Otolaryngology

USE OF LIYOFILIZED HUMAN AMNIOTIC MEMBRANE AS LINING THE TYMPANIC CAVITIES

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SUMMARY: Lyofilized amniotic membrane in 33 patients and teflon sheet in 20 patients was used as lining in tympanic cavities. Only the patients whose contralateral ears were normal were included in the study and these contralateral ears served as control group. The patients were reexplored 1 year later and the newly formed mucosa examined histologically. The middle ear pressures of the amnion lined and teflon lined ears were measured and compared statistically with each other and with the control group. Our experience shows a normal appearing mucosa in amnion lined group on reexplanation 1 year later compared to the thick, less vascularised mucosa in teflon lined group. The mobility of the tympanic membrane was better in amnion lined ears (66.6%) than teflon lined ears (60%) although the difference was not found significant statistically. In the light of these findings it can be said that lyofilized human amnion membrane is a good biologic material which can be used for lining the tympanic cavities.

Key Words: Human amniotic membrane - tympanic cavities.

INTRODUCTION

One of the main purpose of tympanoplasty operation is to create a middle ear space which contains air. The synthetic materials such as silastic and teflon sheets have some problems of extrusion, infection and adhesions. Human amniotic membrane has been used with good results as temporary or long-term wound dressing, vaginal epithelization, replacement of mucosa, arthroplasty since Davis first reported the use of fetal membrane in skin transplantation in 1910 (2,4,9,10,11). Therefore human amnion membrane was used to determine its usefulness as lining in tympanic cavities and the problems it may cause. The amniotic mesenchyme is derived from the primary extraembryonic mesoderm of the blastocyst and is formed by delamination from the undersurface of the trophoblast. Amniotic membrane is a single layer of cuboidal, epidermis-like cells on a base of scattered fibroblasts in a collagen matrix (1,6,11).

MATERIALS AND METHODS

This study was carried out on 53 patients who was operated by the same group at the ENT Clinic of Hacettepe Medical Faculty. Only the patients whose contralateral ear needed no surgical treatment were included in the study in order to evaluate the ears in a biologic medium. The contralateral ears of these patients served as control group. Liyofilized amnion membrane was used in 33 ears and teflon sheet in 20 ears. The operation methods are shown in Table 1. After the pathology in the tympanic and mastoid cavity was cleaned, amniotic membrane or

Table 1: The operation methods in patients with amnion membrane lined middle ears.

<table>
<thead>
<tr>
<th>Operation method</th>
<th>No of the patients</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radical mastoidectomy + Posterior wall reconstr + cavity obliteration</td>
<td>27</td>
<td>81.8</td>
</tr>
<tr>
<td>Atticoantrotomi</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Atticotomy</td>
<td>4</td>
<td>12.2</td>
</tr>
<tr>
<td>Combined approach</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>33</td>
<td>100.0</td>
</tr>
</tbody>
</table>

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TEFLON SHEET WAS REPLACED INSTEAD OF PATHOLOGIC MUCOSA. TEMPORAL MUSCLE FASCIA GRAFT WAS USED IN RECONSTRUCTION OF TYMPANIC MEMBRANE. THE COMPLETE AUDILOGICAL EXAMINATION WAS PERFORMED BEFORE AND AFTER THE OPERATION USING VIENNATANE M142 AUDIOMETER AND IMPEDANSMETER MEASUREMENTS 1 YEAR LATER AFTER THE OPERATION USING INTERACOUSTICS AZ 3 ELECTRO ACoustIC IMPEDANSMETER IN IAC STANDARD SILENT ROOMS.

THE FOLLOWING CRITERIA WERE USED IN THE EVALUATION OF THE RESULT:

- Pressure between 0, -75 mm H₂O Normal
- Pressure between -75, -300 mm H₂O Eustachian tube dysfunction
- Pressure between -300, -400 mm H₂O Adhesion, mass effect in the middle ear.

The results of the middle ear pressure measured from the operated ears were compared with the normal ears and each operation group with each other using t-test statistically. 10 patients whose middle ear was covered with amniotic membrane and 4 patients with teflon sheet were reexplored 1 year later. The appearance of middle ear mucosa was recorded and the newly formed mucosa was taken for histologic examination.

RESULT

A) Clinical exam: No graft failure or reaction to either amniotic membrane or teflon sheet observed. On control exams after the operations the grafts was well vascularized.

B) Audiological exam: The results of postoperative middle ear impedansmetric measurements of amniotic membrane lined ears, teflon sheet lined ears and normal ears are shown respectively in Tables 2, 3 and 4. The difference between normal ears and the amnion membrane lined ears was found statistically significant (t=2.093, p<0.05). The difference between normal ears and teflon sheet lined ears was found statistically significant (t=2.982, p<0.01). The difference between the amnion membrane and teflon sheet lined ears was not found significant statistically (t=0.865, p>0.05). However, the percentage of the mobile ears postoperatively was higher in amnion lined ears when compared to teflon sheet lined ears.

