ABSTRACT

The OmniGuide® CO2 laser with flexible wave guide and handpiece has been used to perform laser stapedotomy in patients with otosclerosis. These patients have been reviewed retrospectively in an effort to determine safety, efficacy, and complications among these patients.

Thirty-four patients from June 2007 to November 2008 were found. Pre-operative and post-operative audiologic data were analyzed showing improved air conduction pure-tone average and closure of the air-bone gap as well as improvement of bone conduction pure-tone average post-operatively. There was one reported stapes gusher and one displaced prosthesis which was unrelated to the use of the laser. The patient with a displaced prosthesis had ≥10dB increase in pure-tone bone conduction after surgery.

METHODS AND MATERIALS

Thirty-four patients who had undergone stapedotomy/stapedectomy for otosclerosis were included for study. Absence of pre-operative audiologic data eliminated 3 patients from statistical analysis; none of these 3 patients had adverse outcomes secondary to the surgery. Incomplete bone-conduction (BC) data was available for 2 patients; however, they were included in the analysis using the remaining BC data and air-conduction(AC) data. One of 34 underwent stapedotomy.

Patients underwent pre-operative audiologic evaluations followed by laser stapedotomy under general anesthesia using the OmniGuide® CO2 laser with flexible wave guide and handpiece and placement of stapes prosthesis. Power settings were between 2-6 Watts; 47% were at 6 Watts and 77% were greater than or equal to 4 Watts. Pulse duration was 100 milliseconds, except in 2 cases the duration was 200 milliseconds. Prosthesis varieties included K-piston, Smart Piston, Richard’s Piston, and Bartel’s Bucket. One patient received a Dornhoffer TORP after undergoing stapedotomy due to severe tympanosclerosis. Post-operative audiologic data was collected at follow-up visits. The most recently available data was used with the exception of one patient who had a displaced prosthesis (his immediate post-op data was used). Pre-op and post-op pure-tone averages and the change in air-bone gap (ABG) were evaluated. The medical record was reviewed for post-operative complications.

Statistical significance was measured using the student’s t-test, one-tailed, paired analysis.

RESULTS

The data show that the average pre-operative BC puretone average deficit was 23.98dB and the average post-operative BC puretone average deficit was 19.35dB (Figure 1) with a difference of 4.63dB decrease in deficit (p=0.011). There was 1 patient with an increase in BC deficit of 10.6dB (patient with displaced prosthesis); no other patients had an increase of ≥10dB, indicating no further evidence of SNHL in this set of patients post-operatively.

The pre-operative and post-operative air-bone gap (ABG) puretone average was calculated and found to be 27.29dB and 9.67dB respectively (p≤0.0001)(Figure 2). The number of patients with an ABG ≥10dB pre-op vs. post-op was 0(0%) vs. 18 (62%), respectively. Those with an ABG >10 but ≤20 pre-op and post-op were 9(31%) and 9(31%), respectively, and those with an ABG >20 were 20(69%) and 2(7%), respectively. Post-operatively, 93% of patients had an ABG ≤20.

The only complications known at the time of review were one patient with a stapes gusher and one patient had a displacement of the prosthesis remotely from surgery. This was unrelated to the use of the laser. There were no known episodes of vertigo or facial paresis/paralysis.

CONCLUSIONS

The OmniGuide® CO2 laser with flexible wave guide and handpiece is a unique device which assists the surgeon:

- In using the CO2 laser in difficult to reach areas of the middle ear, assisting in procedures such as stapedotomy.
- It allows the surgeon to precisely place the laser without the need to have a second, visible laser to serve as an aiming beam and also avoiding the calibration of two beams.
- The handpiece is convenient and easy to use.
- Laser technology, including the CO2 laser, has been shown to be effective and safe in the performance of stapedotomy.

This data has shown that there is a statistically significant improvement in bone conduction puretone average as well as the air-bone gap postoperatively using this technique. There were no complications attributable to the CO2 laser. There were no patients with vertigo post-operatively and no patients with facial nerve paresis/paralysis. There was one patient with a delayed increase in puretone bone conduction postoperatively which was not attributable to the laser.

REFERENCES