

Mastoid Cavity Obliteration Using Bone Pate and Ribbon Like Temporalis Muscle Flap: Our Experience



Bansal Chetan¹, Varma Arvind² and VP Singh^{2*}

¹Department of ENT, Shri Guru Ram Rai Institute of Medical Sciences, India

²Department of ENT, Shri Mahant Indires Hospital, India

Submission: March 09, 2018; **Published:** March 22, 2018

***Corresponding author:** VP Singh, Department of ENT, Shri Mahant Indires Hospital, Dehradun, Uttarakhand, India, Tel: 08979467716; Email: drchetanent@yahoo.in

Abstract

Objective: The aim of this study was to elucidate a mix of bone pate with ribbon like temporalis muscle flap for mastoid cavity obliteration after mastoid surgery to avoid mastoid cavity problems.

Materials And Method: In 54 patients of Unsafe CSOM (Chronic Suppurative Otitis Media), canal wall down mastoidectomy was done, size of the cavity assessed and ribbon like temporalis muscle flap with bone pate used for mastoid cavity obliteration. Follow up was done at 3 weeks, 3 months and then at 6 months.

Results: Dry cavity with success rate of 83% is achieved with temporalis muscle flap technique of mastoid cavity obliteration.

Conclusion: A mix of bone pate to obliterate the small spaces in the mastoid cavity along with a ribbon like temporalis muscle flap is effective method of mastoid cavity obliteration as it gives a dry ear, is not bulky and most importantly maintains the canal.

Keywords: Chronic Suppurative Otitis Media (CSOM); Cavity Obliteration; Temporalis Muscle Flap

Introduction

Unsafe CSOM (Chronic Suppurative Otitis Media) is traditionally treated with surgery. The surgery is usually an open cavity mastoidectomy (MRM-Modified Radical Mastoidectomy) or Canal Wall Down surgery. At a conservative estimate, 20% of post operative ears stay wet. To create a good self cleansing, dry cavity apart from the low facial ridge, the secret is the match between the cavity size and the meatoplasty. However, there is a cosmetic limit to the size of the meatoplasty that can be done. At times, it is felt that the meatoplasty will be actually inadequate in a very large post operative mastoid cavity. The only answer is to decrease the size of the postoperative mastoid cavity. This is done by cavity obliteration.

Obliteration is a technique which obliterates the cavity and promotes healing by decreasing the surface area to be epithelialised. Materials and flaps are usually used for the obliteration. The materials which have been tried are blood clot, cartilage, bone chips, bone pate, inert glass beads, bone wax and hydroxyapatite amongst other materials. The variety of flaps devised for obliteration are also numerous. However, all the flaps which are required for adequate obliteration are usually too bulky, or they are unable to reach the depths of the cavity including the mastoid tip. This study is aimed to describe a

ribbon like temporalis muscle flap for mastoid cavity obliteration and its results discussed.

Material and Method

54 patients underwent mainly revision mastoidectomy using post aural approach from July 2011 to Jun 2014. Inclusion criteria were patients undergoing Modified Radical Mastoidectomy (MRM) for unsafe disease with or without complication, facial nerve decompressions and in revision cases (discharging ears post Modified Radical Mastoidectomy). Exclusion criteria were Safe Chronic Suppurative Otitis Media. Using a retroauricular approach, an extended retroauricular incision in shape of lazy S extending into the temporal region is given (Figure 1). Temporalis fascia is widely exposed and graft taken (Figure 2). Starting with the mastoid cortex bone removed with a drill, the bone dust is collected from the initial drilling. Canal Wall Down mastoidectomy is done and the size of the cavity assessed. Area or extent of obliteration is assessed. Small deep cells or pockets are eradicated or obliterated using the bone paste (Figure 3). A ribbon like temporalis flap is created whose length is as per the requirement (Figures 4-6). The ribbon like flap is placed into the cavity as required (Figure 7). Fascia is placed in the middle ear and extending over the muscle flap. Meatoplasty is done and

ensured that the skin flaps cover the fascia. A antibiotic pack is placed in the canal. A normal mastoid dressing done this is removed after 48 hrs. Sutures are removed after 7 days. The ear

pack is removed after 3 weeks. Follow up is done at 3 weeks, 3 months and then at 6 months (Figure 8) and results analysed.

