Role of Acetic Acid Irrigation in Medical Management of Chronic Suppurative Otitis Media: A Comparative Study

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Abstract Chronic otitis media is persistent and insidious disease. It is one of the most common bacterial infections in the field of otolaryngology having significant economic and individual repercussion. Medical management of chronic suppurative otitis media (CSOM) for dry ear is essential before surgical treatment. The objective is to consider the most appropriate medical treatment modalities for patients of CSOM. To assess results of acetic acid irrigation and topical and systemic antibiotic in CSOM and consider, the most appropriate medical management. This study was conducted prospectively from Nov 2011 to Sep 2013 in 100 patients of CSOM (tubotympanic type). Patient included in the present study were divided in two groups. In one group patients were treated with aural toilet and irrigation with acetic acid and in other group patients were treated with topical and systemic antibiotic. After a follow up period of 3 months duration results were assessed on the basis of absence of discharge, healing of perforation and status of middle ear. Otorrhoea resolution in group treated with acetic acid was 84 % and healing of perforation was noted in 26 % while failure rate of 16 %

was noted. In group treated with topical and systemic antibiotic 58 % of patient shows otorrhoea resolution, 14 % achieve healing of perforation and 32 % had failure. Medical management of CSOM without Cholesteatoma by frequent aural cleaning and irrigation using dilute acetic acid can be more desirable choice as compared to the topical and oral antibiotics.

Keywords CSOM · Middle ear · Acetic acid

Introduction

Chronic otitis media is persistent and insidious disease. It is one of the most common bacterial infections in the field of otolaryngology having significant economic and individual repercussion [1].

Medical management of chronic suppurative otitis media (CSOM) for dry ear is essential before surgical treatment. Biofilms are most prevalent microbial form in biological environment [2] and thought to play a central role in chronic infections. CSOM is considered as a biofilm disease and it also explains the observed resistance to antibiotics [3].

There are no published guidelines for the treatment of CSOM. Drawback of treatment using antibiotic both orally and parentally includes cost, adverse effects, toxic reaction and inconvenience for patients.

There is no consensus among general and specialist physicians with regard to the medical management of CSOM. However, there is general agreement that aural toilet must be part of the standard medical treatment for CSOM [4].

The recognition that chronic otolaryngological bacterial infections are biofilm related has been the impetus for the

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development of new technologies for the study of biofilms and their prevention and treatment [5].

Physical removal or disruption of bacterial biofilm is effective in treating this chronic infection but is often not clinically feasible [6]. There are currently no specific reliable alternative methods to prevent or eradicate microbial biofilm in patient. A number of strategies have been proposed and are under investigation.

The objective of our study is to consider the most appropriate medical treatment modality for patients of CSOM by comparing the efficacy of aural cleansing and irrigation with dilute acetic acid with topical and systemic antibiotics

Materials and Methods

A prospective clinical study was performed at Department of Otorhinolaryngology of a tertiary care hospital during the period, November 2011 to September 2013 and was approved by the Institutional Ethics committee. Eligibility requirement for present study was patient with active mucosal disease with defect of pars tensa, inflamed middle ear mucosa and mucopurulent discharge for more than 4 weeks; hundred such patients were selected for this study and randomly distributed between two study groups.

Patients excluded from the study were those with

1. Dry ear with CSOM.
2. CSOM with atticointral type.
3. Serous Otitis Media.
4. CSOM with otomycosis.
5. CSOM with vertigo.
6. Patient on systemic antibiotics or any topical ear drop preparation preceding 2 weeks in group of patients selected for irrigation with acetic acid.

History of otorrhoea its duration, character, amount, presence or absence of odour, otalgia, hearing loss, tinnitus, vertigo were noted. Evaluation of patients binocular microscopic examination of ear to assess the integrity of tympanic membrane, degree of inflammation of middle ear mucosa as well as presence of Cholesteatoma, polyp, granulation, these findings were recorded. Fistula test if patient reports vestibular function test, inspection of nasopharynx, Eustachian tube function test and gross assessment of hearing with 512 tuning forks were done. All patients had pure tone audiometry prior and after the treatment period and also radiological investigation (X-ray) were done in every patient.

