*Research Article*

# Cartilagenous tympanoplasty: palisade technique versus perichondrium/cartilage composite graft technique

**Ahmed M. Youssef, Ahmed Adbdel Rahman A. Aziz, Ahmed A. Sadek and Salwa M. Mohammed**
Department of ENT, El-Minia Faculty of Medicine

## Abstract
***Objective:*** The graft taken rates and auditory outcomes of to compare endoscopic cartilage tympanoplasty in two groups of patients using palisade technique in one group and perichondrium/cartilage composite graft technique in the second group. ***Methodology:*** A prospective comparative study was conducted at ENT department, Minia university hospital on patients with CSOM with central perforation prepared for endoscopic cartilage tympanoplasty, patients attending in the period from January ٢٠١٣ to November ٢٠١٣, ٤٦ *patients divided into two groups*: A- Palisade cartilage technique. B- Perichondrium/ cartilage composite graft technique. Patients were subjected to ENT examination including hearing tests (Rinne &Weber tests) & Preoperative C.T scan of the temporal bone. Follow up was done within ٣ Months. **Results:** Patients age ranged from ١٣ to ٥٤ years, Of ٤٦ patients, ٢٣ cases were operated using the palisade technique & ٢٣ cases with perichondrium/ cartilage composite graft. Graft take rate in cases of palisade technique group was ٦٩.٦٪ while in cases of composite technique group was ٦٢.٢٪. There is improvement in postoperative ABG in both techniques with a statistically significant difference in the postoperative ABG between both techniques at ٥٠٠ frequencies, with a significant improvement more in palisade cartilage technique group. ***Conclusion:*** there is improvement in healing and hearing with both techniques; improvement was more with palisade cartilage technique group.
**Key words:** tympanoplasty, palisade cartilage technique, perichondrium/cartilage composite graft technique.

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## Introduction
The aims of the tympanoplasty operation are to create an intact tympanic membrane (TM) and to restore hearing. Cartilage is a very effective material for the reconstruction of the TM and can provide an excellent anatomical result and good functional outcomes[١]. There are many described techniques for cartilage tympanoplasty such as cartilage butterfly inlay technique, cartilage palisade technique, perichondrium cartilage island technique, perichondrium/cartilage composite technique, cartilage mosaic technique and cartilage reinforcement technique[٢]. Endoscopic tympanoplasty follows the principles of minimal invasive surgery as the tympanomeatal flap is not raised, so there is no trauma to skin of the external auditory canal[٣]. The rigid endoscope has a significant advantage as it is easy to use, provides a magnified vision and helps the surgeon to change rapidly from a close-up to a wide angle view, just by going closer or by withdrawing the scope[٤].

## Patients and methods
***Patients classified into ٢ groups:** (٢٣ patients in each group)
A- Palisade cartilage technique.
B- Perichondrium/cartilage composite graft technique.

***<u>Inclusion criteria of the patients:</u>**
Age > ١٢ years old, small central perforation, the middle ear was dry > ٣ months and intact ossicular chain.

***Exclusion criteria:**

Patients having ears with otorrhea or suffering from sensorineural hearing loss, chronic ear disease with granulations or cholesteatoma.

Patients having disconnected ossicular chain or Eustachian tube dysfunction.

**Surgical technique:**

-Under general anesthesia, a transcanal endoscope-assisted approach will be performed. Tragal cartilage is harvested with perichondrium attached via a small incision on the internal surface of the tragus. **In cartilage/perichondrium composite graft technique,** the cartilage–perichondrium graft is placed as a medial graft (underlay technique) with the perichondrium towards the external canal wall for stabilization. **In cases of palisade cartilage technique,** the palisades are cut into about ٠.٥ to ٣ mm wide, usually ٤–٦ in number, positioned in an-underlay fashion from anterior to posterior direction with the perichondrium attached to the side towards the external auditory canal.

