

**THE ROLE OF TRANSDERMAL APPLICATION OF MAGNESIUM SULFATE IN BACK PAIN USING AN ANATOMICAL AND CLINICAL APPROACH****\*<sup>1</sup>Chu J., <sup>2</sup>Bruyninckx F. and <sup>3</sup>Goodman S.**<sup>1</sup>Emeritus Associate Professor, Department of Physical Medicine and Rehabilitation, University of Pennsylvania School of Medicine, Philadelphia, Pennsylvania, USA.<sup>2</sup>Emeritus Clinical Professor, Department of Physical Medicine and Rehabilitation, University of Leuven Medical School, Leuven, Belgium.<sup>3</sup>Consultant.**\*Corresponding Author: Chu J.**

Associate Professor, Department of Physical Medicine and Rehabilitation, University of Pennsylvania School of Medicine, Philadelphia, Pennsylvania, USA.

Article Received on 21/09/2024

Article Revised on 11/10/2024

Article Accepted on 31/10/2024

Formerly, we have reported the importance of the transdermal application of magnesium sulfate on spinal muscles in chronic refractory lower back pain.<sup>[1]</sup>

Paraspinal muscles are a group of muscles that run along the spine and support its stability. The paraspinal muscles enable the person to bend, twist, arch, and maintain an erect posture.

The spinal muscles consists of three columns of the erector spinae which are the iliocostalis, longissimus, and spinalis which are essential to extend the vertebral column.

The density and cross-sectional area of paraspinal muscles are associated with age, gender and weight. Patients with chronic lower back pain tend to have smaller paraspinal muscles than healthy people of similar age.

In a study involving normal subjects who did scraping and grinding work and had surface electromyography (EMG) examination of the spinal muscles showed that they are less likely to be fatigued when the posture is 15°, 30 times per minute, but they are more likely to be fatigued when working at 5°, 60 times per minute. This confirms the importance of fatiguing posture which predisposes to injuries of the spinal muscles.<sup>[3]</sup>

Also, in normal subjects studied with transcranial magnetic stimulation of the motor cortex and recordings done from erector spinae and deltoid muscles while the arm was abducted voluntarily showed that during arm abduction the drive to the contralateral erector spinae comprises a corticospinal origin.<sup>[4]</sup>

Patients with lumbar disc herniation have characteristic surface EMG changes in the back muscles that are different from those of normal people. These features can more objectively reflect the patient's muscle condition and can be an effective indicator for the diagnosis and treatment effect evaluation of patients with lumbar disc herniation (LDH).

Patients with chronic LDH have been noted to have the muscle strength of the multifidus muscle on the affected side to be significantly reduced.

There is degeneration of lumbosacral multifidus muscle on the affected side of patients with unilateral L4/5 intervertebral disc herniation, featuring multifidus muscular atrophy and fatty infiltration.<sup>[3]</sup>

The proportion of lipoatrophy in female patients with L4/5 and L5/S1 disc herniations was greater than that in male patients. Lipoatrophy of the multifidus muscle increased with age and was significantly worse in patients over 50 years of age. A comparison of degeneration showed no significant difference between the L4/5 patients and the L5/S1 patients in terms of atrophy on the affected side of the herniated disc compared to the healthy side.

Disc degeneration and multifidus muscle atrophy were positively correlated at the L3/L4 disc level. A lumbar extension muscle strengthening program could be helpful in preventing muscle atrophy and osseous lumbar spinal degeneration.

Our experience treating patients with back pain solely using transdermal Magnesium sulfate shows that all the paraspinal muscles are interconnected to each other and also through fascial connections including muscles of the

limbs plus a corticospinal influence<sup>[4]</sup> adding to the importance of diffuse treatment of multiple muscles.