Patients included in the present study were randomly distributed in two groups. In one (group A) patients treated with aural toilet and irrigation with acetic acid and in other

(group B) patients were treated with topical and systemic antibiotic.

The ear was thoroughly cleaned with dry mopping prior to a swab of the middle ear being taken for microscopy and culture. In the group treated with aural cleansing and irrigation with acetic acid, the patients were advised to visit our hospital every other day. At each visit, the external auditory canal and middle ear cavity were cleaned with suction tube as clearly as possible and irrigated with diluted acetic acid (2 ml, 37 °C) using 1 ml syringe. The patients were advised for self irrigation once daily at home. The criteria for discontinuing the treatment were no discharge in morning, external canal should be dry and clean and thirdly the ear mucosa should not be wet or oedematous.

In other group also the external auditory canal and middle ear cavity were thoroughly cleaned by dry mopping and suction followed by instillation of topical antibiotic i.e. ciprofloxacin ear drop for 3 months. The topical antibiotic was combined with systemic antibiotic i.e. ciprofloxacin 500 mg twice daily for 15 days. Rationale for using Fluoroquinolones, it is a broad spectrum antibiotic and various study proved that it is most effective drug in CSOM.

Patients followed for 3 months and following signs were noted absence of discharge, healing of perforation and status of middle ear mucosa.

Result

A total of 100 patients were included in this study of age range 6–72 years (mean age—36.4), 54 were male, and 46 were female.

Discharge and hearing loss were presenting complaint in all patients while tinnitus was present in 36 % and vertigo was not a complaint in this study group. Around 59 % patient had moderate, 26 % patient had mild and 15 % patient had severe discharge. Bilateral ear disease was found in 34 patients, right ear in 45 patients, and left ear in 21 patients. Distribution of various sizes of perforation in 134 ears 35 had SCP, 63 MCP, 22 had LCP and 14 patients had subtotal perforation.

In group A (patient treated with acetic acid)

- We found dry ear in 42 patients (84 %) in mean 27.3 days. 15 patients (35.7 %) had dry ear in 15 days, 16 patients (38.09 %) in 1 month, 8 patients (19.04 %) in one and half month and 2 patients (4.7 %) in 3 months. While in 1 patient (2.3 %) we could achieve dry ear after months.
- Perforation healed in 13 patients (26 %). The minimum period for healing was 1 month and maximum 3 months as depicted in Fig. 1.

Fig. 1 Results obtained in group A (patients treated with acetic acid irrigation) after follow up period of 3 months

In group B (patient treated with topical and systemic antibiotic)

- We found dry ear in 29 patients (69.04 %) in mean 31.0 days. 10 patients (34.4 %) had dry ear in 15 days, 9 patients (31.03 %) in 1 month, 6 patients (20.6 %) in one and half month and 3 patients (10.3 %) in 2 months. While in 1 patient (3.4 %) we could achieve dry ear after 3 months.
- Perforation healed in 7 patients (14 %). The minimum period for healing was 1 month and maximum 3 month as depicted in Fig. 2.

Discussion

The prevention and treatment of deep seated infection in very poorly vascularized sites is difficult to treat with conventional systemic antibiotic therapy.

Roland in 2002 proposed that biofilms are the likely cause of CSOM, and this would explain the observed resistance to antibiotic therapy [3].

Nowadays biofilms are thought to play a central role in chronic infections and infections associated with implantable devices [7].

Our study shows that careful irrigation with 2 % acetic acid resolved otorrhoea in 42 patients. Over a mean period of 27.3 days, follow up period was every 15 days for

Fig. 2 Results obtained in group B (patients treated with topical and systemic antibiotics) after follow up period of 3 months

3 months. 13 (26 %) of them had spontaneous closure of tympanic membrane.

Our finding for dry ear and healed perforation is comparable with that of study done by Hyeog Gi Choi et al. i.e. (79.5 % achieve dry ear and no healing was noticed) but slightly on higher side. It may be because of more number of irrigation. Result of Mallik et al. 1975 and Chhangani and Goyal in treatment of CSOM with acetic acid are much lower i.e. 40 % than our findings. [8–10] as depicted in Fig. 3.

Failure of treatment in our study was in 16 % (8 patients) in comparison of 15 % failure rate in study of Hyeog Gi Choi and 20.40 % in the study of Mailk et al. 1975 and Chhangani and Goyal but it is insignificant [9, 10].

