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RESEARCH ARTICLE

OSSICULOPLASTY: AUTOGRAFT VS ALLOGRAFT

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Abstract

Background: Chronic otitis media (COM) is defined as a perforation of the tympanic membrane with persistent drainage of pus from the middle ear lasting at least two weeks. Tympanoplasty is a surgical procedure in ENT practice which aims at removal of diseased pathology from middle ear along with reconstruction of sound conducting mechanism by reconstructing the ossicular chain with various materials.

Methods: All the cases of CSOM with ossicular chain deformity were included. Ear examination was done in detail, Preoperative hearing assessment was done and Hearing loss was calculated by average air bone gap on PTA. For Auto graft tragal cartilage or incus was used and for allograft Teflon TORP/PORP with cartilage cap was used.

Results: Comparison for ossiculoplasty was done by comparing its advantages and disadvantages in the terms of extrusion rate and hearing restoration in postoperative period. Overall failure rate for autologous material was 8% and for alloplastic material was 12%.

Conclusion: the use of autologous graft is more advantageous in terms of surgical outcome, extrusion rate, and postoperative hearing gain.

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Introduction:-

Chronic otitis media (COM) is defined as a perforation of the tympanic membrane with persistent drainage of pus from the middle ear lasting at least two weeks [1]. The burden of CSOM varies global. Its prevalence rate is estimated between a range of 1% to 46%. Patient with CSOM may present with ear discharge, deafness, ear ache or life threatening complication. Total 65–330 million individuals have discharging ears, out of which 60% suffer from significant hearing impairment [2]. Tympanoplasty is a surgical procedure in ENT practice which aims at removal of diseased pathology from middle ear along with reconstruction of sound conducting mechanism by reconstructing the ossicular chain with various materials. Examples of autologous materials are tragal cartilage, incus, etc; alloplastic materials are Teflon, titanium, gold, etc; homologous materials are septal cartilage, ossicles, etc. The object of this study is to identify ossicular chain deformity seen in CSOM and the proportion of deafness and its prevalence seen in various aspects of ossiculoplasty, aiming to give them normal and functioning ear which would otherwise make them handicap due to deafness.

Aims And Objectives:-

1. To determine which is the most suitable material for ossicular reconstruction among autologous material (tragal cartilage, incus) and alloplastic material (Teflon total/partial ossicular replacement prosthesis) after performing tympanoplasty or tympanoplasty with mastoidectomy,

2. To study the difference between preoperative and postoperative hearing improvement,
3. To study postoperative graft uptake.
4. To see advantages and disadvantages of graft material like autologous (tragal cartilage, incus) and alloplastic (Teflon TORP/PORP) in the form of extrusion rate, biocompatibility, hearing restoration, etc.

Materials And Method:-

Inclusion Criteria

1. All the cases of CSOM with ossicular chain deformity of all the ages and both sex
2. Patients in age group of 06 to 65 years

Exclusion Criteria:

1. Intact ossicular chain
2. Patients < 06 years and > 65 years.
3. Otosclerosis with stapes fixation
4. Eustachian tube dysfunction with safe type CSOM
5. Chronic otitis media with impending or overt complications
6. Patients with severe sensory neural hearing loss
7. Patient with only hearing ear
8. Patients not consent for surgery
9. Patients not giving consent for study

Methodology:-

1. Clinical tests for study : Pre-operative and post-operative(2nd and 6th month) hearing comparison of ossicular graft using tests like Tuning Fork Tests , Pure Tone Audiometry, Impedance Audiometry.
2. Study population: Patients who came in ENT outpatient department at L.G.Hospital, Ahmedabad

Materials Used In This Study:-

1. Autologous Tragal cartilage
2. Autologous incus
3. Teflon Total Ossicular Reconstruction prosthesis (TORP)
4. Teflon Partial Ossicular Reconstruction prosthesis (PORP)

A detailed history about disease according to study proforma was taken. Ear examination was done in detail. Preoperative hearing assessment was done by tuning fork tests and impedance audiometry. Hearing loss was calculated by average air bone gap on PTA. All the patients were taken under either local or general anesthesia according to patients' compliance and type of surgery to be performed. Status of ossicular chain deformity was checked. Presence granulation tissue and cholesteatoma was noted. Tympanoplasty with or without mastoidectomy was done according to type of CSOM and ossicular reconstruction was done. We used autologous tragal cartilage or incus in 25 patients randomly and Teflon TORP/PORP with cartilage cap in 25 patients. PROP was used in patients who had intact stapes suprastructure while TORP was used in patients who had loss of stapes suprastructure.

Observations And Discussion:-

In 25 patients we used tragal cartilage or incus as an autologous material. In 25 patients we used Teflon TORP/PORP with cartilage cap as an alloplastic material according to present of ossicular deformity.

Table 1:- Age Distribution.

