 month before surgery.

After preoperative routine ENT examination, a microscopic examination was performed in an attempt to identify any discharge, perforation, polyps, cholesteatoma, granulation tissue, and changes in middle ear mucosa. Preoperatively, outer ear canal smear cultures were taken from all patients. General anesthesia was used for operating all included patients. Antiseptic or antimicrobial solution was used for washing the outer ear canal and tympanic cavity. A spongel tampon was placed to the mastoid and or tympanic cavities of the patients who underwent to modified radical mastoidectomy at the end of the surgery.

A volume of 10 ml of blood was drawn from all patients immediately before, and after the surgery. The blood samples were separated into two equal parts, and were transferred into liquid media prepared for aerobic and anerobic microorganisms, and were evaluated with BacT/Alert (Organon Teknico Corp NC 27704) automated blood culture system.

Smear cultures were obtained with a cotton tip while retrieving the dressing.

All the obtained culture samples were sent to the microbiology laboratory within 30 minutes. Smear samples were grown on bloody agar and EMG agar media and incubated at 37 °C for 16 to 24 hours. The growing microorganisms were identified with traditional methods "at the end of the incubation period". The outer ear canal smear cultures obtained before the surgery, and the pressure dressing smear cultures were compared for the similarity of the microorganisms that they contained,

and it was analyzed whether these microorganisms carried the risk for bacteremia caused by the operation.

Statistical analysis:

Statistical analysis was carried out using SPSS program (version 20). Mean and standard deviation (SD) were calculated for continuous variables and number & (%) were used for categorical variables.

RESULTS

This study included 30 patients (17 males "56.7%" and 13 females "43.3%"). The mean age of them was 24.9 ± 9.1 ranged (16-52). Regarding the major complaints of COM of studied patients, Cholesteatoma was the major complaint.

Of the 30 included patients, 27 cases (90.0%) complained of intermittent ear discharge, 16 cases (53.3%) complained about hearing loss and only 3 cases (10.0%) complained of tinnitus (**Table 1**).

Table (1): Demographic variables and complains of studied group

Variables		Descriptive (n=30)
Age (year)		29.4 ± 9.1 (16-52)
Sex	Male	17 (56.7%)
	Female	13 (43.3%)
Complaints	intermittent ear discharge	27 (90.0%)
	hearing loss	16 (53.3%)
	tinnitus	3 (10.0%)

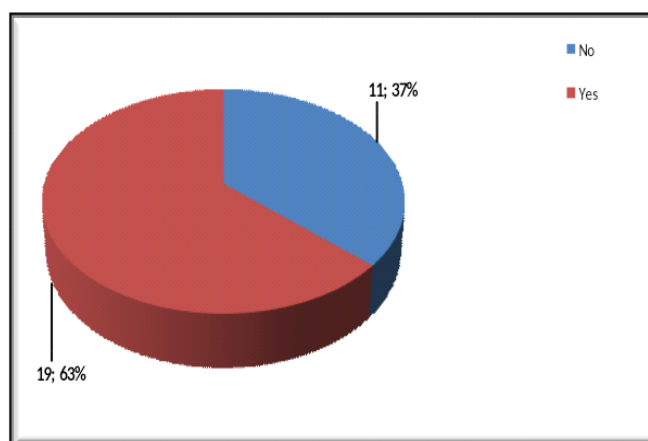
Regarding the microorganisms isolated from preoperative external ear canal and postoperative dressing smear cultures. Streptococcus spp was the main organism found in 6 cases (20.0%) in preoperative external ear canal and in 7 cases (23.3%) in postoperative dressing smear cultures, followed by Pseudomonas aeruginosa in 5 cases (16.7%) and 4 cases (13.3%),

Dipteroid bacilli in 4 cases (13.3%) and 2 cases (6.7%), Coagulase staphylococcus in 4 cases (13.3%) and 2 cases (6.7%), also, Klebsiella spp was found in 2 cases (6.7%) and 2 cases (6.7%) for preoperative external ear canal and postoperative dressing smear cultures, respectively (**Table 2**).

