Mastoid cavity obliteration: Our experience

Shraddha Deshmukh*, Arpit Sharma, Jyoti Dabholkar

Department of Otorhinolaryngology & Head-Neck Services, Seth GS Medical College, KEM Hospital, Parel Mumbai 400012, India

Introduction:
A chronic discharging ear has been a challenge for the otologists for centuries. The mainstay of treatment for cholesteatoma is surgery and the surgical treatment of choice is modified radical mastoidectomy. The open mastoidectomy technique has been the mainstay of management of chronic ear disease; however this type of surgery is not without its problem. It results in the formation of a mastoid cavity which has various problems. Mastoid obliteration is done to eliminate the cavity related problems.

Aims and objectives: To study surgical results of mastoid obliteration, efficacy of different methods of mastoid obliteration, cavity problems and the need of cavity care.

Materials and methods: This study was conducted on 30 subjects having evidence of attico-antral type of disease in middle ear cleft. The mastoid cavity was obliterated with either cartilage/bone dust/flap. Scientific design-prospective study.

Results and conclusions: Incidence of discharge, debris, giddiness, pain was reduced in obliterated cavities. Healing of cavity was better in obliterated ears. Cavity obliterated with bone dust and flap had better and early epithelialisation as compared to cartilage.

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* Corresponding author.
E-mail address: drshrradhadeshmukh@yahoo.co.in (S. Deshmukh).
oblation was first introduced by Mosher in 1911 [3]. He described the use of a superiorly based postauricular soft tissue flap for obliteration.

Subsequently various methods were introduced for obliteration including bone, cartilage, fat, flaps, hydroxyapatite and others.

**Material and methods**

**Selection of patients**

This study was conducted on 30 subjects. Patients selected were of either sex; less than 60 years of age having evidence of attic-antral type of disease in middle ear cleft. These 30 subjects selected were subjected to clinical, audiological and laboratory examination. Pure tone audiogram was done and examination under microscope was done to confirm findings of otoscopy. Consent of patient was taken for mastoidectomy under local or general anaesthesia.

**Surgical technique**

A postauricular skin incision was made. Temporalis fascia graft was harvested. The soft tissue was incised down to the bone. External meatotomy was done. Tympanomeatal flap was elevated. Middle ear was exposed and status of ossicles and presence of cholesteatoma was confirmed. The perios- teum was elevated to expose the mastoid cortex. Mastoid cortex drilling was done. All diseased air cells till dural plate superiorly, sinus plate posteriorly, sinodural angle posteriorly and tip cells inferiorly were removed. Exteriorisation of cavity was done by breaking bridge and lowering facial ridge till level of lateral semi-circular canal. Complete removal of disease was done from middle ear cleft including sinus tympani and facial recess.

**Control group**

In patients assigned to the control group, temporalis fascia graft was used to cover the middle ear. Mastoid cavity was left unobliterated. Adequate meatoplasty was done. Haemostasis was achieved. Post auricular incision was closed in layers.

**Case group**

Mastoid cavity was obliterated with either cartilage/bone dust/flaps. In our study tragal cartilage or conchal cartilage were used for obliteration. The bone dust used for obliteration was collected using a large cutting burr with minimum irrigation, care was taken to prevent contamination by infected discharge or squamous epithelium. For obliteration with flap a post auricular incision is taken. Temporalis fascia and graft is harvested. The bony cortex is now exposed by raising a poster superior temporalis musculoperiosteal flap. The bony cortex is now exposed and canal wall down tympanomastoidectomy was done. The temporalis musculoperiosteal flap is then rotated into the mastoid cavity. Adequate meatoplasty was done. Finally external auditory canal was packed with gel foam. Post auricular incision was closed in layers.

**Postoperative care**

All patients were put on oral antibiotics, analgesics and antihistaminic in the postoperative period. Skin stitches were removed after 7 days. Antibiotics were continued for seven days. All patients were followed up in OPD on days 7, 15, 21, 30, 60, 90 and at 6 months. Healing of the cavity and the associated cavity problems in terms of pain, discharge, giddiness, debris, wax formation were assessed.

**Results**

In our study, 33.33% patients presented with unsafe chronic otitis media were in the age group of 21–30 years, 30% were above 30 years of age, 26.6% were in the age group of 11–20 years and 10% were below 10 years of age. There was equal sex prediction. In our study, all the patients were presented with complaints of ear discharge. 86.6% presented with history of decreased hearing and only 13% presented with tinnitus, and 6% had vertigo. In examination under microscope, it was found that 80% of patients had cholesteatoma, 13.3% had granulations and only 6.6% had polyp. On pure tone audiometry 33.3% had hearing loss of <30 dB, 50% had hearing loss between 30 and 60 dB and only 16.6% had hearing loss >60 dB. Intraoperatively, antrum and aditus were the site of maximum occurrence of cholesteatoma. On postoperative day 30, 40% of control group had pain, while only 20% of cases group experienced pain, 54% of cases had a dry cavity whereas 66% of control group still had ear discharge. Among the patients where cartilage and flap were used to obliterate mastoid cavity, epithelisation had occurred in 60% of cases whereas where bone dust was used epithelisation had occurred in 40% of cases. At the end of 2 months, 80% patients had a dry cavity whereas 20% still had ear discharge. Of the control cases, 60% had a dry cavity whereas 40% still had ear discharge. Amongst the obliteration group, complete epithelisation had occurred in 80% during this period. Three months after surgery, 87% had a dry cavity whereas 13% still had ear discharge. Of the control group 74% had a dry cavity whereas 26% had ear discharge. In addition to this 2 patients of control group were presented with wax. Epithelisation had occurred in 80% of patients where cartilage and flap was used whereas 100% of patients showed epithelisation with the use of bone dust for obliteration.

