Myringoplasty : A Simple Procedure for Out-patients

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Abstract

The standard treatment of tympanic membrane perforation is myringoplasty. We describe a new myringoplasty technique requiring only a partial removal of skin on the ear drum remnant followed by lateral placing of fascia and free skin graft. The overall cure rate in our series is 97 per cent. The hearing gains for the overall cases are 13.9 dB ($p < 0.001$) for the AC, 13.6 dB ($p < 0.001$) for the air bone gap closure, 13.1 dB ($p < 0.001$) for the SRT and 4.2 per cent ($p = 0.005$) for the SDS. Minor complications are observed in only 14 per cent. Our technique is simple, effective and can be performed on an out-patient basis.

Key word : Myringoplasty, Otitis Media, Tympanic Membrane

Persistent central or marginal perforation of the tympanic membrane usually leads to hearing loss and intermittent middle ear infections. Occasionally, it may result in a more dangerous form of chronic otitis media, the cholesteatomas, especially in the marginal type, and subsequently a more severe hearing deficit(1).

Attempts to close the tympanic membrane perforation have dated back to from the second half of the 19th century to the first half of the 20th. These ranged from the application of a paper patch up on the drum head, cauterizing the perforation rim with trichloracetic acid and a combination of acid cautery and paper patch, to an introduction of a full thickness skin graft(2-5). However, the results were still in wax and wane.

It was Wullstein and Zollner who opened and explored the era of tympanoplasty. Their excellent contributions are still used as the basic principles in the present standard enaural and postauricular myringoplastic techniques(6,7).

Many authors have carried out studies in order to find a simple and cost-effective method in repairing the tympanic membrane perforation(8,9). In 1996, our group conducted a prospective trial on homograft myringoplasty. However, the technique was quite difficult and the outcome was unsatisfactory(10). In the present trial, we changed to an auto-

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graft procedure. However, it is still simple and cost-effective.

PATIENTS AND METHOD

This prospective study was carried out in both King Chulalongkorn Memorial Hospital and private hospitals from October 1, 1995 to September 30, 1997. The total number of cases was 31, but two cases had insufficient data and were therefore excluded. Of the 29 patients, 11 cases were male and 18 cases were female. The patients' ages ranged from 13 years to 65 years (average 39.1 years). The majority of the patients (69%) were between 20 and 50 years.

The inclusion criteria were those teenagers and adults with perforations of the tympanic membrane of any size. All the patients were informed about this new out-patient procedure done under local anesthesia, including the predicting outcome and complications. They agreed to undergo an operation with this technique and signed the consent form. The young and pregnant women and those who did not agree with the operation and had excessive anxiety were excluded from the study.

The causes of the perforation of the tympanic membrane are varied. They may be the result of either chronic otitis media, trauma, tympanostomy tube removal, incomplete healing of tympanoplasty or a late recurrence of perforation following a completely healed tympanoplasty. Cholesteatoma and specific middle ear infections were excluded. However, any granulation tissue, polyps, subsequent acute infection and external otitis were treated until a dry, clean ear was obtained.

The size of the perforation was measured and recorded.

Preoperative and postoperative pure tone audiograms and speech audiometry were performed a week before and four weeks after the operation.

Myringoplasty technique

The procedure should be performed in the following steps :

1. The operated ear is sterilized with povidone iodine and draped.

2. The ear canal, tympanic membrane and upper postauricular area are anesthesized with 4-5 ml of 2 per cent xylocaine with 1:80,000 adrenaline.

3. Temporal fascia is taken *via* a 1.5-cm incision on the upper portion of postauricular crease. The fascia is prepared in a dry, thin sheet and kept for use as a graft.

4. A 0.5 x 0.5 cm free skin graft is harvested from the ear canal and kept moist with normal saline solution. (Fig. 1 A)

5. The edge of the perforation is trimmed and removed with small-cupped forceps. The squamous epithelium is elevated from the drum remnant with a sharp curved pick and duckbill or curette. The epithelium is then completely removed with small or delicate cupped forceps exposing the fresh, clear fibrous layers. (Fig. 1 B, C)

6. Antibiotic ear drop soaked gelfoam is placed into and filled the middle ear cavity up to the undersurface of the eardrum. A small cotton ball is used to remove the excessive fluid and blood from the drum and the middle ear cavity by placing the cotton ball with continuous suction against the drum and gelfoam.

