



CLINICAL STUDY

COMPLICATIONS OF COCHLEAR IMPLANTATION IN ADULTS

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SUMMARY

The objective of this study was to determine complications of cochlear Implantation in adults. Adult CI patients are reviewed retrospectively. 105 cochlear implant operations in 103 adults, 69 males and 34 females, aged between 21 to 56 years were included to the study. These patients have been operated between 1998 and June 2004. Complications were defined as major complications, those requiring explantation of the device or further operation, causing a significant medical problem, leading to any degree of facial paralysis or require additional hospitalization for treatment, or minor complications, those settled spontaneously, with conservative treatment, local care and/or with medication alone. There were 14 (13.33%) minor complications and 4 (3.8%) major complications. The most frequented minor complication was postoperative head pain (4.76%). It is followed by Dizziness, vomiting and vertigo 3 (2.8%), Wound infection 1 (0.9%), nistagmus 1 (0.9%), seroma 1 (0.9%), rhinoliquire 1 (0.9%), taste disturbances 1 (0.9%) and hypertension 1 (0.9%). The most frequented major complication was facial nerve paresis or paralysis 2 (1.9%) followed by per-op profuse bleeding 1 (0.9%) and failure to implant 1 (0.9%). There were not any life threatening complications in any of our implanted adults. This study confirms that cochlear implantation in adults is relatively safe and that major complications are few and within acceptable limits.

Keywords: Cochlear implantation, complication, adult

ERİŞKİNLERDE KOKLEER İMPLANT KOMPLİKASYONLARI

ÖZET

Bu çalışmanın amacı erişkin hastalarda kokleer implant komplikasyonlarının belirlenmesidir. Bunun için kokleer implantasyon yapılmış hastalar retrospektif olarak değerlendirilmiştir. 1998 ile 2004 yılları arasında yaşları 21 ile 56 arasında değişen 69 kadın ve 34 erkek hastaya 105 kokleer implantasyon yapılmıştır. Cihazın çıkartılmasına sebebiyet veren ve yeni bir operasyonu gerektiren, ciddi bir tıbbi soruna veya fasiyel paraliziyeye yol açan ve hastanede yatış süresini uzatan komplikasyonlara major komplikasyonlar, kendiliğinden veya basit lokal veya ilaç tedavisi ile geçen komplikasyonlara da minör komplikasyonlar denilmiştir. Çalışmamızda 14 (13.33%) minör ve 4 (3.8%) major komplikasyona rastlanmıştır. En sık rastlanan minör komplikasyon ameliyat sonrası baş ağrısı (4.76%) dir. Bunu sersemlik hali, kusma ve baş dönmesi 3 (2.8%), yara enfeksiyonu 1 (0.9%), nistagmus 1 (0.9%), seroma 1 (0.9%), rinoliquire 1 (0.9%), tat bozukluğu 1 (0.9%) ve hipertansiyon 1 (0.9%) takip etmiştir. En sık rastlanan major komplikasyon ise fasiyel sinir parezisi veya paralizisi 2(1.9%) dir. Bunu peroperatuar kanama 1 (0.9%) ve implantın takılamaması 1 (0.9%) takip eder. Ameliyat edilen hiç bir hastamızda hayatı tehlikeye sokan bir komplikasyon görülmemiştir. Bu çalışma erişkinlerde kokleer implantasyonun güvenli bir ameliyat olduğunu ve komplikasyonlarında kabul edilebilir sınırlarda olduğunu göstermektedir.

Anahtar Sözcükler: Kokleer implantasyon, komplikasyon, erişkin

INTRODUCTION

The new FDA recommendations extends candidacy to postlingually deafened adults who exhibit bilateral severe hearing loss with pure tone averages of 70 dB or greater and who obtain no greater than 30% open-set discrimination with sentence materials in the best-aided condition¹. Cochlear implants led to significant improvements in a number of factors: communication skills, conversation with others, telephone usage and self-confidence within 6 months of implantation.

Surgery for CI bears the risks of complications associated with all major surgery, in addition to particular risks associated with implanting a foreign body into the peripheral auditory system².

