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Levator Scapulae Muscle Asymmetry Presenting as a Palpable Neck Mass: CT Evaluation

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PURPOSE: To define the normal CT anatomy of the levator scapulae muscle and to report on a series of five patients who presented with a palpable mass in the posterior triangle due to asymmetry of the levator scapulae muscles. **PATIENTS AND METHODS:** The contrast-enhanced CT examinations of the neck in 25 patients without palpable masses were reviewed to establish the normal CT appearance of the levator scapulae muscle. We retrospectively reviewed the contrast-enhanced CT examinations of the neck in five patients who presented with a palpable mass secondary to asymmetric levator scapulae muscles. **RESULTS:** In three patients who had undergone unilateral radical neck dissection, hypertrophy of the ipsilateral levator scapulae muscle was found. In one patient, the normal levator scapulae muscle produced a factitious "mass" due to atrophy of the contralateral levator scapulae muscle. One patient had an intramuscular neoplasm of the levator scapulae. **CONCLUSION:** Asymmetry of the levator scapulae muscles, an unusual cause of a posterior triangle mass, can be diagnosed using CT.

Index terms: Neck, muscles; Neck, computed tomography

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The levator scapulae muscle can be identified readily on axial images by its characteristic appearance and its relationship to the other muscles forming the boundaries of the posterior triangle. Asymmetry of the levator scapulae muscles is an unusual cause of a palpable posterior triangle mass. In our series, hypertrophy of the ipsilateral levator scapulae muscle in patients who had undergone unilateral radical neck dissection for cancer was the most frequent cause. A palpable mass in the posterior triangle in these patients may raise suspicion for recurrent disease (1). Recognition of levator scapulae muscle hypertrophy will eliminate the need for further workup or surgery.

Materials and Methods

The clinical histories and computed tomography (CT) examinations of five patients with palpable asymmetry of the levator scapulae muscles evaluated at our institution

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between January 1987 and March 1991 were reviewed. All patients presented with a palpable mass in the posterior triangle of the infrahyoid neck. The patients, three men and two women, ranged in age from 37 to 77. Three of the five patients had previously undergone unilateral radical neck dissection for carcinoma of the aerodigestive tract.

All CT examinations were performed using a CT/T 9800 scanner (GE Medical Systems, Milwaukee, WI) using 5-mm contiguous sections from the tongue base to the thoracic inlet. All cases were performed following the intravenous administration of 150 mL of iohalamate meglumine 60% (Mallinckrodt, St. Louis, MO) using a bolus-drip technique. Similar CT examinations in 25 consecutive patients without palpable neck masses were reviewed in association with cross-sectional atlases of cervical anatomy (2, 3) to assess the normal axial appearance of the levator scapulae muscle.

Results

The levator scapulae arises from the transverse processes of the first through fourth cervical vertebrae and descends in a posterolateral direction to insert into the upper medial border of the scapula (4). The levator scapulae muscle, along with the scalene and splenius capitis muscles, forms the floor of the posterior triangle of the neck, deep to the sternocleidomastoid muscle (3). The normal CT appearance of the levator scapulae muscle at four representative levels was established.

At the level of the hyoid bone (C3–C4), the levator scapulae appears as an ovoid muscle anterior to the more elliptical splenius capitis muscle (Fig. 1A). The fat within the posterior triangle abuts the lateral margin of the levator scapulae, providing a convenient radiographic landmark. At the level of the cricoid cartilage (C5–C6), the levator scapulae muscle has a triangular configuration and is located lateral to the paraspinal muscles and posterior to the scalene muscles (Fig. 1B). The trapezius muscle flanks the posterior aspect of the levator scapulae muscle from this point inferiorly, with the fat of the posterior triangle interposed between the two muscles. At the level of the first tracheal ring (C7), the levator scapulae muscle assumes a more rounded shape. As it courses posterolaterally in the neck, the levator scapulae separates from the

scalene muscles which descend in an anterolateral direction (Fig. 1C). At the level of the cervicothoracic junction (T1), the levator scapulae once again appears ovoid in shape at its insertion on the superomedial border of the scapula (Fig. 1D).

Hypertrophy of the ipsilateral levator scapulae muscle was found in three of the five patients with palpable neck masses (Fig. 2). These patients had all undergone radical neck dissection. The ipsilateral trapezius muscle was atrophic in all three cases secondary to surgical sacrifice of the spinal accessory nerve. None of these cases had CT evidence of recurrent nodal disease and no other mass lesions were found in the neck.

