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## ORIGINAL ARTICLE

# Revision Cochlear Implantations: Experiences of the Pakistan Cochlear Implant Program

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## ABSTRACT

**Objectives:** To determine the incidence, causes and outcomes of revision cochlear implant surgeries in the Pakistan cochlear implant programme.

**Type:** It is a retrospective descriptive study.

**Duration:** Between August 2000 and January 2013.

**Setting:** Pakistan cochlear implant programme, Lahore, Pakistan

**Patient and methods:** A review of the medical data of the patients undergoing revision cochlear implantation was performed.

**Results:** There were only 15 patients with revision cochlear implants out of 419 cochlear implants. Ten were male and 5 female. The time interval between the first and the second implant ranged from 1 to 7 years with a mean of  $3 \pm 1.96$  years. The causes for revision surgeries were electronic device failure in 11(73%) patients followed by trauma in 4(27%) patients.

**Conclusion:** Cochlear implantation revision is a safe and effective procedure though revision itself is rarely required in these patients.

## INTRODUCTION

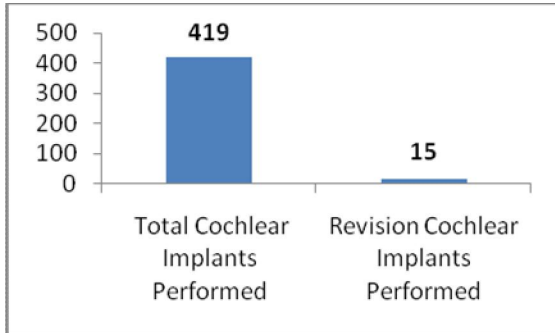
The benefits of cochlear implantation for patients of severe to profound sensorineural hearing loss are significant. These include improved sound awareness, enhanced lip reading, and speech understanding. In most of the patients, cochlear implants provide safe and reliable auditory benefit, but occasionally many patients develop problems that require revision surgery. Common complications that may necessitate revision surgery include skin flap breakdown, wound infection, device extrusion, and electrode malposition. In most cases, these problems are readily apparent and revision surgery is undertaken as a medical necessity. Other patients may present with complaints of decreased auditory performance or the new development of other troubling auditory (e.g., tinnitus) or nonauditory (e.g., pain) symptoms. For patients in whom the device provides no auditory input to the patient (i.e., hard failure), the decision to undertake revision cochlear implantation is a relatively simple one. The present study was undertaken to review one center's experience with revision cochlear implantation.

## MATERIALS AND METHODS

A retrospective review of the data of patients, who had cochlear re-implantations between August 2000 and January 2013, was carried out. There were total of fifteen re-implantation surgeries. Thirteen implant failures occurred in individuals out of 419 devices implanted between Aug. 2000 and Jan. 2013 under the Pakistan Cochlear Implant Program. The Pakistan Cochlear Implant Program performed two revision surgeries on individuals who had received their first implant from some other centres, giving a total of fifteen re-implantations. The causes of failure were categorised and comparisons were made of pre and post re-implantation perception levels.

## RESULTS

Three hundred and sixteen cochlear implants were performed during the study period including 15 revision cochlear implant procedures. Two re-implantations were performed on patients who received their first implant in centres other than that of the Pakistan Cochlear Implant Program (Fig. 1).



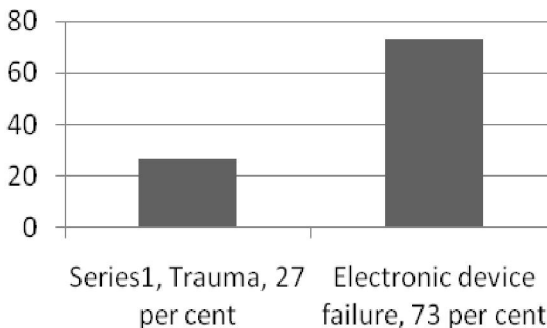
**Fig 1:** Frequency of re-implantation in patients under Pakistan Cochlear Implant Program

Out of the fifteen re-implantations, ten (66.6%) were males and five (33.3%) were females. The age distribution of the re-implanted patients by gender is highlighted in table 1. As is evident, majority (46.7%) of the patients undergoing revision surgeries belonged to the age category of 5-10 years followed by four (26.7%) re-implantations in the age group of 10-15 years. Three re-implantations were in adult group. There was no device extrusion due to infection or skin flap problems.