Table (2): Microorganisms isolated from preoperative external ear canal and postoperative dressing smear cultures

Culture	Microorganisms growing in preoperative external ear canal n (%)	Microorganisms growing in postoperative dressing smear cultures n (%)
Streptococcus spp	6 (20.0%)	7 (23.3%)
Pseudomonas aeruginosa	5 (16.7%)	4 (13.3%)
Diphtheroid bacilli	4 (13.3%)	2 (6.7%)
Coagulase (-) staphylococcus	4 (13.3%)	2 (6.7%)
Coagulase (+) staphylococcus	3 (10.0%)	2 (6.7%)
Klebsiella spp	2 (6.7%)	2 (6.7%)
Haemophilus spp	2 (6.7%)	-
Neisseria spp	2 (6.7%)	1 (3.0%)
Candida spp	1 (3.0%)	1 (3.0%)
Acinobacter spp	1 (3.0%)	-
Gram (-) basil	1 (3.0%)	-

The results showed that 19 cases (63.3%) developed bacteremia postoperatively (**fig. 1**).

**Figure (1): Cases developed bacteremia postoperatively**

Regarding type and number of bacteria growing in blood culture immediately after surgery, the results showed that Streptococcus spp was presented in 11

cases (58.0%) and both Coagulase (-) staphylococcus and Bacillus spp with spores were found in 4 cases (21.0%) (**fig. 2**).

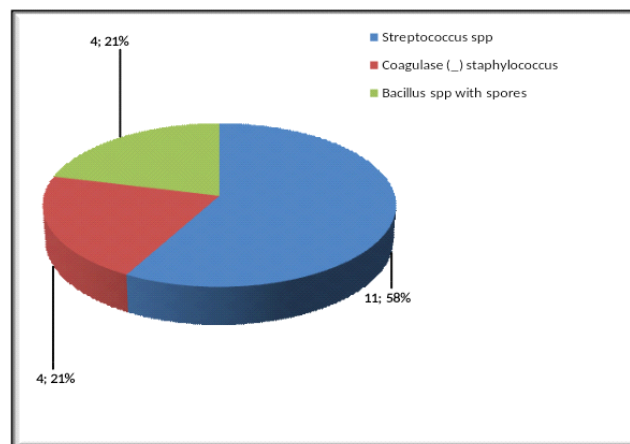


Figure (2): Distribution of the microorganisms growing in postoperative blood cultures.

DISCUSSION

In the current study, *Streptococcus* spp was the main organism found in 20.0% in preoperative external ear canal, and in 23.3% in postoperative dressing smear cultures, followed by *Pseudomonas aeruginosa* in 16.7% and 13.3%. Diptheroid bacilli in 13.3% and 6.7%. Coagulase staphylococcus in 13.3% and 6.7% also. *Klebsiella* spp was found in 6.7% and 6.7% for preoperative external ear canal and postoperative dressing smear cultures, respectively. In chronic otitis media without cholesteatoma, the most common isolated microorganisms are *Pseudomonas aeruginosa* and staphylococci species, mainly *S. aureus* (Yawman *et al.*, 2010). Also Gram-negative organisms are isolated, such as *Klebsiella*, *Proteus* or *Haemophilus* and gram-positive bacteria, with predominance of Streptococci. In the periods of otorrhea the isolates are mostly polymicrobial. The isolated microorganisms are the same in otitis media with cholesteatoma and simple chronic otitis media.