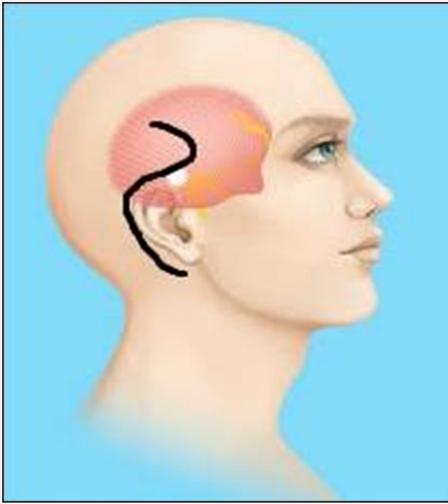


Figure 1: An extended retroauricular incision in shape of lazy S.

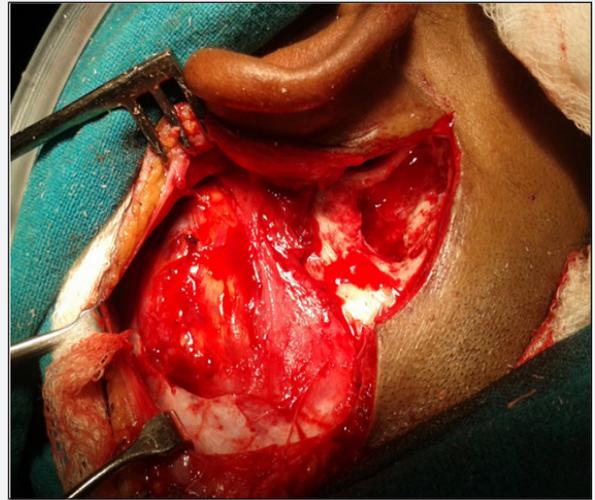


Figure 2 :Temporalis fascia with muscle is widely exposed and graft taken.

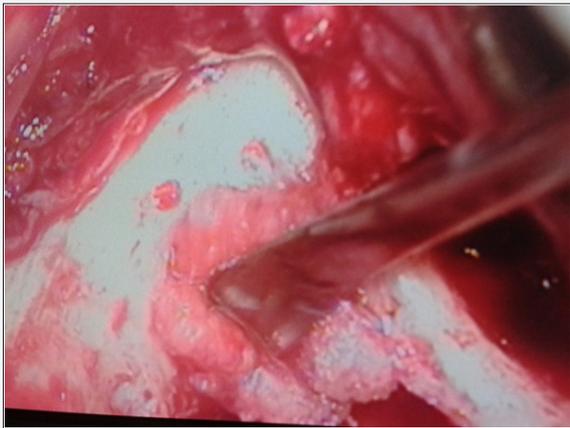


Figure 3 : Small deep cells or pockets are obliterated using the bone paste.

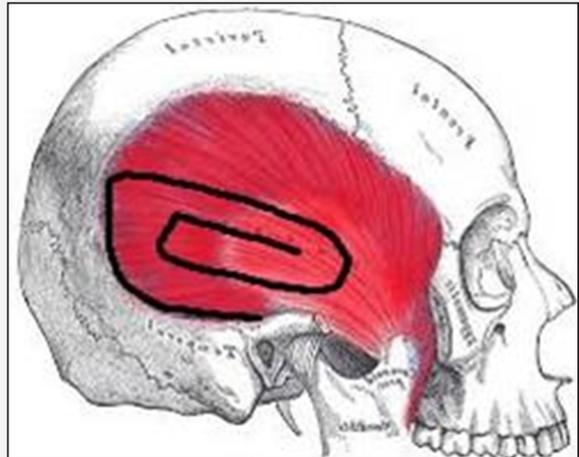


Figure 4 : Incision outline.



