Clinical Study of Influence of Prognostic Factors on the Outcome of Tympanoplasty Surgery

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Abstract: Myringoplasty is the operation specifically designed to close tympanic membrane defects the main aim of surgery of chronic ear disease is to eliminate disease process and reconstruct middle ear to give the patient a dry safe and functioning ear. In this study a clinical study of myringoplasty underlay technique in the management of central perforations done. Main emphasis is laid on evaluation of prognostic factors like Eustachian tube function, middle ear mucosa at operation and audiometric evaluation pre and post operatively. A series of patients treated in the Department of ENT, Government General Hospital, Kurnool during the period of two years is taken for the study. Relevant literature regarding anatomy, physiology, pathophysiology, clinical features and various methods of medical and surgical management are reviewed.

Keywords: Chronic suppurative otitis media, Tympanoplasty, Eustachian tube function, middle ear mucosa, audiometric evaluation.

I. Introduction

Myringoplasty is the operation specifically designed to close tympanic membrane defects. A perforation in the tympanic membrane can result from physical injury, scalds, burns, pressure effects, head injuries or infection process; out of this suppurative process is the most common cause. Most of these perforations usually heal spontaneously. But this spontaneous healing is hampered by chronicity of infection and certain pathophysiological changes at the perforated margin, leading to a non healing permanent perforation. It leads to constant exposure of middle ear for reinfection hearing disability and danger of certain intracranial and extracranial complications. The main aim of surgery of chronic ear disease is to eliminate disease process and reconstruct middle ear to give the patient a dry safe and functioning ear. In this journey towards the aim, the first milestone is reconstruction of tympanic membrane. In this study a clinical study of myringoplasty underlay technique in the management of central perforations done. Main emphasis is laid on evaluation of prognostic factors like Eustachian tube function, middle ear mucosa at operation and audiometric evaluation pre and post operatively. A series of patients treated in the Department of ENT, Government General Hospital, Kurnool during the period of two years is taken for the study. Relevant literature regarding anatomy, physiology, pathophysiology, clinical features and various methods of medical and surgical management are reviewed.

II. Materials And Methods

A prospective study was carried out at Dept. of ENT and HN Surgery KMC, Kurnool, as part of thesis submission, during period 2006-08. Fifty cases of CSOM with deafness aged between 15-45yrs age group and all cases with Middle ear risk index between 1to3, were taken up for type I Tympanoplasty, with temporalis fascia as graft material. Simple Mastoidectomy was done in cases where mucosa was found abnormal.

Exclusion criteria
1. Infection in nose sinuses, nasopharynx and oropharynx.
2. Deviated nasal septum enlarged inferior turbinate, polyp in the nose.
4. Atticoantral disease cholesteatoma.,

Preoperative evaluation

Duration of Otorrhea, duration of deafness, size of perforation, webers lateralization, Eustatian tube mucociliary clearance by dye test, status of middle ear mucosa pathology at operation, were assessed. Pre and post operative pure tone audiograms were taken to assess pure tone average hearing gain air bone gap closure.

Postoperative follow up:-

Graft uptake was assessed by otoscopy at eight weeks postoperatively. Postoperative audio –grams were taken to assess the improvement in hearing. Patients are categorized for each variable, to be assessed and the base line data thus obtained is analyzed. The analyses of results obtained are represented in a tabular form.
Tympanoplasty reporting protocol

Deafness grading: Mild = 21 to 40 db loss, Moderate = 41 to 55 db loss, Severe = More than 55 db loss.

1. Size of perforation: Large = More than 50% of T.M surface area, Small = Small than 50% of T.M surface area
2. Mucociliary clearance of Eustastic tube: Abnormal = dye not seen within 10 min Normal= dye seen within 10 min
3. Middle Ear risk Index: Normal = 0, Mild pathology = 1-3, Moderate pathology = 4-6, Severe pathology = 7-12
4. Air bone gap closer Brackmann criterion: Excellent = 0-10 db, Good = 10-20 db, Fair = 20-30 db Poor = More than 30 db

Assessment of Eustachian tube function

Just prior to operation, Eustachian tubal function was tested by nasal endoscopy following instillation of 15 drops of fluorescein sodium dye (one in five dilution of 20% solution – sterile) into external auditory canal of the ear with perforated tympanic membrane. Cases in which, the dye was seen at nasopharyngeal end of tube within 10 min of its instillation into the ear were classified as having normal patent Eustachian tubes and others as having abnormal blocked eustatian tubes.

