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Hypoplasia of the Trapezius and History of Ipsilateral Transient Neonatal Brachial Plexus Palsy

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We present two children with hypoplasia of the left trapezius muscle and a history of ipsilateral transient neonatal brachial plexus palsy without documented trapezius weakness. Magnetic resonance imaging in these patients with unilateral left hypoplasia of the trapezius revealed decreased muscles in the left side of the neck and left supraclavicular region on coronal views, decreased muscle mass between the left splenius capitis muscle and the subcutaneous tissue at the level of the neck on axial views, and decreased size of the left paraspinal region on sagittal views. Three possibilities can explain the association of hypoplasia of the trapezius and obstetric brachial plexus palsy: increased vulnerability of the brachial plexus to stretch injury during delivery because of intrauterine trapezius weakness, a casual association of these two conditions, or an erroneous diagnosis of brachial plexus palsy in patients with trapezial weakness. Careful documentation of neck and shoulder movements can distinguish among shoulder weakness because of trapezius hypoplasia, brachial plexus palsy, or brachial plexus palsy with trapezius hypoplasia. Hence, we recommend precise documentation of neck movements in the initial description of patients with suspected neonatal brachial plexus palsy.

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Introduction

Clinical descriptions of unilateral aplasia or hypoplasia of the trapezius are seldom reported in the pediatric population [1-4]. The trapezius is the most superficial of the dorsal muscles of the neck and back. It has a triangular shape, and can be divided into three segments. The upper segment arises from the medial third of the nuchal line, the external protuberance of the occipital bone, and the ligament nuchae. Its fibers proceed downward and laterally, and insert into the posterior border of the lateral third of the clavicle. Contraction of the upper segment of the trapezius when the head is fixed elevates the ipsilateral shoulder. Contraction of the upper segment of the trapezius when the shoulders are fixed draws the head backward toward the ipsilateral side.

The middle segment originates from a semielliptical aponeurosis attached medially to the spinous processes of the sixth cervical vertebra to the third thoracic vertebra. Its fibers are oriented transversely, and insert into the medial margin of the acromion and the superior lip of the posterior border of the spine of the scapula. Contraction of the middle segment of the trapezius retracts the scapula.

The lower segment arises from the spinous processes of the sixth to the twelfth thoracic vertebrae. Its fibers proceed upward and laterally, and insert into the medial end of the spine of the scapula. Contraction of the lower segment of the trapezius depresses the scapula.

The simultaneous contraction of both trapezii when the shoulders are fixed draws the head directly backward. The simultaneous contraction of both trapezii when the head is fixed shrugs the shoulders [5]. The trapezius is innervated by the spinal accessory nerve, with potential contributions from the anterior rami of C_2, C_3, and C_4 [6].

We present two children with hypoplasia of the left trapezius muscle and a history of ipsilateral transient brachial plexus palsy, without documented trapezial weakness during the neonatal period. We discuss the possible causes for this association, recommend an approach to distinguish

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among these possibilities, and provide, to our knowledge, the first description of magnetic resonance imaging findings in children with unilateral hypoplasia of the trapezius.

Case Reports

Patient 1

A 2-year-old boy presented for an evaluation of shoulder asymmetry. He was the product of a normal, uncomplicated pregnancy and delivery. Shortly after birth, the possibility of arm weakness was considered, but by age 3 months, the movements were deemed symmetric. At age 9 months, his mother observed that his left shoulder was depressed in relation to his right shoulder. This asymmetry was more noticeable with certain movements, and remained so from the time it was first observed until time of presentation. Otherwise, the boy's development was normal.

On physical examination, the left shoulder was depressed. At rest, the medial border of the left scapula was laterally displaced, and its inferior angle was medially rotated. On attempts to bend the neck straight backward, the head tilted toward the right. The degree of shoulder depression increased with forward flexion of the arm (Fig 1). Winging of the affected scapula increased with external rotation of the shoulder while the arm was flexed at the elbow. Winging of the scapula was more prominent while abducting the affected arm than while flexing it forward. The passive range of motion was normal in both shoulders. Confrontation testing of the sternocleidomastoid muscle produced normal results. The active elevation lag sign and triangle sign were not tested because of poor cooperation.

Plain radiographs of the neck and clavicle produced normal results. Magnetic resonance imaging of the brachial plexus revealed a smaller left trapezius (Fig 2). An axial T_1-weighted image indicated hypoplasia of the superior, middle, and inferior segments of the left trapezius and scapula winging.