Figure 5 : Incision outlined on patient.

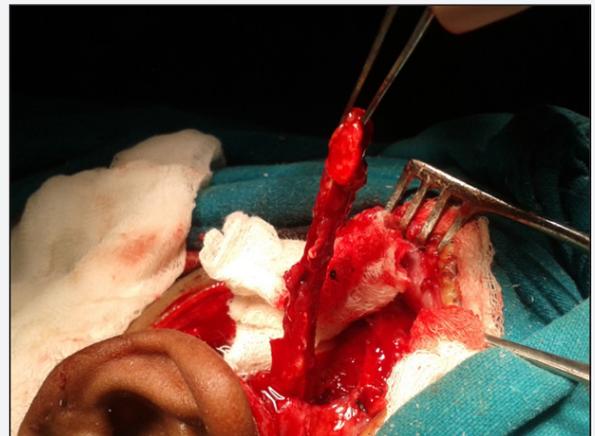


Figure 6 : Raised temporalis muscle flap.



Figure 7 : Flap being placed into the cavity.



Figure 8 : Post operative result.

Statistical Analysis

The data was entered into Microsoft Excel and analysed using SPSS (Statistical Package for Social Sciences) package version 21.0 (IBM inc. Chicago, USA) for relevant statistical comparisons. Results are presented in the form of tables and graphs. The Categorical variables are summarized as frequencies and percentages. Inferential statistics was done using the chi-square test for the categorical variables. Level of statistical significance was set at p-value less than or equal to 0.05.

Informed Written Consent: Informed written consent was taken from all the patients involved both for treatment as well as for any documentation/presentation/publication/data analysis.

Institutional Ethics Committee (IEC) Clearance: Study is done as per the clearance and guidelines of our IEC.(LETTER ENCLOSED)

Results

54 cases of mastoid cavity obliteration were done in the past 3 years using ribbon like temporalis muscle flap. The distributions of these cases are as below

- I. Primary Obliteration in Unsafe Chronic Suppurative Otitis Media 03
- II. Otitis Media 03

- III. Revision surgery and obliteration in a wet ear 28
- IV. Unsafe Chronic Suppurative Otitis Media with erosion of the tegmen tympani 08
- V. Unsafe Chronic Suppurative Otitis Media with lateral sinus thrombosis 06 nerve exploration with Canal Wall Down approach 04
- VI. Cerebrospinal Fluid otorrhoea and brain fungus 03 Mastoid tip obliteration (Bezold abscess) 02 TOTAL 54

Table 1: Post operative results.

Follow Up	At 3 months	At 6 months
Dry ears	45	53
Still discharging ears	9	1
Total	54	54

At the end of 3 months 45 ears were dry (Table 1). 9 had persistent discharging ear which had to be revised. The cause was an inadequate meatoplasty. At end of 6 months only one ear was wet. 2 cases had a narrow meatus with a bulky posterior wall 2 (though dry). In addition to these 7 cases had granulations near the meatoplasty which required repeated sittings of chemical cautery. On assessment after 3 months 52 cases had mild to moderate deafness. 2 cases had developed Sensory Neural Hearing Loss (caused by? drilling).

Discussion

Canal wall down mastoidectomy has been the backbone in treatment of unsafe ear disease. None the less this surgery leads to creation of a mastoid cavity which is abnormal and anatomically and physiologically unacceptable. The causes of persistent otorrhoea was given by Sade in his article as high facial ridge, large cavity, small meatus causing incomplete drainage, tympanic membrane perforation leaving middle ear mucosa and eustachian tube opening open to the discharging cavity and inadequate clearance of the disease. In addition, an open cavity [1,2] also leads to chronic ear discharge with incidence being 20% to 53%, regular hospital visits for ear cleaning, vertigo due to exposure of semicircular canals to direct caloric stimulation by air/water entering the cavity , ugly appearance due to large meatoplasty and hinderance in fitting the hearing aids. This in the long term results in patient unsatisfaction. An ideal mastoid cavity should be

