DIFFERENTIAL SPINAL ACCESSORY-FACIAL ANASTOMOSIS WITH PRESERVATION OF FUNCTION OF TRAPEZIUS*

FLOYD H. BRAGDON, M.D.,† AND GEORGE H. GRAY, JR., M.D.†

Pittsburgh, Pennsylvania

(Received for publication May 31, 1962)

Historically, the use of the spinal accessory nerve as the proximal segment of a craniofacial type of anastomosis antedates all other procedures. While the first opinion that divided nerves should be sutured was formulated by Guy de Chauliac in 1363, it was not until 1842 that Flourens in Paris carried out the early experimentation on anastomosis of nerves. In 1879, Drobnik performed the first anastomosis of the proximal branch of the spinal accessory nerve to the distal branch of the facial nerve and, following this procedure, demonstrated increased symmetry of the face. There followed then the work of Ballance in 1895 and Faure in 1898. An excellent return of function after spinal-facial anastomosis was reported by Kennedy of London in 1901. A fairly satisfactory result in the use of the spinal accessory nerve in spinal accessory-facial anastomosis was reported by Harvey Cushing in 1903. Additional cases of spinal-facial anastomosis were reported by Munch, Girard, and Beck through 1908 and by Love and Cannon, Caldwell and others since that time. While it must be admitted that the return of facial function after spinal-facial anastomosis does not approximate the function of the intact facial nerve, and with appropriate consideration to the claims of the proponents of hypoglossal-facial anastomosis, glossopharyngeal-facial anastomosis, and phrenicofacial anastomosis that these tend to induce more satisfactory facial function with less attendant massive motion, we believe it can be stated fairly that one of the prime objections to the spinal-facial anastomosis is the resulting paralysis of the trapezius muscle in the majority of cases in which this procedure is performed.

The variations in the distal distribution of the spinal accessory nerve with regard to the trapezius muscle were well documented by Coleman in his excellent report in 1950 of the case of a 14-year-old girl in whom he used the entire spinal accessory nerve, splitting it into three parts and anastomosing it to the distal branches of the facial nerve. This procedure had been carried out following partial extirpation of the facial nerve with removal of a parotid tumor. He pointed out that in this particular patient there was no noticeable dysfunction in movement of the trapezius and there was no evidence of any atrophy of the shoulder. In this case, as in other individuals, it is obvious that the superior fibers of the trapezius muscle were being supplied by the upper cervical roots and not by the spinal accessory nerve. This anomaly is not rare but, certainly in the majority of individuals, complete section of the spinal accessory nerve will result in paralysis of the trapezius muscle and severe dysfunction of the shoulder. The trapezius muscle not only helps in the actual elevation of the shoulder, but also forms the upper and medial components necessary for scapular rotation and scapular fixation in motion of the shoulder. The loss of this function induces a fairly severe deficit. This prompted the development of a technique utilizing the portion of the spinal accessory nerve innervating the sternocleidomastoid muscle and sparing the branch to the trapezius. It is the purpose of this paper to report 14 such cases documenting the results, and demonstrating several follow-up results by a motion picture which will be shown shortly.

† Address: 1501 Locust St., Pittsburgh 19, Pennsylvania.

981
Investigation of the innervation of the sternocleidomastoid and trapezius muscles on cadavers demonstrated, in the majority of specimens, that a very clear-cut trunkal split was present as the spinal accessory nerve passed beneath the medial border of the sternocleidomastoid muscle. At this point, there is a fairly sharp delineation of fibers passing into the sternocleidomastoid muscle from those which will pass through the posterior portion of the sternocleidomastoid muscle and into the posterior cervical triangle to innervate the upper fibers of the trapezius muscle (Figs. 1 and 2). In some individuals, the actual trunkal split will be evidenced for a distance of 1 to 1.5 cm. proximal to the muscle, while in other individuals it is necessary to dissect slightly into the fibers of the sternocleidomastoid muscle before definite division can be ascertained. In some instances, it would appear that the fibers that pass to the sternocleidomastoid muscle come off singly and without any semblance of a trunk. In these individuals, careful examination of the nerve itself will reveal two definite trunks beneath the neurilemma, and with a sharp scalpel the outer sheath is split upward and definite separation of the fiber trunks into the two divisions of the spinal accessory nerve can be delineated. The extent of the separation after splitting of the sheath generally will vary from 2.5 to 4 cm. on the average. The width of the trunkal portion to the sternocleidomastoid muscle has an average diameter of 3 mm. which provides a satisfactory trunk for anastomosis to the facial nerve (Fig. 3).

In only 2 of the cases reported here was there any difficulty in securing adequate length in the sternocleidomastoid portion of the nerve to effect satisfactory anastomosis to the distal trunk of the facial nerve. The anastomosis generally was carried out by looping the fibers of the spinal accessory nerve under the belly of the digastric muscle. Depending to some extent on the relative sizes of the facial and the sternocleidomastoid portions of the spinal accessory nerve, the anastomosis usually was accomplished by the insertion of two to four fine silk neurilemmal sutures.

Spinal accessory-facial anastomosis using the split-nerve technique has been performed...