Role of Paediatric Tympanoplasty in Modern Otology



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✓ *Discharging ear [Chronic Suppurative Otitis Media:CSOM] is a massive health problem*

- Prevalence [India]: 6% [>4%: Health Problem][1]
- Paediatrics [Northern India]: 4.79%[2]
- CSOM: 164 million deaf/year [90% in developing world][1]
- CSOM: 28000 deaths[1] /year



NO INTERNATIONAL GUIDELINES

1-Child and adolescent health and development prevention of blindness and deafness/ World Health Organization. Chronic suppurative otitis media: burden of illness and management options. World Health Organization. Switzerland: 2004; 1-84

2-Chadha SK, Sayal A, Malhotra V et al. Prevalence of preventable ear disorders in over 15000 school children in northern India. J Laryngol Otol. 2013; 127(1): 28-32

CSOM:Classification

CSOM-Attico Antral

- ✓ **Discharge:** scant, purulent & foul smelling
- ✓ **Cholesteatoma** : present
- ✓ **Complications:** common
- ✓ ***Perforation:***



Cholesteatoma

- ✓ **Treatment:** Mastoid Surgery

CSOM-Tubo Tympanic

- ✓ *CSOM-Mucosal Disease*
- ✓ **Discharge**: profuse,mucoid
- ✓ **Cholesteatoma:** absent
- ✓ **Complications:** rare
- ✓ ***Perforation:***



CSOM tubo-tympanic type

- ✓ **Treatment:** Tympanoplasty

CSOM: Mucosal Disease

Clinical Course: MORBIDITY

❖ DEAFNESS

- ✓ Adverse speech/language
- ✓ Undermines academics
- ✓ Poor peer acceptance
- ✓ Alters personality

OTHER REASONS

- ❖ Perforation: severe disease
- ❖ Ossicular erosions
- ❖ Epithelial migration: *Cholesteatoma*
- ❖ Damage to cochlea: *Nerve deafness*

COMPLICATIONS

❖ INTRATEMPORAL

- ✓ Mastoiditis
- ✓ Petrositis
- ✓ Facial Nerve Palsy
- ✓ Labyrinthitis

❖ EXTRATEMPORAL

- ✓ Extradural Abscess
- ✓ Subdural Abscess
- ✓ Meningitis
- ✓ Brain Abscess
- ✓ Lateral Sinus thrombosis
- ✓ Otitic hydrocephalus

MANAGEMENT:Children

- Antibiotics
- Reassurance
- No surgical treatment required
- Delay Tympanoplasty: 16-18yrs



ENT PERSPECTIVE

- PAEDIATRIC TYMPANOPLASTY: ***Controversial***
  - *When to do?
  - *What are the influencing factors?
  - *Success rate?

- 21ST CENTURY:
  - *Mention in Standard Text
  - *Minimum age reported :***8-10 years***
  - ***Success rate:**
    - GRAFT UPTAKE: ***32% to 92%***
    - HEARING IMPROVEMENT: ***68% to 100%***