III. Observations

64% of the patients presented with duration of Otorrhea for more than 5 yrs 86% of the patients presented with duration deafness for more than 5 yrs. 54% of the patients presented with age more than 25 yrs. 64% of the patients are females. 58% of the patients are mildly deaf 34% moderately deaf 8% were severely deaf. 58% of the patients presented with small tympanic membrane perforation and 42% presented with large perforation. Eustachian tube mucociliary clearance assessed by dye test showed that the test is abnormal in 54%. Middle Ear mucosa Pathology was assessed at operation and in 58% of the cases it was found normal. Simple Mastoidectomy was done in cases showing abnormal middle Ear mucosa Pathology. Postoperatively graft uptake was assessed at 8 weeks and found that in 78% of the cases it is successful. Postoperative hearing evaluation by pure tone audiometry revealed that the serviceable hearing that is air bone gap closer achieved in db was 54% up to 10 db, up to 15 db 12%, more than 30 db 22%. When Belfast rule of thumb (Gordon Smyth) was applied, postoperative air threshold gain or improvement by less than 30 db was observed in 38% and more than 30 db in 62% of patients. The average hearing gain in db observed in the study population is 7.7 db. The average air bone gap closure achieved in the study population is 9.75 db. Master chart showed the observations in patients in table no. 1

IV. Discussion

Analysis of results showed in table no. 2. The present study was undertaken, 1) to evaluate patients undergoing type – I tympanoplasty for Chronic Suppurative Otitis Media with Deafness in terms of Graft uptake and Hearing gain or improvement , 2) to evaluate the relative incidence of the following factors viz., a) duration of otorrhea b) duration of deafness c) Eustachian Tube mucociliary clearance function, d) Middle ear mucosa pathology at operation in patients undergoing Type – I Tympanoplasty 3) The surgical outcome measures and relative incidence of these factors will be compared with that of similar studies . The final objective in myringoplasty is to achieve a safe, dry ear, with an intact tympanic membrane . Most authors agree that preoperative abnormalities indicative of severity of underlying Eustachian tube dysfunction and Infection have a significant influence on prognosis . Black noted that good risk patients had a 67% chance of obtaining hearing within 10 db versus only a 25 % chance if they were considered poor risk.In the present study 54% of the patients are of more than 25 yrs of age. 46% of them were in the age group of less than 25 yrs. where as in a study conducted by Ajmal (Ref.2) 66% of the patients belonged to the age group of more than 25 yrs and 33% of them belonged to less than 25 years. The sex distribution in the present study showed 36% of males and 64% females, where as Ajmal in Ref.2- Showed 58.4% of males and 41.6 females, Saeed in Ref.24- Showed 59% males 40.95 females. In the present study Eustachian tube mucociliary function as assessed by fluorescein dye test showed abnormal patency in 54% and normal in 46% where as Sethi in Ref.26- Showed abnormal patency in 32% and normal in 68%. Gimenz (Ref.9) showed abnormality in 22% and 50% normal patency. The present study showed abnormal middle ear mucosal pathology such as polyoidal mucosa, granulations, tympanosclerosis in 42% of patients and normal mucosa in 58%. Whereas Debora in (Ref. 5) has shown 13.4 % of his patients showed middle ear mucosal pathology and normal mucosa in 81.4%. Sethi in Ref 26- has shown 20% abnormal mucosa and 80% of them having normal mucosa. The present study showed that in 58% of patients there was small central perforation and in 42% large perforation was present. In the study done by Ajmal in Ref. 2- there were patients with small perforations in 33.3% and 25% large, Sethi in Ref. 26- 16% were small perforations and 66% were large Saeed in Ref.24- 66% were large perforation, Debora in Ref.5- 42.2% were small perforations and 57.7% were large perforations. The present study showed successful graft
uptake in 78% and failure of graft in 22% of patients. In the review literature various authors have reported the successful Graft uptake and closure rate as follows, viz., Ajminal in Ref.2- 60% Debora in Ref.5- 80.4%, Frade in Ref.6-73.6%, Kageyama in Ref.14- 82%, Kotcheva in Ref. 15- 82.2% Saeed in Ref.24- 73.2%, Sheehy in Ref.25- 97%, Sethi in Ref.26- 76%, Yaor in Ref.28- as 89%. In the present study Air-Bone Gap closure upto 10db was achieved in 54% and up to 15db in 12% of patients. In a similar study by Yaor in Ref.28- reported air-bone gap closure to 10db in 40.5% of patients and upto 15db closure in 2.7%, Dr. Mahadevaiah Ref.17- reported 10 db closure in 26% and upto 15db closure in 32% of his patients. In the present study the average hearing gain observed among study population is 7.7db. Whereas Pala & Ramsay in Ref.19- reported 8.0db in their studies. This is in coincidence with the above authors. In the present study, when Belfast rule of thumb (Gordon Smyth) was applied post-operative air threshold gain or improvement in hearing was less than 30db in 38% and more than 30db was observed in 62%. From the above discussion it is apparent that even though the middle ear mucosa was normal only in 58% of patients when compared to similar studies by Debora (81.4%) Sethi (80%), the successful graft uptake observed in the present study is 78% when compared to Graft uptake by Debora (80.4%) and by Sethi (76%). Thus uniform data may not be obtained in all of the variables studied because of observer variation in various studies. The variables are analyzed separately by various authors but in clinical practice all these factors are interconnected and act concomitantly in disease morbidity.

