


*CLINICAL STUDY*

# Teflon Implants Versus Titanium Implants in Stapedotomy - a Comparative Study

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## ABSTRACT

**Objective** : This study compares two types of implants- a Teflon piston and a titanium piston, used in stapes surgery for otosclerosis.

**Study Design** : A non-randomised prospective study conducted on 40 patients, in 2 groups of 20 each, undergoing stapedotomy in a tertiary care hospital. Pure tone audiometry results were noted preoperatively and 3 weeks post-operatively.

**Results** : Both Teflon and titanium prostheses provided almost equal benefits to patients in terms of Air-Bone gap closure.

**Conclusion** : While there is statistically no significant difference in the results observed, surgical skill of the operating surgeon plays an important role in hearing improvement and long-term results would require long term evaluation.

**KEYWORDS**: Otosclerosis; Stapedotomy; Teflon; Soft Clip.

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## INTRODUCTION

Otosclerosis is a hereditary disorder of bone metabolism of the otic capsule enchondral bone and is one of the most common causes of bilateral, gradually progressive conductive hearing loss with a normal tympanic membrane and Eustachian tube <sup>[1,2]</sup>. Surgical procedures to correct this began early as 1956, when Shea first used a Teflon prosthesis to replace the stapes <sup>[3]</sup>. Various materials have been used to manufacture the ideal stapes piston such as Teflon, stainless steel, platinum, titanium and nitinol <sup>[4]</sup>. An ideal piston demonstrates biocompatibility and provides adequate sound transmission. In this study, we compare Teflon and titanium implants, which are commonly used by ENT practitioners today.

## AIMS AND OBJECTIVES

To compare the effectiveness of Teflon and titanium pistons, in the improvement of conductive hearing loss in otosclerosis.

To study the advantages that Teflon and titanium pistons have over each other

## MATERIALS AND METHODS

This is a non- randomised prospective study conducted on 40 patients undergoing stapedotomy in a tertiary care hospital. Patients included in this study are those having an intact tympanic membrane and a conductive hearing loss with an air-bone gap of atleast 15dB.

The exclusion criteria pertains to the following patients:

- Patients with tympanosclerosis, otitis externa and media, otomycosis, polyp, granulations, cholesteatoma, only hearing ear
- patients with symptoms of active infection of nose, paranasal sinuses, throat
- Revision cases
- Patients with vertigo
- Patients with a history of otogenic intracranial complications.

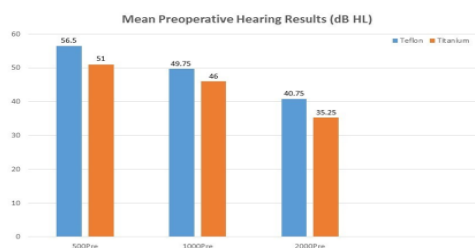
After a physical examination of the ears nose and throat, Tuning fork tests, Pure Tone Audiometry (PTA), Immittance was tested (tympanometry and reflexes).

Two groups of 20 twenty patients each were made, where the Teflon piston was used in one group and titanium piston was used in the other.

A stapedotomy with endaural approach was performed. PTA is re-evaluated postoperatively after 3 weeks, noting the Air-Bone gap closure.

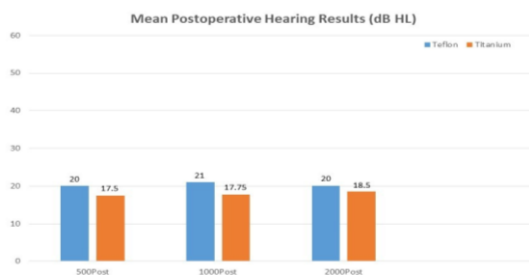
## RESULTS

The mean preoperative hearing threshold for patients in which Teflon implants were used was 56.5, 49.5 and 40.75 dB HL at 500, 1000 and 2000 Hz. The post-operative hearing threshold was 20, 21 and 21 dB HL at 500,1000 and 2000 Hz. Post -operative gain was 20.75, 28.75 and 36.6 respectively, at these frequencies (Fig 1).



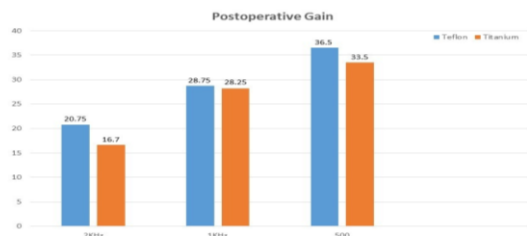
**Fig.1 :** Mean Preoperative Hearing Results (dB HL).

