

# Temporalis Fascia Versus Cartilage Graft in Myringoplasty

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## Abstract

**Objective:** The aim of the present study is to compare the surgical and audiological results of temporalis fascia versus conchal cartilage in myringoplasty.

**Methods:** A randomized prospective study concerned with 40 patients for whom myringoplasty have been done. These patients were collected from the Out Patient Department of ENT at Al-Jamhory Teaching Hospital, Mosul/IRAQ from January 2009 to January 2012. Patients were randomly assigned into two groups; in the first group temporalis fascia graft was used (18 patient) while conchal cartilage graft was used in the second group (22 patients).

**Results:** Our study included 40 patients, 23 males and 17 females. The average age of our patients is 28.4 years with a range from 13- 55 years. Surgical success rates for the first and second groups are 77.78% and 95.45%, respectively. There is 19.4 dB improvement in mean hearing threshold in fascia group, compared to 15.2 dB improvement in cartilage group, giving an average of 17 dB improvement in mean hearing threshold of the total series.

**Conclusions:** There was no significant difference neither in surgical success rate nor in hearing gain between the two groups.

**Keywords:** Temporalis Fascia, Cartilage Myringoplasty.

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## Introduction

Temporalis fascia is one of the oldest and most commonly used graft materials for myringoplasty. Success rate ranges from 80-90%, with good closure of air-bone gap<sup>(1,2,3,4)</sup>. Cartilage is used increasingly for

myringoplasty, however there is some controversy regarding its use; although many surgeons recommend the use of cartilage specially in large perforations and revision cases<sup>(2,3,4)</sup>, others feel that improvement of air conduction after cartilage myringoplasty is not satisfactory due to the thick bulky nature of

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cartilage<sup>(5,6,7)</sup>. There is large debate regarding this issue in articles, and many recent studies didn't find difference in hearing gain between fascia and cartilage graft<sup>(8, 9)</sup>. However, most of these studies are retrospective or not controlled.

This clinical trial is conducted to compare the surgical success rate and hearing results between cartilage and temporalis fascia graft in myringoplasty. To standardize the reporting of hearing results in tympanoplasty, it is recommended to follow the guidelines of the Committee on Hearing and Equilibrium of the American Academy of Otolaryngology-Head and Neck Surgery. According to these guidelines, hearing threshold for air conduction (AC) is the mean of four pure tone averages (0.5, 1, 2 and 3 kHz). Hearing results are assessed by comparing both airconduction and air-bone gap (ABG) between preoperative and postoperative averages<sup>(10)</sup>.

### Patients and Methods

This randomized prospective study included forty ears of 40 patients for whom myringoplasty have been done. Patients are referred from outpatient clinic and surgery was done at Al-Jamhori Teaching Hospital by all of the four authors. Patients were randomly assigned into two groups; in the first group temporalis fascia graft was used while bareconchal cartilage graft was used in the second group.

Patients were examined preoperatively by two surgeons regarding size and site of perforation, presence of infection, and assessment of hearing by tuning fork, and audiogram. Audiogram was done in a sound attenuated booth using Amplivox 260 diagnostic audiometer (made in England). Pure tone audiometer was determined at frequencies of 250, 500, 1000, 2000, 3000,

4000 and 8000 Hz for air conduction and 250, 500, 1000, 2000, 3000 and 4000 Hz for bone conduction. Hearing level was determined by pure tone average for air conduction at frequencies 500, 1000, 2000 and 3000. Air-bone gap is calculated as the four-tone pure-tone average for air conduction minus the same average for bone conduction. All audiometers were performed by one audiometrist whom was kept blind to the procedure used in myringoplasty.

In order to obtain good matching between the two groups, the following points have been taken into consideration:

1. Only medium sized perforations have been included which are more than 25% but less than 75% of tympanic membrane surface area.
2. The same surgical steps are adopted in all patients.
3. Ages of patients in the two groups were matched as far as possible.

Inclusion Criteria:

- A) Central medium-sized perforation, dry for at least 2 months.
- B) No evidence of other ear disease.

Exclusion Criteria:

- A) Presence of cholesteatoma.
- B) Presence of otosclerosis or ossicular fixation.
- C) Revision cases.

The decision to use fascia or cartilage was taken randomly just before surgery.