**Table 1:** Age distribution of re-implanted patients by gender

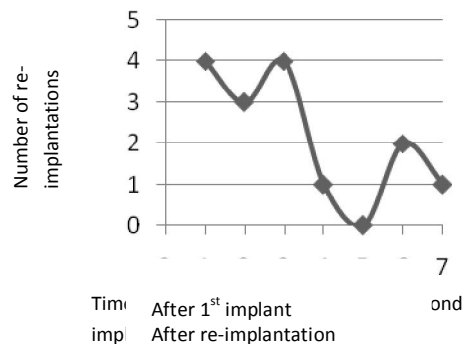
Gender	Age group					Total
	Up to 5 years	5-10 years	10-15 years	15-20 years	25-30 years	
Male	0 (0%)	6 (60%)	4 (40%)	0 (0%)	0 (0%)	10 (100%)
Female	1 (20%)	1 (20%)	0 (0%)	2 (40%)	1 (20%)	5 (100%)
<b>Total</b>	1 (6.7%)	7 (46.7%)	4 (26.7%)	2 (13.3%)	1 (6.7%)	15 (100%)

The causes for revision CI surgery were electronic device failure in 11(73%) patients followed by trauma in 4(27%) patients as is shown in fig. 2.

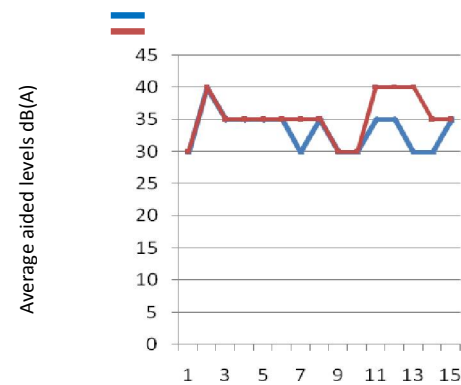


**Fig. 2:** Reasons for revision cochlear implant surgeries

The time interval between the first and the second implant ranged from 1 to 7 years with a mean of  $3 \pm 1.96$  years, as is depicted in fig. 3. As shown in figure 4, the average aided levels between the second and first implant were comparable. Electrode insertion was equal or deeper in all the fifteen cases.



**Fig. 3:** Time interval between the first and second implant



**Fig. 4:** Pre and post-reimplant average aided levels

## DISCUSSION

The re-implantation surgery is rare but a major complication of cochlear implant surgery. Device failure, trauma or other medical complications are the main reasons for re-implant surgery.<sup>1</sup> The results of our study(3.1%) are comparable with other published data. In Melbourne Clinic, sixty two (5.3%) re-implants were performed out of 1164 cochlear implantations between September 1982 and October 2006.<sup>2</sup> Similarly, at the Michigan centre, 58 patients underwent revision surgery, of which 13 patients received their first implant elsewhere; thus giving an institutional failure rate of 3.7% and an overall revision rate of 5.1%.<sup>3</sup>

The present study identified electronic device failure 11(73%) followed by trauma 4(27%) as the reasons for revision surgery. In addition, scalp flap failure, optimization of electrode placements and intra-temporal pathologies could be the factors for re-implantations or revision surgeries.<sup>1,3,4</sup>

Our study showed that the time interval between the first and the second implant ranged from 1 to 7 years with a mean of  $3 \pm 1.96$  years. However, Sorrentino et al found that the mean time to device failure was 7.6 years and 1.5 years in children and adults respectively.<sup>5</sup>

Consistent with the findings of other studies, our study also showed comparable or better average aided levels between the first and second implant.<sup>2,4,6,7</sup> It was found that the electrode insertion was equal or deeper in all fifteen cases, as compared to 53 of 58 cases in a study conducted in Michigan.<sup>3</sup>

## CONCLUSION

Cochlear re-implantation is a safe and effective procedure, which should be performed timely, with appropriate counselling.

## Learning Outcome

Device failure is rectified by cochlear re-implantation. However, technology in the manufacturing and design of the implantable devices should improve to minimise cochlear implant replacements.

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