Prosthodontic management of a patient with neurological disorders after resection of an acoustic neurinoma: A clinical report

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This clinical report describes the treatment of an edentulous patient who had undergone resection of an acoustic neurinoma and subsequently developed neurological problems. A replacement maxillary denture combined with a mandibular denture placed in the neutral zone was selected as the treatment of choice. A simple procedure for recording the neutral zone is presented. (J Prosthet Dent 2002;87:419-22.)

Neurinoma (also referred to as *neurilem[m]oma or neuroma)* is a slow-growing benign tumor that originates from Schwann cells and most commonly develops on the vestibular portion of the eighth cranial nerve.[1] The acoustic neurinoma originates just inside the internal auditory meatus.[2] As the tumor grows, it fills the cerebellopontine angle (CPA) and inevitably produces displacement of the adjacent brain tissue involving the cerebellum, as well as the trigeminal, facial, glossopharyngeal, and vagus nerves. The most common resulting neurological disorders are unilateral facial paralysis of the peripheral type, unilateral facial hypalgesia, ipsilateral cerebellar ataxia, dysphonia, dysarthria, and dysphagia. The increased intracranial pressure also causes headaches and vomiting.[3]

This article describes the prosthodontic management of an edentulous patient with severe neurological disorders after resection of an acoustic neurinoma. Establishment of the neutral zone in such patients is a challenge. A detailed description of a technique for locating the neutral zone in standard situations has been reported by Schiesser.[4] An alternative procedure for patients with neurological disorders is presented below.

CLINICAL REPORT

A 85-year-old man was referred to the department of removable prosthodontics at the University of Athens Dental School. According to his medical history, a large right acoustic neurinoma had been removed from the right CPA 33 years earlier along with a part of the adjacent cerebellar hemisphere. As a result, the patient presented cerebellar ataxia and unilateral disorders of trigeminal (V), abducens (VI), facial (VII), vestibulocochlear (VIII), glossopharyngeal (IX), vagus (X), and spinal accessory (XI) cranial nerves. After a long recovery period, he was able to perform daily hygiene functions, including those related to oral hygiene.

During the initial interview, the patient appeared to be comfortable, alert, and capable of communicating despite his obvious dysarthria, visual impairment, and hearing loss in the right ear. He was also able to maintain balance while sitting on the dental chair during treatment. An extraoral examination revealed a considerable right-sided facial weakness, loss of sensation of the skin on the affected side, and a reproducible contralateral deviation of the mandible on opening but no signs or symptoms of angular stomatitis (Fig. 1). An intraoral clinical examination revealed a completely edentulous oral cavity with well-rounded residual ridges, deviation of the tongue during rest and on protrusion, impaired deglutition, and lack of oral and pharyngeal sensation on the affected side. There were no signs or symptoms of salivary hypofunction.

Fig. 1. Extraoral examination of patient. Note marked right facial weakness, drooping corner of mouth with obliteration of nasiolabial fold, and deviation of tongue toward affected side during slight protrusion.

The patient's chief complaint was impaired mastication due to inadequate retention and stability of his existing dentures (Fig. 2). The patient had been wearing the same incrementally modified removable partial dentures for more than 15 years and applying denture adhesive 2 to 3 times daily. Because of the poor quality of the existing dentures, the absence of true denture-wearing skills, and the patient's inability to afford implant therapy, a replacement maxillary denture com-

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Fig. 2. Modified removable partial dentures with which patient presented.

Fig. 3. Tissue conditioning material used as occlusion rim after final molding. Note asymmetrical distribution of material as result of paralyzed musculature, right deviation of tongue, and disturbed swallowing pattern.

Fig. 4. Mandibular occlusion rim conformed to neutral zone.

Fig. 5. Completed wax occlusion rims. Note added soft wax on occlusal surface of mandibular occlusion rim.

bined with a mandibular denture placed in the neutral zone was selected as the treatment of choice.

