Original Research Article

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Efficacy of platelet rich fibrin in myringoplasty

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ABSTRACT

Background: Myringoplasty involves repair of tympanic membrane perforation with an autologous graft. The aim was to compare between myringoplasty with PRF and myringoplasty without fibrin.

Methods: This study was conducted from July 2016 to June 2017,100 patients were taken. In 50 patients platelet rich fibrin was placed over graft and external auditory canal during myringoplasty and 50 without PRF.

Results: It was seen in the study that PRF improves overall success rate of myringoplasty study and there was significant improvement in ABG at 500 hz, 1000 hz, 2000 hz frequencies.

Conclusions: The higher success rate of myringoplasty with PRF was seen as compared to myringoplasty without fibrin. There were no noticeable side effects.

Keywords: Graft, Myringoplasty, PRF, 500 hz, 1000 hz, 2000 hz

INTRODUCTION

Chronic suppurative otitis media is the permanent abnormality or perforation of pars tensa and flaccida, due to acute otitis media, negative middle ear pressure or otitis media with effusion.¹ It is more common in lower socioeconomic groups and developing countries like India.² Tympanoplasty is myringoplasty with ossicular reconstruction and underlay graft of temporalis fascia or sometimes perichondrium is used. The rim of perforation is excised so that there is raw surface and from this new tissue will grow.³ Outcome of myringoplasty depends on various factors and has some limitations. Studies have shown that closure rates also depend upon the size of perforation also vary from surgeon to surgeon.

Various studies shows experimental use of some agents for healing of tympanic membrane perforation such as hyaluronic acid, pentoxifylline and fibroblast growth factors.⁴ Platelet-rich fibrin (PRF) was first described by Choukroun et al is a second generation platelet concentrate. It contains fibrin membrane which has platelets and growth factors prepared from patient's own blood free of any anticoagulant. It contains leukocytes, cytokines, structural glycoproteins, growth factors like platelet derived growth factor (PDGF), vascular endothelial growth factor (VEGF) and transforming growth factor-B (TGF-B). PRF provides both mechanical and inflammatory protection to the tympanic graft and accelerates cell proliferation and matrix remodelling.⁵ This autologous biomaterial is easy, quick and cheap to produce and is biocompatible, safe and easily manipulated during surgical procedure.⁶ A study was conducted by Habesoglu et al in 32 patients with acute tympanic membrane perforations. He concluded that use of platelet rich fibrin accelerated the tympanic membrane closure.⁴ The purpose of the study was to find the efficacy of autologous platelet rich fibrin during myringoplasty in closure of tympanic membrane perforation by subjecting the patient to otoscopic examination and pure tone audiometry.

METHODS

This study was a randomised prospective observational study which was conducted in the Department of Otorhinolaryngology- Head and neck surgery, Indira Gandhi Medical College, Shimla, over a period of one year from July 2016 to June 2017. All subjects were included in the study after obtaining an informed consent.

Inclusion criteria

Chronic otitis media (COM) mucosal type, inactive for atleast 6 weeks, perforations with conductive hearing loss less than 45db, patent eustachian tube and good cochlear function.

Exclusion criteria

Patients with active ear disease, patients with atopic ear conditions, Diabetes mellitus and age group less than 12 year.

Assessment of the patients was done in outpatient department including history, general physical examination, and examination of ear (otoendoscopy and or otomicroscopy), nose and throat. On otoendoscopy, perforations were classified according to the size of perforation as small (less than 50%), medium (50-75%) and large (more than 75%). Hearing assessment was performed with pure tone audiometry with or without masking using 500 hz, 1000 hz, 2000 hz frequencies (average pure tone obtained). Patients included in the study were subjected to routine blood tests.

Preparation of PRF

8 to 10 cc of blood of the patient was taken into the test tubes. No anticoagulant was added. Blood was centrifuged using a centrifuge machine for 12 min at 2,700 rpm in a laboratory centrifuge machine with 4x15ml swing out head. Voltage supply 220-240 volts. Rotor capacity of 4×15 ml. Number of tubes 4 with maximum speed of 3500 rpm. Weight 6.8 kg.



Figure 1: Blood divided into three fractions: lowerred blood cell, middle-fibrin and upper-acellular fraction.



Figure 2: Isolated platelet rich fibrin (PRF) by separating the middle fraction from the centrifuged blood.

The resultant product consisted of the following three layers (Figure 1):

- Topmost layer consisting of acellular platelet poor plasma.
- PRF clot in the middle (Figure 2).
- RBC's at the bottom.

The procedure

All surgeries were performed under local anaesthesia (2% lignocaine with 1:100000 adrenaline) and diluted intra venous pentazocine. Standard surgical procedure of endoscopic approach using temporalis fascia graft, underlay technique was adopted. Platelet rich fibrin was placed on the graft and filled in the external auditory canal (Figure 3). No pack was placed.



Figure 3: Intra-operative endoscopic view showing fibrin over the graft.

Postoperative instructions

Patients were given instructions to keep the ear dry and avoid wetting. They were also instructed to avoid forceful blowing of nose.

Follow up

Endoscopic evaluation was done every month for at least 3 months (Figure 4). Outcome documented following surgeries as

- 1. Early graft uptake (Intact neo- tympanum) after 1, 2 and 3 months following surgery (closure rate).
- 2. Pure tone audiometry (postoperative audiograms air conduction calculated on 500, 1000, 2000 and 3000 Hz) after 3 months of surgery.



Figure 4: Postoperative endoscopic view of tympanic membrane three months after myringoplasty.