7. The fascia graft is cut into a proper shape and size and placed laterally onto the drum and completely covering the perforation. (Fig. 1 D, E)

8. The free canal skin graft is laid down on top of the fascia with special care to perfectly enroll the skin edge before packing. (Fig. 1 D, E)

9. A small round piece of plastic sheet about 0.7-0.8 cm in diameter is seated over the skin graft to stabilize both fascia and skin grafts.

10. The ear canal is packed with antibiotic ear drop soaked gelfoam from the eardrum up to the level above the skin graft donor site. After that a rose-bud packing with rayon and cotton balls is applied.

Postoperative management

A two-week course of prophylactic antibiotic therapy including some analgesics was regularly provided for the patient. Each patient was appointed to have regular follow-ups in the clinic on day 7 for stitches out, day 14 for removal of the ear packing, day 28 for postoperative audiometry and day 56 for final check. In case of incomplete healing on day 28, audiologic testing should be performed on day 56.

Statistical analysis

The pre- and post-operative data of all parameters: air conduction threshold (AC), air-bone gap (ABG), speech reception threshold (SRT) and speech discrimination score (SDS); from both

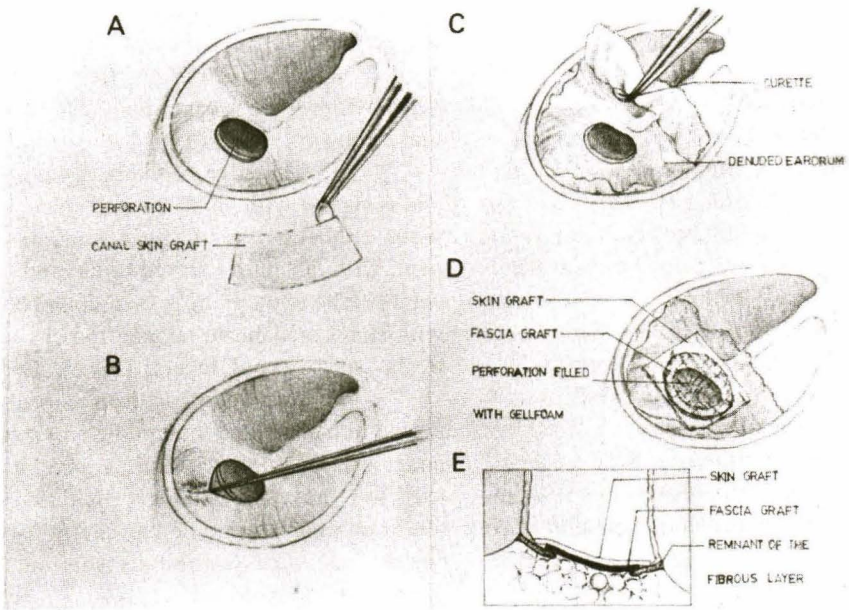

Fig. 1. Myringoplasty technique : A. the free skin graft (0.5 x 0.5 cm) harvested from the posterior canal, B, C. removal of skin around the perforation by a sharp pick and curette, D, E. placing the fascia and free skin grafts laterally in layers.

Table 1. Sex and age distributions.

Total patients	29
Male	14
Female	15
Age range (yrs)	13 – 65
Age average (yrs)	39.1

Table 2. Healing in the operated ears.

	No of ear	No of healing ear
Right	15	14
Left	14	14
Small perforation (< 3 mm)	10	9
Medium to large perforation (3-5 mm)	19	19
Total	29	28 (97%)

Table 3. Minor complications in 4 cases (14%).

Epithelial inclusion cyst	2
Myringitis	1
Thickened graft	1
Reperforation	1

groups and over-all cases were analyzed with paired *t*-test. The speech discrimination score (SDS) of the medium to large group and overall cases that did not exhibit, the normal curves were analyzed with Wilcoxon matched pairs signed-rank test. The results of treatment in both groups (small and medium to large perforation group) were compared by the Mann-Whitney U-Wilcoxon Rank Sum W test (ABG and SDS) and unpaired *t*-test. (AC and SRT)

RESULT

Of the 29 patients, 15 cases involved the right ear and 14 cases involved the left ear. The ears were categorized into 2 groups depending on the size of tympanic membrane perforation : 10 cases fell into the small perforation group (< 3 mm) and 19 cases into the medium to large perforation group (> 4 mm). The medium to large perforations comprised 65.5 per cent of cases. All 29 except 3 cases were completely healed without any difficulties within 4 weeks.