In one patient, atrophy of the contralateral levator scapulae and scalene muscles resulted in

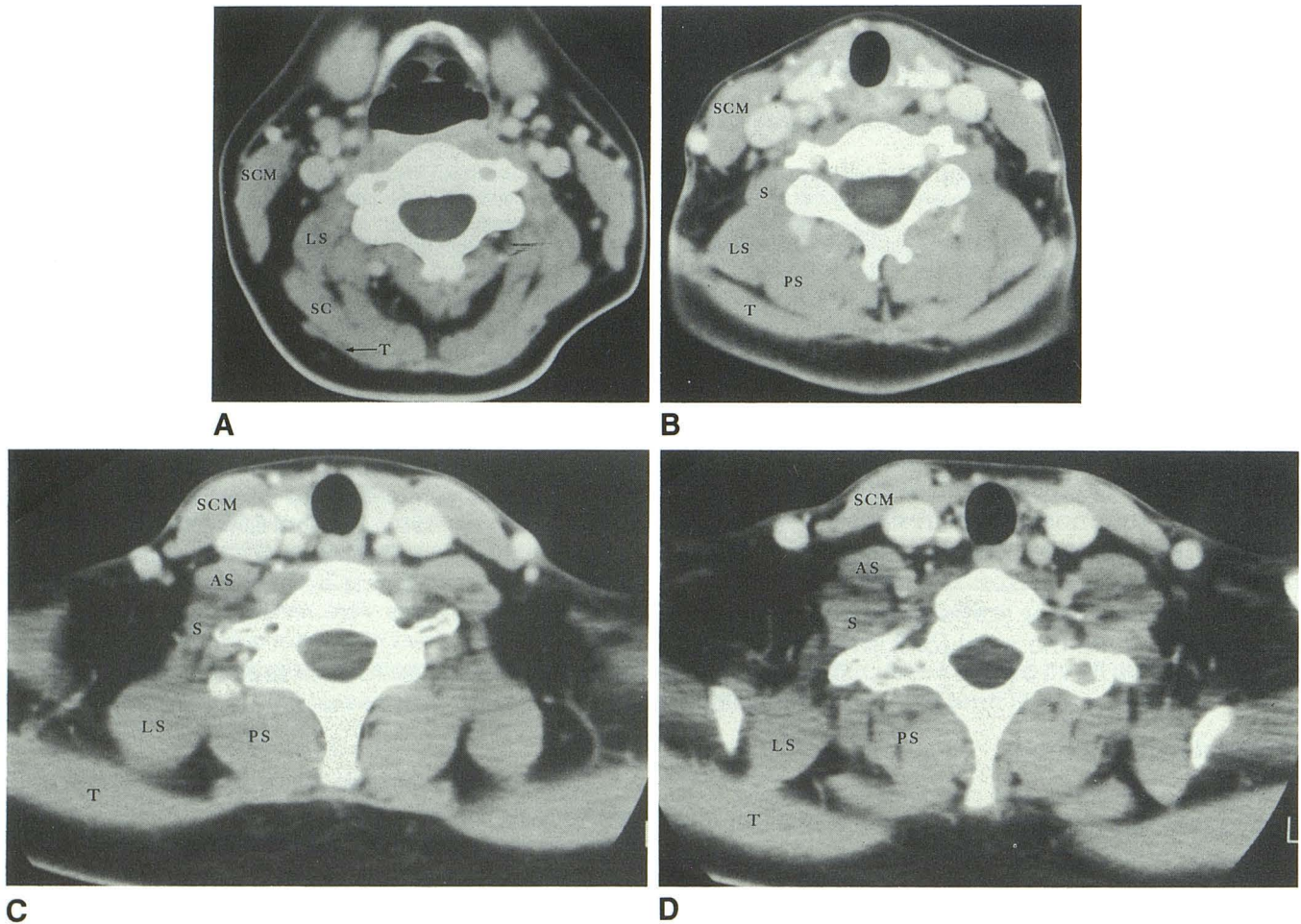


Fig. 1. A, Normal appearance of the levator scapulae muscle at the level of the hyoid bone. B, Normal appearance of the levator scapulae muscle at the level of the cricoid cartilage. C, Normal appearance of the levator scapulae muscle at the level of the first tracheal ring. D, Normal appearance of the levator scapulae muscle at its insertion on the scapula. Key to abbreviations in A–D: LS = levator scapulae, SCM = sternocleidomastoid, T = trapezius, S = posterior and middle scalenes, AS = anterior scalene, PS = paraspinal muscles, SC = splenius capitis.

