Cable Grafting of the Spinal Accessory Nerve After Radical Neck Dissection
Edward C. Weisberger, MD; John Kincaid, MD; Jeanne Riteris, PT, MA

Background: From January 1981 through March 1996, 20 patients with head and neck cancer underwent radical neck dissection with sacrifice of the spinal accessory nerve and immediate reconstruction of the nerve using a microsurgical technique and a cable graft of the great auricular nerve.

Methods: Postoperative shoulder function was assessed via a subjective questionnaire, objective strength testing, and/or postoperative electromyography. The latter was used to evaluate for the presence and amplitude of voluntary motor potentials, the presence of fibrillation potentials, and nerve conduction latency. The group of patients who underwent cable grafting of the spinal accessory nerve was compared with a group of patients who underwent modified radical neck dissection with preservation of the spinal accessory nerve and with another group of patients who underwent a classic neck dissection with sacrifice of the spinal accessory nerve and no reconstruction.

Results: In terms of shoulder function, the group of patients in whom the spinal accessory nerve was reconstructed occupied an intermediate position; i.e., their postoperative shoulder function was better than that of the patients who underwent radical neck dissection without reconstruction but not as good as that of the patients who underwent modified neck dissection with preservation of the spinal accessory nerve.

Conclusion: Cable grafting of the spinal accessory nerve that has been sacrificed during radical neck dissection results in improved shoulder function in the postoperative period.


Compromise of shoulder function is a recognized consequence of radical neck dissection (RND) of the cervical lymphatics for eradication of regional metastasis of head and neck cancer.1 In the 1950s, some surgeons began to modify the classic technique of neck dissection and, in selected cases, preserved the sternocleidomastoid muscle, internal jugular vein, and spinal accessory nerve.2-4 Nevertheless, in cases involving more advanced neck disease, it is still necessary to perform a neck dissection that sacrifices the integrity of the spinal accessory nerve. Herein, we describe 15 years of experience in cable grafting (CG) of the spinal accessory nerve after it has been sacrificed during neck dissection.

Ten patients undergoing MND completed the subjective questionnaire and were evaluated by objective strength testing. Eight of 10 underwent postoperative EMG. Although 20 patients underwent RND with CG, only 13 patients were evaluated as described in the "Patients and Methods" section. Twelve of these patients underwent subjective and objective testing, and 12 underwent postoperative EMG. One of the 13 patients who were evaluated underwent subjective and objective testing but did not undergo EMG, and 1 underwent EMG but no subjective or objective testing. Six patients who underwent RND without reconstruction of the spinal accessory nerve were evaluated by subjective and objective testing and postoperative EMG.

The MND group scored a mean of 15.6 of 16 on the subjective questionnaire and a mean of 13.2 of 18 on objective strength testing. Eight of 8 patients in the MND group exhibited voluntary motor potentials in the trapezius muscle, and 8 of 8 displayed an absence of fibrillation potentials. Nerve conduction latency was normal in 7 patients and increased in 1 patient. The group who underwent RND with CG of the spinal accessory nerve scored a...
PATIENTS AND METHODS

From January 1981 through March 1996, 20 patients underwent classic RND with division of the spinal accessory nerve for the eradication of metastases to the cervical lymphatics from head and neck cancer. These patients underwent immediate reconstruction of the spinal accessory nerve with a CG using the great auricular nerve. The results of the initial experience with the use of this technique were published earlier. Three groups were shown to differ significantly on all 5 tests (P < .01). When one group was compared with another, the score on the subjective questionnaire for the MND group and for the RND with CG group was significantly higher than for the RND without CG group (P < .04). However, the RND with CG group did not differ significantly from the MND group (P = .08). On the objective strength testing, all 3 groups differed significantly from one another (P < .01).