Here we present a retrospective study involving 105 cochlear implant operations in 103 adults to evaluate the rate of intra- and post-operative complications.

MATERIAL and METHODS

103 (105 CI) adults were included to this retrospective study. 69 males and 34 females, aged between 21 to 56 years. These patients have been operated between 1998 and June 2004 and were chosen from a self developed database. 50 (47.61%) of our patients received a Medel® (Medical Electronics, Innsbruck Austria) and 55 (52.39%) of them received a Clarion® (Advanced Bionics Corporation, California U.S.A.) Cochlear Implant. The overall mean duration of deafness before implantation was 11.4 years.

Complications were defined as major complications, those requiring explantation of the device or further operation, causing a significant

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medical problem, leading to any degree of facial paralysis or require additional hospitalization for treatment, or minor complications, those settled spontaneously, with conservative treatment, local care and/or with medication alone^{3,4,5,6}.

RESULTS

There were 14 (13.33%) minor complications and 4 (3.8%) major complications. Their distributions were shown in table 1 and 2. The most frequented minor and major complications were postoperative head pain (4.76%) and facial nerve paresis or paralysis (1.9%) respectively. There were not any life threatening complications in any of our implanted adults.

	Number of patients
Dizzines, vomiting and vertigo	3 (2.8%)
Wound infection	1 (0.9%)
nistagmus	1 (0.9%)
seroma	1 (0.9%)
rhinoliquire	1 (0.9%)
head pain	5 (4.7%)
taste disturbances	1 (0.9%)
hypertension	1 (0.9%)

Table 1. Minor complications after cochlear implantation.

	Number of patients
Facial nerve paresis or paralysis	2 (1.9%)
Per-op profuse bleeding	1 (0.9%)
failure to implant	1 (0.9%)

Table 2. Major complications in cochlear implantation

DISCUSSION

Significant advances in surgical technique in the past five years include reduction in complications, improvements in skin flap design, electrode fixation, and the ability to implant partially and fully ossified cochleas¹.

This study represents the largest single-center review of adult cochlear implant complications in Turkey and confirms the safety profile of implant operations.

The first detailed report of surgical complications of cochlear implantation was that Cohen et al. In 1988⁷. The complications of cochlear implant surgery are a reflection of the complexity of the surgical procedure, the skill of the operating surgeon, the surgeons experience with the operation being performed and risks inherent in the insertion of a large foreign body immediately deep to the scalp^{4,8}. Areas of possible involvement with complication include scalp, the mastoid bone and adjacent skull, the facial recess, the middle ear, and the scala tympani⁹.

Minor complications

Dizziness, vomiting and vertigo:

Dizziness and vertigo after cochlear implantation have been reported in the literature¹⁰.

There were 3 (2.85%) patients with postoperative dizziness and vomiting in our study group, subsided within 48 hours, didn't need any additional therapy. This mild complication may result from anaesthesical medications or irritation of the vestibuler system. Our policy for vertigo and vomiting management in CI surgery is to wait at least 24 hours without any medication postoperatively. In serious cases lasting more than 24 hours, if it is also resistant to vestibuler stabilising agents, case will be reexamined since it may be a sign for a perilymph fistula.

Wound infection:

There was 1 (0.95%) patient who had a wound infection after 5 months of the implantation in our study group, treated with local and systemic antibiotics, healed without necessitating further revisional surgery. The first evidence of infection or necrosis should be treated intensively in an attempt to avoid progression and potential loss of device. Early culture and sensitivity tests should be followed by topical and oral antibiotics. If resolution is not prompt, hospitalization, intra venous antibiotics and more aggressive surgical management may be appropriate⁸. In our Center, 24 hours before the operation, Ceftriaxone 1gr/day is started I.V. for infection prophylaxis, which is also continued during hospitalization. Patients are treated inpatient at the center for about 5-7 days with daily wound treatment using regular antiseptics. After discharge, Levofloxacin, 500mg/day is prescribed for 7 days. There are no special considerations for CI patients with regards to inpatient treatments as they are hospitalized in 3 patient-wards with other patients.