V. Conclusions

Chronic suppurative Otitis media still remains a important health problem in the society. The incidence of chronic suppurative Otitis media, 29.7% in the general populations shows the demand for the availability of medical services. The incidence of reporting of the disease is more common in the females and willingness to undergo surgery is also found more common in them. It may be because of the improved social interaction of females in the present day situations. It is represented in the present study that is 64%. Tubotympanic type of CSOM is more common than the Attico-antral type (5.7%). This is evident in the present study, Thorough clinical examination, history taking and the requirement of the patient in relation to hearing impairment is mandatory to plan the surgery. It is also necessary to have audiological evaluation for both prognostic evaluation and medicolegal aspect. The condition of the middle ear mucosa determines the outcome of the surgery. It also helps in predicting post-operative hearing gain. Patent Eustachian tube is required in tympanoplasty. Patency test like flurecin dye instillation is a simple and effective method of assessing the mucociliary clearance function of the E.T. tube. Cortical Mastoidectomy in those patients who have a middle ear disease in the form of hypertrophy, mucosal edema and granulations helps in clearing the auditus and disease from the mastoid air cells, which is a pre-requisite of a successful Tympanoplasty. Post-operative audiological evaluation after 8 weeks showed hearing gain of 7.7dB on the average is similar to studies compared in the literature. Serviceable hearing that is air bone gap closure to less than 10 dB was achieved in majority of the patients (54%). Long term follow-up for more than 2 years is prescribed to declare the successful tympanoplasty and serviceable hearing, which was not possible in this study. The study has made an attempt to show that careful selection of patients might play a role in obtaining better results, in terms of graft uptake or closure rate and also in interpreting hearing gain results after Tympanoplasty, as well as good technical expertise.

References

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Textbooks
2. Diseases of the Ear; Sixth edition 2006 Edited by Harold Ludman and Tony Wright

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| TABLE No. 2: ANALYSIS OF THESIS RESULTS - GOVT GENERAL HOSPITAL KMC, KURNOOL, DEPT. OF ENT |
|---------------------------------|-----------------|----------------|-----------------|---------------|---------------|---------------|-----------------|---------------|
| Incidence of CSOM with Deafness | ENT - Dept       | OF Census      | 38125           | CSOM with Deafness | 11343         | %              | 29.7 %          | Study period    | Study Size | Study Age Grou   |
|                                 |                 |                |                 |                |               |                |                 | 2006-08        | 50           | p               |
| Duration of Otorrhea            | >5 yrs          | 32/50          | 64%             | <5yrs          | 18/50         | 36%            |                 |               | 50           | 15-45 yrs       |
| Deafness grading                | Mild            | 29/50          | 58%             | Moderate       | 70/50         | 34%            | Severe          | 4/50          | 8%            |
| Size of perforation             | Large           | 21/50          | 42%             | Small          | 29/50         | 58%            |                 |               |               |
| East. Tube function             | Abnormal        | 54%            | Normal          | 46%            |               |                 |                 |               |               |
| Dye test                        | Abnormal        | 32%            | Normal          | 68%            | Sethi A, Singh LJOHNS - 2005 vl 57 Is4 Pg - 283 |
| Middles ear mucosa              | Abnormal        | 21/50          | 42%             | Normal         | 29/50         | 58%            |                 |               |               |
| Simple Mastoidectomy            | 21/50           | 42%            | Nil             |               |               |                 |                 |               |               |
| Duration of deafness            | >5yrs           | 7/50           | 14%             | <5yrs          | 43/50         | 86%            |                 |               |               |
| Sex distribution                | Males           | 18/50          | 36%             | Females        | 32/50         | 64%            |                 |               |               |
| Age distribution                | >25yrs          | 27/50          | 54%             | <25yrs         | 23/50         | 46%            |                 |               |               |
| Graft uptake at 8 wks POP       | Failure         | 22%            | Good            | 78%            |               |                 |                 |               |               |
| Belfast rule of thumb           | >30 db          | 31/50          | 62%             | < 30 db        | 90/50         | 38%            |                 |               |               |
| Average hearing gain db         | 7.7 db          |               |                 |               |               |                 |                 |               |               |
| Average air bone gap closure    | 9.75 db         |               |                 |               |               |                 |                 |               |               |
| achieved db                     |                 |               |                 |               |               |                 |                 |               |               |
| Serviceable hearing - air bone  | 15 db           | 6/50           | 12%             | 10 db          | 27/50         | 54%            | < 10 db         | 6/50          | 12%          | >30db          |
| gap closure achieved db         |                 |               |                 |               |               |                 |                 |               |               |
| Dr. Mahadevaiah                 | 32%             |               |                 |               |               |                 |                 |               |               |
| Middle ear risk Index           | Mild Pathology  | 1to3           | All cases       |               |               |                 |                 |               |               |
| MER Normal                      | 0               |               |                 |               |               |                 |                 |               |               |
| MER Mild Pathology              | 1to3            |               |                 |               |               |                 |                 |               |               |
| MER Moderate                    | 4 to 6          |               |                 |               |               |                 |                 |               |               |
| MER Severe                      | 7 to 12         |               |                 |               |               |                 |                 |               |               |
| MER Uniform Reporting Protocol  |                  |               |                 |               |               |                 |                 |               |               |

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