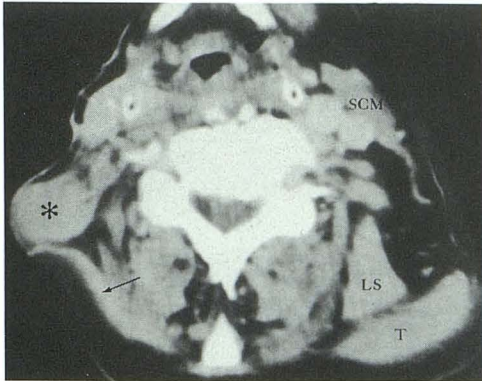


Fig. 2. Hypertrophy of the right levator scapulae muscle. Contrast-enhanced CT scan at the level of the hyoid bone demonstrates absence of the right sternocleidomastoid muscle, submandibular gland, and internal jugular vein compatible with right radical neck dissection. Atrophy of the right trapezius muscle is secondary to sacrifice of the right spinal accessory nerve. Note the altered contour of the neck secondary to the enlarged right levator scapulae muscle (*asterisk*). (*LS* = left levator scapulae, *SCM* = left sternocleidomastoid, *T* = left trapezius, *arrow* = atrophic right trapezius.)

a palpable asymmetry of the posterior triangle musculature (Fig. 3). The normal-sized levator scapulae muscle was misinterpreted as a pathologic mass on physical examination. Evaluation of the cervical spine revealed multilevel right-sided cervical spondylosis with severe foraminal stenosis at the C3–C4 and C4–C5 levels. No other pathologic masses were found in the neck.

One patient was a 37-year-old man who presented with progressive swelling of the left posterior neck over a 6-month period. Physical examination revealed a firm, mobile left posterior triangle mass. A 1+ bruit was present on auscultation of the mass. CT examination demonstrated a large mass within the left levator scapulae muscle displaying variable areas of intense contrast enhancement and hypodensity. No calcifications were identified within the mass (Figs. 4A and 4B). At surgery, the mass was confined to the levator scapulae muscle. Pathologic examination revealed an intramuscular hemangioma of the levator scapulae.

Discussion

The levator scapulae muscle is considered a chief elevator of the scapula, along with the trapezius and rhomboid muscles (5). The spinal accessory nerve provides motor innervation to the trapezius muscle. Following sacrifice of the spinal accessory nerve in a radical neck dissection, paralysis and atrophy of the trapezius ensue.

Paralysis of the trapezius muscle results in depression and internal rotation of the scapula with loss of shoulder stabilization and decreased shoulder function (6). Compensatory hypertrophy of the levator scapulae provides continued scapular elevation and stabilization, thus preserving shoulder function (7).

The sternocleidomastoid muscle is removed during radical neck dissection. Resection of the sternocleidomastoid facilitates palpation of the hypertrophied levator scapulae, which would normally lie hidden within the floor of the posterior triangle. Since nodal enlargement is the most common cause of a palpable neck mass in the adult, a palpable neck mass in the postoperative patient raises the possibility of recurrent neoplasm (1). Under these clinical circumstances, familiarity with the appearance of the levator scapulae muscle on axial images will exclude recurrent neoplasm, sparing the patient unnecessary surgery.

Atrophy of the levator scapulae, seen in one case in this series, was secondary to spinal nerve compression of the C4 and C5 roots. Although the levator scapulae is innervated primarily by C3 and C4 via branches of the cervical plexus, there is frequently some supply from C5 via the dorsal scapular nerve (8). Spinal nerve compression at these levels resulted in atrophy not only of the levator scapulae, but also of the anterior and middle scalene muscles that also derive innervation from these nerves (4).

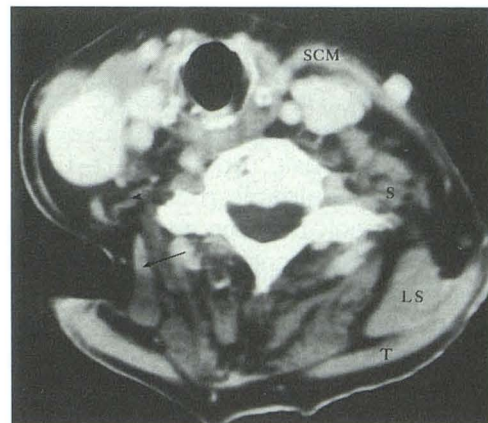


Fig. 3. Atrophy of the right levator scapulae muscle. Contrast-enhanced CT scan at the level of the cricoid cartilage demonstrates atrophy of the right levator scapulae and scalene muscles. Note the altered contour of the right neck. The normal sized left levator scapulae muscle was interpreted as a mass on physical examination. (*LS* = left levator scapulae, *SCM* = left sternocleidomastoid, *T* = left trapezius, *S* = left posterior and middle scalenes, *arrow* = atrophic right levator scapulae, *arrowhead* = atrophic scalene muscles).