There were 5 (4.76%) patients with head pain, one of them because of a hypoliquire syndrome, all of them subsided within 48 hours, 1 (0.95%) patient with nistagmus, that subsided in a few hours, 1 (0.95%) patient with seroma, it was managed with aspiration and local drainage, and 1(0.95%) patient with rhinoliquire, and 1 (0.95%) patient with hypertension, that also subsided within hours with antihypertensive medication and 1 (0.95%) patient with taste disturbances.

As the literature was reviewed, the other minor complications of adult cochlear implantation can be classified as: tympanic membrane perforation, post operative bleeding, ear infection, thick flap,



misplaced package, suture insufficiency, face edema, and tinnitus^{11,12}. Di Girolamo also reported a benign paroxysmal positional vertigo three days after the initial fitting of the cochlear device in a 40-year-old woman¹³.

The rate of minor complications in our study was 13.33%. This compares well with other series with reported rates between 7 to 37%¹⁴.

Major Complications

Facial nerve paresis or paralysis:

There was 2 patients (1.9%) with postoperative facial paresis in our study group, one with a high possibility of thermic injury, and the other, during subfacial insertion of the electrode, probably encountered a contact with the facial nerve and it caused the temporary paresis.

The facial recess approach to the mesotympanum places the facial nerve at risk. Facial nerve injury may be minimized by using a facial nerve monitor, but even this is not a guarantee of avoidance of injury. By carefully identifying the short process of incus in the fossa incudis and the corda tympani nerve, the boundaries of the facial recess can be defined without exposing the facial nerve¹⁴. The corda tympani nerve can usually be preserved, but occasionally a narrow facial recess necessitates sacrifice of this structure⁹. A thin shelf of bone covering the facial nerve also provides a measure of protection from any required instrumentation performed through the facial recess and may be very helpful should the need for revision surgery arise¹⁵. Continuous irrigation should be employed while opening the facial recess since considerable thermal energy is generated by diamond burrs and burr shafts¹⁵.

Several authors reported facial paralysis or paresis in their series. Its incidence vary between 0.55% and 3%^{7,11}.

Per-op profuse bleeding:

Mastoid emissary vein should be looked for radiographically. If a large one is present, the skin flaps and siting of the implant can be adjusted to avoid it. If bleeding occurs from mastoid emissary vein, it can usually be controlled with pressure, bone wax or crushed muscle^{5,16}. There was 1 (0.9%) patient in our study group with profuse bleeding, but not from Mastoid emissary vein, he was an anti-inflammatory drug abuser, the bleeding was controlled with pressure.

Reimplantation and device failure:

There wasn't any device failure in our study group. We have explanted only 1 (0.9%) patient. The patient was with hemosiderosis and did not benefit from CI. We have 2 (1.9%) reimplantation cases. They were meningitis patients, did not benefit from implantation, they were explanted and reimplanted to the other ear. Both of the patients benefit from the implantation now.

The most common indication for cochlear reimplantation is device failure².

As the literature was reviewed, the other major cochlear implantation can be classified as: Meningitis, flap breakdown, Gusher, perilymph leakage, receiver/stimulator migration, failure to implant, exposure of the mastoid bowl electrodes, electrode tie erosion of the external auditory canal skin, electrode slippage, persistent increase in tinnitus, bronchospasm (anaesthesia related)^{5,8}. Implant removal due to allergic reaction to the silicone of the implant casing also have been reported¹⁴.

In one patient, the before-planned ear could not be implanted because of the heavy cochlear ossification, though radiologically better ear, the implantation could be accomplished to the other side in the same time.

The incidence of complications was not related to age at implantation, neither underlying cause of deafness nor implant type¹⁴.

Cochlear implantation is performed more commonly than ever. These devices can be sensitive to electrical interference and, in fact, electrical current can damage the device or result in unintended cochlear stimulation and injury through the electrode array. Most manufacturers recommend that monopolar electrosurgical instruments not be used in these patients. Bipolar devices may be used, but only at a distance of 1 cm or more from the device¹⁷.

The rate of major complications in our study was 3.8%. This compares well with other series with reported rates between 3 to 13.7%¹⁴.

CONCLUSION

This study confirms that cochlear implantation is relatively safe and that major complications are few and within acceptable limits. The minor complications were treated without concern.

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