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ORIGINAL ARTICLE

Endoscopic Myringoplasty: Comparison of Cubism Graft Versus Temporalis Fascia Graft with Platelet-Rich Plasma

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Abstract

Background: ***Reconstruction of the tympanic membrane (TM) is known as a myringoplasty procedure, and it can be carried out using a variety of techniques under a microscope or endoscope to address hearing impairment caused by TM rupture.***

Aim and Objectives: ***to evaluate the surgical & functional results between 2 techniques in endoscopic myringoplasty: the 1st with the new "cubism" graft and the other with temporalis fascia graft + PRP.***

Patient and Methods: ***40 patients undergoing endoscopic myringoplasty for chronic otitis media with dry central perforation presented to Al-Azhar University hospitals (Al-Hussein & Sayed Galal). Regarding the graft material, cases were divided into two equal groups, A and B. Group A comprises patients who underwent endoscopic myringoplasty with the new "cubism" graft. Group B: patients who underwent endoscopic myringoplasty with temporalis facia graft + Platelet-Rich Plasma.***

Results: ***There was no statistically significant difference between the two groups regarding age, sex, success rates, and air-bone gap throughout the follow-up period. However, there was a considerable improvement (Decrease) in the air-bone gap over time in the same group. Postoperative follow-ups of patients who underwent endoscopic myringoplasty with cubism graft showed fewer complications.***

Conclusion: ***We concluded that endoscopic myringoplasty with cubism graft showed a promising outcome as it showed comparable results with the other graft and less complication.***

Keywords: Endoscopic Myringoplasty, CUBISM , TFG+PRP

1. Introduction

When a tympanic membrane perforation requires repair, a standard surgical procedure is tympanoplasty. Improving hearing and obtaining a healthy tympanic membrane by graft closure are the primary objectives of tympanoplasty.[1]

Fat, fascia, perichondrium, and cartilage are some of the most frequent graft materials utilized to repair perforated tympanic membranes.[2,3]

Platelet-rich fibrin (PRF), the second generation of platelet concentrates, has been shown in clinical tests to enhance healing and homeostasis in soft and hard tissue wounds.[4]

Furthermore, plastic and microsurgery have both been proposed as potential uses. Postoperative results from tympanic surgeries may be better with platelet-rich fibrin as well.[5]

Cartilage graft procedures have been used frequently during the past few decades. The tragus or concha of the auricle are ideal locations for obtaining cartilage grafts. Cartilage has been the subject of dozens of research studies, and it is superior to other graft materials. Cartilage can improve the graft take rate by obtaining vital nutrients through diffusion.[6]

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However, unless the cartilage has been thinned, the hearing gain from a cartilage tympanoplasty may be lower than that of other graft materials. According to multiple prior studies, partial-thickness cartilage significantly improves hearing compared to full-thickness cartilage.[7,8]

This study examined two endoscopic myringoplasty techniques: temporalis fascia graft plus PRP and the novel "cubism" graft. The purpose of the comparison was to examine the functional and surgical results.

2. Patients and methods

This comparative prospective study included 40 patients with dry central perforations and chronic otitis media who had endoscopic myringoplasty; the patients were sent to Al-Azhar University hospitals (Al-Hussein & Sayed Galal). The cases were separated into two equal groups, A and B, with regard to the graft material. Patients in Group A had endoscopic myringoplasty using the novel "cubism" graft. Patients in Group B had endoscopic myringoplasty combined with platelet-rich plasma and a temporalis facia graft.

Inclusion criteria: Subjects that meet the following criteria are considered to have chronic otitis media with dry central perforation and intact ossicular chain, both genders, middle age ranging from 20 to 50 years

Exclusion criteria: patients with chronic illness, age < 20 and > 50 years, cholesteatoma, signs of infection during surgery, as well as a prior middle ear surgery and patients refusing surgery.

Methods:

All cases were exposed to the following: history taking, general examination, complete ENT examination, laboratory investigations & pure tone audiometry, written consent and ethical consideration.

Surgical Technique:

UGA, sterilization, prone position, using 0-degree rigid endoscopes (2.7 mm & 4 mm diameter), and all procedures were conducted using a transcranial approach.

Group A: the new "cubism" graft: Injection of epinephrine/saline (1-2 ml) (1:10.000) into each of the four corners of the external auditory canal. Refreshment of the edge of the perforation. I explored to confirm an intact ossicular chain by elevating the tympanometry flap following a hemi-circular external auditory canal incision.

