Comparison between outcome of Inside-out & Outside-in mastoidectomy

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Abstract

Background: Chronic suppurative otitis media is a disease that is known worldwide and that is more common in developing countries. Many techniques are available for operating the disease.

Objectives: To compare outcome between Inside-out & Outside-in mastoidectomy.

Methods: A cross-sectional study was conducted to compare outcome between Inside-Out & Outside-in mastoidectomy. Period of study was from July’ 2010 to March, 2012 in the Department of Otolaryngology and Head-Neck Surgery, BSMMU- Dhaka

Result: majority of the patient were found dry mastoid cavity 13(68.42%) and rest were wet mastoid cavity 6 (31.58%). On the other hand in outside–in mastoidectomy dry mastoid cavity were 80.6% and wet were 19.4%. In inside-out mastoidectomy, among 8 attic cholesteatoma cases 5(62.50%) had gained hearing (average 6.66 dB) and 3(37.50%) had no gain or loss of hearing (average 3.89dB); among 11 entire mastoid bowl cholesteatoma cases 3(27.27%) had gained of hearing (average 6.11dB) and 8(72.73%) had no gain or loss of hearing (average 6.87dB)

Introduction

Chronic suppurative otitis media is a disease that is known worldwide and that is more common in developing countries. Higher incidence of CSOM with cholesteatoma has been attributed in developing countries due to poor living condition, overcrowding, poor personal hygiene, lack of breast feeding, passive smoking, poor general health, poor resistance to infection, lack of health awareness, paucity of accessible health care, illiteracy & ignorance. Poverty is a major risk factor in developing countries & certain neglected population¹

CSOM is a common condition, affecting 0.5-30% of any community. The prevalence of squamous type of COM is 3.5% in Nepal. Now a days, prevalence of CSOM is less than 1% in USA & UK²

One study in two selected slum dwellers in Dhaka city shows the prevalence of CSOM is 7.39% and cholesteatoma is 6.7% (Kamal et al.
In a prevalence study, it was shown that 5% general populations have chronic otitis media and in this 1.8% will be active in any time. In clinical practice up to 50% of ears with chronic otitis media will be associated with cholesteatoma.

The approach of surgical treatment in the management of the middle ear cholesteatoma has been the matter under debate for years (Sade 2000 and Chang & Chen 2000). Various surgical techniques and approaches have been advocated to treat aural cholesteatoma but the controversy over open or closed procedures and Outside-in or Inside-out approaches for cholesteatoma surgery is still far from.

The Inside-out mastoidectomy allows the safe removal of cholesteatoma according to the stage of the disease combining the advantage of canal wall down technique with respect to radicality of cholesteatoma removal and canal wall up technique with respect to functional result with the added advantage of single stage reconstruction.

Some studies showed better results in hearing level after Inside-out mastoidectomy where A-B gap < 25 dB in 38.46% cases and A-B gap <30 dB in 78% cases compared with results after Outside-in mastoidectomy where there was no hearing gain.

Inside-out mastoidectomy is better for hearing gain & prevention of cavity problem though some studies showed almost equal results. The post operative result of a dry ear in a series was 83% and hearing results in the CWW mastoidectomy patients were superior to the CWD groups.

Aims and Objectives
1. To compare outcome between Inside-out & Outside-in mastoidectomy.
2. To assess hearing gain in Inside-out mastoidectomy in comparison to Outside-in mastoidectomy.
3. To find out the graft take rate.

Methods
A cross-sectional study was conducted to compare outcome between Inside-Out & Outside-in mastoidectomy.

A hospital based cross-sectional study was conducted to compare outcome between Inside-out & Outside-in mastoidectomy. Period of study was from July’ 2010 to March, 2012 in the Department of Otolaryngology and Head-Neck Surgery, BSMMU- Dhaka, had been used as the source of data collection.

All cases of CSOM with cholesteatoma admitted in BSMMU was treated by Inside-out mastoidectomy & Outside-in mastoidectomy.

Statistical technique:
A semi-structured questionnaire was developed in English. The questionnaire was developed using the selected variables according to the specific objectives. The questionnaire contained questions related to Socio-demographic and hearing status. A check list section was also developed.

The number of patient having Inside-out mastoidectomy were 19 and Outside-in mastoidectomy were 18. Hearing impairment was assessed by Pure tone audiometry with or without masking. Radiologically X-ray mastoid and CT scan of the ears were done. Microscopic examination was done to confirm otoscopic findings and extension of cholesteatoma was noted. Then data were entered into computer with the help of software SPSS windows version 12. After frequency run, data were cleaned and frequencies were checked. Statistical test used for data analysis was Chi - square test & a level of significance was 95%. P-value < 0.05 was considered as significant.
Results:

The analyzed data have been presented in this chapter through tables and appropriate graphs.