For the other 3 cases, one (5 mm perforation) had a persistent small perforation at the time when the packing was removed (day 14), one (2

mm perforation) had a thick swollen graft which was thinned by CO_2 laser vaporization, both of them healed within 6 weeks. The third case (3 mm perforation) re-perforated of 2 mm at the 6th week and this required a revision myringoplasty 3 months after the first. It finally healed without further problem. The percentage of the healing cases was quite satisfactory (97%). (Table 2).

Minor complications occurred in 4 cases (14%). They included epithelial inclusion cyst (2), myringitis (1), reperforation (1) and thickened graft (1). Fortunately, we did not have any patient with iatrogenic traumatic and/or noise induced hearing loss (Table 3).

Hearing functions

The pre- and postoperative pure tone air conduction thresholds (AC), air bone gaps (ABG), speech reception thresholds (SRT) and speech discrimination scores (SDS) were analyzed in all 29 ears, and each group. The means and standard deviations were presented (Table 4). The means of pre- and postoperative difference in each parameter: the mean AC gain (d AC), mean air bone gap closure (d ABG) and mean speech reception threshold gain (d SRT), were of statistical significance ($p < 0.001$). The speech discrimination score (SDS) results were increased postoperatively. The means of differences (SDS gain) were statistically significant in the medium to large perforation group ($p = 0.018$) and in the overall cases ($p = 0.005$). In small perforation group, the SDS gain was not statistically significant ($p = 0.168$). The poorest scores (72% preoperatively and 88% postoperatively) were obtained in one patient who had a moderately mixed hearing loss (Table 4).

Table 4. Audiological testing in 2 groups and overall cases.

Audiological testing (dB)	Small perforation (< 3 mm) (10 cases)		Medium to large perforation (4 mm) (19 cases)		Overall cases (29 cases)	
	pre-op	post-op	pre-op	post-op	pre-op	post-op
Air conduction (AC)						
Range	18-63	6-41	22-71	16-67	18-63	6-67
Mean AC (x AC)	35	20.5	40.7	27.2	38.7	24.9
SD AC	15	8.7	11.6	10.7	12.9	10.4
Mean AC gain (d AC)	14.5 ($p<0.001$)*		13.5 ($p<0.001$)*		13.9 ($p<0.001$)*	
Air bone gap (ABG)						
Range	0-20	0-5	0-30	0-10	0-25	0-10
Mean ABG(x ABG)	11.0	1.0	17.9	2.4	15.5	1.9
SD ABC	6.6	2.1	9	3.5	8.8	3.1
Mean ABG closure (d ABG)	10 ($p<0.001$)*		15.5 ($p<0.001$)*		13.6 ($p<0.001$)*	
SRT						
Range	20-65	10-25	20-70	15-65	15-70	10-65
Mean SRT (x SRT)	33.5	21.0	40.3	26.8	37.9	24.8
SD SRT	14.3	9.9	12.2	11.1	13.1	10.9
Mean SRT gain (d SRT)	12.5 ($p<0.001$)*		13.4 ($p<0.001$)*		13.1 ($p < 0.001$)*	
SDS (%)						
Range	96-100	100	72-100	88-100	72-100	88-100
Mean SDS (x SDS)	97.6	100	91.9	97.3	94.3	98.1
SD SDS	5	0	10.9	4.5	9.8	3.9
Mean SDS gain (d SDS)	2.4 ($p = 0.168$)*		5.9 ($p = 0.018$)**		4.2 ($p = 0.005$)**	

* paired *t*-test

** Wilcoxon Matched-Pairs Signed-Ranks test

The results of treatment in both groups (small and medium to large perforation) were compared with the unpaired-*t*-test (AC and SRT) and Mann-Whitney U-Wilcoxon Rank Sum W test (ABG and SDS) which revealed no differences in both groups.

DISCUSSION

Myringoplasty is the standard treatment for repairing tympanic membrane perforation resulting from any cause. Many techniques have been described with varying success. The success rate for the standard myringoplasty ranged from 80.9 per cent to 91.4 per cent (average 89.3%)[11]. The major drawbacks of the standard procedures include 1) requiring a large postauricular or enaural skin incision, which may frequently result in a certain complication 2) needing much more skill for the surgeon in elevating and returning the tympanomeatal skin flap and 3) demanding hospitalization which requirs much more money. Our simple cost-effective myringoplasty technique could be performed on an out-patient basis and may provide the solution for those disadvantages.