Trapezius muscles: Starting from the inferior nuchal line descends to the T12 vertebra and overlaps the thoracolumbosacral fascia.(Fig. 1) See below:

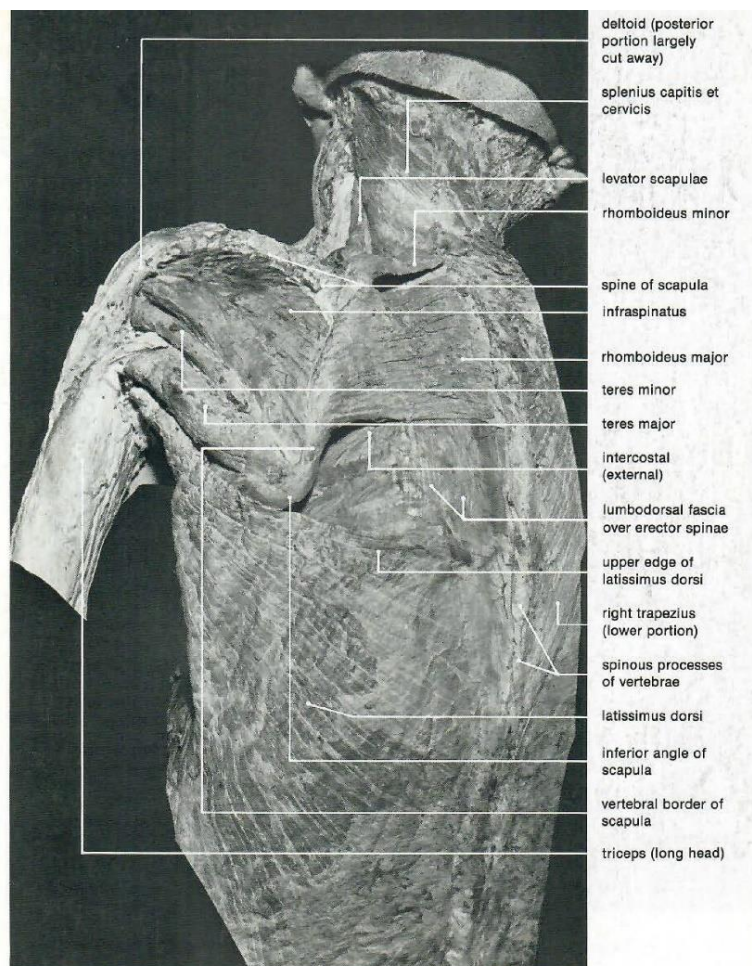


FIGURE 1-12 Superficial and deep muscles of the back and shoulder—posterolateral view (left trapezius removed).

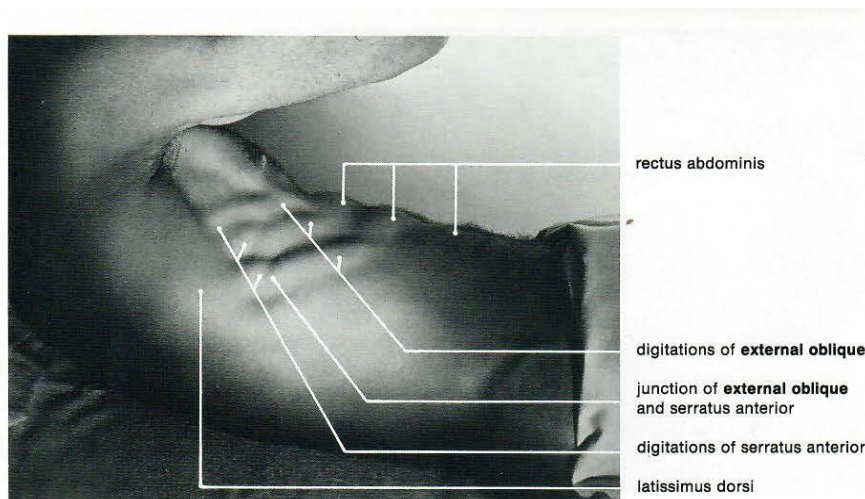


FIGURE 2-16 External oblique.

