Stapes Surgery in Elderly

Mohamed R. Ghonim\textsuperscript{1}, Yousef K. Shabana\textsuperscript{1}, C.B. Pedersen\textsuperscript{2} and Ahmed A. El-Degwi\textsuperscript{1}

\textsuperscript{1}ORL Department, Faculty of Medicine, Mansoura University, Mansoura, Egypt

\textsuperscript{2}ORL Department, Faculty of Medicine, Aarhus University hospital, Aarhus, Denmark

Correspondence: Yousef K. Shabana
Department of Otorhinolaryngology
Mansoura University, Faculty of Medicine
Mansoura, Egypt
Fax: 050 226 70 16
E-mail: yousefshabana@yahoo.com

Running title: Stapedotomy: old age
Abstract:

Sixty five stapedotomy procedures in patients 65 years or more were reviewed. There were 30 males and 35 females. The mean age at the time of surgery was 68.5 years with a range from 65 to 77 years.

Follow up period ranged from 1 to 10 years. Our results showed that the mean postoperative air-bone gap, calculated as the difference between the postoperative air and bone conduction thresholds (500-4000 Hz), was 10.2 dB. Closure of the air-bone gap to within 10 dB was achieved in 55% (36 patients), whereas closure to within 20 dB was achieved in 95.3% (62 patients). The average hearing gain (500-4000 Hz) was 27.7 dB. The cochlear function after stapes surgery was stable with a mean improvement of bone conduction threshold of 5.2 dB.

Conclusion: According to our results, we conclude that stapes surgery in elderly patients is safe and effective and the results are satisfactory.

Keywords: Stapedotomy, old age
**Introduction:**

Since John shea introduced stapedectomy at 1958, this operation is considered the principle management for otosclerosis. Stapes surgery in elderly patients is controversial. In the literature, the aging cochlea has been reported to be more susceptible to surgical trauma than the inner ear of younger individuals and the hearing results of stapedectomy in elderly patients were poorer than in younger patients with otosclerosis (Fisch, 1980; Beales, 1987; a´Wengen et al., 1992 and a´Wengen, 1993). Moreover, the complications of stapes surgery have been reported also to be more frequent in older patients (Beales, 1987 and a´Wengen, 1993).

On the other hand, other studies reported that there were no significant data, regarding sensorineural hearing loss, after stapedectomy, related to the age of patient. They reported that the age should not be considered a contraindication to stapedectomy and stapes surgery should be offered to both elderly and younger patients with otosclerosis with the same indications (Del Bo et al., 1987).

Meyerhoff and Paparella (1991) reported that the elderly do quite well with stapedectomy and unless there is a specific medical or otologic contraindications those patients are satisfactory candidates.

The aim of this study is to evaluate the results of stapes surgery in elderly patients and to spot light on this controversy.
Patients and methods:

This study was conducted on 65 patients operated upon for otosclerosis at Otolaryngology department Mansoura University hospital, Egypt and Otolaryngology department Aarhus University hospital, Denmark between 1987 and 1999. Thirty seven patients were operated at Mansoura University hospital and 28 patients were operated at Aarhus University hospital. The mean age at operation was 68.5 years with a range between 65 and 77 years. There were 30 males (46%) and 35 females (54%). Hearing loss was bilateral in all cases. Operations were performed in the right ear in 27 patients (41.5%) and in the left ear in 38 patients (58.5%). Follow up period ranged from 1 to 10 years with an average of 2 years.

Audiological evaluation was carried out using a clinical audiometer (Madsen, Model OB 822). Pure tone audiometry (air conduction and bone conduction thresholds at frequencies: 250, 500 Hz, 1, 2, 4, and 8 kHz), speech reception thresholds (SRT) and speech discrimination scores (SDS) were reviewed preoperatively, postoperatively (1 month, 3 months, 6 months and 1 year) and at the last available follow up.

Data were evaluated using an IBM computer and statistical analyses were done through the SPSS program version 10. The values were considered statistically significant when $p$ value was $< 0.05$.

