Differences in Cochlear Nerve Cross-sectional Area Between Normal Hearing and Post-lingually Deafened Patients on MRI

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ABSTRACT

Objectives: To demonstrate that parasagittal Magnetic resonance imaging (MRI) has been shown to reliably measure the diameter of the cochlear nerve in normal hearing adults. There were 19 post-lingually deafened and seven normal hearing adults included in the study. The mean age in the post-lingually deafened group was 53 ± 18 years (range 26-80) and the mean age in the normal hearing group was 47 ± 9 years (range 35-58). Anterior-posterior cochlear nerve diameter was 1.07 ± 0.17 mm in the normal hearing group versus 0.85 ± 0.13 mm in the post-lingually deafened group. The difference was statistically significant (p=0.009). The superior-inferior cochlear nerve diameter was 1.10 ± 0.17 mm in the normal hearing group versus 0.81 ± 0.15 mm in the post-lingually deafened group. The difference was statistically significant (p=0.002). There was good agreement between independent observer measurements. Conclusions: Cross-sectional area on MRI among cochlear implant candidates can help predict cochlear implant success is warranted.

RESULTS

There were 19 post-lingually deafened and seven normal hearing adults included in the study. The mean age in the post-lingually deafened group was 53 ± 18 years (range 26-80) and the mean age in the normal hearing group was 47 ± 9 years (range 35-58). Anterior-posterior cochlear nerve diameter was 1.07 ± 0.17 mm in the normal hearing group versus 0.85 ± 0.13 mm in the post-lingually deafened group. The difference was statistically significant (p=0.009). The superior-inferior cochlear nerve diameter was 1.10 ± 0.17 mm in the normal hearing group versus 0.81 ± 0.15 mm in the post-lingually deafened group. The difference was statistically significant (p=0.002). There was good agreement between independent observer measurements. Conclusions: Cross-sectional area on MRI among cochlear implant candidates can help predict cochlear implant success is warranted.

DISCUSSION

Our control group of normal hearing patients was made up entirely of female patients, but Nadol and Xu found that there was no difference in sex and female cochlear nerve diameters in their cadaver studies, so there is no reason to think that this coincidental cohort characteristic distorts our results. Since cochlear implants stimulate residual spiral ganglion cells of the cochlear nerve, thus providing audibility to patients with profound sensorineural hearing impairment, more available spiral ganglion cells may mean a more successful cochlear implant implantation rate. Even once patients are identified as candidates for cochlear implantation, it is difficult to predict who will provide the best experience for the hearing they can still get from their cochlear implants. Our study is a good diagnostic tool available, it could help surgeons determine whether or not the nerve is imaged on MRI. It is critical to determine whether cochlear nerve cross-sectional area on MRI can reliably serve as a predictor of cochlear nerve implant success is warranted.

CONCLUSIONS

Post-linguistic deafness results in a smaller cochlear nerve diameter compared to normal hearing adults. The cross-sectional area on MRI among cochlear implant candidates can help predict cochlear implant success is warranted.

REFERENCES