Table-I: Distribution of patients by age group (n=37)

| Age group (Completed years) | Frequency (n) (%) | Inside-out Mastoidectomy n (%) | Outside-in Mastoidectomy n (%) |
|-----------------------------|------------------|-------------------------------|-------------------------------|
| 6 – 15 years                | 11(29.73)        | 7 (18.02)                     | 4 (10.81)                     |
| 16 – 25 years               | 17 (45.95)       | 8 (21.62)                     | 9 (24.32)                     |
| 26 + years                  | 9 (24.32)        | 4 (10.81)                     | 5 (13.51)                     |
| Total                       | 37 (100)         | 19 (51.35)                    | 18 (48.65)                    |

Mean = SD = 20±8.5; Minimum = 7; Maximum=52

Table-II: Extension of cholesteatoma (n=37)

| Characteristics | Inside-out mastoidectomy | Outside-in mastoidectomy | Total n (%) |
|-----------------|----------------------------|---------------------------|-------------|
| Extension of Cholesteatom | Frequency (n=19) | Frequency (n=18) |             |
| Attic           | 8                         | 6                         | 14(37.84%)   |
| Entire mastoid bowl | 11                          | 12                        | 23(62.16%)   |
| Total           | 19                        | 18                        | 37(100%)     |

Table shows that cholesteatoma was limited in attic region were 14(37.84%) and extended into the entire mastoid bowl were 23(62.16%).
Table -III: Distribution of patients by different type of surgery (n=37)

| Type of surgery            | Frequency (n) | Percentage (%) |
|----------------------------|---------------|----------------|
| Inside-out mastoidectomy   | 19            | 51.35          |
| Outside-in mastoidectomy   | 18            | 48.65          |
| Total                      | 37            | 100            |

Table shows inside-out mastoidectomy was done to more than half of the patients 19(51.35%) and outside-in mastoidectomy was done to less than half of the patient 18 (48.65).

Table –IV: Distribution of patients by post operative condition of mastoid cavity (n=37)

| Condition of the mastoid cavity | Approaches of the surgery | $\chi^2$ | df | P     |
|---------------------------------|---------------------------|---------|----|-------|
|                                 | Inside-out mastoidectomy n (%) | Outside-in mastoidectomy n (%) |       |      |       |
| Dry                             | 13(68.42%)                | 8(44.44%) | 2.27 | 1     | >0.05 ns |
| Wet                             | 6(31.58%)                 | 10(55.56%) |       |      |       |
| Total                           | 19(100.0%)                | 18(100.0%) |       |      |       |

Table-V: Proportion of patients by graft taken after mastoidectomy (n=37)

| Approach of operation of Cholesteatoma | Attic | Extention of Cholesteatoma | Frequency of Graft taken (n%) | Frequency of Graft Not taken (n%) | Total |
|----------------------------------------|-------|---------------------------|------------------------------|----------------------------------|-------|
| Inside-out mastoidectomy               | Attic | 5(26.31%)                 | 3(15.79%)                   | 8                                |
|                                        | EMB   | 6(31.58%)                 | 5(26.32%)                   | 11                               |
|                                        | Total | 11(57.89%)                | 8(42.11%)                   | 19(100%)                         |
| Outside-in mastoidectomy               | Attic | 2(11.11%)                 | 4(22.22%)                   | 6                                |
|                                        | EMB   | 4(22.22%)                 | 8(44.45%)                   | 12                               |
|                                        | Total | 6(33.33%)                 | 12(66.67%)                  | 18(100%)                         |
\[ \chi^2 = 4.64, \quad \text{df} = 1, \quad \text{P value}<0.05 \]

Table VI : Comparative hearing status after mastoidectomy (n=37)

| Approach of Operation | Extension of Cholesteatoma | Frequency of hearing gain | Frequency of hearing loss |
|-----------------------|----------------------------|---------------------------|--------------------------|
|                       | n (%) | Average gain (dB) | n (%) | Average loss or no gain (dB) |
| Inside-out Mastoidectomy | Attic (n=8) | 5(62.50) | 6.66 | 3(37.50) | 3.89 |
|                       | Entire Mastoid Bowl (n=11) | 3(27.27) | 6.11 | 8(72.73) | 6.87 |
| Total (N=19) | 8 | 11 |
| Outside-in Mastoidectomy | Attic (n=6) | 2(33.33) | 5.00 | 4(66.67) | 7.92 |
|                       | Entire Mastoid Bowl (n=12) | 5(41.67) | 9.00 | 7(58.33) | 6.99 |
| Total (N=18) | 7 | 11 |

For Attic: \( \chi^2 = 1.38, \quad \text{df} = 1, \quad \text{P value}>0.05 \)

For EMB: \( \chi^2 = 0.24, \quad \text{df} = 1, \quad \text{P value}>0.05 \)

Discussion

Chronic suppurative otitis media with cholesteatoma affects a large number of patients in developing countries and is quite common in our country especially in middle age and low socioeconomic groups. In attic-antral variety of chronic suppurative otitis media with cholesteatoma is usually present in middle ear, mastoid antrum and mastoid air cell system which is mainly responsible for different complications.