Surgical techniques:

The majority of cases were performed under local anaesthesia (63 operations) with adequate preoperative sedation. Local anaesthesia allowed immediate intraoperative assessment of hearing function as well as any evidence of balance disturbance. Local anaesthesia was used also in cases done under general anaesthesia (2 operations) to minimize bleeding.
A classic transcanal approach was done. After adequate exposure of the oval window, all anatomic landmarks were inspected, the ossicular chain was tested and the middle ear was examined to exclude other middle ear pathology. The small fenestra technique with teflon piston (0.6 mm diameter) or teflon platinum (0.4 mm diameter) prostheses was performed, both prostheses diameters were found to produce equally good results (Shabana et al., 1999). Perforation of the footplate was done using manual footplate perforator. In order to diminish the hazards of unwanted mobilization of the incus and to achieve its stability, the prosthesis was introduced and secured in place over the long process of the incus before removal of the stapes superstructure. In cases with narrow niche, the superstructure was removed first. To achieve a good seal of the fenestrated footplate, a drop of the patient blood was used. The mobility of the prosthesis is checked by applying gentle pressure to the under surface of the manubrium, then the tympanomeatal flap is returned to its original position. The patient is then checked for subjective improvement of hearing and for any feeling of vestibular disturbance. A small pad of gelfoam is placed over the flap and the incision line.
Results:

The mean preoperative air conduction (500-4000 Hz) was 69.1 dB and the mean preoperative bone conduction (500-4000 Hz) was 36.3 dB. The mean postoperative air conduction (500-4000 Hz) was 41.3 dB and the mean postoperative bone conduction (500-4000 Hz) was 31.1 dB. Pre and postoperative hearing thresholds are shown in figure 1 and 2.

The postoperative air conduction showed a mean improvement of 27.8 dB. Air conduction improvements at each frequency are shown in figure 3.

The postoperative bone conduction showed a mean improvement of 5.2 dB. Significant sensorineural hearing loss (deterioration of bone conduction more than 20 dB) occurred only in one patient (1.5%).

The mean postoperative air bone gap was 10.2 dB. Air bone gap at each frequency is shown in figure 4. Closure of air bone gap to within 10 dB was achieved in 36 patients (55.3%) while closure of air bone gap to within 20 dB was achieved in 62 patients (95.3%). Closure of air bone gap is shown in table 1.

Postoperative SRT and SDS are demonstrated in table 2.
Discussion:

The ideal age at which stapes surgery could offer maximum hearing results and least complication is still a point of controversy. Every now and then, an ear surgeon may be faced with stapes fixation in an elderly patient and he has to decide whether to operate on these patients or not.

The results of this study agreed with many published data in the literature (Del Bo et al., 1987 and Vartiainen, 1995) that, stapedotomy is effective procedure in elderly patients as the mean improvement of air conduction was 22.7 dB and the mean improvement of bone conduction was 5.2 dB.

Although the aging cochlea has been reported to be more susceptible to surgical trauma than the inner ear of younger individuals with otosclerosis [Fisch, 1980; Beales, 1987; a´Wengen et al., 1992 and a´Wengen, 1993] our results did not support the deterioration of cochlear function after stapedotomy in elderly as we have only one ear with significant sensorineural hearing loss after operation, this incidence is comparable with that of younger patients.

Our results also indicated that closure of air-bone gap to within 10 dB occurred only in 55.3% of elderly patients, but closure of air-bone gap to within 20 dB occurred in 95.3%. We think that the results are satisfactory in elderly patients as they gained 22.7 dB and closure of air-bone gap to within 20 dB was achieved in 95.3%.
Conclusions:

According to our results we concluded that stapes surgery in elderly patients is safe and effective and the results are satisfactory.
References:


Figure 1. Preoperative hearing thresholds
Figure 2. Postoperative hearing thresholds

![Graph showing postoperative hearing thresholds for different frequencies in Hz and dB, comparing air conduction and bone conduction.](image)
Figure 3. The mean air conduction improvements

![Bar chart showing mean air conduction improvement across different frequencies (Hz): 500 Hz = 35 dB, 1000 Hz = 30 dB, 2000 Hz = 25 dB, 4000 Hz = 15 dB]
Figure 4 The mean postoperative air bone gap
### Table 1 Percentage of air bone gap closure

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<tr>
<td>Within 10 dB</td>
<td>55.3%</td>
<td>36 patients</td>
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<tr>
<td>Within 15 dB</td>
<td>86.1</td>
<td>56 patients</td>
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<tr>
<td>Within 20 dB</td>
<td>95.3</td>
<td>62 patients</td>
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### Table 2. Pre and postoperative SRT and SDS.

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<tr>
<td>SRT</td>
<td>60.6 dB</td>
<td>29.3 dB</td>
<td>94%</td>
<td>95.2%</td>
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<td>SDS</td>
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*Stapedotomy: old age*