BRIEF COMMUNICATION

Split Thickness Skin Grafts in Four Cases of Medial Meatal Fibrosis of the External Auditory Canal

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Received 31 March 2014; accepted 16 July 2014

Abstract Medial meatal fibrosis is a rare condition in which the medial portion of the external auditory canal is obliterated with fibrous tissue.

We selected 4 cases of patients with medial meatal fibrosis with a history of recurrent otitis media who underwent surgery during the years of 2012 and 2013, presenting the surgical results here. Physical examination showed an obliterated external auditory canal and conductive hypoacusis. All cases were solved using a split thickness skin graft from the thigh.

The surgical principles that appear to correlate with a favorable outcome are the removal of all fibrous tissue and unhealthy skin, a wide canaloplasty and the use of a split thickness skin graft.

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KEYWORDS
Fibrosis; External ear canal; Free tissue flaps

Injerto parcial de piel en cuatro casos de fibrosis media del conducto auditivo externo

Resumen La fibrosis media del conducto auditivo externo es una situación rara caracterizada por la presencia de tejido fibroso en la zona media de dicho conducto.

Se seleccionaron 4 pacientes con fibrosis media del conducto auditivo externo intervenidos quirúrgicamente durante los años 2012 y 2013. Todos los pacientes presentaban como antecedente una otitis media recurrente. El examen físico mostró un conducto auditivo externo invadido con tejido fibroso y una pérdida auditiva conductiva. Todos los casos fueron resueltos con recurso a la sustitución de la piel del conducto auditivo externo por injerto parcial de piel.

Los principios quirúrgicos que parecen traducir un resultado favorable se basan en la eliminación de la totalidad del tejido fibroso y de la piel del canal auditivo externo, en la realización de una amplia canaloplastia y en el recurso al injerto parcial de piel.

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Introduction

The medial fibrosis of the external auditory canal (EAC) is a rare condition in which the medial portion of the CAE is obliterated with fibrous tissue. The etiology can be traumatic, post-operative or post-inflammatory/infectious.\(^1,2\)

The pathophysiology is not yet fully known but it is thought that the process begins with an ’’aggression’’ to the EAC and tympanic membrane.\(^2\) It is characterized by an active and progressive inflammatory/infectious stage followed by formation of a mature fibrous scar in the medial portion of EAC.\(^3\)

In the active stage of the disease the treatment is limited to the local debridement, anti-microbial treatment and cauterization.\(^7\) In the mature phase, treatment options are the use of hearing aids or surgery.\(^3\)

Surgery involves excision of all the fibrous tissue of the EAC and the involved skin followed by canaloplasty and reconstruction with partial skin graft.

Materials and Methods

We present 4 clinical cases of patients with medial fibrosis of the EAC who underwent surgical treatment in 2012 and 2013. The surgical technique used in the 4 patients is described below.

Harvest of the Split Thickness Skin Graft

A manual dermatome was used. The donor skin is lubricated. The dermatome is placed at an angle of 30°–45° with the donor surface (in this case the skin of the thigh). Proper skin tensioning is important. After being harvested the graft is placed on fat gauze with the inner surface facing upward. Incisions are performed in the skin with a blade to increase the area and to avoid flap retraction. Fat gauze was placed over the donor surface.

Removal of the Fibrous Scar and Placing the Flap

A retroauricular approach was used. A circumferential skin incision is made laterally to the EAC fibrous scar. The entire affected skin and fibrous scar are removed, leaving the bone exposed, and also the epithelial layer of the tympanic membrane.

A wide canalplasty is made with drill in order to view the entire tympanic anulus. A single flap of skin is placed in order to cover the whole circumference of the EAC. Attention to this step because the flap will undergo some shrinkage. The EAC is packed with fat gauze and the plans are closed with sutures. The plug was removed after 15–20 days postoperatively.

Results

Case Report 1

Male patient, 34 years old with a history of left otorrhea with about 1 year of evolution which stopped one month before observation, and bilateral hearing loss.

On physical examination a left EAC obliterated with fibrous tissue (Fig. 1) and a normal right ear were found. The audometry and audiometry suggested a left conduction hearing loss (SRT: 30 dB; Air-Bone Gap (ABG): 10 dB). The CT scan showed a mass occupying the entire left EAC (Fig. 2).

The patient underwent multiple surgeries to remove the fibrous scar with re-stenosis after 1–4 months.