The proportion of patients with voluntary motor potentials was significantly different for the RND with CG group vs the RND without CG group and for the MND group vs the RND without CG group (P < .01). Only the MND group and the RND without CG group differed significantly regarding the absence of fibrillation potentials (P = .01). The RND with CG group did not differ significantly from the MND group regarding the presence of voluntary motor potentials (P = .07) or the absence of fibrillation potentials (P = .06). For nerve conduction latency scores, all groups differed significantly from one another (P < .01).

The primary goal of neck dissection for metastatic head and neck cancer is eradication of malignant disease and not maximization of postoperative shoulder function.
The neck dissection can compromise postoperative reconstruction of the head and neck, such as the pectoralis major and by the extent to which the muscles are strengthened through postoperative rehabilitation. Flaps for shoulder function after neck dissection. As noted, the levator scapula and serratus anterior muscle also serve to aid in abduction of the upper extremity.

Comparisons of techniques of neck dissection that preserve or reconstruct the anatomical integrity of the spinal accessory nerve with those that sacrifice this nerve are complicated by the fact that there are other determinants of postoperative shoulder function. As mentioned, there may be alternative motor input through the cervical plexus, leading Brown et al. to describe the motor innervation of the trapezius muscle as the “spinal accessory nerve plexus.” Preoperative shoulder dysfunction and adhesive capsulitis, age of the patient, and motivation to pursue postoperative range-of-motion exercises and rehabilitation are interrelated factors that determine shoulder function after neck dissection. As noted, the levator scapula and serratus anterior muscles can, to some degree, compensate for loss of trapezius function. The degree to which this compensation occurs is determined by whether the motor supply to these muscles is interrupted during neck dissection (ie, by dissection deep to the prevertebral fascia) and by the extent to which the muscles are strengthened through postoperative rehabilitation. Flaps for reconstruction of the head and neck, such as the pectoralis major or the latissimus dorsi myocutaneous flaps, when harvested from the side ipsilateral to the side of the neck dissection can compromise postoperative shoulder function.

Even when the spinal accessory nerve is thought to have been left anatomically intact, as in MND, postoperative shoulder disability can exist. There is often a temporary neuropraxia related to intraoperative dissection of the nerve that can improve over the 12 months after surgery. More permanent shoulder disability can result from a greater degree of injury to the spinal accessory nerve.

The spinal accessory nerve can be unknowingly transected during MND. Retraction of the sternocleidomastoid muscle causes an artifactual alteration in the course of this nerve at a point after it has exited the posterior border of the sternocleidomastoid muscle, allowing the spinal accessory nerve to be confused with cervical sensory roots. Despite these limitations, the findings of several studies support the theory that postoperative shoulder function is improved when the spinal accessory nerve is preserved or reconstructed.

There have been previous studies on CG of the spinal accessory nerve, but in only 1 (to our knowledge) was there an attempt to evaluate postoperative trapezius function. Anderson and Flowers performed postoperative EMG in 4 cases. In recent years, more sophisticated methods for evaluating postoperative trapezius and shoulder function have been described. The “gold standard” may be that used by Hillel et al., which is based on sophisticated strength-testing technology. Other methods for rehabilitation of postoperative shoulder function after neck dissection include physical therapy and range-of-motion exercises, orthopedic reconstruction of the shoulder girdle, and preservation of the cervical plexus, which attempts to maintain alternative motor input to the trapezius. Certainly, physical therapy and range-of-motion exercises are important after CG, as reinnervation does not occur for about 5 months, allowing plenty of time for adhesive capsulitis to occur. When the latter occurs in older patients, it is very difficult to reverse.

Cable grafting of a spinal accessory nerve that has been sacrificed during RND results in improved postoperative shoulder function compared with RND without reconstruction of the spinal accessory nerve. However, postoperative shoulder function is best when the anatomical integrity of the spinal accessory nerve is not interrupted, as in the performance of MND.

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Reprints: Edward C. Weisberger, MD, Department of Otolaryngology–Head and Neck Surgery, Indiana University School of Medicine, 702 Barnhill Dr, Suite 0860, Indianapolis, IN 46202.
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