Hyperpressure in the trapezius muscle associated with fibrosis

Carl-Göran Hagert and Jan T. Christenson

The intramuscular pressure at rest and during load in 25 symptomatic trapezius muscles was found to be higher than in 32 asymptomatic muscles. Operative findings in 4 patients revealed dense fibrosis around the muscle, including the accessory nerve, which might explain the increased intramuscular pressure. Fibrotic tissue release resulted in the relief of symptoms and normalized pressure both at rest and during load. We believe trapezius fibrosis may be a new entity to include in the neck-shoulder syndrome.

Chronic pain in the neck-shoulder region is mostly confined to the upper part of the trapezius muscle; the term *trapezius myalgia* has been frequently used (Brown Jr 1983). Muscle tenderness and tenseness causing chronic pain have previously been demonstrated to be obligate clinical findings in conditions of increased intramuscular pressure, e.g., the chronic anterior tibial compartment syndrome (Qvarfordt et al. 1983).

We report measurements of the intramuscular pressure in normal and symptomatic trapezius muscles.

Patients and methods

The control material comprised 32 asymptomatic trapezius muscles, where the intramuscular pressure was measured in 26 patients (17 females, 9 males), with an average age of 35 (20–50) years. Six measurements were performed in healthy volunteers, whereas the remaining control measurements were obtained from the asymptomatic side in patients with unilateral symptoms of trapezius myalgia.

In another group comprising 25 symptomatic trapezius muscles, the intramuscular pressure was measured in 18 patients (16 females and 2 males), with an average age of 37 (20–45) years. The side distribution of symptoms was equal, with bilateral symptoms in 7 patients. Totally, 15/16 examined females were housewives. The duration of symptoms varied from 4 months to several years. All the symptomatic muscles were tender and tense over the upper part of the muscle, including a distinct trigger point approximately halfway between the lateral border of the neck and the acromion and frequently with the appearance of a slanting shoulder (Figure 1).

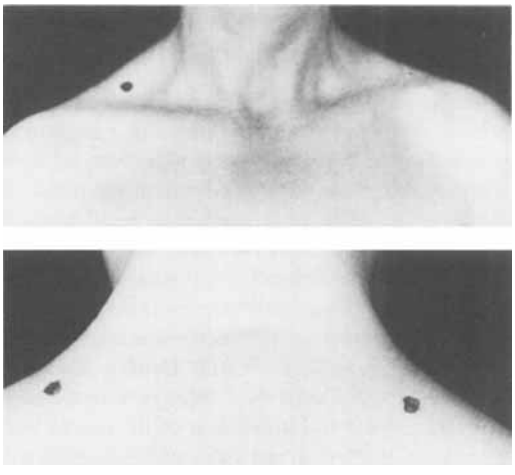


Figure 1. The external appearance of a female patient with a right-sided symptomatic trapezius muscle, anterior view. Note the slanting shoulder and the protruding contour indicating swelling over the trapezius muscle on the right side. The trigger point is marked. Intramuscular pressures were at rest 32 mm Hg (Rt) , 6 mm Hg (Lt) and during load 51 mm Hg (Rt) and 8 mm Hg (Lt)—average values of three measurements. The same patient, posterior view, showing the site where the pressure measurement needles were inserted bilaterally.

Department of Surgery, Faculty of Medicine, Kuwait University, P. O. Box 24923, 13110 Safat, Kuwait

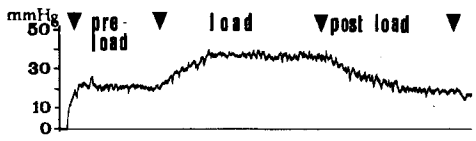


Figure 2. A pressure recording at rest during hand load and postload (scale 0–50 mm Hg) in a symptomatic trapezius muscle. The arrows indicate changes in arm position.

Table 1. Intramuscular pressures (mm Hg) in the trapezius muscle in operated on patients prior to and 3 weeks postoperatively. Pressures in mm Hg, average of three measurements

			Preoperatively/postoperatively		
Case	Age	Sex	Preload	Load	Postload
1	37	F	20/6	36/10	20/12
2	41	F	36/5	60/9	29/10
3	38	F	54/7	53/10	54/6
4	42	F	16/20	20/22	12/20

After the initial pressure measurements, 4 patients with severe symptoms underwent surgical exploration. The trigger point was carefully marked prior to surgery.

Intramuscular pressure measurements

With the patients sitting and the examiner standing behind, the upper part of the trapezius muscle was palpated symmetrically medially to laterally on both sides. A pen mark was placed within the midst of the upper rim of the muscle and at an equal distance from the midline. Under local skin infiltration analgesia (0.5 percent Xylocain), a 21-gauge needle was introduced 15–20 mm into the muscle perpendicular to the sloping contour. The needle was connected to a pressure transducer (12917 Hewlett Packard, USA.) by a stiff silastic tube, filled with sterile normal saline. Prior to introduction of the needle into the muscle, the system was calibrated and connected to a recorder. The zero level was defined at the measuring point. No fluids were introduced into the muscle at any time (Qvarfordt et al. 1983). No complications from the pressure measurements and no obstruction due to clot formation of measuring needles occurred. The preload intramuscular pressure was first recorded with the patient in complete resting position. Thereafter, the patient was asked to lift a 500-g weight held in his hand, straight forward up to the horizontal plane, with a fully extended elbow and the shoulder in a fixed position. The pressure was continuously measured, and the maximal value, after reaching a steady state (within 1 min), was recorded as load pressure. The arm was then lowered to the resting position and a postload pressure was recorded. Measurements were performed on one side at a time and repeated three times for each muscle (Figure 2).