C) Reexploration findings:

1) Findings of the middle ear mucosa covered with amniotic membrane:

Table 2: Operation methods in patients with teflon sheet lined ears.

<table>
<thead>
<tr>
<th>Operation method</th>
<th>Number of the patients</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radical mastoidectomy + posterior wall reconst + cavity obliteration</td>
<td>6</td>
<td>30</td>
</tr>
<tr>
<td>Atticoantrotomi</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>Atticotomi</td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>Combined</td>
<td>6</td>
<td>30</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 3: Middle ear pressure values of the amnion membrane lined middle ears and contralateral normal ears.

<table>
<thead>
<tr>
<th>Middle ear pressure (mm H₂O)</th>
<th>Number of patients</th>
<th>%</th>
<th>Number of patients</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0, -75</td>
<td>13</td>
<td>39.3</td>
<td>22</td>
<td>66.6</td>
</tr>
<tr>
<td>-75, -300</td>
<td>7</td>
<td>21.4</td>
<td>4</td>
<td>12.0</td>
</tr>
<tr>
<td>-300, -400</td>
<td>13</td>
<td>39.3</td>
<td>7</td>
<td>21.4</td>
</tr>
<tr>
<td>Total</td>
<td>33</td>
<td>100.0</td>
<td>33</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Figure 1: Normal mucosa is seen 1 year later after amnion membrane use (H+EX230).
cause secondary tympanic membrane perforations and
extrusions (3). According to our experience until now the
results with teflon sheet are better than silastic in creating
a middle ear space. However, a thick fibrotic tissue with
minor degree of vascularization was found on histologic
examination of the mucosa with teflon sheet. In a few
patients it was seen on reexploration that this thick fibrotic
tissue obstructed the round window niche. Some authors
(7,8) recommend the removal of these synthetic materials.
However, it is rejected by some patients, because of the
necessity for a second operation.

Therefore it was thought to cover the tympanic cavity
with human amniotic membrane instead of synthetic
materials. It was shown that antigenicity of the amnion
appears to be very low and no evidence of rejection after
transplantation was reported (9,10,11). Amniotic mem-
branes have been shown to have the ability to decrease
bacterial growth (10). Human amniotic membrane is
readily available, easily stored and inexpensive. It was
used with good results as wound dressing for burns, vagi-
nal epithelization, replacement of nasal mucosa in hered-
itary hemorrhagic telangiectasia, arthroplasty and in ear
surgery to close the small tympanic membrane perfora-
tions and as lining in mastoid cavities (2,4,9,10,11).

The middle ear was covered with a thin and well vas-
cularized mucosa. Round window nische can be seen
easily. The histologic examination showed mucosa which
contains small capillaries in a loose connective tissue
(Figure 1).

2) Findings of the middle ear mucosa covered with
teflon sheets:

The middle ear was covered with a thick, slightly vas-
cularised mucosa. In a patient the thick mucosa
obstructed the round window niche. A thick fibrotic tissue
which has very little vascularization and foreign body reac-
tion was seen on histologic exam (Figure 2).

DISCUSSION

Removal or disturbance of tympanic mucosa results in
adhesions. To prevent these adhesions and to have an air
filled middle ear space, various materials such as Gelfilm,
silastic and teflon sheets have been used to line the tym-
panic cavity. The gel film has been abandoned because it
does not prevent adhesions (3,5). Silastic sheet may

Figure 2: A thick fibrotic tissue which has very little vascularisation
and foreign body reaction seen 1 year later after teflon
use (H+EX230).

Table 5: Results of statistical analysis.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Sd</th>
<th>x (Operation)</th>
<th>t</th>
<th>0.05</th>
<th>0.01</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>O (amnion) - Normal</td>
<td>32</td>
<td>91.66</td>
<td>2.093</td>
<td>2.04</td>
<td>2.75</td>
<td>p&lt;0.05</td>
</tr>
<tr>
<td>O (Teflon) - Normal</td>
<td>19</td>
<td>139.75</td>
<td>2.982</td>
<td>2.09</td>
<td>2.85</td>
<td>p&lt;0.01</td>
</tr>
<tr>
<td>O (amnion) - (Teflon)</td>
<td>51</td>
<td>44.33</td>
<td>0.065</td>
<td>2.00</td>
<td>2.66</td>
<td>p&gt;0.05</td>
</tr>
</tbody>
</table>

In the light of these finding it can be said that human
amniotic membrane is a biologic material which might be
used in lining the tympanic cavities.
REFERENCES


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