

# Posterior Ear Canal Reconstruction by Autologous Cartilage and Flaps in One Stage

Khaled M Mokbel Khalefa, MD

Professor of ORL, Faculty of Medicine, Mansoura University, Egypt

Corresponding author: Dr. Khaled M Mokbel Khalefa

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## ABSTRACT

**Background:** Reconstruction of the posterior canal wall should be planned by the surgeon in canal wall down mastoidectomy to prevent the resulting cavity that is prone to recurrent infection. The surgeon should choose the type of grafts either autologous, homologous or allografts. Furthermore, the surgeon should decide whether to do immediate reconstruction or delayed one.

**Methods:** In this study, the ridge was reconstructed at the same time of mastoidectomy by autologous tissues. We used conchal cartilage graft vascularized by pedicled perichondrial and periosteal flaps. The study included 48 patients (32 males and 16 females) with age ranged from 18-55 years. All patients were with unilateral chronic suppurative otitis media with persistent discharge. They had been operated at our tertiary hospital between Jan. 2012 to march 2014

**Results:** Successful reconstruction was obtained in all cases with no dehiscence, necrosis or canal stenosis

**Conclusion:** The use of composite conchal cartilage with perichondrial and periosteal flaps in repair of the ridge is highly efficient. The presenting study recommends doing this repair at the same operative time concomitantly with canal wall down mastoidectomy

**Keywords:** Mastoidectomy, Cholesteatoma, Cartilage graft, Perichondrium, Periosteum, flaps

## INTRODUCTION

Goals of surgical management of chronic otitis media include eradication of the

disease together with preservation and restoration of functional anatomical structures. Many otologic surgeons prefer intact canal wall mastoidectomy with tympanoplasty but sometimes there will be indications for canal wall removal because of extensive disease, cholesteatoma difficult to access, operation on the only hearing ear or uncertainty of adequate follow-up [1]. In the canal down technique, the resulting cavity often prone to recurrent infection and needs periodic cleaning. Extensive cholesteatoma with or without granulation tissues is the main pathology that indicate the necessity to the operation. Lowering of the ridge (the posterior bony canal wall) makes myringoplasty and ossiculoplasty difficult [2]. Leaving the cavity unrepaired is not ethical because it will lead to deterioration of hearing, exposure to recurrent infection, and subsequent hearing aid difficult fitting. So, the reconstruction of the canal wall is necessary to eliminate the resulting cavity problems and to facilitate hearing reconstruction. Canal wall repair can be achieved by a number of organic and non-organic materials as autologous or homologous cartilage or mastoid bone pate [3,4]. Allo-materials as hydroxyapatite, glass, ceramics, titanium [5,6]. Beside the hard tissue repair of the canal wall, soft tissue is added to give blood supply to the reconstructed part for that the best is a local pedicled flap. The use of cartilage in repair of tympanic membrane by different techniques are well established hence that

encouraged us to reconstruct the canal wall by using autogenous conchal cartilage from the same ear. Vascularization of the cartilage graft is necessary for its survival so the necessity to use a vascularized flap where graft necrosis is a possibility if there is lacking in vascularization. In this study we used composite conchal cartilage with perichondrial flap widely based on the posterior surface of the auricle.

## **MATERIALS & METHODS**

The posterior canal wall (ridge) was reconstructed immediately after canal wall down mastoidectomy in 48 patients (32 males and 16 females) with age ranged 18-55 years. All cases had unilateral chronic suppurative otitis media. Reconstruction was achieved by composite conchal cartilage graft and perichondrial flap with the posterior periosteal extension. All cases were repaired immediately in the same stage of the operation. The clinical presentations were hearing loss, offensive discharge, cholesteatoma in 30 cases, granulation tissues in 12 cases and aural polyp in 6 cases. Severe conductive hearing loss was detected in all cases. Cases with sensorineural loss were excluded. The follow up period ranged from 12-30 months.

### **Operation:**

Canal wall down mastoidectomy was performed by postauricular incision. The periosteum was incised 3 cm postauricularly in the form of U-shaped flap that dissected forward. The posterior meatal skin flap was elevated till the tympanic annulus. In the polyp cases, it was removed at first to facilitate the elevation of the skin flap. Mastoidectomy was completed conventionally provided that the anterior buttress and the posterior buttress were created. The healthy parts of tympanic membrane and ossicles were preserved intact.