## Results

The total number of cases was ٤٦ patients, with CSOM with central perforation and underwent endoscopic tympanoplasty using tragal cartilage graft through a transcanal approach. Patients are classified into ٢ groups, the first group includes ٢٣ patients in whom tympanoplasty is done by cartilage/ perichondrium composite graft and the second group included ٢٣ patients in whom tympanoplasty was done using cartilage palisade technique. The age of the patients ranged from ١٣ to ٥٤ years with mean of ٢٤.٣ years and standard deviation of ٩.٧ in cases of tympanoplasty with cartilage perichondrium composite graft & with mean of ٢٧.٣ and standard deviation of ١١.٨ in cases of tympanoplasty with cartilage palisade technique. There was no significant difference between the age groups regarding the age distribution (P value ٠.٣). There was improvement in postoperative ABG in both techniques, improvement more in palisade cartilage technique group, with a statistically significant difference between both techniques at ٥٠٠ Hz frequency. ABG closure was improved in both techniques with more improvement in cases of tympanoplasty with palisade technique, with no statistically significant differences between both techniques. The graft was taken in ١٥ cases of composite technique group (٦٢.٢٪) and in ١٦ cases of palisade technique group (٦٩.٦٪), with no statistically significant difference between both techniques.

**Table (١): ABG in both techniques**

| ABG | Composite graft: n.=٢٣ | Palisade graft n.=٢٣ | P |
|---|---|---|---|
| **At ٥٠٠ pre** | ٣١.٩±١٠.٩ | ٣٠±١٠.٧ | ٠.٥ |
| **Post** | ٢٨.٤±١٢.١ | ١٩.٥±٨.٥ | ٠.٠٠٦ |
| **At ١٠٠٠ pre** | ٢٥.٦±١٠.٥ | ٢٢.٣±١١.٨ | ٠.٣ |
| **Post** | ١٩.٣±١١ | ١٥±٦.٩ | ٠.١ |
| **At ٢٠٠٠ pre** | ١٩.١±٧.١ | ١٨.٠٤±٨.٧ | ٠.٦ |
| **Post** | ١٥.٨±٨.٦ | ١٥.٤±٧.٢ | ٠.٨ |
| **At ٤٠٠٠ pre** | ١٨.٩±٨.١ | ٢٠.٢±١١.٧ | ٠.٦ |
| **Post** | ٢٠±١٢.٩ | ١٢.٤±١١.١ | ٠.٩ |

**Table (٢): graft taken in both techniques**

| Graft taken | Composite graft: n.=٢٣ | Palisade graft n.=٢٣ | P |
|---|---|---|---|
| **Well taken** | ١٥(٦٢.٢٪) | ١٦(٦٩.٦٪) | ٠.٠٢ |
| **Not taken** | ٨(٣٤.٨٪) | ٧ (٣٠.٤٪) | |

## Discussion

This study had been conducted at ENT department, EL-Minia university hospital on patients with CSOM with central perforation prepared for endoscopic cartilage tympanoplasty, patients attending in the period from January ٢٠١٣ to October ٢٠١٣. Patient's age ranged from ١٣ to ٥٤ years, Of ٤٦ patients underwent endoscopic cartilage tympanoplasty, through a per-meatal approach, ٢٣ cases were operated using the palisade technique & ٢٣ cases with perichondrium/cartilage composite graft.

***Palisade technique group:***

The study showed improvement in postoperative AC threshold at the overall ٤ frequencies; of a statistically significant at ٥٠٠,١٠٠٠, ٢٠٠٠ Hz at frequency ٥٠٠ Hz with mean ٩.٧±٤٤.٧ preoperative and ٧.١±٣٠.٦ postoperative (improved by ١٤.١ dBHl), at frequency ١٠٠٠ Hz with mean ٣٥.٨±١١.٤ preoperative and ٢٨.٢±٧.٩ postoperative (improved by ٧.٦ dBHl) & at frequency ٢٠٠٠Hz with mean ٣٢.٦±١٢.٠٤ preoperative and ٢٩.٣±١٤.٢ postoperative (improved by ٣.٣ dBHl).

The study showed significant improvement in air bone gap at the overall Four frequencies, at frequency ٥٠٠Hz with mean ٣٠±١٠.٧ preoperative and ١٩.٥±٨.٥ postoperative (improved by ١٠.٥ dB).and at frequency ١٠٠٠Hz with mean ٢٢.٣±١١.٨ preoperative and ١٥±٦.٩ postoperative (improved by ٧.٣dB), at frequency ٢٠٠٠ Hz with mean ١٨.٠٤±٨.٧ preoperative and ١٥.٤ ±٧.٢ postoperative (improved by ٢.٦dB) and at frequency ٤٠٠٠ Hz with mean ٢٠.٢±١١.٧ preoperative and ١٢.٤±١١.١ postoperative. (Improved by ٧.٨dB).Graft takes in this group achieved in ١٦ cases (٦٩.٦٪). This result parallel with results of a study carried out by Inci Alkan Demirpehlivan, et al., ٢٠١١ With the same inclusion criteria, Cartilage palisades were used in ١٩ the patient, the graft take rate was ٧٩٪ and average ABG was ٢٨.٣ dB preoperative and ١٥.٢dB postoperative (improvement by ١٣.١dB), the differences from our study was in the type of surgical approach which was postauricular and the duration of follow up which was ١٢ to ٦٤ months, While in our study we use a transcanal approach and follow up period was within ٣ months postoperatively[٥].