### Surgical Procedure

All operations were performed under general anesthesia. Xylocaine 1% with adrenalin 1:100000 was infiltrated into post-aural area and the meatal skin. The perforation edges were refreshed using fine probe to

stimulate growth of tympanic membrane remnants over the graft. Post-aural incision was done followed by elevation of tympano-meatal flap. The auricle together with the tympano-meatal skin flap was held forward by self-retaining retractors. If the bony meatus was narrow canalplasty was achieved by diamond burr drilling. Ossicular chain mobility must be judged as good before the graft is inserted. Temporalis fascia was harvested, cleaned from muscle fibers and left to dry for few minutes before it was used. On the other hand, if cartilage was to be used it was harvested from conchal cartilage and cleaned from perichondrium so that bare cartilage was inserted. Whether cartilage or fascia was used they were inserted below tympanic membrane remnants and handle of malleus (under-lay technique). Cartilage was used without thinning but a small slit was made to accommodate for the handle of malleus. Skin flap was repositioned and pledges of gel-foam were put on the graft and the ear was packed with BIPP pack.

One gram of ceftriaxone was given to the patient daily for five days postoperatively. Stitches were removed after 7 days while the

pack was removed on the 10<sup>th</sup> day, after which ciprofloxacin drops were prescribed for 10 days. Gel-foam was usually left for spontaneous absorption or sucked-out after 3 weeks.

Audiogram was repeated after 3, 6 and 9 months for comparison. Surgical success is defined by the absence of residual perforation after surgery with no re-perforation during follow-up. Audiological success is measured by comparing both air conduction (AC) and air-bone gap (ABG) between preoperative and postoperative averages. Hearing threshold is the mean of four pure tone averages (0.5, 1, 2 and 3 kHz). The final audiogram was done at 9 months postoperatively and was used for comparison.

**Results**

Our study included 40 patients, 23 males and 17 females. The average age of our patients is 28.4 years with a range from 13- 55 years. There are 22 right ears and 18 left ears. The mean ages for the first (fascia) group and the second (cartilage) group are 30.6±11.8 years and 29.3±10.2 years respectively. There is no statistical difference between the two groups regarding age and sex (Table 1).

**Table 1. Age and sex distribution of the study sample (n = 40)**

	<b>T. fascia graft [n=18] No. (%)</b>	<b>Cartilage graft [n=22] No. (%)</b>	<b>Total No. (%)</b>	<b>P-value</b>
<b>Sex</b>				
<b>Male</b>	11 (61.11)	12 (54.55)	23 (57.50)	0.676*
<b>Female</b>	7 (38.89)	10 (45.45)	17 (42.50)	
<b>Age(Mean ± SD); years</b>	30.6 ± 11.8	29.3 ± 10.2	29.9 ± 10.83**	0.724***

\* Chi-square test was used for sex difference.

\*\* Range age: 13.0; 55.0 years.

\*\*\*Independent t-test of two means was used for age difference.

The mean preoperative and postoperative ABG for the whole series is 29.8± 6.17 dB and 11.9± 6.1 dB respectively, whereas the mean preoperative and postoperative air conduction (AC) for the two groups was 36.9±6.99 dB and

19.9±11.15 dB respectively. The difference between pre- and postoperative hearing is statistically significant for both ABG and AC, P= 0.001 (Table 2).

**Table 2. Comparison between pre and post-operative hearing ability (ABG and AC) of total sample**

	<b>Pre-operative Mean ± SD</b>	<b>Post-operative Mean ± SD</b>	<b>Difference Mean ± SD</b>	<b>P-value*</b>	<b>% improvement rate**</b>
<b>ABG</b>	29.8 ± 6.17	11.9 ± 6.10	17.4 ± 9.56	0.001	58.39%
<b>AC</b>	36.9 ± 6.99	19.9 ± 11.15	17.0 ± 10.21	0.001	46.07%

\* Paired t-test was used.

\*\* % improvement rate = [(pre – post) / pre] × 100

**Table 3. Comparison in pre-operative ABG and AC between fascia and cartilage grafts**

	<b>fascia graft [n=18] Mean ± SD</b>	<b>Cartilage graft [n=22] Mean ± SD</b>	<b>P-value*</b>
<b>ABG</b>	29.7 ± 6.56	28.9 ± 5.94	0.683
<b>AC</b>	37.6 ± 5.89	36.5 ± 7.89	0.641

\* Independent t-test of two means was used.