The graft material was sourced from the tragal cartilage on the same side. The perichondrium covering the outwardly curved side of the tragal cartilage graft was removed, but the inwardly curved side remained intact in the cartilage.

The perichondrium-free side of the cartilage was thinned by gently scraping it with a scalpel blade no. 11, while ensuring the blade was held at a right angle to the cartilage. All scalpel movements were unidirectional. Meanwhile, cartilage particles resembling dough had developed on the scalpel. To create a flat cartilage island graft, we avoided excessive cartilage bending while harvesting it, ensuring that it had the required thickness. The island graft was designed with a notch to accommodate the malleus handle.

A 10-ml anticoagulant-free sterile tube was utilized to draw venous blood samples. For ten minutes, the sample was centrifuged at 3,000 revolutions per minute. In the tube's uppermost layer, a fibrin clot containing platelet-rich fibrin (PRF) was found. The cartilage dust was treated with the platelet-rich fibrin that was extracted from the tube.

Subsequently, the combination of cartilage dust and PRF was pulverized using two robust glass slides. Further quantities of dust & PRF were introduced into the mixture and pulverized once more. Consequently, a slender and adhesive cubism graft was created, allowing for easy placement at an underlay position after the cartilage island graft's insertion, including no, tch for includes a handle. Ultimately, the tympanometry flap was relocated to its original anatomical position, and the external auditory canal was filled with Gelfoam.

Group B: Temporalis fascia graft + PRP: The same as group A except for graft material. A supra-auricular incision (minor surgical incision 1 centimetre superior to the auricle) was made, and the temporalis fascia graft was harvested.

Preparation of Autologous Platelet Rich Plasma: A 10-ml sterile tube without anticoagulant was used to collect a venous blood sample, which was subsequently centrifuged at 3000 rpm for 10 minutes. As a consequence, there were two distinct layers: an upper layer with a yellowish colour and a bottom layer with a dark red colour.

Using a sterile pipette, the supernatant plasma was moved to a another sterile tube for high-speed centrifugation. To get the top supernatant, a second centrifugation was carried out for 15 minutes at a speed of 3000 revolutions per minute. With the aid of a pipette, the platelet-depleted plasma was gently sucked, leaving 1 ml of fluid at the bottom to be saved for surgical use.

Before usage, 0.1 ml of calcium gluconate was introduced to trigger the release of the growth factor. This pronoun was added to an adequate amount of gel foam utilized throughout the operation.

Two drops of platelet-rich plasma were applied to either side of the temporal fascia graft. The graft was positioned on the inner side of the malleus handle following the elevation of the tympanometry flap. Ultimately, the tympanometry flap was relocated to its original anatomical position, and the external auditory canal was filled

with PRP wet gel foam. A slender strip of ribbon was inserted into the cartilaginous section of the external auditory canal.

Postoperative follow-up: Following the surgical procedure, all patients received systemic antibiotics for 7-10 days. They were monitored in the outpatient clinic at specific intervals: one week, two weeks, one month, and three months after the surgery.

Postoperative pain was assessed using VAS (visual analogue scale).

After 1st week following the operation, the stitches and aural packs were removed. Additionally, the patient was prescribed a one-week antibiotic-steroid ear drops and instructed to keep the operated ear dry and avoid contact with water.

In 2 weeks, the patient underwent an examination to rule out any potential problems.

In One month, the ear underwent endoscopy to assess graft integration and PTA to evaluate auditory function.

Following three months, the patient underwent endoscopy to assess the acceptance of the graft. Additionally, PTA tests were conducted.

CASE (1): Male patient 38 years old presented with left CSOM underwent endoscopic myringoplasty by new CUBISM technique

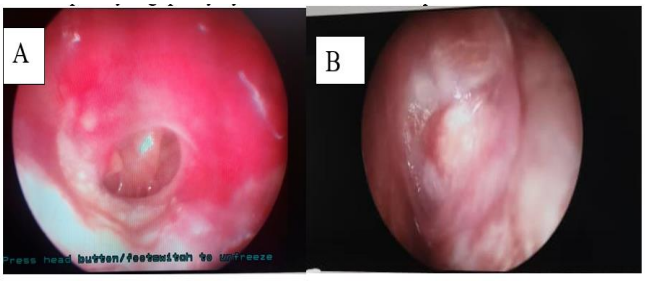

Figure 1. (A) Endoscopic view of medium sized perforation On left side and (B) 3 monthes post operative follow up show intact TM