Because the patient's reduced pharyngeal sensation and poor gag reflexes predisposed him to chest infections, he was seated in an upright position with his head properly supported. Moreover, during the impression sessions, excess material was immediately removed from the posterior palatal area with a spatula. Initial and final impressions, as well as master casts were made with the use of standard techniques.[5] For the final impressions, a medium-bodied polyether material (Impregum F; Espe, Seefeld, Germany) was selected because of its relatively high viscosity and control during the setting period. A properly fitting occlusion rim was placed in the maxilla and trimmed to meet the particular esthetic needs of the patient.[6] During these procedures, the paralyzed side of the lip was carefully retracted to create symmetry on both sides.

A thick mixture of a tissue conditioning material (TCM) (Visco-gel; Dentsply/DeTrey, Surrey, United Kingdom) was adapted to the top of a mandibular record base with slightly underextended borders and shaped like an occlusal rim. The record base was carefully placed in the mouth together with the maxillary wax rim, and the patient was instructed to sip a little water, swallow, and relax. For better molding of the material by the tongue, cheeks, and lips, the patient also was instructed to slowly count from 1 to 10 and attempt to wet his lips with his tongue.

The same procedure was followed to allow the tissue conditioner to set. After the initial set, the TCM occlusion rim was removed from the mouth and evaluated. Additional conditioner was added where needed, excess bulk was trimmed, and the TCM rim was placed back into the mouth for another 10 minutes. Apart from the molding of the buccal and lingual surfaces, the repeated swallowing actions guided the mandible close to the centric relation position and vertical dimension of

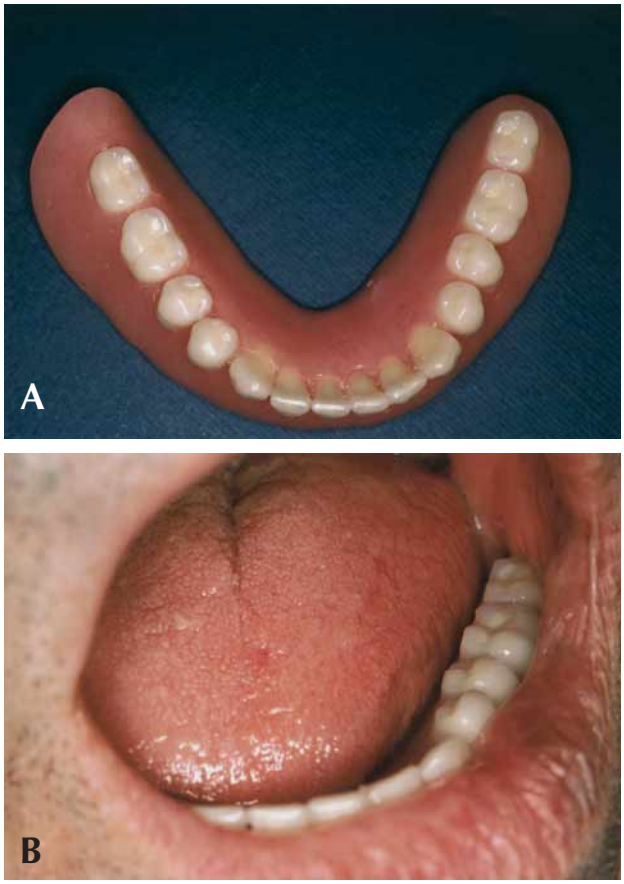

Fig. 6. A, Neutral zone mandibular denture. **B,** Denture was stabilized by lips, cheeks, and tongue during opening.

Fig. 7. A, Replacement dentures. **B,** Dentures in situ while patient tried to contract his facial muscles and show his teeth.

occlusion, squeezing the tissue conditioning material onto the maxillary wax rim.[7] The TCM rim then was removed from the mouth, carefully examined, and prepared for duplication in wax (Fig. 3).

The record base with the molded TCM was placed on the mandibular cast, and buccal and lingual indices were carefully fabricated with silicone putty impression material. The TCM then was removed from the base. Indices were returned and sealed into place with sticky wax, and the empty space, representing the neutral zone, was filled with molten pink denture wax slightly below the level of the occlusal plane. The tentatively completed wax neutral zone rim then was ready for the final maxillomandibular registration (Fig. 4).