Statistical method and software

Data was expressed as percentages for discrete variables and mean \pm SD for continuous variables. Statistical software was used for the analysis of the data and Microsoft word and Microsoft Excel have been used to generate graphs, tables, etc. Data was analysed using Chi Square test. Statistical significance was assumed at p<0.05.

RESULTS

In our study of 100 cases of chronic suppurative otitis media there were two groups.

Case: Myringoplasty with autologous platelet rich fibrin

Control: Myringoplasty without platelet rich fibrin.

In this study, the age of patients varied from 18 years to 55 years (Figure 5). Majority of the patients were females with female: male ratio of 1.27:1. In this study, right-sided disease (29%) was more common than left sided (50%) disease and (21%) bilateral CSOM. The success rate of myringoplasty in this present study was better for smaller perforations than large size perforation (Table 1). The results were clinically significant but statistically insignificant. Overall graft take up rate at the first month was seen in 82% in case and 54% in control with p-value (<0.003) which was statistically significant. At the second month follow up 88% case and 64% control had complete graft uptake. The p value was statistically significant. At the end of third month 92% cases and 64% control had complete graft uptake (Figure 6).

ABG <10 dB at 500 hz postoperatively improved to 82% in case group. ABG <10 dB at 1000 hz percentage improved to 80% in case group and ABG <10 dB at 2000 hz the percentage improved to 37.74%. In control group the improvement in ABG <10 dB at 500 hz was 38%, at 1000 hz was 48% and at 2000 hz the percentage improved to 74%. The results were statistically significant with p value.

Group			Size of perforation			
			Small (<50%)	Medium (50-75%)	Large (>75%)	Total
Cases graft uptake 3 month	In-complete	Count	0	2	2	4
		% within graft uptake-3 month	0%	50%	50%	100%
		% within size of perforation	0%	7.7%	20%	8%
	Complete	Count	14	24	8	46
		% within graft uptake-3 month	30.4%	52.2%	17.4%	100%
		% within size of perforation	100%	92.3%	80%	92%
Total		Count	14	26	10	50
		% within graft uptake-3 month	28%	52%	20%	100%
		% within size of perforation	100%	100%	100%	100%
Controls graft uptake 3 month	In- complete	Count	2	9	5	16
		% within graft uptake-3 month	12.5%	56.3%	31.3%	100%
		% within size of perforation	22.2%	27.3%	62.5%	32%
	Complete	Count	7	24	3	34
		% within graft uptake-3 month	20.6%	70.6%	8.8%	100%
		% within size of perforation	77.8%	72.7%	37.5%	68%
Total		Count	9	33	8	50
		% within graft uptake-3 month	18%	66%	16%	100%
		% within size of perforation	100%	100%	100%	100%

Table 1: Size of perforation vs. graft uptake at three months.



Figure 5: Age distribution.



Figure 6: Graft uptake at 3rd month.

DISCUSSION

Myringoplasty involves repair of tympanic membrane perforation with an autologous graft by two techniques overlay and underlay. Vartiainen et al analysed failures occurring in 417 myringoplasties. Infection was the most common cause of re-perforations and occurred more frequently with larger perforations.⁷ Chauvin et al proved in their study that growth accelerators are the most promising agents.³ According to them more rapid TM closure was produces by growth accelerators like hyaluronic acid (HA), 0.4 µg basic fibroblast growth factor (bFGF), or 1.0 µg epidermal growth factor than the control ears. PRP, when activated, can release multiple growth factors, including BMP-2, connective tissue growth factor (CTGF), fibroblastic growth factor-2 (FGF-2) and TGF- β 2. The multiple growth factors released from PRP may play a synergistic role in the cell proliferation.⁸ Advantage of platelet rich fibrin includes easy preparation and lack of biochemical handling of blood, which makes this preparation strictly autologous preparation. The required quantity of blood is drawn into 10-ml test tubes without an anticoagulant and centrifuged immediately.9

According to Sankaranarayanan et al study 96% closure were seen in case group with the use of PRF and 80% closure in control group seen at the end of third month in tympanic membrane perforation during myringoplasty.²

Habesoglu et al studied the effect of PRF on the healing of traumatic tympanic membrane perforation of 32 patients with acute tympanic membrane perforations due to trauma.³ In 9 of 14 patients with use of PRF there was total closure of TM at the end of 1 month. But, in control group, total closure was seen in only 4 of 18 patients.

Alvaro et al presented the preliminary results of three cases with inactive central tympanic membrane perforation with an imbibition of the PRP around the perforation in a prospective study.¹⁰ In all three cases, the perforation closed entirely.

In our study in case group 100% graft uptake was seen in small perforation 92% uptake in medium size and 80% uptake in large perforation. In control group 77% uptake was seen in small perforation.72% uptake of graft was seen in medium size perforation and 37% uptake in large size perforation. Although results were statistically insignificant but size of perforation was one of the factors that influenced success of myringoplasty according to our study. Das et al showed success rate of 100% in small perforation, 69.2 and 42.9% in medium and large perforations respectively which was comparable with our study.¹¹

In this study there was significant improvement in ABG at 500 hz, 1000 hz, 2000 hz frequencies. It was seen in the study that PRF improves overall success rate of myringoplasty. In case group, 92% graft uptake was seen and in control group the graft uptake was 64%. In most of the cases, the cause for graft failure was upper respiratory tract infection.

Considering the higher success rate of myringoplasty with PRF compared to myringoplasty without fibrin, together without any noticeable side effects we recommend that myringoplasty with autologous PRF should be preferred as it accelerates the tympanic membrane closure and prevent graft displacement.

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