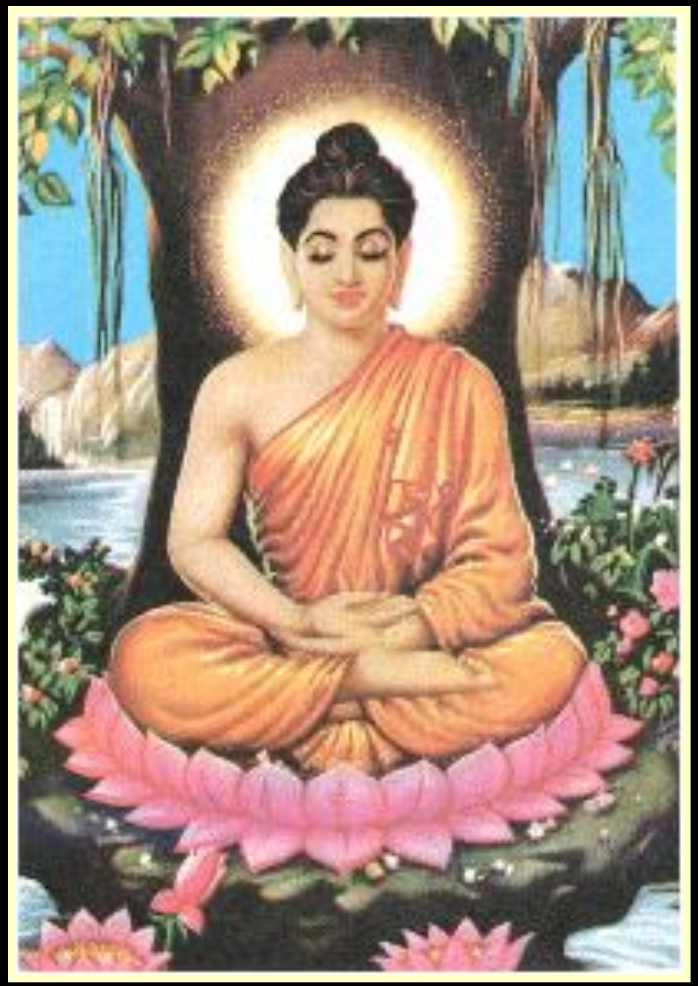
Bias:Paediatric Tympanoplasty

- Repeated bouts of URTI
- Eustachian tube dysfunction
- Perforation:

  -Pressure equalizing vent
- Perforations close with age
- Technically difficult operation:

  -Narrow anatomical canal
- Immunological immaturity
- Parents:Lack of confidence

EVIDENCE-BASED MEDICINE



- "Believe nothing, no matter where you read it, or who has said it, not even if I have said it. Unless it agrees with your own reason and common sense."

-LORD BUDDHA

[6th century BC]

RESEARCH

- ***Singh GB***, Arora R, Garg S, Kumar S, Kumar D.[1]
  Paediatric Tympanoplasty:a comparative study between age groups of 5-8 years and above 14 years.
  Journal of Laryngology & Otology, *(2016);* July; 130(7): 635-9

- ***Singh GB***, Arora R, Garg S, Ranjan S, Kumar S.[2]
  Role of tympanometric volume in paediatric tympanoplasty.
  International Journal of Pediatric Otorhinolaryngologyy. *(2015);* 79: 1872- 75

- ***Singh GB***, Sidhu TS, Sharma A, Singh N.[3]
  Tympanoplasty Type I in Children: An evaluative study.
  International Journal of Pediatric Otorhinolaryngology. *(2005)*; 69:1071-1076

1,2. Thesis study: LHMC, New Delhi

3. Funded by CSIR, Govt of India, New Delhi]

STUDY I: SYNOPSIS

- **PGIMER & Dr. RML Hospital, NEW DELHI**
- **STUDY DESIGN:** Cohort study with control [prospective]
- **AIMS AND OBJECTIVES:**
  - *Evaluate the success rate of tympanoplasty Type 1 in paediatric population
  - *Analyse:factors responsible for the success rate of tympanoplasty type 1 in children
- **Sample:**
  - *CSOM-mucosal disease [6 months]
  - *Two groups(20 each): A (8-14 years) / B (> 14 years)

STUDY I: SYNOPSIS

- **INTERVENTION:**

  *TYMPANOPLASTY TYPE 1 UNDER GA, (ADULTS-LA)
  *Post auricular-inlay (temporalis fascia)

- **CRITERIA FOR SUCCESS:**

  *INTACT GRAFT:6th MONTH END

  *HEARING IMPROVEMENT: MINIMUM 10dB IN TWO CONSECUTIVE FREQUENCIES

- **STATISTICAL INTERPRETATION**:

  *CHI SQUARE TEST WITH YATES' CORRECTION

STUDY I:RESULTS

- **OVERALL SUCCESS RATE:**

	TOTAL CASES	GRAFT UPTAKE	HEARING IMPROVEMENT
GROUP-A [8-14years]	20	16[80%]	11[69%]
GROUP-B [Adults]	20	17[85%]	13[76%]

- **COMPLICATIONS:**

Two patients: granulations

One patient: glue ear

STUDY I: RESULTS

- **NO SIGNIFICANCE OF CONTRALATERAL EAR PATHOLOGY [Measure of *Eustachian Tube* function]**

	Total Cases	Graft Rejection	Residual Perforation	% Fail Rate	Statistical Significance
GROUP-A	08	01	01	25	$\chi^2 = 0.013$
GROUP-B	12	01	01	16.6	$p>0.05$

