Risk of Monopolar Electrosurgery in Cochlear Implant Recipients is Nominal: Evidence to Guide Clinical Practice

James R Dornhoffer MD[1]; Travis Haller, MD[1]; Christine M Lohse, MS[2] Colin L W Driscoll MD[1]; Brian A Neff MD[1]; Aniket A. Saoji, PhD[1]; Matthew L Carlson MD[1]

[1]Department of Otolaryngology-Head and Neck Surgery, [2]Department of Quantitative Health Sciences

ABSTRACT

BACKGROUND

As the number of cochlear implant (CI) recipients increase and certain procedures preferentially use or rely on electrosurgery, surgeons will increasingly face the dilemma of using monopolar electrosurgery in CI recipients. Unfortunately, the prevalence of electrosurgery-related patient- and CI-related complications is unknown.

METHODS

Multifaceted approach including: *i.* review of the current literature; *ii.* historical review of institutional data from an academic, tertiary CI center; *iii.* review of industry data provided by 3 FDA-approved CI manufacturers; and *iv.* survey of high-volume CI centers.

RESULTS

Literature review identified 9 human studies, detailing 84 devices with 199 episodes of device-cautery exposure. From studies reporting on patients records, no implant showed evidence of damage after exposure. One cadaveric study using unconventional dental cautery reported 1 episode of device damage. Review of the authors' institutional records did not identify any case of CI damage in 84 instances of exposure. Data from the 3 major implant manufacturers showed a single report of damage that could be reasonably linked to monopolar electrosurgery, out of a possible 689,426 CIs. Last, a survey of 8 high-volume CI centers did not identify any adverse events associated with monopolar cautery..

CONCLUSION

These data estimate the risk of adverse device-related events or tissue injury to be extraordinarily low. Short of operating in immediate proximity to the CI (i.e., the ipsilateral temporoparietal scalp), these data indicate that monopolar electrosurgery can be used in the body and the head-and-neck of CI recipients with nominal risk. These findings may guide decision-making in cases that are optimally or preferably performed with monopolar electrocautery and can be used to counsel CI patients following inadvertent exposures.

OBJECTIVES

PRIMARY OBJECTIVE

Comprehensively assess the prevalence of monopolar electrosurgery-related device complications among CI recipients.

SECONDARY OBJECTIVE

Inform clinical decision making, patient counseling, and potential amendment of manufacture recommendations on monopolar electrosurgery in CI recipients

INTRODUCTION

The presence of a CI is traditionally considered a contraindication for use of monopolar electrosurgery or cautery as the electrical current generated by the device could cause damage to the device or cause harmful discharge into adjacent tissues.[1]

As the number of CI recipients approaches 1 million and some surgeries preferential use cautery, surgeons will increasing face the dilemma of using monopolar electrosurgery in this population.[2]

To-date there is no *clinical* evidence supporting the theoretical concern associated with cautery use in CI recipients.[1,3,4]

RESULTS

LITERATURE REVIEW:

-One episode of CI dysfunction in a cadaveric study using dental cautery at high levels

-No report of CI dysfunction in a patient or remaining cadaveric studies in 199 discrete episodes of exposure

INSTITUTIONAL RETROSPECTIVE REVIEW

-78 patients with 84 exposures were identified. **Table 1**

-Estimated incidence of CI exposure was 3% for all sites, 0.4% for the head and neck

-No episode of CI dysfunction identified.

REVIEW OF MANUFACTURER RECORDS

-Cochlear: 1 failure "reasonably linked to cautery in 450,000 implant records

-Advanced Bionics: No failures in 39,526 records

-MED-EL: No failures in >200,000 records

SURVEY OF CI CENTERS

-8 CI centers surveyed

-All centers endorsed caring for at least one CI recipients with monopolar exposure

-No centers reported knowledge of CI failure directly related to said exposure.

TABLE 1: Patient and Monopolar Electrosurgery Exposure Details from an Institutional Retrospective Review

N	78
Monopolar Electrosurgery Exposures	84
Feature*	
Age at exposure (years)	68 (19)
Sex	
Female	34 (40)
Male	50 (60)
Manufacturer	
Cochlear	63 (75)
Advanced Bionics	12 (14)
MED-EL	9 (11)
Region of cautery use	
Head-and-neck	12 (14)
Thorax/abdomen	43 (51)
Extremity	20 (24)
Genitourinary tract	9 (11)
Extent of cautery use**	
Substantial use	28 (33)
Moderate use	29 (35)
Brief use/incision only	26 (31)
Unknown	1 (1)
Post-cautery CI function	
Unaffected	73 (87)
Adversely impacted	0 (0)
Unknown/lost to follow-up	11 (13)

*Features are summarized with respect to exposure as average (SD) or n (%)

**Substantial use defined as use throughout the case; moderate use defined as use less than throughout the case but more than isolated use for incision; brief use/incisional use defined as use solely for incision or brief use with documented realization of CI status and immediate cessation

METHODS

Multifaceted review of available information

i. Guided literature review Pubmed, Scopus, and CINAHL databases per PRISMA guidelines, performed on August 2022

ii. Institutional retrospective review of patients with CI and subsequent known cautery exposure from December 1999 to January 2023

iii. Query of Advanced Bionics, Cochlear Ltd., and MED-EL GmbH. records on any known electrosurgery-related CI dysfunction

iv. Convenience survey of 8 high volume (>150 implants per year) CI centers

DISCUSSION

- Our review reported on almost 700,000 implants with a single report of CI damage in a patient, and one in a cadaveric study
- By extrapolating institutional rates of exposure to data from CI manufacturers, we estimate the risk of CI dysfunction from monopolar electrosurgery to be ~0.005% for all exposures and ~0.04% for exposures in the head-and neck

CONCLUSIONS

- The available data estimate the risk of patient- and device-related events associated with CI exposure to monopolar electrosurgery to be low
- Based on available data, short of operating in immediate proximity to the CI, these data indicated the monopolar electrosurgery can be used in the body and head-and-neck with low risk

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