In a comparative study conducted by Cagdas et al., ٢٠٠٧ the use of palisade cartilage for management of subtotal perforations in comparison with temporalis fascia; using a postauricular approach, In cases of palisade technique (n=٢٣) graft take was achieved in ٢٢ patients (٩٥.٧٪). The average preoperative ABG in PCT group was ٢٥.٦ & ٨.٦ dB, and postoperative ABG being ١٧.٣& ٨.٨ dB (improvement by ٨.٣ dB)[٦].

**Perichondrium/cartilage composite graft *technique group:***

Our study showed improvement in postoperative air conduction threshold at ٥٠٠,١٠٠٠,٢٠٠٠ frequencies, of a statistically significance at ١٠٠٠ Hz), at frequency ٥٠٠ Hz with mean ٤٥.٨±١١.٩ preoperative and ٤٣.٤±١٣.٥ postoperative (improved by ٢.٤ dBHl) ,at frequency ١٠٠٠ Hz with mean ٤٠ ±١٢.٧ preoperative and ٣٤.٣ ±١٠.٩ postoperative (improved by ٥.٧dBHl) & at frequencies ٢٠٠٠Hz with mean ٣١.٧±١٠.٤ preoperative and ٢٩.١ ±١٠.٠٧ postoperative (improved by ٢.٦ dBHl).

The study showed improvement in postoperative ABG with this technique at three frequencies, of no statistically significance, at frequency ٥٠٠Hz with

mean ٣١.٩±١٠.٩ preoperative and ٢٨.٤±١٢.١ postoperative (improved by ٣.٥dB), at frequency ١٠٠٠Hz with mean ٢٥.٦±١٠.٥ preoperative and ١٩.٣±١١ postoperative (improved by ٦.٣dB). And at frequency ٢٠٠٠ Hz with mean ١٩.١±٧.١ preoperative and ١٥.٨±٨.٦ postoperative (improved by ٣.٣dB). Graft take in this group achieved in ١٥ case (٦٢.٢٪).

Our study showed improvement in ABG closure in both techniques; improvement is better in cases of tympanoplasty with palisade technique than cases with composite with no statistical significant differences. Our results agree with results of study conducted by Sunita Chhapola and Inita Matta, ٢٠١٢ cartilage perichondrium (composite graft) was used in ٦١Patient , ٦٠(٩٨.٣٦٪) showed a healed tympanic membrane and only ١(١.٦٣٪) had re-perforation, ABG closure with tragal cartilage perichondrium was less than ٤٥ (٧٨٪) patients and more than ١٠ dB in ١٣ patients (٢٢ %)[٧].

In study by CHEN Xiao-wei, et al., ٢٠١٠, The tragal or conchal perichondrium/ cartilage was used to replace the tympanic membrane. Graft taken in this study was successful in all patients and ٨٥.٨٪ patients achieved a postoperative hearing improvement.[٨].

In study by Jyothi P., et al., ٢٠٠٧, Tragal perichondrium achieved a success rate of ٨٠% graft uptake and ٧٥٪ hearing gain, higher success rate[٩].

Publications have previously reported the value of the endoscope-assisted. Tympanoplasty, a study by Stephane Ayache, ٢٠١٢, thirty patients with a tympanic membrane perforation underwent a transcanal endoscopic cartilaginous myringoplasty, Three patients had a residual perforation at ٢ months after surgery. There was no case of blunting, lateralization of the tympanic membrane or ossicular injury. The mean ABG decreased from ١٧.٧ dB to ٧.٩ dB[١٠].

**Conclusion:**

Our experience with cartilage tympano-plasty demonstrates that cartilage appears to offer an extremely reliable method for reconstruction of the TM. Also the use of the endoscope provides an excellent magnified image with minimal effort and using of the endoscopic transcanal tympanoplasty is a simple and minimal invasive surgery.

We concluded that there is improvement in hearing gain and graft take rate with palisade technique and perichondrium/ cartilage composite graft technique, with no considerable difference between both techniques.

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