The values of intramuscular pressure from the asymptomatic trapezius muscles were correlated with age and sex.

Operated on patients underwent repeated intramuscular pressure measurements 3 weeks and 6 to 9 months postoperatively.

All the pressure data were summarized as mean ± SD for each group. For statistical comparisons within a group, the Student's *t*-test for paired data was used, and for differences between groups the *t*-test for unpaired data was employed. A probability of 0.05 or less was regarded as significant.

Results

In the control muscles the preload pressure was 7.4 ± 3.8 mmHg, increased significantly during load (12 ± 4.9 mmHg), and returned to the preload value. No correlation between the intramuscular pressure and age was found. However, higher preload, load, and postload pressures were found in females compared with males ($P < 0.05$), even though the pattern of pressure changes during load was similar.

In symptomatic trapezius muscles the preload pressure was 27 ± 12 mmHg, followed by a marked increase to 49 ± 16 mmHg during load. As in the control group, the postload pressures dropped to preload values.

All the symptomatic trapezius muscles had higher preload, load, and postload intramuscular pressures than the asymptomatic controls. In the 4 operated on patients, a dense, rigid fibrosis was found, spreading all the way from the subcutaneous layer down to the muscle. The accessory nerve, involved in the fibrotic process, was carefully released and showed suspicious signs of changes in terms of varying caliber within a course of 2–3 cm prior to its entry into the muscle. Further, an indentation in the nerve was seen at its entry into the muscle. The entire upper part of the muscle was released from the fibrotic tissue. No ischemic muscle changes were observed.

Clinically, 3 patients had symptomatic relief postoperatively, while 1 patient (Case 4, Table 1) remained symptomatic after the surgery. However, this patient had less marked elevation of the intramuscular pressures preoperatively, and also had tenderness over the supraclavicular region, including the trunks of the brachial plexus. Three weeks postoperatively, the 3 symptom-relieved patients showed a decrease in intramuscular pressures—preload, load, and postload—compared with the preoperative values (Table 2). Moreover, it was noted that no increase in intramuscular pressure occurred during load, previously described in the control muscle. The 3-week pressure recordings were reproduced on repeated measurements 6 to 9 months postoperatively.

Discussion

Our abnormal pressure curves had a shape similar to those from measurements in chronic tibial-compartment syndromes in the leg (Puranen and Alavaikko 1981, Qvarfordt et al. 1983). After exercise the intramuscular pressure decreased rapidly to preexercise values in asymptomatic muscles. This finding also agreed with findings in the chronic compartment syndrome in the leg (Qvarfordt et al. 1983).

Accordingly, it seems that what we have described in the trapezius muscle is a condition similar to a chronic compartment syndrome in the leg. However, due to the operative findings—the dense and rigid fibrosis—we are inclined to consider the possibility that this fibrosis can act as a limitation for increased muscle volume, thus leading to an increase of the intramuscular pressure in a similar fashion as seen in the closed compartment syndrome elsewhere. Therefore, the operative technique used was not a regular fasciotomy, but a release of the fibrous tissue surrounding the muscle. The postoperative pressure measurements also showed an inability to build up any pressure during hand load, which is similar to the findings described after fasciotomy in the leg (Puranen and Alavaikko 1981).

Also the accessory nerve was found to be included in the fibrous process, with extremely suspicious signs of compression effects over a long distance, but particularly at its entry into the muscle. These observations agree well with what has been discussed by Styv (1986), where he suggested that during an increased intramuscular pressure in the tibialis anterior compartment a compression of the blood vessels entering the compartment may also occur due to a pressure gradient. The trigger point corresponded to the point where the accessory nerve enters the muscle (Brown Jr. 1983).

In addition, a striking clinical finding in our patient has been the presence of a slanting shoulder, perhaps due to entrapment of the accessory nerve at its entry into the muscle, because this is the point where the nerve passes a pressure gradient.

The nature of the fibrotic process is still unclear and needs further studies. As long as the cause of this process is unknown, it is possible that the presented operative treatment may result in only temporary relief.

References

Brown B R Jr. Myofascial and musculoskeletal pain. Int Anesthesiol Clin 1983; 21(4): 139-51.

Puranen J, Alavaikko A. Intracompartmental pressure increase on exertion in patients with chronic compartment syndrome in the leg. J Bone Joint Surg(Am) 1981; 63(8): 1304-9.

Qvarfordt P, Christenson J T, Eklöf B, Ohlin P, Saltin B. Intramuscular pressure, muscle blood flow, and skeletal muscle metabolism in chronic anterior tibial compartment syndrome. Clin Orthop 1983; (179): 284-90.

Styv J. Chronic anterior compartment syndrome of the lower leg. An experimental and clinical study. Thesis, University of Gothenburg, Gothenburg, Sweden 1986.