- a) Small
- b) Well saucerized
- c) With no sumps and ridges
- d) With adequately lowered facial ridge
- e) With adequate meatus for drainage
- f) With intact tympanic membrane or closed air filled middle ear which isolates eustachian tube opening from the canal and the mastoid cavity

This is difficult to do in all the primary surgeries as removal of the disease is the primary aim. However, as a secondary surgery it can be achieved by mastoid cavity obliteration. Obliteration of the mastoid cavity is usually done in

- a) A large mastoid cavity resulting from disease in a well pneumatized ear, resulting in a very large cavity. In these cases an adequate meatoplasty would result in a unsightly cymba choncha.
- b) Dura exposed in the tegmen tympani
- c) In CSF otorrhea with a dural defect
- d) A chronically discharging ear for revision surgery,
- e) Sigmoid sinus exposed in the sinus plate
- f) Obliteration of the mastoid tip
- g) To avoid the formation of a sump
- h) To decrease the volume of the ear for fitting of a hearing aid

Raising of the muscle flap was initially used to close post auricular fistulas, but subsequently used to obliterate the mastoid cavity. In 1911 Musher was the first to conceptualize the technique of mastoid cavity obliteration to enhance early healing of mastoid defect [3]. Over the past 2 to 3 decades various materials, flaps and techniques have evolved for mastoid cavity obliteration. These flaps are can be pedicled muscle flaps which are largely superiorly based, inferiorly based or anteriorly based. Most of these flaps are bulky and cannot obliterate in depth, i.e. the attic or the mastoid tip especially anterior and inferior flaps. At times these also leave a very narrow canal wall which is not self cleaning. Materials ranging from biological as well as alloplastic have been used for mastoid cavity obliteration [4-14]. Each of the methods has advantages and disadvantages. Biological materials including cartilage [13], bone, fat and various flaps are resistant to infection, but have the disadvantage of resorption, atrophy, curvature, difficulty in sculpturing and donor site morbidity. The most popular of these all is the muscle flap and various flaps have been devised over the years. A few examples are the Palva flap, Korner flap, Guilford flap for the mastoid tip amongst others. Whereas alloplastic materials, including hydroxyapatite and bone wax, have the advantages of being easily available, no resorption and no donor site morbidity; Out of all the alloplastic materials used, hydroxyapatite has been the most successfully used, but has been associated with the risk of infection and exposure [10]. Some of the materials used result in a foreign body reaction which requires reoperation and removal of the material.

Requirement of an ideal muscular flap is:

- a. Conveniently accessible from the surgical site
- b. Which is versatile?
- c. Is reasonably robust

- d. Can be adjusted to the situation.
- e. It should have a good long term prospect.
- f. Easily harvestable,
- g. With a good blood supply
- h. With adequate material present
- i. Is not too bulky

A thin Temporalis muscle flap is usually based on the superficial temporal artery, is ribbon like and has a more than adequate length. It is versatile and flexible. Donor area is close to the receptor area, therefore blood supply is apparently not really an issue. We are yet to see complete fibrosis or necrosis of the flap. In similar studies conducted by Palva et al, an anteriorly based musculoperiosteal flap was used with success rate of 80% [11] and by N B Solomon using bone pate for mastoid cavity obliteration was 78% [12]. This study shows similar results with success rate of 83%. Epithelisation is early in obliterated cavity due to smaller surface area. Chances of granulation and discharge decreases as exposed bone are covered by flap. Moreover because of smaller cavity size it is expected to retain its epithelial migration and self cleaning and thus remains dry [15]. Patient can also swim without complications because of small cavity size and protection of lateral wall by obliterated material. 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. Especially useful is the combined use of bone dust for obliteration of small cavities and the muscle flaps for the larger outline of the cavity. It lessens the postoperative cavity problems thereby reducing the patients' reliance on the doctor thus improving the quality of life.

