Partial myotomy/myectomy of the trapezius muscle with an asleep-awake-asleep anesthetic technique for treatment of cervical dystonia

Technical note

JOACHIM K. KRAUSS, M.D., REMO KOLLER, M.D., AND JEAN-MARC BURGUNDER, M.D.

Departments of Neurosurgery, Anesthesiology, and Neurology, Inselspital, University of Berne, Berne, Switzerland

The authors describe a technique for performing partial sectioning and myectomy of the trapezius muscle in patients with severe cervical dystonia that is unresponsive to conservative treatment. Asleep-awake-asleep anesthesia allows intraoperative control of the sectioning procedure to avoid causing postoperative weakness of arm elevation above the horizontal plane. The procedure has been performed successfully in three patients. In all cases the dystonic posture of the shoulder and local pain were improved postoperatively. There were no new deficits. This technique can be used as an adjunct to other peripheral surgical procedures in patients with marked laterocollis and dystonic elevation and anteversion of the shoulder.

KEY WORDS • anesthesia • cervical dystonia • spasmodic torticollis • trapezius muscle

The surgical treatment of cervical dystonia has gained more widespread attention recently.7,12 Candidates for surgery are patients who develop antibodies to botulinum injections or those who do not respond primarily.5,7 A wide variety of techniques have been applied in the past.10 Myotomy was performed in the past but was largely abandoned. Currently, most surgeons perform either selective peripheral denervation including C1–6 ramisectomy or intradural upper cervical anterior rhizotomy.1,4,6 The branches of the spinal accessory nerve to the sternocleidomastoid muscle can be sectioned intradurally or peripherally after the portion to the trapezius muscle has branched off. In each technique, care is taken not to sever the innervation of the trapezius muscle because this would likely result postoperatively in the patient’s inability to elevate his arm above the horizontal plane.

A number of patients with cervical dystonia suffer from painful dystonic activity of the trapezius muscle, which results in elevation and anteversion of the shoulder.2,8 Dystonia of the trapezius muscle may also reinforce tilting of the head to the shoulder. Both intra- and extradural denervation techniques are not suited to solving this problem. Partial resection of the trapezius muscle via a posterior approach has been described by Chen.7 This method, however, appears to have not been widely adopted, possibly because of its inherent risk of causing subsequent paralysis of arm elevation. We have previously reported on the benefit of selective myotomy/myectomy as an adjunct to the aforementioned denervation techniques for treatment of cervical dystonia.11 Here, we describe the use of an asleep-awake-asleep anesthetic technique to perform safely myotomy and myectomy of the upper portion of the trapezius muscle.

Operative and Anesthetic Techniques

Patients are premedicated with benzodiazepine midazolam. General anesthesia is induced with propofol and fentanyl. For intubation a single dose of atracurium, a short-acting muscle relaxant, is given. No other muscle relaxants are administered to allow for intraoperative nerve stimulation. To maintain anesthetic effect, target-controlled infusion of propofol is used. In general, we choose a target concentration of approximately 4 μg/ml to keep the patient in deep sedation.

The procedure can be performed with the patient in the supine position, with the head rotated to the contralateral side, or in a sitting position by using a three-pronged head holder. The choice of position depends mainly on
which other measures are planned in the same operative session. The ipsilateral arm is draped separately, regardless which position is used. The posterior rim of the sternocleidomastoid muscle and the anterior rim of the trapezius muscle are identified by palpation. We have found it useful to mark the muscle contours on the skin with a felt-tip pen while the patient is still awake. A lateral cervical 4-cm skin incision is made approximately 4 cm below and parallel to the lower jaw. The sternocleidomastoid and trapezius muscles are dissected and the branches of the spinal accessory nerve are identified by bipolar stimulation. In patients in whom dystonic activity of the levator scapulae is present, this muscle can also be dissected and sectioned transversely. Approximately 1 cm of muscle is cut and removed from the proximal and distal stumps to prevent readaptation.

