

Research report

The relationship between palpation of thoracic tissues and deep paraspinal muscle thickness

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Abstract

Background: Segmental paraspinal tissue texture irregularity and tenderness, particularly when detected in the paravertebral gutter (PVG), has been proposed to be an important diagnostic sign of intervertebral somatic dysfunction. The pathophysiology of tissues underlying sites that appear ‘abnormal to palpation and are reported tender’ (AbPT) by the subject, is speculative, but it has been suggested that a difference in paraspinal muscle size in these regions could produce segmental tissue texture abnormalities. This study aimed to examine whether there was a difference in paraspinal muscle size between AbPT and ‘normal to palpation and non-tender’ (NT) sites located in the PVG.

Methods: An experienced osteopath examined the thoracic PVG regions of 40 subjects (14 males, 26 females, age range 19–33 years, mean (SD) = 22.3 (3.3); 33 asymptomatic, seven with mild thoracic symptoms) to detect an AbPT site in each individual. Three NT regions (immediately above, below and opposite the AbPT site) were also located, and the sites were marked with numbered stickers. An experienced ultrasonographer, who was blinded to the status of the marked regions, measured the anteroposterior cross-sectional dimension (thickness) of the paraspinal muscle bulk directly underlying each marked location, using diagnostic ultrasound.

Results: The AbPT and NT regions had similar mean anteroposterior dimensions (AbPT: 1.11 cm ± 0.36, NT above: 1.12 cm ± 0.34, NT below: 1.20 cm ± 0.46, NT opposite: 1.10 cm ± 0.36), and a one-way ANOVA determined that these means were not significantly different from each other ($F_{3,156} = 0.606$, $P = 0.612$).

Conclusions: The results of this study suggest that factors other than differences in paraspinal muscle thickness are likely to account for abnormal tissue texture detected with palpation in the thoracic PVG regions of young, largely asymptomatic adults.

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1. Introduction

Authors in the field of osteopathy have claimed that intervertebral somatic dysfunction can be detected with skilled manual palpation. According to osteopathic texts, a change in segmental paraspinal tissue texture is one clinical sign of dysfunction.^{1–4} The acronym ‘TART’ is sometimes used as a memory aid for the diagnostic signs of segmental dysfunction, which include

segmental tissue texture change, asymmetry, range of motion abnormality and tenderness.^{1,5,6} Many osteopathic authors claim that segmental tissue texture irregularities occurring in the paravertebral ‘gutter’ (PVG) region, between the midline prominence of the spinous processes and the more lateral bulk of the erector spinae muscle mass, are particularly indicative of intervertebral dysfunction.^{1,3,7} Greenman³ has reported that tissue change in the PVG is usually found unilaterally and reported as being tender by the patient.

The reliability for the detection of intervertebral dysfunction remains to be established. Of the individual

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clinical signs, palpation for tenderness appears to be the most reliable.^{8–11} The reliability of segmental motion palpation has been reported to be poor, as has detection of static asymmetry.^{12–16} Palpation for tissue texture irregularities has received little attention from researchers, and evidence of objective characteristics of these tissues is lacking.

The authors of the current study have previously investigated the pressure pain thresholds (PPT) of sites located in the thoracic PVG that appeared ‘abnormal to palpation and reported to be tender’ (AbPT) by the subject.¹⁷ In the previous study, the PVG regions of 38 subjects (32 were asymptomatic, whereas six reported mild thoracic pain or stiffness) were examined to identify one AbPT site and three adjacent (one level above, one level below, one at the same level on the contralateral side) ‘non-tender and normal to palpation’ (NT) sites. The primary feature of the AbPT site was irregularity to deep palpation (described as a discrete hard or lumpy spot). Once identified, confirmation of the tenderness was immediately sought from the subject. The authors noted that there were often multiple AbPT sites within the thoracic PVG regions of many individuals, which varied from being slightly apparent to very obvious to palpation, and an attempt was made to locate the most obvious AbPT site for this study.¹⁷