In July 2012 the patient underwent surgery for removal of medial fibrosis of the EAC according to the technique described above. The tympanic membrane was normal, without perforation.

At 4 months postoperatively the patient was well healed with no evidence of fibrosis of the EAC and we performed an audiogram which showed improvement (SRT: 20 dB; no ABG).

At one and a half year postoperatively the patient was still without evidence of re-stenosis (Fig. 3).

Figure 1 Left EAC obliterated with fibrous tissue.

Figure 2 A mass occupying the entire left EAC.
Skin Grafts in Cases of Medial Meatal Fibrosis

**Case Report 2**

Male patient, 55 years old with a history of hearing loss and recurrent bilateral otorrhea since childhood, with no complaints of otorrhea since 8 years ago.

On physical examination a fibrosis of both CAE was found and acuity suggested a bilateral conduction hearing loss. The audiogram revealed a mixed hearing loss bilaterally (Bilateral SRT: 80 dB; ABG: 35 dB). The CT demonstrated a soft tissue filling in the mastoid cells, mastoid antrum extending to the tympanic cavity with expression in epitympanum and mesotympanum and medial portion of the EAC.

In October 2012 the patient underwent a left tympanomastoidectomy ''canal wall up'' with type III tympanoplasty, complemented by the removal of medial fibrosis of the EAC according to the technique described above. A total perforation of the tympanic membrane was found and the middle ear ossicles were absent. The inflammatory tissue was cleaned, with no evidence of cholesteatoma. Then a reconstruction of the ossicular chain with titanium Total Ossicular Replacement Prosthesis (TORP) and reconstruction of the tympanic membrane with cartilage and temporalis fascia were made. In this case a flap of skin on the external surface of the tympanic membrane was also used.

At the last observation, 1 year postoperatively, the patient was with no evidence of re-stenosis and an audiometry with a SRT of 70 dB and an ABG of 25 dB.

**Case Report 3**

Female patient, 48 years old with a history of bilateral otorrhea and hearing loss for the last 20 years. Physical examination showed a right ear with a chronic otitis media and a left ear with medial fibrosis of the EAC. The audiometry showed a mixed hearing loss on the left ear (SRT: 85 dB; ABG: 25 dB). The CT showed a soft tissue density in the left mastoid, aditus and antrum, epitympanic region evolving the ossicular chain, and EAC.

In February 2013 the patient underwent a left tympanomastoidectomy ''canal wall up'' with type II tympanoplasty, complemented by the removal of medial fibrosis of the EAC according to the technique described above. An intact tympanic membrane and a fixed ossicular chain were found. The inflammatory tissue was cleaned, with no evidence of cholesteatoma and the incus was removed. The ossicular chain was reconstructed with titanium Partial Ossicular Replacement Prosthesis (PORP).

The last observation of the patient, 1 year postoperatively revealed a CAE with no evidence of re-stenosis and an audiometry with a SRT of 80 dB and an ABG of 20 dB.

**Case Report 4**

Male patient, 52 years old with a history of bilateral otorrhea and bilateral hearing loss for the last 30 years. The patient had a history of two surgeries to the left ear (timpanoplasty).

The physical examination revealed a left EAC obliterated with fibrous tissue and a chronic otitis media in the right ear. Acuity suggested a bilateral conduction hearing loss.

The audiometry showed a mixed hearing loss bilaterally (left SRT: 80 dB; left ABG: 40 dB; right SRT: 75 dB; right ABG: 30 dB).

In May 2013 the patient underwent a mastoidectomy ''canal wall up'' without timpanoplasty, and removal of medial fibrosis of the EAC according to the technique described above. The tympanic membrane was found intact.

At 8 months postoperatively the patient had no evidence of fibrosis of the EAC. However, the patient had no improved hearing.

The clinical details and results of the four cases are summarized in Table 1.

**Discussion**

The medial fibrosis of the EAC is a rare disorder that causes conductive hearing loss. The aim of treatment is to resolve the concomitant infection and try to correct the hearing loss.

It is a safe procedure with few complications, in which there is some predisposition to relapse. Recurrence rates after surgery are around 6.7%−18.8%.4-6

Some surgical principles appear to correlate with a favorable outcome:

- proper exposure. Birman and Fagan advocate that the retro-auricular route is the way to attain adequate exposure of the anterior sulcus and anterior tympanomeatal angle1;
- removal of all fibrous tissue and unhealthy skin of the EAC;
- a wide canaloplasty;
- using the skin flap to prevent healing by secondary intention;
- use a plug of fat gauze over the skin flap for a good packing of the EAC;
- meticulous postoperative cleaning.
Table 1 Clinical Details and Results of the Four Clinical Cases.