CASE (2)

Female patient 43 years old presented with left CSOM with central perforation underwent endoscopic myringoplasty by TFG + PRP technique >

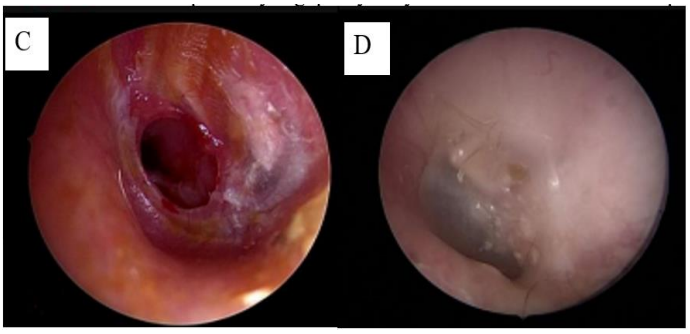

Figure 2. (C) Endoscopic view of medium sized perforation On left side and (D) 3 monthes post operative follow up show intact TM

3. Results

Table 1. Demographic data of included subjects in both study groups

	GROUP A (N = 20)	GROUP B (N = 20)	P. VALUE
AGE	33 ± 8.61	31.8 ± 8.75	0.6646
	31 (21-48)	29 (21-47)	
SEX			
MALE	9 (45%)	7 (35%)	0.5309
FEMALE	11 (55%)	13 (65%)	
SMOKING	4 (20%)	3 (15%)	0.6867

Table 1. displayed that there were no statistical differences amongst two studied group as regard sex, age & smoking status.

Table 2. Follow up complications detection among included subjects in both study groups

	GROUP A (N = 20)	GROUP B (N = 20)	P. VALUE
INFECTION	1 (5%)	6 (30%)	0.0399
PAIN	6 (30%)	14(70%)	0.0125

This table showed that there was statistical significant difference between both study groups regarding postoperative complication.

Table 3. Success rate among included subjects in both study groups.

	GROUP A (N = 20)	GROUP B (N = 20)	P. VALUE
1 MONTH			
RE-PERFORATION	1(5%)	4 (20%)	0.1515
COMPLETE (SUCCESSFUL)	19 (95%)	16 (80%)	
3 MONTHS			
RE-PERFORATION	2 (10%)	3(15%)	0.6369
COMPLETE (SUCCESSFUL)	18 (90%)	17 (85%)	

Table 4 presented that there was no statistical significant alteration in success rates among each study groups at this time point.

Table 4. Follow up Audiogram air bone gab evaluation in both study groups

	GROUP A (N = 20)	GROUP B (N = 20)	P. VALUE
PRE-OPERATIVE			
MEAN ± SD	23.2 ± 1.44	22.55 ± 1.88	0.2263
MEDIAN (RANGE)	23.5 (21-26)	23 (20-26)	
1 MONTH			
AUDIOGRAM AIR BONE GAP (DB)	16.35 ± 2.43	15.45 ± 1.7	0.1832
	16 (13-21)	15 (13-19)	
DIFFERENCE WITH PRE-OP	6.85 ± 1.46	7.1 ± 1.52	0.5988
	7 (3-8)	7.5 (3-9)	
CHANGE (%) BETWEEN 1 MONTH AND PRE OPERATIVE AIR BONE GAB	29.79 ± 7.18	31.41 ± 6.01	0.4428
	31.82 (12.5-38.1)	32.67 (14.29-38.1)	
P. VALUE	<0.0001*	<0.0001*	
3 MONTHS			
AUDIOGRAM AIR BONE GAP (DB)	12.9 ± 2.83	12.25 ± 1.45	0.3657
	12 (10-19)	12.5 (10-15)	
DIFFERENCE WITH PRE-OP	10.3 ± 2.18	10.3 ± 1.63	0.98
	11 (5-12)	11 (6-12)	
CHANGE (%) BETWEEN 3 MONTH AND PRE OPERATIVE AIR BONE GAB	44.67 ± 10.03	45.59 ± 5.78	0.7232
	49 (20.83-52.38)	46.83 (28.57-52.38)	
P. VALUE	<0.0001*	<0.0001*	
DIFFERENCE WITH 1 MONTH	3.45 ± 0.94	3.2 ± 0.52	0.307
	4 (2-5)	3 (2-4)	
CHANGE (%) BETWEEN 1 MONTH AND 3 MONTHS AIR BONE GAB	21.67 ± 6.27	20.75 ± 2.66	0.5497
	23.53 (9.52-27.78)	21.24 (13.33-23.53)	
P. VALUE	0.00019*	<0.0001*	

This table indicated that there was no significant variance among both study groups regarding audiogram air bone gab through follow up period. However, there was significant improvement (Decrease) in air bone gab through time in the same group.