**Table 4. Comparison in post-operative ABG and AC between fascia and cartilage grafts**

	<b>fascia graft [n=18] Mean ± SD</b>	<b>Cartilage graft [n=22] Mean ± SD</b>	<b>P-value*</b>
<b>ABG</b>	10.2 ± 6.68	13.2 ± 5.34	0.116
<b>AC</b>	18.1 ± 12.3	21.3 ± 10.20	0.372

\* Independent t-test of two means was used.

There is no significant difference between first (fascia) group and the second (cartilage) group regarding preoperative ABG and AC, P=0.683 and 0.641 respectively (Table 3).

The mean postoperative ABG for the first and second groups is 10.2± 6.68 dB and 13.2±5.34 dB, respectively. On the other hand, the mean postoperative AC for the first and second groups is 18.1±12.3 dB and 21.3±10.20

dB, respectively. There is no statistical difference between the two groups regarding hearing gain, P= 0.116 and 0.372 (Table 4).

The mean preoperative and postoperative ABG for the whole series is 29.3± 6.16 dB and 11.9±6.1 dB, respectively. The difference is statistically significant, P= 0.001, Percent improvement rate = 59.5%. The mean preoperative and postoperative ABG for the

first group is 29.7±6.56 dB and 10.17±6.68 dB, respectively. The difference is statistically significant, P= 0.001, Percent improvement rate = 66%. Moreover, the mean preoperative and postoperative AC for the second group is 37.6±5.89 and 18.1±12.25dB, respectively. The difference is also statistically significant, P= 0.001, percent improvement rate = 51.6% (Table 5).

Overall the surgical success rate for the whole series is 87.5%. In the first group there

were two failed cases initially, however two additional cases showed re-perforation one of them after 5 months and the other after 7 months. There was a single case of graft failure in the second group, with no case of re-perforation during follow up. Table (6) shows that surgical success rates for the first and second groups are 77.78% and 95.45%, respectively. There is no significant difference regarding graft take between the two groups, P= 0.155.

**Table 5. Percent improvement rates in mean ABG and AC for each group separately**

	Pre-operative Mean ± SD	Post-operative Mean ± SD	Difference Mean ± SD	P-value*	% improvement rate <sup>a</sup>
<b>fascia [n = 18]</b>					
<b>ABG</b>	29.7 ± 6.56	10.17 ± 6.68	19.6 ± 11.26	0.001	66.00%
<b>AC</b>	37.6 ± 5.89	18.1 ± 12.25	19.4 ± 12.54	0.001	51.60%
<b>Cartilage [n = 22]</b>					
<b>ABG</b>	28.9 ± 5.93	13.23 ± 5.34	15.7 ± 7.75	0.001	54.33%
<b>AC</b>	36.5 ± 7.89	21.3 ± 10.21	15.2 ± 7.58	0.001	41.64%

\* Paired t-test was used.

<sup>a</sup> No significant differences between two procedures, (ABG: 66.00% Vs 54.33%) and (AC: 51.60% Vs 41.64%).

**Table 6. Comparison in success rate between fascia and cartilage grafts**

Type of graft	No.	Success	Success rate	P-value*
<b>fascia</b>	18	14	77.78%	0.155
<b>Cartilage</b>	22	21	95.45%	
<b>Total</b>	40	35	87.50%	---

\* Z-test for two proportions was used.

**Discussion**

My ringoplasty is generally successful surgery whether cartilage or fascia is used. Total success rate in our series is 87.5% which is comparable to other studies<sup>(1, 2)</sup>.

Our study included two well-matched groups of patients; as there is no difference in mean age, sex or preoperative hearing between the two groups (Tables 1 and 3).

We didn't find statistical difference

between the two groups regarding surgical success (Table 6). This finding is in agreement with Mauri et al.<sup>(11)</sup>, Cabra and Monux<sup>(12)</sup> and Yung et al.<sup>(13)</sup>. However, Tek et al. found cartilage graft significantly better than fascia<sup>(2)</sup>. This study differs from our study in that authors included large perforations.

In both procedures there is good improvement of hearing, this is manifested as 19.4 dB improvement in mean hearing threshold in fascia group, compared to 15.2 dB improvement in cartilage group, giving an average of 17 dB improvement in mean hearing threshold of the total series. There is no priority of one graft material over the other regarding hearing gain as there is no significant difference in hearing improvement between the two groups (Table 5).