Age in years	No of patients Our study	Sharma T &Kuchchal V, 2017 [3]
10-19	13 (26%)	23(38.33%)
20-29	14 (28%)	29(48.33%)
30-39	15 (30%)	5(8.33%)
40-49	6 (12%)	3(5%)
50-59	2 (4%)	60(100%)
>60	0	
Total	50	

Table 2:- Gender Distribution.

Sex	Our study	Sharma T &Kuchchal V, 2017[3]
Male	19(38%)	25(41.66%)
Female	31(62%)	35(58.33%)
Total	50(100%)	60(100%)

Table 3:- Symptom Distribution.

Symptoms	No. of patients in our study	Sharma T &Kuchchal V, 2017 [3]
Decrease Hearing	50	60
Ear Discharge	50	60
Earache	15	14
Tinnitus	14	29
Aural fullness	10	10
Itching	7	9
Vertigo	4	6

Table 4:- Preoperative Tympanic Membrane Findings.

Findings of Tympanic membrane	No. of cases pre-operative (%)	Mean conductive hearing loss on PTA
Central perforation	26(52%)	52
Marginal perforation	4(8%)	8
Attic perforation	4(8%)	8
Atelectasis	4(8%)	8
Cholesteatoma	12(24%)	24
Total	50(100%)	100

Table 5:- Ossicle Affected In CSOM

Ossicular part	No. of patients
Malleus handle	5(10%)
Malleus head	10(20%)
Long process of incus	27(54%)
Incus body and lenticular process	22(44%)
Stapes suprastructure	11(22%)

Table 6:- Material Used For Ossiculoplasty.

Type of Material	No. of patients	%
Autologoustragal cartilage	21	42
Autologous incus	4	8
Teflon PORP	17	34
Teflon TORP	8	16
Total	50	100

Table 7:- Extrusion Of Ossicular Material.

Study	Our study			Sharma T &Kuchchal V, 2017 [3]		
Type of ossicular material	Autologous material		Alloplastic material	Autologous material		Alloplastic material
	Tragal cartilage	Incus	Teflon TORP/ PORP	Tragal cartilage	Incus	Teflon TORP/ PORP
No. Of patients	23	2	25	20	20	20

Extrusion of ossicular material	2	0	5	5	3	9
Extrusion rate	2 (8%)		5(20%)	25%	15%	45%
				8(20%)		

Table 1 shows distribution of patients according to age in our study which suggests that maximum number of patients are belong to 21-35 years (52%) followed by 6-20 years of age (30%) which is concurrence with the study of **Guglani A. 2017 [4]**. Thus, presentation of patients with CSOM in third decade(late) because earlier they took treatment but problem did not resolve with medical treatment.

Table 2 shows distribution of patients according to gender in our study. It shows 31 (62%) are female and 19 (38%) are male out of 50 patients and thus male: female ratio is 1:1.6. The higher incidence in females is seen because they are the most neglected part of our society and hardly get early and proper medical treatments during episodes of recurrent upper respiratory tract infection or chronic otitis media leading to its surgical management

In our study out of 50 patients, 48% patients have bilateral while 52% patients have unilateral disease.

Table 3: Shows symptomwise distribution of patients in our study compared to Sharma T & Kuchal V. 2017 [3]

Table 4: shows symptoms of patients in study. We compared our study with the study of **Sharma T, KuchchalV 2017 [3]** in which all the patients had complain of ear discharge and decreased hearing followed by other symptoms. This is concurrence with our study. Thus, it shows that patients with CSOM have main complaints of ear discharge and decreased hearing.

Table 5: shows part of ossicles affected in CSOM intraoperative. In our study we show that long process of incus (54%) was the most common part of ossicles affected in CSOM cases followed by incus (44%). According to **Kaisliwal R 2013**, Incus necrosis is very common and was found in about 60-80% cases [7]. This shows that incus is the most common bone affected in CSOM due to avascular necrosis secondary to localized osteitis.

Table 6: show material used in our study for ossicular chain reconstruction. As autologous material, we used autologous tragal cartilage in 21 patients and autologous incus in 4 patients. We used tragal cartilage more in our patients because most of our patients had squamosal type of disease which has a risk of acquired cholesteatoma and adequate incus was not available for ossicular chain reconstruction in mucoidal type of CSOM. Teflon TORP and PORP are used according to the type of ossicular chain defect.

Table 7: shows extrusion rate for different materials used in ossiculoplasty. It shows that there was 8% extrusion rate for autologous material and 20% for alloplastic material till 6th month postoperatively. The extrusion rate for different material used in ossiculoplasty suggested that autologous material

We compared our study with the study of **Sharma T, Kuchchal 2017[3]**. It showed 5(25%) patients had extrusion of tragal cartilage, 3(15%) patients had extrusion of incus and 9(45%) patients had extrusion of Teflon implants. On seeing overall extrusion rate, autologous material had 8(20%) patients and alloplastic material had 9(45%) patients. This is concurrence with our study.