Patient 2

A 13-month-old girl presented with shoulder asymmetry and a limitation of left shoulder movements. These findings were evident at age 5 months, and were initially considered the sequelae of a perinatal brachial plexus injury. No deterioration was reported. She was the product of a normal, spontaneous vaginal delivery. No shoulder dystocia was reported. Her development was normal.

On physical examination, she exhibited asymmetric shoulders. The left shoulder was lower than the right shoulder, the lateral border of the left scapula was translocated laterally, and the left levator scapula was prominent. Torticollis was not present. The rest of her general examination produced normal results, including the passive range of motion of her left shoulder.

The neurologic examination was limited by the patient's age, but an inability to elevate the left shoulder was clearly evident. On attempts to grab an object held over her head, lumbar spine hyperextension was more pronounced when reaching with the left hand than with the right hand. Confrontation testing of the sternocleidomastoid muscles produced normal results. Electrophysiologic studies demonstrated normal left deltoid, suprascapular, biceps, triceps, and first interosseous muscles. The area normally occupied by the left trapezius exhibited no electromyographic abnormalities. Magnetic resonance imaging of the cervical spine and brachial plexus revealed a reduced thickness of the muscle mass in areas normally occupied by the left trapezius (Fig 3).

Discussion

Unilateral shoulder depression during infancy and early childhood may be attributable to skeletal deformities or neuromuscular pathology. Neuromuscular pathology includes atrophy of the deltoid or supraspinatus muscle or both, and individual or combined weaknesses of the serratus anterior, rhomboid, levator scapula, or superior segment trapezius muscle. Weakness of the serratus anterior, rhomboid, levator scapula, or superior segment of the trapezius muscle may be attributable to agenesis or hypoplasia in these muscles or to injury to the long thoracic, dorsal scapular, or spinal accessory nerves. Isolated weakness of the trapezius may also occur with ventral brainstem lesions and lesions in the lower cervical cord and corresponding ventral rami [1-4,7-10].

In the two patients described here, the constellation of findings indicated a weakness of the superior, middle,

Figure 1. Depression of the shoulder, lateral translocation of the scapula, and prominence of the levator scapula is more noticeable during shoulder flexion than during rest or abduction of the arm.

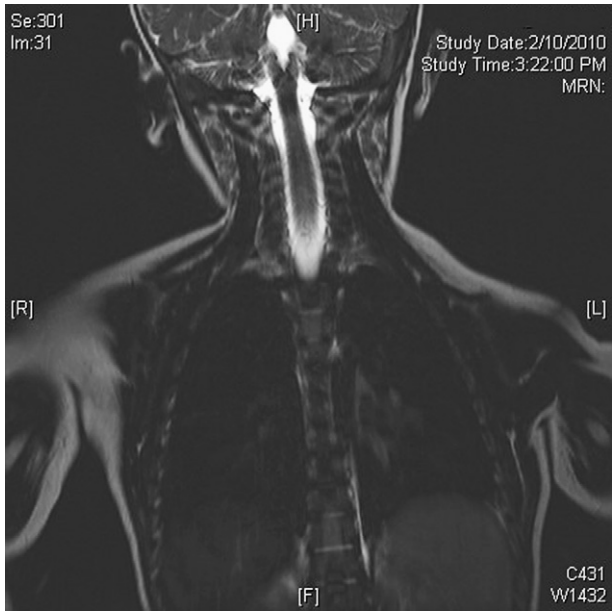

Figure 2. Coronal magnetic resonance imaging of the brachial plexus (T_2-weighted image) indicates asymmetry of the muscles in the neck and supraclavicular region. Note the hypoplasia of the left trapezius, and hypertrophy of the left levator scapula.

and inferior segments of the trapezius. Normal deltoid and supraspinatus muscle strength and mass in both patients, and the normal electromyographic findings of the deltoid and supraspinatus muscles in patient 2, excluded any dysfunction of these muscles. Involvement of the trapezius was distinguished from rhomboid and levator scapula weakness by a marked unilateral depression of the shoulder, the prominence of the levator scapula, the medial rotation of the inferior angle of the scapula, accentuation of the winging of the scapula by abduction of the arm and external rotation of the shoulder, and the amelioration of scapular winging and accentuation of the lower position of the shoulder by forward flexion of the arm (Fig 1). Involvement of the trapezius was distinguished from serratus anterior weakness by the marked unilateral depression of the shoulder, the lateral translocation of the scapula, the pattern of accentuation and amelioration of scapular winging with arm action as previously described (Fig 1), and increased lumbar hyperextension on the affected side in patient 2. In patients with serratus anterior weakness, the

