INTRODUCTION

When vestibular schwannomas are removed surgically, it is critically important to identify the facial nerve, which is displaced and compressed by the tumor in order to avoid injury to it. Although careful microscopic inspection and intraoperative monitoring using electromyography are routinely performed to identify the compressed facial nerve during surgery, preoperative information about the course of the nerve would allow surgeons to plan tumor removal accordingly and may increase the safety of surgery. The purpose is particularly important for large tumors, in which the facial nerve cannot be identified by conventional MRI techniques, such as MRI tractography due to the facts that: (1) the signal intensity of the facial nerve and vestibular schwannomas are almost indistinguishable, (2) facial nerve threading occurs as a result of the tumor mass effect; and (3) in large tumors, no cerebrospinal fluid (CSF) <<vosk><vosk> between the two structures. The purposes of this pilot study were: 1) to demonstrate that pre-operative diffusion tensor (DT) tractography can predict the displacement of the facial nerve in the vicinity of vestibular schwannomas; 2) to demonstrate that the course of the constructed tract consistently agreed with the surgery report of the patients. The present facial nerve position was accurately predicted in all the cases during the surgical procedures. Four patients (27%) underwent subtotal tumor removal in order to avoid major facial nerve injury. Two patients (17%) had immediate postoperative House-Brackmann Grade I or II, 1 patient (6%) had immediate postoperative House-Brackmann Grade III, and the remaining 2 cases (13%) suffering immediate unsatisfactory results (House-Brackmann Grade IV or V). The results of this study demonstrate that: (1) pre-operative DT tractography can predict the displacement and the course of the facial nerve in the vicinity of vestibular schwannomas; and (2) the course of the constructed tract consistently agreed with the surgical findings in most of the cases. The technique delivers useful pre-operative information and may contribute to lower the risk of facial nerve injury during stereotaxic surgical approaches.

METHODS AND MATERIALS

STUDY DESIGN
Prospective observational cohort study.

SETTINGS
One public and 1 private tertiary referral centers.

PARTICIPANTS
15 patients (9 females, 6 males, 56 ± 11 year) undergoing surgical removal of vestibular schwannomas.

INTERVENTIONS
Standard magnetic resonance imaging was obtained pre-operatively in every patient at 3.0 T. Two independent observers (PO and TT) traced the course of the facial nerve using the method of Taira et al. Using magnetic resonance DT tractography (DTT), a group of 15 vestibular schwannoma patients (6 men, 9 women, 56 ± 11 years) were enrolled. Pre-operative axial, transverse, sagittal, and coronal images were reviewed using the commercially available computerized software package (Freesurfer, Medtronic) for the identification of the facial nerve as it passed through the cerebellopontine angle. The course of the facial nerve was traced either by visual inspection or by automated tracing algorithms provided by the software. In each case, the software was used to automatically track the facial nerve through the cerebellopontine angle, and the results were manually assessed by the observers. The course of the facial nerve was then compared with the surgical report of the patients. The facial nerve course was accurately predicted in all the cases during the surgical procedures. Four patients (27%) underwent subtotal tumor removal in order to avoid major facial nerve injury. Two patients (17%) had immediate postoperative House-Brackmann Grade I or II, 1 patient (6%) had immediate postoperative House-Brackmann Grade III, and the remaining 2 cases (13%) suffering immediate unsatisfactory results (House-Brackmann Grade IV or V). The results of this study demonstrate that: (1) pre-operative DT tractography can predict the displacement and the course of the facial nerve in the vicinity of vestibular schwannomas; and (2) the course of the constructed tract consistently agreed with the surgical findings in most of the cases. The technique delivers useful pre-operative information and may contribute to lower the risk of facial nerve injury during stereotaxic surgical approaches.

CONCLUSIONS

DISCUSSION

REFERENCES