The goal of surgical management of CSOM with cholesteatoma includes the complete eradication of diseases, restoration of hearing, restoration of normal anatomical configuration and no or less number of recurrences. Prior to 1950 recommended surgery for CSOM with cholesteatoma was radical or modified radical mastoidectomy (MRM). Now a day’s canal wall down mastoidectomy with tympanoplasty and ossiculoplasty are widely performed.

In the literature surgical technique debated. Some authors primarily set the objective of a dry ear with a low rate of recurrence. whereas others highlighted on the importance of functional results. Inside-out technique of mastoidectomy is a solution that meet both objectives as shown by the present results. In this procedure posterior canal wall is progressively drilled of as far as it is affected by the cholesteatoma process giving a good overview to epitympanic space (attic region). The overview basically as good as canal wall down(CWD) mastoidectomy is clearly better than the combine canal wall up (CWU) approach where the cholesteatoma is often difficult to remove from the region of the facial recess.

In this study majority of the patients 17(45.95%) were of 16-25 years age group followed by 6-15 years age group which consist of 11(29.73%) and rest 9(24.32%) were of 26+ years age group. Average age was 20±8.5(SD) and minimum age was 7 years and maximum age was 52 years. Another similar study conducted by Hossain (2009) showed that the age range was from 8 years to 50 years & the highest
number of patients (45%) was of 11-20 years age group. The average age was 21 years which was almost similar findings with this study. We can conclude that the younger group suffers more as because of cellular mastoid, horizontal position of Eustachian tube, enlarged adenoids and recurrent upper respiratory tract infection which is supported by other studies. In this study Cholesteatoma was limited in attic region were 14(37.84%) and extended into the entire mastoid bowl was 23(62.16%). In a study Cholesteatoma was found to be limited to attic region in 43% cases and extended into the entire mastoid bowl in 57% cases which was approximately similar to the present study. In this series the patients who underwent inside-out mastoidectomy majority of the patient were found dry mastoid cavity 13(68.42%) and rest were wet mastoid cavity 6 (31.58%). Another study done by Niklaus and Rudolf showed that in inside–out mastoidectomy post operative dry cavity was 93% which was higher than this study. This results was higher possibly their meticulous surgical technique. In another series dry mastoid cavity were 89.7% and wet mastoid cavity were 10.3% in inside-out mastoidectomy. On the other hand in outside–in mastoidectomy dry mastoid cavity were 80.6% and wet were 19.4% which was almost similar findings with my study.

In this series patients who underwent inside-out mastoidectomy, graft take were 11(57.89%) and 8(42.11%) were not taken. On the other hand, in another study among the patients who underwent out-side in mastoidectomy, graft take were 6(33.33%) and not taken 12(66.67%). Statistically these differences were found significant (P<.05). Hearing depends on multiple factors and it is therefore difficult to make differentiated assessments on the postoperative hearing improvement. This study showed considerable dependence on the preoperative auditory condition (ABG). This study showed status of hearing of the patients after surgical interventions. In inside-out mastoidectomy, among 8 attic cholesteatoma cases 5(62.50%) had gained of hearing (average 6.66dB) and 3(37.50%) had no gain or loss of hearing (average 3.89dB); among 11 entire mastoid bowl cholesteatoma cases 3(27.27%) had gained of hearing (average 6.11dB) and 8(72.73%) had no gain or loss of hearing (average 6.87dB). In outside-in mastoidectomy, among 6 attic cholesteatoma cases 2(33.33%) had gained of hearing (average 5.00dB) and 4(66.6775%) had no gain or loss of hearing (average 7.92dB), among 12 entire mastoid bowl cholesteatoma cases 5(41.67%) had gained of hearing (average 9.00dB) and 7(58.33%) had no gain or loss of hearing (average 6.99dB). This study also showed that average post operative ABG in inside-out mastoidectomy was 28.54 ± 8.04dB in case of attic & 31.67 ± 8.79dB in case of EMB cholesteatoma. Average post operative ABG in inside-out mastoidectomy was 30.36 dB in 42.11% cases and in outside-in mastoidectomy was 30.83dB in 38.89% cases. Another study conducted by Niklaus and Rudolf (2008) showed that post operative ABG was 30 dB or less in inside-out mastoidectomy was 80% which was higher than my study because of they reconstructed ossicular chain by incus interposition, tympanostapediopexy, tympanoincudopexy and TORP but we reconstructed ossicular chain by above mentioned procedure except TORP.
Finally we can conclude that from the attic region disease can be eradicated completely by inside-out approach along with restoration of good hearing with reconstruction of ossicular chain in the same sitting. We can remove diseases from the attic region by outside-in approach but functionality can be maintained properly which is also time consuming and ossicular chain and posterior canal wall reconstruction cannot be done in the same sitting and there is also cavity problem and more chance of facial nerve injury.

**Conclusion**

Hearing gain was more in inside-out approach of mastoidectomy in case of attic cholesteatoma in comparison to outside-in mastoidectomy, although it was not statistically significant. Graft taken rate was significantly higher in inside-out mastoidectomy. Discharging cavity was also less in inside-out mastoidectomy, although it was not statistically significant.

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