Irrespective of the method used, principles to follow include creating a mastoid cavity with an oval shape, leaving a low facial ridge and creating an adequate sized meatoplasty for easy toileting and inspection. Overall, the surgical method used should be appropriate to the patients diagnosis, defect size and surgeon experience as the result obtained is dependent not just on the type of obliteration or reconstruction method, but also surgeon expertise.

Summary

- a) A mix of bone pate to obliterate the small spaces in the mastoid cavity along with a ribbon like temporalis muscle flap is effective method of mastoid cavity obliteration.
- b) It gives a dry ear, which is not bulky and most importantly maintains the canal.

References

1. Beales PH (1959) The problems of the mastoid cavity. *J Larynol otol* 73: 527-531.
2. Males AG, Gray RF (1994) Mastoid surgery: quantifying the distress in a radical cavity. *Clin Otolaryngol* 19: 194-198.

3. Ojala K, Palva A (1982) Results of oblitative cholesteatoma surgery. Arch Otolaryngol 108(1): 1-3.
4. Ringenberg JC, Fornatto EJ (1962) The fat graft in middle ear surgery. Arch Otolaryngol 76: 407-413.
5. Moffat DA, Gray RF, Irving RM (1994) Mastoid obliteration using bone pate. Clin Otolaryngol Allied Sci 19(2): 149-157.
6. East CA, Brough MD, Grant HR (1991) Mastoid obliteration with the temporoparietal fascia flap. J Laryngol Otol 105(6): 417-420.
7. Cheney ML, Megerian CA, Brown MT, McKenna MJ (1995) Mastoid obliteration and lining using the temporoparietal fascial flap. Laryngoscope 105(9 Pt 1): 1010-1013.
8. Mahendran S, Yung MW (2004) Mastoid obliteration with hydroxyapatite cement: the Ipswich experience. Otol Neurotol 25(1): 19-21.
9. Kakigi A, Taguchi D, Takeda T (2009) Mastoid obliteration using calcium phosphate bone paste with an artificial dermis soaked with basic fibroblast growth factor: preliminary clinical report. Auris Nasus Larynx 36(1): 15-9.
10. Ridenour JS, Poe DS, Roberson DW (2008) Complications with hydroxyapatite cement in mastoid cavity obliteration. Otolaryngol Head Neck Surg 139(5): 641-645.
11. Palva T, Palva A, Salmivalli A (1968) Radical Mastoidectomy with cavity obliteration. Archives of Otolaryngology 88(2): 119-123.
12. Solomon NB, Robinson JM (1988) Obliteration of mastoid cavities using bone pate. J of Laryngol Otol 102(9): 783-784.
13. Lee HJ, Chao JR, Yeon YK, Kumar V, Park CH, et al. (2017) Canal reconstruction and mastoid obliteration using floating cartilages and musculoperiosteal flaps. Laryngoscope 127(5): 1153-1160.
14. Samad Ghiasi (2015) Mastoid cavity obliteration using combined Palva flap and bone pate. Iran J Otorhinolaryngol 27(78): 23-28.
15. Harun A, Clark J, Semenov YR, Francis HW (2015) The role of obliteration in the achievement of a Dry Mastoid Bowl. Otol Neurotol 36(9): 1510-1517.



This work is licensed under Creative Commons Attribution 4.0 License
DOI: [10.19080/GJO.2018.13.555875](https://doi.org/10.19080/GJO.2018.13.555875)

Your next submission with Juniper Publishers will reach you the below assets

- Quality Editorial service
- Swift Peer Review
- Reprints availability
- E-prints Service
- Manuscript Podcast for convenient understanding
- Global attainment for your research
- Manuscript accessibility in different formats
(Pdf, E-pub, Full Text, Audio)
- Unceasing customer service

Track the below URL for one-step submission

<https://juniperpublishers.com/online-submission.php>