Six months after surgery, 100% patients had a dry cavity and only 1 patient was presented with wax. Of the control group 94% had a dry cavity and 6% still had ear discharge. Complete epithelisation had occurred in 100% patients obliterated with bone dust and flap, 80% obliterated with cartilage. In our study tragal cartilage or conchal cartilage were used for obliteration. Of the cases obliterated with cartilage 80% had epithelised by 6 months. Only 1 case of cartilage obliteration presented with wax.
A chronic discharging ear has been a perpetual problem and a challenge to the otologists for centuries. The primary objective in surgery of aural cholesteatoma is to completely eradicate the disease to obtain a safe and a dry ear. The second objective is restoring the functional capacity of the ear, the hearing. The open mastoidectomy technique has been the mainstay of management of chronic ear disease, however this type of surgery is not without its problem. It results in the formation of a mastoid cavity which is unnatural and anatomically and physiologically unsatisfactory. The problems of an open cavity [1, 2] are as follows (1) chronic discharge from the open cavity with the incidence of discharge being 20–60%, (2) Dependence on the surgeon for regular cleaning of the cavity (3) dizziness due to exposure of semicircular canals to direct caloric stimulation by air/water entering the cavity (4) Unsightly appearance due to large meatus (5) Difficulty in placing hearing aids. The concept of mastoid obliteration was first introduced in 1911 by Mosher to promote the healing of mastoidectomy defect [3]. The commonest indication of doing the mastoid obliteration technique is following a canal wall down tympanomastoidectomy done for chronic otitis media. A canal wall down mastoidectomy, if not obliterated, can result in persistent otorrhea not responding to topical management. Sade [4] in his landmark article in 1982 proposed the causes of persistent otorrhea as high facial ridge, large cavity, small meatus causing inadequate drainage, tympanic membrane perforation leaving middle ear mucosa and eustachian tube opening open to the discharging cavity and inadequate clearance of the disease. In view of above an ideal mastoid cavity is described as a small cavity which is well saucerised with no sumps and ridges with adequately lowered facial ridge with adequate meatus for drainage with intact tympanic membrane or closed middle ear which isolates eustachian tube opening from the cavity. So the indications for mastoid obliteration are canal wall down mastoidectomy, chronic otorrhea or nonhealing of mastoid bowl, CSF leak, extensive temporal bone trauma, temporal bone resection for malignancy, coochlear implantation in patients with chronic otitis media, labyrinthitis ossificans in whom a drill out of cochlea is required with removal of posterior canal wall and tympanic membrane, treatment of chronic otitis media in ears with no useful hearing [5].

Obliteration of mastoid cavity thus leaves a smaller surface requiring epithelisation and healing is fast. The exposed bone is covered with flap which reduces the likelihood of granulation and discharge. The cavity being smaller is also more likely to retain its epithelial migration potential and is self-cleaning. In patients with successfully obliterated cavity, the smaller surface area and protection of lateral canal by obliterating material allows most patients to swim free of complications. Hearing aids if required are better tolerated in an obliterated cavity than an open cavity.

On the basis of all above observations we infer that cavity obliteration is a useful method of reducing postoperative morbidity of patients. It reduces the postoperative cavity problems thereby decreasing the patients’ dependence on the doctor thus improving the quality of life. The otologist who fails to produce a dry ear has failed to relieve the patient of what concerns him the most. A discharging foul smelling ear must not be regarded as a successful outcome of cholesteatoma surgery and these patients should be offered an effective treatment in the form of obliteration.

Conclusion

Incidence of discharge, debris formation, giddiness, pain was reduced in obliterated cavities as compared to nonobliterated cavities. Healing of mastoid cavity as evidenced by epithelialisation, at the end of six months was better in obliterated ears versus non obliterated ears. Cavity obliterated with bone dust and flap had better and early epithelialisation as compared to cartilage. Patient with obliteration require less cavity care, thus decreasing doctor dependence, frequent OPD visits and fewer courses of medical treatment and hence less burden on hospital resources.

Authors' contributions/Wkład autorów

Shraddha Deshmukh – study design, data collection, literature search, Arpit Sharma – statistical analysis, data interpretation, Jyoti Dabholkar – acceptance of final manuscript version.

Conflict of interest/Konflikt interesu

None declared.

References/Piśmiennictwo