We also compared our study with the study **Kawatra R, Maheshwari P, 2013, [5]**. It showed that 1(5%) patient had extrusion of tragal cartilage, 2(10%) patients had extrusion of incus and 4(10%) patients had extrusion of Teflon implants. In alloplastic material 2(10%) patients has extrusion of teflon implant and 2(10%) patients had extrusion of silicon material. On seeing overall extrusion rate, autologous material had 3(7.5%) patients and alloplastic material had 4(10%) patients. This is also concurrence with our study.

In another study of **Maheshwatri P, Vijeta, (2019) [6]**, 1 patient had extrusion of autologous tragal cartilage and 2 patients had extrusion of alloplastic Teflon. This is also concurrence with our study.

The rate of extrusion depends on several factors, the most important of which is the status of middle ear and eustachian tube and the implanted material. Other causes are infection, displacement of graft, inability to maintain firm, contact between graft and ossicular remnant or loss of stiffness of graft. Aeration of mucosal-lined tympanic cavity is essential for functioning middle ear. Extrusion of even best designed prosthesis occurs because of abnormal middle ear pathology such as atelectasis, middle ear fibrosis, recurrent cholesteatoma, tympanic membrane perforation and otitis media.

In autologous material advantages of incus are it is locally available, rigid and has low rate of resorption as compared to tragal cartilage. Thus, we can see that autologous incus shows good rate of acceptance than tragal cartilage.

On comparing autologous and alloplastic material, autograft shows better biocompatibility which is the reason of its less extrusion than allograft.

We see **Sharma T, Kuchchal V, 2017 [3]** shows autologous ossicles is superior to autologous cartilage by terms of hearing improvement which is also seen in our study. We also see that autologous materials show better result than alloplastic material in terms of mean hearing gain which is concurrence with our study.

Results

As the objective of surgical procedure on middle ear have two folds: the eradication of disease and achievement of hearing gain. The success rate for any of the implants used for restorations of hearing is determined to a great extent by the nature of middle ear pathology.

1. An ideal graft would be one that is easily available, inexpensive, inert, nontoxic, easy to sterilize, store & mould, is not extruded or absorbed maintains its strength & does not induce any foreign body reaction.
2. Among autologous ossicles, we have used auto incus for reconstructing ossicular chain. Auto incus is best, tolerated, easily available, easily refreshable & maintain their size & shape, including no foreign body reaction. The demerits are refixation, atrophy, creeping substitution i.e. revascularisation of marrow spaces & recurrence of disease due to residual micro-disease in ossicle.
3. Tragal cartilage is also used for ossiculoplasty. Cartilage with attached perichondrium gives better results as attached perichondrium flap anchors to the remnant ossicle & thus provides enough nutrition. Disadvantages are curling, thinning, loss of rigidity, erosion, resorption & fibrosis usually there is no foreign body reaction.
4. In 25 cases we have used Teflon PORP & TORP with attached cartilage. Hearing gain is good. Advantages are easily moldable, efficient as sound conductors & sufficient porosity to encourage best tissue in growth to stabilize. The demerits would be that they have a high slippage rate and extrusion, foreign body reaction are also common.

Summary

The age group which contains maximum patients is from 21-35 year of age. It contains 26(52%) patients. Total 4(8%) patients had extrusion of ossicular material in which 1(4.76%) patient had tragal cartilage extrusion and 3(12%) patients had Teflon prosthesis extrusion. Failure rate for autologous tragal cartilage was 8% and failure of autologous incus was nil. Overall failure rate for autologous material was 8% and for alloplastic material was 12% which showed ≥ 31 dB ABG postoperatively. In postoperative period, net hearing gain of 21.19 dB ABG was seen in tragal cartilage; 23.75 dB ABG was seen in incus and 13.2 dB ABG was seen in Teflon prosthesis.

References:-

1. Smith AW, Macharia I, Muger P, Hatcher J, Randomized control trial of Treatment of chronic otitis media in Kenyan school Children. Lancet, 1996, 348: 1128-1133
2. World Health Organization. Chronic suppurative otitis media; burden of illness and management options. Geneva, Switzerland. World Health Organization. 2004; 2-83.
3. Sharma T, Kuchchal V, Evaluation and comparison of Hearing outcome in Ossiculoplasty using different graft material, Annuals of International Medical and Dental Research 2017; 3(3); 10-14
4. Giuliana A, Patel R, Vishwakarma R, Patel K, Ossiculoplasty: A comparative study using tragal cartilage and partial ossicular reconstruction prosthesis, Indian Journal of Applied Research 2017; 7(11); 253-254
5. Kawatra R, Maheshwari P, A comparative study of surgical outcome of Ossiculoplasty using biomaterials and autologous implants, Bangladesh J Otorhinolaryngol 2013; 19(1): 29-35
6. Maheshwari P, Vijeta, Ossiculoplasty with autologous cartilage versus teflon prosthesis: a comparison of anatomical and functional result, International Journal Scientific Research 2019; 8(3): 52-53

7. Kasliwal N, Joshi S, Parekh SM, Determinants of sensory neural hearing loss in chronic middle ear disease, Indian Journal of Otolaryngology and Head and Neck Surgery.