4. Discussion

The present trial showed that in Group A the mean age of the studied cases was 33 ± 8.61, 45% were males and 20% were smoking. In Group B, the mean age was 31.8 ± 8.75, 35% were males and 15% were smoking. Our findings indicate that there was no statistically significant disparity among the two groups under study in terms of sex distribution, age & prevalence of smoking.

Concerning follow-up complications, the current investigation found statistically significant disparity among the two groups.

The current resesrch can be supported by Kaya et al.,[9] whose disclosure it was that the trans canal endoscopic method was used for the operation in every patient in the study. In the study group, the graft success rate was 100% at the one-month otological assessment. In the control group, 95.5% of the patients (21 out of 22) had successful grafting. At the sixth month otological evaluation, the research group could not find any signs of graft failure. The control group had a graft success rate of 95.5 percent at the six-month evaluation.

As regards complications, el Awady et al.,[10] They sought to determine whether endoscopic trans-canal myringoplasty patients who had PRF added to their grafts had a higher success rate and better healing rates. Forty patients with tubotympanic chronic suppurative otitis media with dry central TM perforation were included in the research. Twenty people had endoscopic trans-canal myringoplasty with tragal perichondrium graft and autologous PRF added to their procedure; twenty patients in group B had the same procedure with tragal perichondrium graft but no PRF added to their procedure. The case group did not experience any infection, whereas the control group had six cases of postoperative otorrhea due to middle ear infections. These six cases were treated with antibiotics, both locally and systemically, as well as the infection was under control with medical intervention. The rate of infection in the control group (12.5 percent) was significantly greater than in the case group (P under 0.037).

According to success rate at 1 month, our results showed that in group A 5% of the studied cases had a re-perforation, 95% had complete (successful) closure. In group B, 20% of their studied cases had re-perforation and 80% had complete (successful) closure. We found that, no significant alteration amongst the two studied

groups as regards success rate after 1 month. Regarding success rate at 3 months, our study revealed that the re-perforation rates for Group A 10% and Group B 15 % with no statistically variance amongst the 2 studied groups (p-value = 0.6369). The complete closure rates at 3 months, with 90% for Group A & 85% for Group B, indicating no significant increase or decrease in success rates among the two study groups at this time point.

Our study can be supported by study of Akash et al.,[11] where the postoperative graft absorption rate was measured one month and six months following surgery. With a matching failure rate of 2.5% and 7.5%, respectively, successful graft uptake was observed in 97.5% of patients in Group A (with PRP) and 92.5% in Group B (without PRP) at the one-month mark. 95% of patients in Group A (with PRP) and 90% in Group B (without PRP) had successful graft uptake at the six-month mark, with comparable failure rates of 5% and 10%, respectively.

The present study demonstrated that there was no significant change amongst each studied groups regarding Audiogram air bone gab through follow up period. However, there was significant improvement (Decrease) in air bone gab through time in the same group.

The present study in consistent with el Awady et al.,[10] noticed that the average preoperative air-bone gap (ABG) in group A was 28 ± 8.335 as well as 25.05 ± 6.143 in group B, with no significant disparities (P = 0.210). Similarly, the postoperative mean ABG was 12.22 ± 3.524 in group A in addition 12.31 ± 4.837 in group B, with no statistically distinction among the two groups (P = 0.955). In group A, the average hearing gain was 14.44 ± 4.501, while in group B, it was 11.69 ± 3.119. There was no statistically significant disparity observed among the two groups in terms of the pre-operative and post-operative A-B gap and hearing gain. The application of PRF did not have an impact on the hearing gain in cases where grafts were removed. The hearing gain is specifically associated with the closure of the tympanic membrane.

5. *Conclusion*

We concluded that endoscopic myringoplasty with cubism graft showed a promising outcome, comparable results with the other graft, and fewer complications.

Disclosure

The authors have no financial interest to declare in relation to the content of this article.

Authorship

All authors have a substantial contribution to the article

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Conflicts of interest

There are no conflicts of interest.

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