General anesthesia is interrupted by stopping the application of propofol. Several minutes pass before the patient is able to follow commands. In case the endotracheal tube is not tolerated, intravenous lidocaine (1 mg/kg) can be administered. A small dose of naxolone may be given to antagonize the opioid medication. The patient then is asked to abduct and elevate the ipsilateral arm above the horizontal plane. The anterior rim of the trapezius muscle is sectioned transversely by using a monopolar cutting probe. The strength of arm abduction and level of elevation are monitored continuously by having the patient move his arm repeatedly from 90° abduction to another 45° elevation in the horizontal plane. After an adequate myotomy is performed by cutting approximately 2 to 3 cm into the dystonic muscle (the depth depends on the hypertrophy of the muscle), general anesthesia is continued with target-controlled infusion of propofol. Additionally, midazolam is given with the intention to induce retrograde amnesia. Partial myectomy of the muscle adjacent to the cut is performed. The gap is filled with a piece of spongostan that can be soaked in a local anesthetic such as bupivacaine. If necessary, the operation can proceed further with selective denervation and/or myotomy of the sternocleidomastoid muscle. The aponeurosis of the trapezius muscle is not sutured. Postoperatively the patient receives anticholinergic medication with ketorolac tromethamine.

**Results**

The technique described has been successfully applied in three patients with cervical dystonia in whom prominent dystonic activity of the trapezius muscle had occurred. Secondary resistance to botulinum injections was present in all three cases (two women and one man; mean age at surgery 45 years). The mean duration of disease was 8 years. No useful benefit was obtained with anticholinergic medication. All patients had undergone previous surgery including anterior rhizotomy (one case), posterior ramisectomy (two cases), and selective peripheral denervation of the sternocleidomastoid muscle (two cases). Although these operations yielded symptomatic and functional improvement, the patients still suffered from lateralcollis, shoulder elevation, and pain. There were no adverse events during the partial trapezius myotomy/myectomy procedure. The endotracheal tube was well tolerated during interruption of general anesthesia. Postoperatively, improvement of shoulder elevation and anteverision, head tilt, and pain was achieved in all patients in a mean follow-up period of 8 months. Local pain at the site of the myotomy/myectomy was controlled by injection of local anesthetic in two patients. There were no surgery-related side effects, and strength on elevation of the arm above 90° was completely unremarkable.

**Discussion**

Surgical treatment of cervical dystonia is only recommended in patients with prolonged dystonia in whom adequate relief is not obtained from botulinum injections or medical therapy.\(^{3,12}\) In the past surgical treatment of cervical dystonia was burdened with a high incidence of complications. An unstable or weak neck has been reported in up to 39% of cases and shoulder paresis in 41% in some series after extensive intradural nerve sectioning was performed.\(^4\) As discussed elsewhere,\(^11\) we advocate targeting only those muscles and their neural supply that contribute to cervical dystonia while preserving the uninvolved muscles. Thus, surgical treatment is tailored to the specific needs of the individual patient rather than performing a “standard” procedure.

A procedure involving selective myotomy and partial myectomy of the trapezius muscle in which an asleep-awake-asleep anesthetic technique is used broadens the armamentarium of surgical options in selected patients with cervical dystonia. This technique is well tolerated and reduces the risk of surgery-related side effects. It reduces dystonic activity of the trapezius muscle while sparing normal motor function. We consider it a second-place procedure reserved for patients whose symptoms do not respond sufficiently to more commonly used techniques. The procedure appears to be suited particularly for a subset of patients with prominent elevation and anteverision of the shoulder and laterocollis. Our technique does not allow adequate intraoperative monitoring of motion of the scapula. Injury to the spinal accessory nerve or paralysis of the trapezius muscle may result in an abnormal position or motion of the scapula as well as accompanying pain. Although we did not observe this side effect in the present study, patients should be counseled appropriately.

Partial myotomy/myectomy of the trapezius muscle in which this asleep-awake-asleep anesthetic technique is applied is feasible only in fully cooperative patients. Detailed preoperative explanation of the technique is essential to obtain the patient’s cooperation during surgery. Several other combinations of anesthetics and analgesic drugs are available for asleep-awake-asleep anesthetic techniques. We prefer the total intravenous anesthesia technique with sedatives and opioids. Care must be taken, however, to avoid conscious sedation with propofol, because other movement disorders may be elicited during this state of anesthesia.\(^9\) We have found it useful to administer a benzodiazepine medication prior to intubation and after the awake phase. None of our patients experienced having been awake during surgery.

Regarding the increasing number of patients with cervical dystonia who develop immunoresistance to botulinum, there is a need for reevaluation of surgical treatment of
Trapezius muscle myotomy/myectomy in cervical dystonia

cervical dystonia. Because the surgery is elective, adequate measures should be taken to avoid any postoperative complications.

References

Manuscript received December 9, 1998.
Accepted in final form June 17, 1999.
Address reprint requests to: Joachim K. Krauss, M.D., Department of Neurosurgery, University Hospital, Klinikum Mannheim, Theodor-Kutzer-Ufer 1-3, Mannheim 68167, Germany. email: joachim.krauss@uch.ma.uni-heidelberg.de.