**GROUP-A: CONTRALATERAL EAR DRUM INTACT*
**GROUP-B: CONTRALATERAL EAR PATHOLOGY PRESENT*

STUDY I: RESULTS

- NO SIGNIFICANCE OF SITE & SIZE OF PERFORATION

	PAEDIATRIC PATIENTS		ADULT PATIENTS	
	No of cases	Graft uptake	No of cases	Graft uptake
SITE OF PERFORATION				
Anterior	04	02	03	01
Inferior	09	08	11	10
Posterior	07	06	06	06
Total	20	16	20	17
SIZE OF PERFORATION				
Small [<25%]	04	03	05	05
Medium[<50%]	08	07	07	06
Large [>50%]	08	06	08	06
Total	20	16	20	17

STUDY II: SYNOPSIS

- **Lady Hardinge Medical College & Associated Hospitals, NEW DELHI**
- **STUDY DESIGN**: Cohort study with control [Prospective]
- **AIMS AND OBJECTIVES:**

  *Evaluate The Success Rate Of Tympanoplasty Type 1 In Paediatric Age Group Of 5-8 Years

  *Analyse: Factors Responsible For The Success Rate Of Tympanoplasty Type 1 In Children [5-8 Yrs]

- **SAMPLE:**

  *CSOM-mucosal disease [6 months]

  *Two groups(30 each): A (5-8 years) / B (> 14 years)

STUDY II: SYNOPSIS

- **INTERVENTION:**
  - *TYMPANOPLASTY TYPE 1 UNDER GA, (ADULTS-LA)
  - *Post auricular-inlay (temporalis fascia)

- **CRITERIA FOR SUCCESS:**
  - *INTACT GRAFT: 6th month
  - *HEARING IMPROVEMENT:
    - Minimum 10 dB In Two Consecutive Frequencies

- **STATISTICAL INTERPRETATION:**
  - *CHI SQUARE TEST WITH YATES' CORRECTION
  - *FISCHER EXACT "P" VALUE TEST
  - *EPI-INFO VERSION 7

STUDY II: RESULTS

- **GRAFT UPTAKE & HEARING IMPROVEMENT**

	Total Cases	Graft Uptake	Statistical Significance	Hearing Improvement	Statistical Significance
GROUP-A [5-8 years]	30	26(87%)	$\chi^2 = 0.159$ p>0.05 [Not Significant]	18(69%)	$\chi^2 = 0.488$ p>0.05 [Not Significant]
GROUP-B [Adults]	30	27(90%)		21(78%)	

- In children**, Graft uptake/ Audiological results** are comparable to adults for Tympanoplasty Type I
- **FAILURE:** Faulty Surgical Technique
- **COMPLICATIONS:** Nil

STUDY II: RESULTS

- **SIGNIFICANCE OF CONTRALATERAL EAR PATHOLOGY:**
  - *Measure of "Eustachian Tube Function"
  - *No Significance Observed: ET has no impact on Paed Tymp

	Total Cases	Success	Failure	Statistical Significance
GROUP-A	17	16(94%)	01(6%)	$\chi^2 = 1.822$ $p>0.05$ [Not Significant]
GROUP-B	13	10(77%)	03(23%)	

KEY: GROUP-A: Contralateral ear drum intact
GROUP-B: Contralateral ear pathology present

STUDY II: RESULTS

❖ SIGNIFICANCE OF SIZE & SITE OF PERFORATION

❖SURGICAL SUCCESS:

*Anterior Perforations Poor Graft Uptake:

- *Poor perfusion of anterior half of tympanic membrane*
- *Faulty technique*

*Independent of the size of Perforation

	PAEDIATRIC PATIENTS No of cases	Graft uptake	Statistical Analysis
SITE OF PERFORATION			
Anterior	01	nil	$\chi^2 = 7.1538$ $p < 0.05$ [Significant]
Inferior	25	22	
Posterior	04	04	
Total	30	26	
SIZE OF PERFORATION			
Small [<25%]	nil	nil	$\chi^2 = 0.0647$ $p>0.05$ [Not Significant]
Medium[<50%]	13	13	
Large [>50%}	17	13	
Total	30	26	

STUDY II: RESULTS

- **IMPACT OF MASTOID PNEUMATIZATION ON PAEDIATRIC TYMPANOPLASTY:**

  [Does adjuvant mastoid surgery improve graft uptake??]