Moreover, the overall success rate in this series was up to 97 per cent for the first operation. It means that this myringoplasty technique is a promising procedure with a low rate of minor complications (14%). All 29 cases except one, healed completely. Only one case re-perforated following complete healing which required a revision myringoplasty resulting in perfect healing. Including this case, the outcome would have increased to 100 per cent. Since we did not find any ear complicated with surgically noise induced hearing loss, the procedure is atraumatic.

The postoperative hearing results in both groups and overall cases were clearly better than the preoperative ones. The hearing gain parameters : AC gain, air bone gap closure and SRT gain in each group and overall cases were statistically significant at least at 99.9 per cent confident level. However, the SDS gain was proved to be significant only in the medium to large perforation group ($p = 0.018$) and in the overall cases ($p = 0.005$). The serviceable hearing is assessed by the Smyth's criteria which included a) a reduction of the intra-aural difference less than 15 dB and b) and AC average less than 30 dB[12]. The hearing outcome in our series all essentially fitted those criteria. One case had a moderate mixed hearing loss of 70 dB in the operative ear, which finally improved to 65 dB postoperatively, but had satisfactory rehabilitation with a hearing aid. Finally, the healing rate and the hearing gains in the two groups were the same. The procedure should be performed in the perforation of the tympanic membrane of any size and from any etiology. Raising and returning of the tympanomeatal flap are the most difficult steps in the standard myringoplasty technique. Only an experienced surgeon can properly do these steps. Our procedure provides a solution for that problem, so it is a simple and effective technique.

SUMMARY

1. Our myringoplasty technique is a simple, effective procedure that can be performed in out-patients.

2. The overall cure rate is 97 per cent for the first operation and 100 per cent in the second operation.

3. The overall hearing gains included 13.9 dB AC gain ($p < 0.001$), 13.6 dB air bone gap closure ($p < 0.001$), 13.1 dB SRT gain ($p < 0.001$) and 4.2 per cent SDS gain ($p = 0.005$)

4. Minor complications were found in 4 cases (14%). Epithelial inclusion cyst, myringitis, thickened graft and re-perforation but no surgical trauma was observed.

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การปะแก้วหูอย่างง่ายสำหรับผู้ป่วยนอก

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วิธีมาตรฐานในการรักษาการทะลุของเยื่อแก้วหู คือการผ่าตัดปะเยื่อแก้วหู ผู้วิจัยนำเสนอวิธีการผ่าตัดปะเยื่อแก้วหูวิธีใหม่ซึ่งต้องการเพียงแค่การลอกเอาผิวหนังที่คลุมแก้วหูส่วนที่เหลือออกเพียงบางส่วน ตามด้วยการปลูกถ่ายเนื้อเยื่อ และผิวหนังบนด้านนอกของเยื่อแก้วหูเท่านั้น ผลการรักษาแก้วหูหายเป็นปกติดีถึงร้อยละ 97 หลังการผ่าตัด การได้ยินทางอากาศ (AC) ดีขึ้น 13.9 เดซิเบล ($p < 0.001$) และลดผลต่างระหว่างการได้ยินทางอากาศและทางกระดูก (air bone gap) ลงได้ถึง 13.6 เดซิเบล ($p < 0.001$) การได้ยินคำพูด (SRT) ดีขึ้น 13.1 เดซิเบล ($p < 0.001$) และการเข้าใจคำพูด (SDS) ดีขึ้น 4.2% ($p = 0.005$) วิธีการผ่าตัดปะแก้วหูวิธีที่นำเสนอนี้มีโรคแทรกซ้อนเกิดขึ้นเพียง 14% และเป็นชนิดที่ไม่สำคัญ โดยสรุปการผ่าตัดปะแก้วหูวิธีนี้ จึงเป็นวิธีที่ง่าย ได้ผลดี และสามารถทำในผู้ป่วยนอกได้

คำสำคัญ : ศัลยกรรมซ่อมแซมเยื่อแก้วหู, การผ่าตัดปะเยื่อแก้วหู, โรคหูชั้นกลางอักเสบ, เยื่อแก้วหู

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