Creation of the composite cartilage and the pedicled flap:

The postauricular skin and connective tissue was elevated from the back of the concha. A curvilinear incision is made in the posterior

conchal perichondrium. Posterosuperiorly the perichondrium was kept in continuity with the periosteum so as to develop a superior based flap consisted of perichondrium with periosteum extension. The conchal cartilage is harvested along the perichondrium on the anterior surface. The amount of the cartilage depended on the size of the canal defect. After completing the mastoidectomy in the conventional way, the zygomatic root anterior buttress and the facial ridge posterior buttress are tunneled in order to retain the cartilage which should be inserted under tension. At this stage tympano-ossicular repair was done. The cartilage was then inserted to fill the defect in the posterior meatal wall then the perichondrial/periosteal flap was draped on the cartilage. The skin of the canal was then spread on the flap. Now the new posterior wall consists of; the skin, the flap and the cartilage in that order from the meatal to mastoid side. Silastic strips are inserted into the canal to line it and support the repaired canal. Gel foam/antibiotic ointment is packed in the mastoid cavity. The ear canal was packed by a mercel ear wick with ointment. Mastoid dressing was maintained for 48 hours. The external canal packing is removed after 2 weeks and the slapstic strips after 4 weeks and then the canal is treated with antibiotic ointment for 1 month.

## **RESULT**

After 4 weeks from the operation 5 cases showed infection with discharge, they were treated with antibiotic ointment and systemic antibiotics for 1 week with complete response. Granulation tissue occurred in 4 cases after 6 weeks; they were cauterized and treated by antibiotic/corticosteroid ointment for 10 days, complete healing occurred in all cases. No canal stenosis or dehiscence had occurred in this study.

## **DISCUSSION**

Still, many patients attending to our ENT clinics with suppurative otitis media have advanced disease with cholesteatoma and

granulation tissues, making its eradication are very difficult by using canal wall up technique [7]

As enthusiasm for intact canal wall tympanoplasty was developing in the mid-1960s, it became apparent that a method for repair of defects in the bony canal wall was imperative [8]

Different materials such as autograft bone, proplast, plastipore, ceravital, hydroxyapatite, glass ionomer and titanium [5, 9-12] can be used for reconstruction of the posterior bony canal. Without doubt the uses of autogenic tissues are better to increase the take rate and avoid rejection. We prefer composite conchal cartilage with perichondrium because it is easily accessible and can be harvested in large amount from the same location of surgery without deformity. Cartilage from concha has contour is ideal for the recipient site; it resists retraction and extrusion and easily used for concomitant tympanic membrane reconstruction. The fact that successful canal reconstruction is not only dependent on the substance of the support layer but also on the viability of the overlying tissues has been well established [9]. The vascular flaps keep the viability and survival of the cartilage. Some authors describe the use of the vascularized pericranial flap in this respect with good result. The perichondrium flap is effectively vascularized, easily to harvest and available in the surgical field without the need for further dissection. So it may reduce the ischemia of the underlying cartilage graft and the overlying skin. The incidence of dehiscence without the application of the perichondrial flap in the study of McCleave [8] was 10 %. So without doubt good vascularization allows good take rate and good healing, this exactly what the perichondrial flap does. Complete eradication of underlying pathology is the mainstay steps in cholesteatoma surgery so canal wall down is essential to accomplish this target. The most common cause of dehiscence in the graft is incomplete soft tissue coverage [13]. The three component flap provides a source of nutritional support

for both cartilage and the epithelium. Canal stenosis is a problem which is reported in some studies [14]. The cause of stenosis was due to thick flaps so it is essential to make thinning of the flap before insertion.

## **CONCLUSION**

Successful reconstruction of the bony posterior wall (ridge) after mastoidectomy demands that the support matrix be covered by a viable soft tissue. The three component flap (cartilage, perichondrium, and periosteum) based on the postero/superior periosteum is used to provide both physical and physiological support to the cartilage and to the canal skin. The flap protects the underlying cartilage from exposure decreasing the incidence of dehiscence, the rapid incorporation of the flap into the canal wall suggests that it provides a nutritional source and encourages vascular ingrowths so decreases atrophy and subsequent dehiscence of the canal wall. I recommend this method because the perichondrium flap is local flap easily created and the cartilage is easily harvested without the use of expensive synthetic materials may not be available all the time. Immediate repair is better than the delayed one because there is no scarring and the tissue is more viable and intact.

## **Declaration by Authors**

**Ethical Approval:** Approved

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**Conflict of Interest:** The authors declare no conflict of interest.

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