The PPT is the level of applied pressure where the subject reports a change from pressure sensation to discomfort. The use and reliability of pressure gauges to determine PPTs on bony and muscle landmarks are well established.^{18–22} In this previous study,¹⁷ the PPTs of each site were determined using a novel algometer, a round, 0.86 cm² pressure sensor attached to the pad of the researcher’s index finger. A conventional mechanical algometer was found to be unreliable due to the deep location of the AbPT sites, the need for probing, searching palpation, and the difficulty in relocating exactly with the rubber tip of the algometer these AbPT sites identified by palpation with the fingertips. Although the ‘digital’ (mounted on the fingerpad) algometer did not display the rate of applied pressure like the electronic algometers used in other studies,²³ it had the advantage of recording pressure during the process of palpation. AbPT sites were found to be significantly ($P < 0.01$) more sensitive to pressure than NT sites immediately above, below, and at the same level on the opposite side to the abnormal region. This was the first study to demonstrate that these sites have characteristics that distinguish them from other NT sites.¹⁷

The pathophysiology of AbPT sites in the PVG is entirely speculative. Osteopathic researchers and authors have speculated that palpable changes in the PVG may be a result of sustained contraction of the deep paraspinal muscles,^{24–27} but the evidence for this is weak.²⁸ Denslow and Clough²⁴ reported spontaneous EMG activity at “lesioned” sites, but the data presented

were inadequate, and Denslow²⁹ later reported that these findings could not be consistently reproduced, and no study has verified their results since.

Selective atrophy of the deep paraspinal muscles has been detected in patients suffering with low back pain (LBP). Hides et al.³⁰ used diagnostic ultrasound to study the cross-sectional area (CSA) of the lumbar multifidus muscles of 26 volunteers suffering from their first episode of unilateral acute/subacute LBP, as well as 51 pain-free control subjects. The symptomatic spinal level was determined on the basis of reproduction of the subject’s pain on direct springing in conjunction with abnormal quality or quantity of tissue resistance to segmental motion. Hides et al. found marked wasting of multifidus on the symptomatic side (31% compared to the opposite side), isolated to one vertebral level. They proposed that the wasting was not likely to be due to disuse atrophy, because of the rapidity of onset and localised distribution. Interestingly, Hides et al. noted that the patients had rounder muscles on the symptomatic side, and suggested this may represent muscle spasm and that the spasm may have decreased the muscle’s circulation, influenced its metabolism and contributed to its atrophy.

Multifidus atrophy has also been observed in patients with chronic LBP using magnetic resonance imaging³¹ and computer tomography.^{32,33} Danneels et al.³² found the atrophy was selective for multifidus, as neither the psoas nor erector spinae muscle masses were significantly smaller compared to the matched controls. Kader et al.³¹ found that multifidus atrophy was present in 80% of the patients with LBP, and in the majority of cases it was bilateral. These researchers reported difficulty in localising the muscle segmentally and were unable to comment on the possibility of unisegmental involvement. Other researchers, however, have reported no reduction of the paraspinal muscle mass in LBP patients.^{34,35}

Fryer^{36,37} and Fryer et al.³⁸ have questioned whether the same processes that cause paraspinal muscle atrophy in patients with LBP may occur to produce tissue changes detected in the PVG with palpation. They have speculated that selective, deep paraspinal muscle atrophy at the level of intervertebral dysfunction may leave the underlying bony architecture more exposed and sensitive to probing palpation.³⁸ The present study aimed to examine the anteroposterior dimension (thickness) of paraspinal muscles deep to locations in the PVG, identified as either AbPT or NT, using the same osteopathic examiner and methods as the previous study that determined these areas were significantly more sensitive to pressure.

2. Methods

2.1. Subjects

Forty-four subjects were recruited from the student and staff population at Victoria University and were

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