The mechanism underlying aural cleansing and irrigation with acetic acid appears to be:

1. Removal of inflammatory debris.
2. Destructive effect on biofilm and.
3. Change in the pH media of ear canal interrupts the growth of bacteria by affecting the amino acid which causes alteration in the three dimensional structure of bacterial enzymes. Extreme changes in pH cause protein denaturation [11].

We had failure of treatment in 8 patients' i.e. 16 %.

Assessment of treatment failure showed that the only qualitative feature that had any bearing on response was duration of otorrhoea, longer duration proved most difficult to resolve. The degree of inflammation and size of perforation had no effect on outcome.

The advantages of this treatment are important from the socioeconomic point of view. The cost of therapy is low compared with antibiotic treatment. As such there are no published guidelines for patient presenting with persistent otorrhoea. CSOM is persistent and insidious disease and the mainstay of medical management of CSOM for dry ear is essential before surgical treatment.

The choice of antimicrobial treatment to be combined with aural toilet is a highly contentious issue. A 1985

Fig. 3 Comparative chart showing results of our study with other study

survey of paediatricians in Dallas, Texas (USA), found that 79 % would prescribe topical antibiotics and 100 % would use oral antibiotics as well. A consensus of management formed by 141 physicians with expertise and interest in middle ear infections yielded the following recommended treatment suction out and culture the discharge, prescribe oral antibiotic and adjust according to sensitivity results.

In search for a cheap yet effective medical treatment for CSOM, the main consideration apart from effectiveness is the potential risk of ototoxicity.

Ludman and Nelson advocated similar approaches and cited potential ototoxic effects as a major disadvantage of topical antibiotics. On the other hand most otolaryngologists recommend topical antibiotic therapy and point out the poor penetration by most antibiotics into a devascularized middle ear mucosa masked with subepithelial scarring and thickening [4, 12, 13].

Risk of ototoxicity is one stumbling block in the widespread use of topical antibiotics. Despite the reports of sensorineural hearing loss in human with ear drops, clinician by and large takes them as theoretical possibility of ototoxicity from topical antibiotic and continues to use them.

Our findings of achieving dry ear in 58 % of patients of CSOM managed with topical and oral antibiotic for 15 days preceded with aural toilet are in accordance with those mentioned in literature, the Cochrane review observed 50 % of otorrhoea resolution, Fradis et al. observed similar results, 47.4 and 55 % of otorrhoea resolution rates in his study while Supiyaphun et al. found that topical and systemic antibiotics resolution of ear discharge (76.9 and 37 %, respectively) were higher. [14, 15].

The higher % of resolution of otorrhoea shown by various studies mentioned in literature may be because of the fact that these studies are from western world, where people are comparatively more particular and conscious about their health problem.

Although combination antibiotics are effective in resolving otorrhoea, adding oral antibiotics to topical antibiotics and aural toilet increases the cost without increasing the success rate. This confirms the difficulty of systemic drug penetration through the devascularized, fibrotic mucosa of the middle ear and mastoid. It also emphasizes the critical role of local treatment.

The basic reason for combining oral antibiotic with topical was on the consideration that personal hygiene, sanitation and other aggravating factor play important role in disease process in our country. Most of the patients in our study belonged to low socio economic group. However the drawbacks of treatment with antibiotics include cost, adverse effect, toxic reaction and inconvenience for our patients.

Topical quinolone antibiotics can clear aural discharge better than systemic antibiotics while topical non-quinolone antibiotic (without steroids) or antiseptic results are

less clear. Further studies should clarify topical non-quinolone and antiseptic effectiveness, assess long-term outcomes (resolution, healing, hearing or complications) and include further safety assessments, particularly to clarify the risks of ototoxicity and whether there may be few adverse events with topical quinolones than other topical or systemic treatment.

Conclusion

Medical management of CSOM without cholesteatoma by frequent aural cleaning and irrigation using dilute acetic acid can be more desirable choice as compared to the topical and oral antibiotics. It is safe and economical without producing any side effects. Alteration of pH of ear canal is one of the main factor for healing, in addition to mechanical disruption of biofilm and removal of deep seated debris in poorly vascularized sites such as bones.

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