INTRODUCTION

Chronic otitis media commonly affects the middle ear bones with erosion which results in the discontinuation of the ossicular chain. A defective incudostapedial joint and stapes superstructure create a conductive hearing loss. Ossicular reconstructions can be generally divided into two types of models: partial ossicular replacement prosthesis (PORP) and total ossicular replacement prosthesis (TORP). The success of the ossicular reconstruction mainly depends on the characteristics of the material used for the prosthesis; the ideal prosthesis should be biocompatible, stable, easy to fit, and capable of optimal sound transmission. Although a variety of materials have been used for reconstruction of the ossicular chain such as auto-graft, gold prosthesis, ceramic prosthesis, hydroxyapatite, and polyethylene, none of them has been proved to have a overwhelming superiority over the others. The new method of titanium ossiculoplasty was first used in ossicular reconstruction in 1993, and was reported to have good prognosis in 1999 by Stupp et al.[2]. The goal of this study involved the review of long-term hearing result of patients undergoing ossicular chain reconstruction with three different types of material which are plastipore, hydroxyapatite and titanium.

METHODS AND MATERIALS

We performed a retrospective study of all the data from patients undergoing ossicular chain reconstruction with three different types of prosthesis at our department from 2004 to 2011, which included 131 ossiculoplasties performed by different surgeons in our department. PORP prostheses were used in the absence of an incus, or when it was eroded, and there were stapedial superstructures. TORP prostheses were used in the absence of the incus and stapes superstructures. Cartilage was used in all cases, placed between the tympanic membrane and the prosthesis. The prostheses were fixed using Gelfoam. PORP were used in 61 cases and TORP in 70 cases. All patients had a minimum follow-up of at least one year, with audiological evaluation. We determined the pure-tone average (PTA) air-bone gap (ABG) through the mean increase in air conduction at 4 frequencies (0.5, 1, 2, and 4 kHz). The criteria for a successful ossiculoplasty was defined as postoperative ABG less than 20 dB with a minimum follow-up of 1 year[7]. The secondary outcome was the extrusion of the prosthesis or exposure of the head plate versus nonextrusion.

RESULTS

1. Types of Prosthesis in the PORP and TORP groups

<table>
<thead>
<tr>
<th>Prosthesis</th>
<th>PORP</th>
<th>TORP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plastipore</td>
<td>21</td>
<td>20</td>
</tr>
<tr>
<td>Hydroxyapatite</td>
<td>20</td>
<td>25</td>
</tr>
<tr>
<td>Titanium</td>
<td>20</td>
<td>25</td>
</tr>
<tr>
<td>Total</td>
<td>61</td>
<td>70</td>
</tr>
</tbody>
</table>

2. The effectiveness of sound transmission in PORP cases

3. The effectiveness of sound transmission in TORP cases

4. Extrusion rate of prosthesis in PORP & TORP cases. The difference in extrusion rate was statistically significant (p<0.019)

5. Total extrusion rate in PORP & TORP cases (p>0.05)

DISCUSSION

The primary goal of surgery for chronic otitis media is the achievement of a safe and dry ear, disruption of recurrent ear drainage, and hearing improvement. Erosion of the long process of the incus is the most common ossicular chain pathology and successful ossiculoplasty requires a firm connection between the vibrating tympanic membrane and the inner ear. Several synthetic biocompatible materials have been used for the production of incus replacement prostheses. PORPs and TORPs have the advantage of being readily available, but extrusion and stability problems are a definite disadvantage. Hydroxyapatite (Ca5(PO4)3(OH) is a natural constituent of bone and seems to exhibit superior properties when compared with bioactive ceramics that were introduced in 1981. Titanium implants have become popular in 1993, and is widely used nowadays. We compared the 3 materials in the clinical setting. Postoperative hearing gain was better in PORP than in TORP but there were no differences in hearing gains among the 3 materials in PORP and TORP. Plastipore showed the highest extrusion rate of 12.2% (5 out of 41 patients), followed by HA (3 out of 45 patients; 6.7%) and titanium (2 out of 45 patients; 4.4%). The overall extrusion rate of TORP was higher than that of PORP (8.6% vs. 6.6%). In terms of hearing results, there was no differences among the three types of prosthesis in PORP and TORP respectively. We obtained similar results in partial ossicular reconstructions and in total ossicular reconstructions in various types, and also found out that our hearing results were similar to those of other series that used different prosthetic materials[12]. But the extrusion rate was slightly higher than those of other authors.

CONCLUSIONS

Most ossiculoplasties in PORP improved hearing conditions but TORP was not as satisfactory. Three types of prosthetic material showed no significant hearing outcome differences in PORP and TORP, but clinically titanium prosthesis revealed the best results. Significantly lower rates of extrusion were found in titanium prosthesis. Therefore, we recommend this material when performing ossicular chain reconstruction surgery.

REFERENCES