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<thead>
<tr>
<th>Clinical case 1</th>
<th>Clinical case 2</th>
<th>Clinical case 3</th>
<th>Clinical case 4</th>
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<tbody>
<tr>
<td><strong>Symptoms</strong></td>
<td>Bilateral otorrhea and hearing loss</td>
<td>Bilateral otorrhea and hearing loss</td>
<td>Bilateral otorrhea and hearing loss</td>
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<td>Left otorrhea, bilateral hearing loss</td>
<td>and otorrhea since childhood</td>
<td>history of 2 surgeries to the left ear</td>
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<td>No otorrhea since 8 years ago</td>
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<td><strong>Otoscopy</strong></td>
<td>Both EAC obliterated with fibrous tissue</td>
<td>Right chronic otitis media</td>
<td>Left EAC obliterated with fibrous tissue and a chronic otitis media in the right ear</td>
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<td>Left EAC obliterated with fibrous tissue</td>
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<td><strong>Rinne test</strong></td>
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<td>+R</td>
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<td><strong>Webber test</strong></td>
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<td>No information</td>
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<td><strong>Audiometry</strong></td>
<td>SRT L: 30 dB</td>
<td>SRT B: 80 dB</td>
<td>SRT L: 80 dB</td>
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<tr>
<td>ABG L: 10 dB</td>
<td>ABG B: 35 dB</td>
<td>ABG L: 25 dB</td>
<td>ABG L: 40 dB</td>
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<tr>
<td><strong>CT scan</strong></td>
<td>Soft tissue filling in the mastoid cells, antrum, tympanic cavity and EAC</td>
<td>Soft tissue density in the mastoid, aditus ad antrum, epitympanum region and EAC</td>
<td>No information</td>
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<td>Mass occupying the entire left EAC</td>
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<tr>
<td><strong>Surgery</strong></td>
<td>Removal of medial fibrosis of the EAC</td>
<td>Left tympanomastoidectomy ''canal wall up'' with type III tympanoplasty+removal of medial fibrosis of the EAC</td>
<td>Left mastoidectomy ''canal wall up'' without tympanoplasty+removal of medial fibrosis of the EAC</td>
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<tr>
<td><strong>PO otoscopy</strong></td>
<td>1 year PO: no evidence of restenosis</td>
<td>1 year PO: no evidence of re-stenosis</td>
<td>8 months PO: no evidence of re-stenosis</td>
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<td>1 and ½ year PO: no evidence of restenosis</td>
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<tr>
<td><strong>PO audiometry</strong></td>
<td>SRT L: 20 dB; no ABG</td>
<td>SRT L: 70 dB</td>
<td>SRT L: 80 dB</td>
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<td>SRT L: 20 dB; no ABG</td>
<td>ABG L: 25 dB</td>
<td>ABG L: 20 dB</td>
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There is an agreement that the isolated removal of fibrous tissue and skin replacement is not appropriate. When the wall of the EAC is stripped it is important not to allow it to granulate as this will tend to lead to recurrence of the fibrosis of the EAC.

Several techniques were used and described: pedicle flaps, total skin flaps and partial skin flap. All techniques have some recurrence rate. Some authors reported that the skin from other sites of the body may not have the same properties of the skin of the EAC and as such there is a tendency to re-stenosis secondary to recurrent infections. The total skin flaps have the advantage of suffering less traction during healing; however, they have the disadvantage of the larger volume.

There is a tendency to use multiple grafts to achieve best adaptation to EAC. In the clinical cases presented a single flap of skin to cover the entire CAE with good results was used. This decision was based on the fact that, as the flap retracts, best control is achieved when all of the EAC is covered by skin.

Note the fact that, in the first clinical case, in the previous surgeries (that was not used in this surgical technique) there has been recurrence of disease in a period ranging from 1 to 4 months. After application of this surgical technique, the patient is still without recurrence of the disease one and a half year after surgery.

In the other three clinical cases the patients had also good and lasting results with this surgery.

**Conclusion**

The canaloplasty with use of split thickness skin flap is a simple technique without major complications that seems to significantly reduce the recurrence rate.

**Conflict of Interest**

None.
References