  # Mastoid Pneumatization was determined by ***Tympanometric Volume***

  # **TYMPANOMETRIC VOLUME**

  Volume of External aud canal, Middle ear cleft & Mastoid cavity

  *Measured by *Impedance Audiometry*

  [*Tympanometric probe, Pressure:-300daPa to +300 daPa & Expressed in cu cm]*

STUDY II: RESULTS

- **TYMPANOMETRIC VOLUME: NO SIGNIFICANCE**

GROUP-A: Tympanometric volume < 1.60 cm^3
GROUP-B: Tympanometric volume > 1.60 cm^3
[1.60 cm^3 – mean tympanometric volume]

	Total Cases	Graft Rejection	Residual Perforation	% Fail Rate	Statistical Significance
GROUP- A	17	01	01	5.88	$\chi^2 = 1.822$
GROUP- B	13	03	03	23.08	$p>0.05$

STUDY II: RESULTS

❖ **PREMISE:** Small Tympanometric volume

↓

Poorly aerated middle ear & mastoid

↓

poor graft uptake

*[Larger the tympanometric volume: greater the chances of success of tympanoplasty]

❖ **STUDY: NO ROLE OF TYMPANOMETRIC VOLUME**

Diamant: mastoid size has Gaussian distribution genetically determined

Role of cortical mastoidectomy in tympanoplasty: Controversial

CONCLUSIONS

- Children have graft uptake & audiological results comparable to adults
- Paediatric age for tympanoplasty: 5 years
- Paediatric tympanoplasty: No significance of Eustachian tube
- No impact of size or site of perforation on paediatric tympanoplasty
- No impact of mastoid pneumatization on paediatric tympanoplasty

REVIEW OF LITERATURE

- **MINIMUM AGE FOR PAEDIATRIC TYMPANOPLASTY?**

Medical text: 8-10 Years

[Anatomical maturity of ET: increase in cartilaginous portion and tensor palati mass]

Study: 5-8 years

[No role of Eustachian tube]

Medical literature: 2 to 3 years of age

REVIEW OF LITERATURE

- **CONCEPT OF SAFE EAR: CHALLENGED?**

Complications of CSOM are seen equally in both CSOM-Tubotympanic/ Attico antral

⇩

All Perforations: Warrant Immediate Closure



CSOM tubo-tympanic type



Cholesteatoma

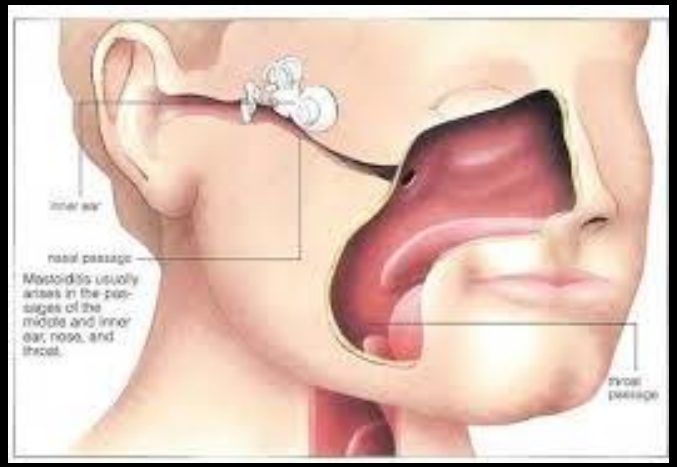
REVIEW OF LITERATURE

- **EUSTACHIAN TUBE: DISPUTED ROLE ?**

  # No Consistent Clinical Method For Evaluation

  # GAS DIFFUSION THEORY: [Plausible Pathophysiological Explanation For Middle Ear Diseases]





REVIEW OF LITERATURE

❖ **CHILDREN - ideal candidates for tympanoplasty:**

- ✓ ***OSSICULAR EROSIONS ARE LESS***
- ✓ ***GOOD COCHLEAR RESERVES***
- ✓ ***QUALITY OF LIFE IMPROVED:***
  - **# Physical activity: *water sports***
  - **# Reduced emotional stress**
  - **# Decreased parent concern**
- ✓ **POTENTIAL RISK: CHOLESTEATOMA**
- ✓ ***PREVENTION : DEAFNESS*** **[repeated bouts of CSOM]**

REVIEW OF LITERATURE

❖ **PREVENTION [WHO Guidelines]:**

- ✓ ASOM: proper management
- ✓ Minimize Risk factors:
  - # Good ear hygiene
  - # Avoid Dirty water
  - # Proper posture during breast feeding
- ✓ Immunization: Measles/H. Influenzae/ Pneumococcal
- ✓ Preschool/School Screening for CSOM