Although there is abundant data comparing different graft materials and techniques, most are retrospective. The literature search identified four randomized controlled trials comparing cartilage to fascia in myringoplasty.

Mauri et al. compared inlay butterfly cartilage graft versus fascia graft in perforations less than 50%. They didn't find significant difference in surgical success rate or in hearing<sup>(11)</sup>. Similarly, Cabra and Monux noticed no difference in surgical success or hearing gain between cartilage palisade graft and fascia in medium sized and large perforations<sup>(12)</sup>. Yung et al. found no significant difference in graft take or hearing gain between cartilage (with or without perichondrium) and fascia graft in perforations larger than 50%. Moreover a meta-analysis done by the same authors pooling the data from the last two studies (Cabra and Monux and Yung et al.) confirmed the same conclusion<sup>(13)</sup>.

Tek et al. compared cartilage reinforcement

graft under fascia versus fascia alone in different sizes of tympanic membrane perforations. They found cartilage reinforcement graft significantly better than fascia in graft take rates. Regarding hearing there was no significant difference between the two graft materials<sup>(2)</sup>.

Given the diversity between the mentioned studies and our study regarding perforation size, period of follow up and the grafting material and technique it was not possible to pool the data and give meta-analysis; Mauri et al. used inlay butterfly cartilage graft, included perforations less than 50% and the follow-up period is two months. Cabra and Monux and Yung et al. included in their studies medium and large perforations and the follow-up is 24 months. Tek et al. used different technique from all other studies and included all perforation sizes. They followed up the cases for 6 months.

The main drawback of all these studies (including ours) is the small sample size. Adding another factor of Mauri et al. and Tek et al. is the relatively short follow-up period, that's why these results must be interpreted with caution. Even with all these facts in mind, two important points are observed:

1. There is no evidence in any controlled prospective study that postoperative hearing gain with fascia graft is better than cartilage graft.
2. Most prospective studies didn't find difference in surgical success between fascia and cartilage. Tek et al. found cartilage reinforcement graft better than cartilage in surgical success, but they noticed that most surgical failures in fascia group occurred when they used fascia (alone) in revision cases or in cases with large perforation, which are the cases that are excluded from our study.

## Conclusion

Our study shows that there is no significant difference neither in surgical success rate nor in hearing gain between the two groups. As we

mentioned above, recommendations cannot be drawn directly here and more studies need to be done to recommend one graft material over the other.

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## اللفافة الصدغية مقابل الغضروف في ترقيع الطبلية

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### الملخص

**الهدف:** تهدف الدراسة الحاضرة إلى مقارنة النتائج السمعية والجراحية لللفافة الصدغية بالمقارنة مع غضروف الصيوان في ترقيع الطبلية.  
**الطريقة:** دراسة استباقية عشوائية مهتمة بأربعين مريضاً ممن أجريت لهم عملية ترقيع الطبلية. أجريت الدراسة في شعبة الأنف والأذن والحنجرة، مستشفى الجمهوري التعليمي، الموصل/العراق، للفترة من كانون الثاني 2009 إلى كانون الثاني 2012. تم تقسيم المرضى عشوائياً إلى مجموعتين: استعملت اللفافة الصدغية للمجموعة الأولى (18) مريضاً بينما استعمل غضروف الصيوان للمجموعة الثانية 22 مريضاً.

**النتائج:** أجريت الدراسة على 40 مريضاً، منهم 23 ذكراً و17 أنثى. وكان متوسط العمر بمعدل 28.4 سنة بمديات تراوحت بين 13 إلى 55 سنة. تشير النتائج إلى أن معدل النجاح الجراحي للمجموعة الأولى والمجموعة الثانية كان 77.78% و95.45% على التوالي، في حين كان معدل التحسن في مستوى السمع للمجموعة الأولى كان 19,4 ديسي بل، وللمجموعة الثانية كان 15,2 ديسي بل، مما يعني معدل تحسن في مستوى السمع بمقدار 17 ديسي بل للمجموع الكلي للمرضى.  
**الاستنتاجات:** ليس هناك فرق معنوي في معدل النجاح الجراحي أو الكسب السمعي بين المجموعتين.

**الكلمات الدالة:** اللفافة الصدغية، غضروف الصيوان، ترقيع الطبلية.