The main finding of the current study revealed that 63.3% developed bacteremia postoperatively. So, the incidence of bacteremia in our study was higher than in previous studies. Uysal *et al.*, (2014) investigated the relationship between the amount of bleeding and bacteremia during tympanomastoidectomy surgery. They found that blood cultures taken preoperatively were negative. However, the cultures obtained intraoperative were positive in 12.3% who underwent tympanomastoidectomy, and bacteremia was more frequent among those with a greater amount of bleeding during the surgery. Also, Shishegar and Ashraf (2014) studied post-tonsillectomy bacteremia in children. They found that 76.1% and 79.6% cultures from surface and depth of tonsils represented multiple microorganisms, respectively. Besides, staphylococci coagulase positive was the most common organism in both surface and depth of tonsils.

It has been reported that if the bacteria can reach the circulation through mucosal capillaries during upper and lower gastrointestinal system endoscopies,

nasotracheal intubations, tonsillectomies, dental and urological surgical procedures. It can also pass into the blood stream via similar routes during traumas such as nasal mucosal incision, nasal tamponade, septoplasty and septorhinoplasty.

In the present study, regarding type and number of bacteria growing in blood culture immediately after surgery, the results showed that *Streptococcus* spp was presented in 58.0% and both *Coagulase* (-) *staphylococcus* and *Bacillus* spp with spores were found in 21.0%. *Uysal et al. (2014)* investigated the relationship between the amount of bleeding and bacteremia during tympanomastoidectomy surgery. *Shishegar and Ashraf (2014)* found that *staphylococci coagulase* positive was the most common organism in both surface and depth of tonsils. *Peptostreptococcus* are anaerobic gram-positive cocci that are normally found in the flora of the mouth and colon (*Levinson, 2012*). Even though it is rare, *Peptostreptococcus* is associated with IE and is also known for its high morbidity (*Minces et al., 2010*). Another pathogen found in the blood samples was the *Streptococcus anginosus*, also found primarily in the mouth and colon (*Levinson, 2012*).

CONCLUSION

The risk of bacteremia should be considered in the preoperative period for the patients undergoing mastoidectomy. Bacteremia may lead to serious complications in patients with particular risk factors such as cardiovascular or valvular diseases. Postoperative use of antibiotics is recommended especially in patients with ear cholesteatoma who present specific risk factors which

prevents several undesired complications and increases the success rate of the surgical procedure.

Source of funding: None.

Conflict of interest: There are no conflicts of interest.

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التجرثم الدموى أثناء إستئصال عظمة النتوء الحلمى مع الحفاظ على الجدار الخلفى للقناة السمعية فى حالات الكوليستياتوما

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خلفية البحث: تمثل إلتهابات الأذن الوسطى مجموعة واسعة من الأمراض المعدية، وتمثل جزءا كبيرا من الأمراض التى تصيب الأطفال، والتجرثم الدموى هو وجود بكتيريا مختلفة فى تيار الدم أثناء إجراء بعض التداخلات الجراحية.

الهدف من البحث: تحديد معامل الخطورة بالإصابة بالتجرثم الدموى أثناء اجراء عمليات إستئصال النتوء الحلمى مع الحفاظ على الجدار الخلفى للقناة السمعية فى حالات إلتهابات الأذن الوسطى المزمنة.

المرضى وطرق البحث: أجريت الدراسة فى معهد السمع والكلام فى الفترة ما بين مارس إلى ديسمبر 2019، وشملت الدراسة 30 مريضا يعانون من إلتهابات مزمنة بالأذن الوسطى، وتم تحديد مواعيد لإجراء الجراحة لهم، وتم أخذ عينات دم منهم قبل وبعد العملية لتقييم التجرثم الدموى.

نتائج البحث: كانت الكوليستياتوما هى الشكوى الرئيسية لجميع المرضى، وأظهرت النتائج وجود تجرثم دموى فى 19 مريض بعد العملية. وكانت أنواع البكتريا السببية هى الأنواع الرئيسية فى الإصابة.

الإستنتاج: هناك إحتمالية عالية بالإصابة بالتجرثم الدموى بعد إجراء الجراحة. ويجب إستعمال مضادات حيوية مناسبة قبل إجراء الجراحة لتلافى هذه المضاعفات.