[Patients can be recruited for tympanoplasty]

TAKE HOME MESSAGE

- **Discharging ear in children: *Tympanoplasty* is the treatment of choice**

- ✓ Discharging ear : [morbidity-*DEAFNESS*]
- ✓ No role of Eustachian tube
- ✓ No concept of safe/unsafe ear

Please do paed tympanoplasty

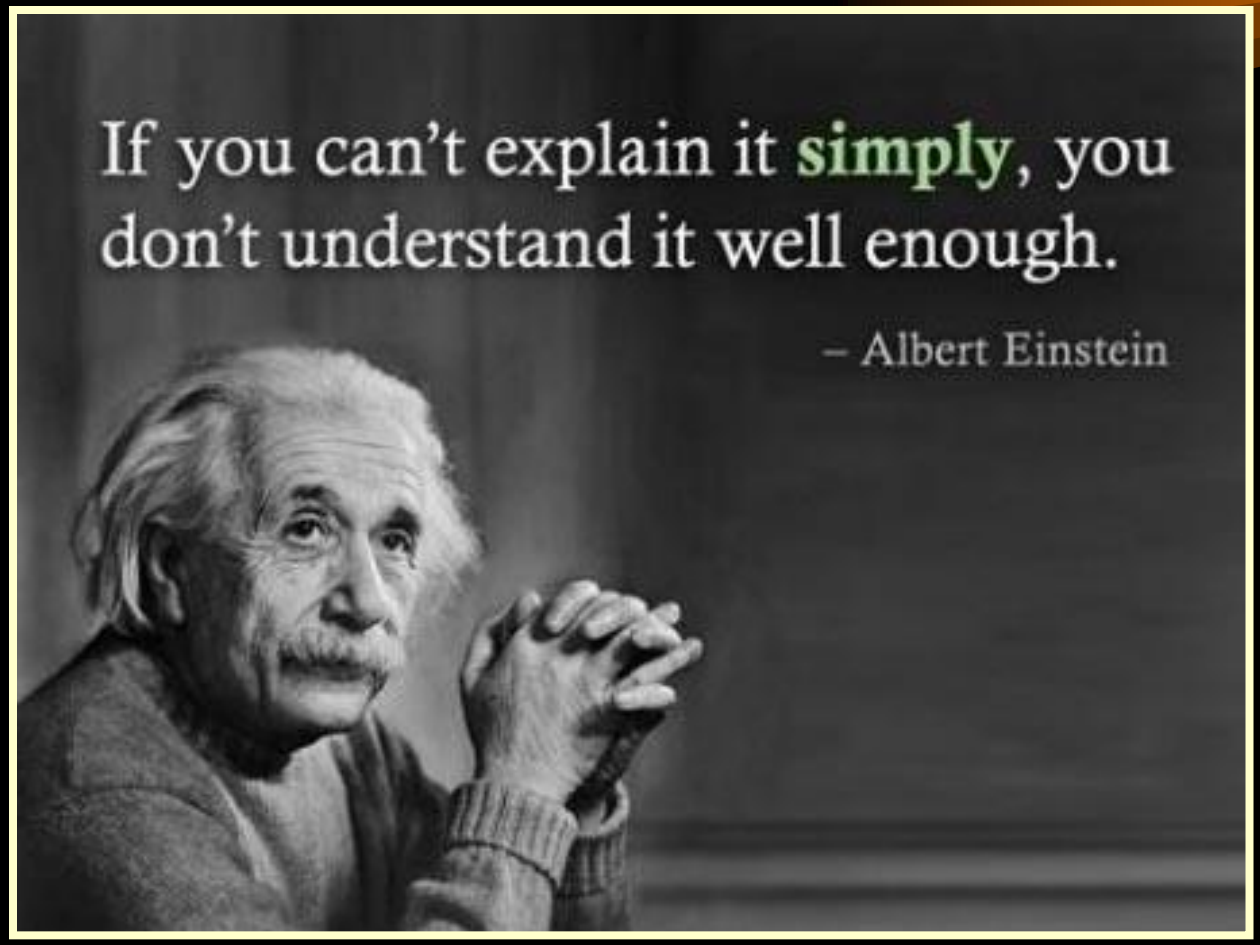


DEAFNESS: Dreadfull

MAGIC OF SOUND



THANK YOU


If you can't explain it simply, you don't understand it well enough.
– Albert Einstein