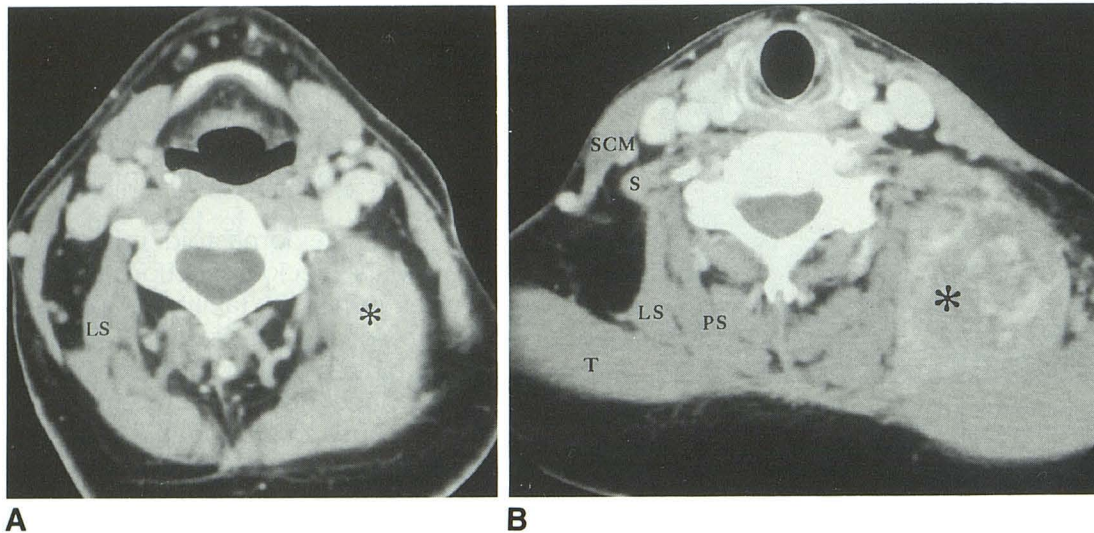


Fig. 4. A, Intramuscular hemangioma of the left levator scapulae muscle. Contrast-enhanced CT scan at the level of the hyoid bone demonstrates an irregularly enhancing mass (*asterisk*) within the muscle (compare with 1A). (LS = right levator scapulae.)

B, Intramuscular hemangioma of the left levator scapulae muscle. Contrast-enhanced CT scan at the level of the cricoid cartilage demonstrates the intramuscular mass (*asterisk*) clearly separate from the deeper paraspinal muscles medially and the scalenes anteriorly (compare with 1B). (LS = right levator scapulae, SCM = right sternocleidomastoid, T = right trapezius, S = right posterior and middle scalenes, PS = right paraspinal muscles.)

Intramuscular hemangiomas are benign tumors that never metastasize but show varying predilections for local invasion and recurrence. Unlike the more common cutaneous, subglottic, and parotid hemangiomas of infancy, intramuscular hemangiomas occur most commonly in the second to third decades. Intramuscular hemangiomas represent less than 1% of all hemangiomas (9) and are rare in the head and neck region, with less than 75 cases reported in the literature (10, 11). The masseter muscle is the most common site (11), followed by the trapezius and sternocleidomastoid muscles. To our knowledge no case of intramuscular hemangioma of the levator scapulae has been previously reported (10–13).

In summary, a palpable mass in the posterior triangle of the neck may be secondary to asymmetry of the levator scapulae muscles. Although this is most commonly due to ipsilateral hypertrophy of the levator scapulae, contralateral atrophy and intramuscular tumors do occur. In patients who have undergone prior neck surgery for cancer with sacrifice of the spinal accessory nerve, compensatory hypertrophy of the levator scapulae should not be confused with recurrent disease in the posterior triangle. Familiarity with the cross-sectional anatomy of the posterior triangle with regard to the location and characteristic appearance of the levator scapulae muscle will eliminate the need for further workup of these patients and may prevent unnecessary surgery.

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