The final determination of the vertical dimension of occlusion and centric relation was made by adding a layer of soft wax (heated with a flame) on the occlusal surface of the mandibular wax rim. The record base was placed in the mouth together with the lubricated maxillary occlusal rim, and the mandible was guided carefully into centric relation. When the softened wax touched the maxillary occlusal rim, the patient was instructed to close. It has been clinically observed that guidance prior to closing and swallowing produces more accurate results,[8] particularly in patients with neurological deficiencies. Excess wax was trimmed, the remaining wax was softened again in the flame, and the patient was instructed to swallow without guidance (Fig. 5).

Teeth were selected and arranged in accordance with normal prosthodontic procedures.[5] The maxillary anterior teeth were selected to fulfill the esthetic demands of the upper lip. Semianatomic posterior teeth rather than nonanatomic teeth were selected in an attempt to stabilize occlusion in the maximal intercuspal position and improve mastication. The mandibular posterior teeth were positioned in the recorded neutral zone, and special care was taken to preserve the form of the polished surfaces. Because of the unfavorable relationship between the maxillary and mandibular residual ridges, and to avoid any violation of the recorded neutral zone, a reverse articulation occlusion scheme was developed in the left molar area.

After the final evaluation, the dentures were processed in the usual manner. During the finishing procedures, no denture base acrylic was removed from

the polished surfaces (Fig. 6). The dentures were delivered to the patient with the necessary instructions for use and maintenance. The patient was also instructed to avoid the use of denture adhesives at least for the first 2 weeks. Routine follow-up appointments were scheduled. A considerable improvement in speech, comfort, and mastication were reported after 1 month (Fig. 7).

DISCUSSION

Severe neurological disorders that result from brain lesions or extensive brain surgery often pose problems for the restoration of compromised dentition. Among the affected cranial nerves, the trigeminal, facial, and hypoglossal nerves are the most relevant to prosthodontic management because they affect the musculature involved in the passive and active control of the mandibular denture. Damage to the sensory branches of the trigeminal nerves causes hypoaesthesia in the areas of distribution; unilateral lesions involving the motor branch, although difficult to detect, may cause deviation of the mandible toward the affected side during opening. Hypoesthesia requires careful manipulation of impression trays and materials to prevent tissue damage; similar problems arise from the patient's inability to realize and locate spots made sore by overextended flanges. Conversely, deviation of the mandible during open-close movements becomes more apparent when setting the teeth and evaluating the occlusion.

Unilateral paralysis of all facial muscles is the result of lower motor neuron lesions. In these situations, drooping of the corner of the mouth often causes angular stomatitis, and food collection in the vestibule of the affected side is common because of poor coordination between the buccinator muscle and the tongue. Damage of the hypoglossal nerve, apart from dysarthria, may cause deviation of the tongue toward the affected side on protrusion because of the dominant action of the contralateral healthy genioglossus muscle. Tongue weakness and disturbed swallowing function pose difficulties for the dentist attempting to record the neutral zone and therefore require clear communication between the dentist and patient. The patient's motivation is an equally important factor.

For the patient in this report, a tissue-conditioning material was preferred over modeling plastic impression compound because the former's ease of mixing, elective initial viscosity, and slow-setting properties enable capture of the movable tissue morphology in the functional state. Moreover, the TCM permits an incremental molding procedure, which is particularly important in patients with focal neurological deficits and slow or false reactions to various commands. The most important benefit of this procedure was the immediate improvement in oral function due to the passive and active muscular fixation of the mandibular denture.[9-11]

The mandibular dentures did not cover the retromolar pads because the regular (panoramic) x-ray examination revealed 2 vertically impacted third molars. The right molar was almost under the oral mucosa. The patient and relatives were informed but refused surgery. It was decided that the molars would be left as they were, but an attempt was made not to disturb the area with the denture base. The dentures were well tolerated.

SUMMARY

The treatment of an edentulous patient who had undergone resection of an acoustic neurinoma and subsequently developed neurological problems has been described. For this patient, a neutral zone mandibular complete denture addressed the need to maximize muscle control. The polished surfaces of the mandibular denture were fitted to the functional anatomy of the surrounding soft tissues.

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