The mean preoperative hearing threshold for patients in which titanium implants were used was 52, 49.5 and 35.25 dB HL at 500, 1000 and 2000 Hz. The post-operative hearing threshold was 17.5, 17.75 and 18.5 dB HL at 500,1000 and 2000 Hz. Post -operative gain was 16.7, 28.25 and 33.5 respectively, at these frequencies (Fig 2).



**Fig.2 :** Mean Post-operative Hearing Results (dB HL).

The mean post-operative gain at 500,1000 and 2000 Hz with the Teflon implants was 20.75, 28.75 and 36.5 respectively, whereas for titanium it was 16.7, 28.75 and 33.5 respectively (Fig 3).



**Fig 3** Mean Post-operative Hearing Gain.

## DISCUSSION

Both the prostheses showed good results in reduction of hearing loss. The Teflon piston showed a higher post-operative gain at 500 Hz. Manual crimping is not required for both, the Teflon loop piston and the Soft-Clip titanium piston. This overcomes the possibility of avascular necrosis in the case of tight crimping and erosion of long process of incus, in case of loose crimping [5]. While it is more expensive, titanium has excellent corrosion resistance, is well tolerated by tissue and light in weight [6]. Teflon is the brand name for a fluoropolymer, which is highly regarded for its inertness and smoothness of texture. It is also more economical. Despite the type of material, shape and approach, the experience of the surgeon becomes a decisive factor which directs the success of stapedotomy procedures [7].

## CONCLUSION

Both Teflon and titanium prostheses provide almost equal benefits to patients in terms of Air-Bone gap closure as there is no statistically significant difference between the results observed. Long term clinical and audiological benefits would require long term evaluation to analyse benefits of titanium prosthesis over Teflon prostheses.

## ACKNOWLEDGMENTS

None.

## AUTHORS' CONTRIBUTIONS

The participation of each author corresponds to the criteria of authorship and contributorship emphasized in the [Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly work in Medical Journals of the International Committee of Medical Journal Editors](#). Indeed, all the authors have actively participated in the redaction, the revision of the manuscript, and provided approval for this final revised version.

## COMPETING INTERESTS

The authors declare no competing interests with this case.

## FUNDING SOURCES

None.

## PATIENTS CONSENT

Written informed consents were obtained from the patients for the publication of this case report.

## REFERENCES

- [1] Christopher P., Bibas A., Bittermann A., Browning G., Grolman W., Rea P, Tange R., Wegner I.(2019). Scott-Brown's Otorhinolaryngology and Head and Neck Surgery, 8<sup>th</sup> Edition, Volume 2, Chapter 89, p 1062.
- [2] Bansal M. (2016). Teflon Implants Versus Titanium Implants in Stapes Surgery. Indian journal of otolaryngology and head and neck surgery : official publication of the Association of Otolaryngologists of India, 68(1), 16–19. <https://doi.org/10.1007/s12070-015-0938-0>
- [3] Gjuric, M., & Rukavina, L. (2007). Evolution of stapedectomy prostheses over time. Advances in otorhino-laryngology, 65, 174–178. <https://doi.org/10.1159/000098803>
- [4] Vishwakarma R., Patadia S., Goswami P., Patel K., Darji D.(2014). Teflon vs titanium prosthesis in stapes surgery. Otolaryngology online journal. Volume 4 Issue 2. <https://www.alliedacademies.org/articles/teflon-vs-titanium-prostheses-in-stapes-surgery.pdf>
- [5] Faramarzi, M., Gilanifar, N., & Roosta, S. (2017). Comparison of Fluoroplastic Causse Loop Piston and Titanium Soft-Clip in Stapedotomy. Iranian journal of otorhinolaryngology, 29(90), 23–28.
- [6] Smith, D. C., Lugowski, S., McHugh, A., Deporter, D., Watson, P. A., & Chipman, M. (1997). Systemic metal ion levels in dental implant patients. The International journal of oral & maxillofacial implants, 12(6), 828–834.
- [7] Bast, F., & Schrom, T. (2009). Das Soft-CliP Piston Titanium als alloplastische Prothese bei der operativen Versorgung der Otosklerose: Erste Ergebnisse [First experiences with the new soft-clip piston as an alloplastic prosthesis during stapedotomy]. Laryngo-rhino- otologie, 88(5), 304–308. <https://doi.org/10.1055/s-0028-1100384>