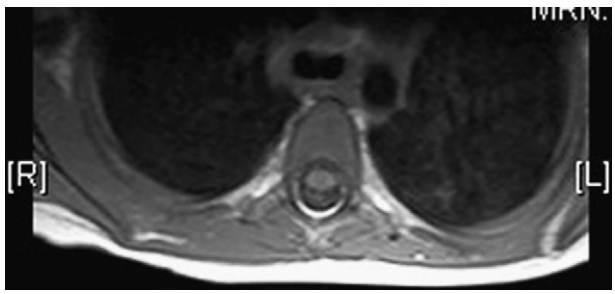

Figure 3. Axial magnetic resonance imaging of the cervicothoracic spine (T_2-weighted image) at the level of the scapulae reveals decreased muscle mass in the left paraspinal region, corresponding to the trapezius.

shoulder at rest is elevated instead of depressed, and it is only during forward flexion that the failure of upward rotation of the scapula produces the appearance of a depressed shoulder. Scapular winging is more prominent during forward flexion than during abduction of the arm, and does not worsen with external rotation of the shoulder [11,12]. A useful clinical sign for diagnosing trapezial weakness in patient 1 was the deviation of the head toward the normal side upon active attempts to draw the head directly backward. This finding distinguishes trapezial weakness from rhomboid or serratus anterior weakness, because the trapezius is the only one of these muscles that influences neck movements.

Magnetic resonance imaging in both patients revealed a normal size of the right trapezius in the coronal, transverse, and parasagittal views, whereas the area corresponding to the left trapezius was decreased (Figs 2 and 3). The upper fibers of the right trapezius were visualized in the coronal and transverse views of the neck region. Lower thoracic transverse and parasagittal views demonstrated the smaller mass of the left middle and lower trapezius segments, compared with the same segments on the right (Fig 3).

The decreased muscle mass in the area corresponding to the left trapezius suggested either a primary developmental muscle problem (aplasia or hypoplasia) or atrophy of the trapezius secondary to nerve injury.

Atrophy involving all segments of the trapezius occurs with injuries to the accessory nerve and all contributions from the anterior rami C_2, C_3, and C_4 to the innervation of the trapezius. In a patient with a lesion producing atrophy involving all segments of the trapezius, sparing of the sternocleidomastoid muscle, and a normal intracranial portion of the accessory nerve as determined by magnetic resonance imaging, the only possible site of the lesion is the posterior cervical triangle. Such a lesion was unlikely in these patients, because they exhibited no history of neck trauma or evidence of phrenic nerve involvement. Further support against nerve injury was the permanent nature of the trapezius involvement and the transient nature of the weakness of the brachial plexus innervated muscles.

Evidence favoring hypoplasia of the trapezius includes the lack of chronic denervation or signs of reinnervation according to electromyography in the areas corresponding to the left trapezius in patient 2, and the uniform involvement of all trapezial segments in both patients. The likelihood of hypoplasia of the trapezius is further supported by Adams et al. [4], who associated unilateral neonatal brachial plexus palsy with familial aplasia of the ipsilateral trapezius. In addition to our patients, Adams et al. [4] presented a third patient with a history of transient brachial plexus palsy associated with hypoplasia or aplasia of the ipsilateral trapezius muscle. Hence, although the distinction between atrophy and hypoplasia of the trapezius could not be made categorically in these patients, we feel that enough evidence exists to support hypoplasia of the trapezius.

Three possibilities may explain the association of hypoplasia of the trapezius and ipsilateral obstetric brachial plexus palsy: increased vulnerability of the brachial plexus to stretch injury during delivery because of weakness of the trapezius, a casual association of brachial plexus injury and aplasia of hypoplasia of the trapezius, or an erroneous diagnosis of brachial plexus palsy in patients with trapezius weakness. The first possibility is supported by previous reports of obstetric brachial plexus palsy occurring in patients with decreased intrauterine arm movements and with conditions associated with decreased intrauterine arm movements, such as physical constraint and cortical dysplasia [13,14]. A casual association seems unlikely because three of the six reported children with unilateral aplasia or hypoplasia of the trapezius had a history of brachial plexus palsy [1-4]. An erroneous diagnosis of brachial plexus palsy may be suspected because of the limited description of the neonatal arm deficit provided by Adams et al. [4] and by the physicians who had earlier contact with the patients we describe. A careful description of the initial deficit, with emphasis on shoulder and neck functions, would establish the presence of brachial plexus palsy, trapezial weakness, or both.

In conclusion, we report on two patients with trapezius hypoplasia, describe the characteristic magnetic resonance imaging findings of this condition, and recommend that, in addition to documentation of upper extremity movements, a careful examination and description of the movements of the neck be performed in all patients with suspected neonatal brachial plexus palsy.

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