The latissimus dorsi muscles wrap around ventrally to connect with the abdominal muscles, serratus anterior

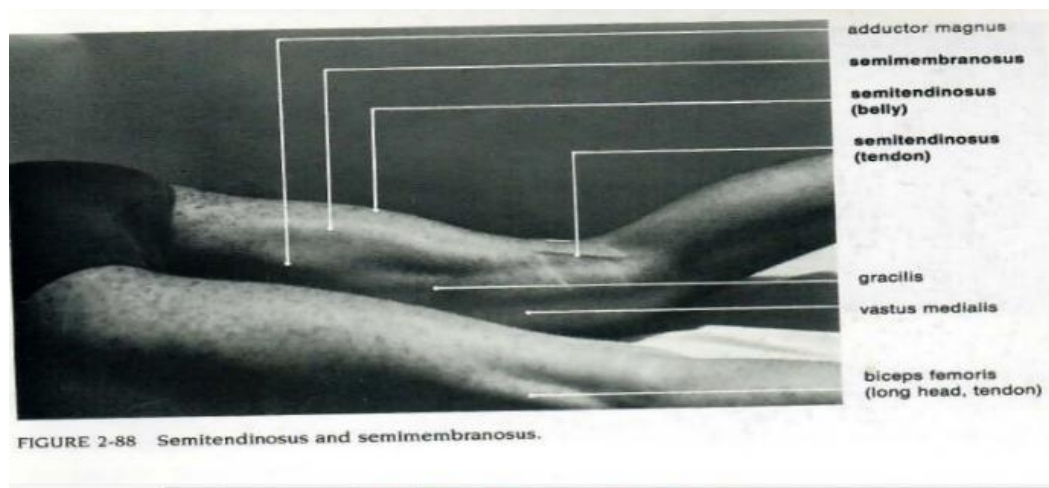
and so also with the pectoralis major muscles (Fig. 2). See below:

On the dorsal aspect, the latissimus dorsi muscles connect with the teres major and minor muscles and the rotator cuff muscles. The rotator cuff muscles supraspinatus and infraspinatus also connect with the teres major and minor muscles.(Fig. 1)

Latissimus dorsi muscles connect with pectoralis major muscle. When this muscle becomes tight or painful, being near the insertion of sternocleidomastoid muscles can produce neck pain. Pectoralis major and minor when they become tight makes it very difficult for the arm and forearm muscles down to the hand to move freely due to

tightness of the muscles from the shoulder and chest down to arm, forearm and hand.

The lumbosacral paraspinal muscles connect with the gluteus maximus through the thoraco-lumbosacral fascia. This muscle in turn is connected to gluteus medius and minimus muscles. The anterolateral thigh muscles consisting of tensor fascia lata, rectus femoris, vastus lateralis and vastus medialis to the adductor longus muscles medially and posteriorly to the semitendinosus, semimembranosus and gracilis medially to the adductor magnus (Fig. 3). See below:



And the fascial connection goes anteriorly into the legs to the muscles supplied by the superficial and deep peroneal nerves and posteriorly to the calf muscles supplied by the tibial nerve down to the foot.

The patient in our previous publication (1) had chronic lower back pain, but he immerses in the bathtub for 90 minutes using magnesium sulfate crystals helping him greatly and clearly helps his back and lower limb problems allowing him the ability to do heavy duty work at least 12 hours a day, six days a week. (1)

Due to the extensive fascial connections, in treating chronic back pain, it is essential to include the muscles in the back of the neck to the lower back, the front of the body and the upper and lower limbs down to the hands and feet. Soaking in the bathtub with added magnesium sulfate crystals will cover all these areas.

To make it more convenient for use at all times of the day, magnesium sulfate in the form of a spray to all areas is equally effective. However, to prolong its effects, we suggest to seal over the spray with magnesium sulfate in a cream formula.

Note: The 3 anatomical photographs (Fig. 1, 2, and 3) are all copyrighted by this article's first author, and are reproduced from the book mentioned in Ref.2.

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