RETROSPECTIVE STATISTICAL ANALYSIS OF NON-SPECIFIC LOW BACK PAIN (NSLBP)

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ABSTRACT
The origin of non-specific lower back pain (NSLBP) is traditionally difficult to diagnose and the spine damage and vertebral degeneration are often thought of as the culprits. Trending that direction, expensive but often futile imaging diagnostics and invasive treatments are prescribed. The authors of the following analysis draw on the years of experience and on the direct patient data to conclude that, in reality, the majority of cases of NSLBP are caused by muscle strain and inflammation in the lower back region rather than by the degeneration of the vertebral structures and herniation, and as such are effectively treatable by stimulating relevant sets of muscles to resolve inflammation and strain and thus relieve the pain.

The data analysis revealed the age- and gender- specific pattern of muscle pain in patients that came for a treatment of NSLBP. This division in the muscular locale of pain makes sense in the light of physiological/anatomical, lifestyle and work activity differences between the age groups as well as between the genders. All patients were treated with and positively responded to the electrical intra-muscular stimulation (EIMS) used in Richmond Muscle and Tendon Clinic. The migrating pattern of pain per patient between the treatment sessions also confirms the hypothesis about the muscular origin of the lower back pain. The role of soft tissues in identifying the source of and treating the NSLBP in various subsets of the population thus must not be overlooked and must actually be considered ahead of the skeletal abnormalities and the rigorous treatments that the latter typically entail.

BACKGROUND
Non-Specific Low Back Pain (NSLBP) is one of the most common complaints in the developed world, yet it is one of the hardest to diagnose (1-4). It can be extremely disabling, and the social and economic burden is enormous. Costs arise from treatment, investigations, compensation for pain and suffering, and lost work time. Ironically, it is likely that part of the burden of NSLBP arises from the unnecessary and ineffective investigations, misdiagnosis and therefore inappropriate treatment, and from the incomplete understanding of its clinical course. One of the conclusions of the present analysis is that in-depth imaging investigations are rarely necessary for the low back pain.

Majority of the studies on low back pain are focused on spine abnormalities confirmed through imaging diagnostics and the treatment options offered consequently are based on the data collected by such imaging. However, this approach often fails to explain recurrence of the problem (5). This may be due to pain’s etiology residing not only in the vertebrae but also in tissues surrounding the spine. Typically the affected tissues are spine extensors, injured at a level below the detection limit of an imaging technique but significant enough to influence the ability of the tissue to perform. Electrical Stimulation is a popular treatment tool for the low back pain, yet the authors see it as having an analgesic effect only, probably because of a lack of definitions on high and low frequency. There are reports on a superiority of the percutaneous approach over the transcutaneous one in a treatment of low back pain, but authors of the publications didn’t
correlate needling with any specific tissues (6-8). There is a certain miscommunication between practitioners and physicians on the matter of the low back pain, where physicians believe in the vertebrogenic cause, relying on the imaging studies while practitioners see a more multivariate picture of the origins of pain.

The present study was triggered by a lack of information on the statistics of tissues implicated in NSLBP. We believe that physical examination should be broader than just identification of the morphological abnormalities and must delve into a question of the correlation between known anatomical function(s) versus a range of motion(s) affected in each case of NSLBP. Recognition of the implicated tissues will lead to a development of more effective treatment protocols for such impairment and to lowering the cost of treatment.

The retrospective study was done on a group of people coming to the clinic with a pain located in the lower lumbar area which affected their ability to walk, stand or rise from a chair. There is no random group, no control group and no testing of a new treatment protocol. The protocol was the same as for any other patient at any other time and included percutaneous electrical stimulation of tissues affected most recently and described as a cause of a reduced ability to perform a certain motion due to pain. As an initial step of the study, we focused on collecting the data on the implicated tissues using physical examination and palpation.

**Tested Hypothesis**

We hypothesize that in most cases, the etiology of the non-specific low back pain rests with the soft tissue injuries or/and strains.

**Inclusion**

- All patients admitted for a treatment of EIMS for low back pain and pointing to a low back pain as a major source of pain
- having a reduced ability to stand, bend or rise from a sitting position
- of any age and gender
- with or without a previous history of low back pain
- in the period from April 2012 to March 31, 2013

**Exclusion**

- established autoimmune nature of the low back pain
- cancer treatment within last 5 years
- scheduled surgery for a low back pain
- use of a pacemaker
- under 18 and over 84 years of age

**Methods**
All data was collected during the initial and consequent visits of patients and typed into an Excel sheet with categorical indicatives such as gender, age and treated tissues. The records of 71 patients were included into this analysis. The data collection was based on the results of physical examination of a patient and the results of the treatment protocol. The protocol was percutaneous electrical stimulation called electrical intramuscular stimulation (EIMS) and looked like a standard electro-acupuncture session. The only difference was a western approach in recognition of the affected tissues through physical examination and palpation. Each patient had received an examination of the area where the pain was located as well as of the surrounding tissues so as to control for possible errors or misperceptions. The identification of muscles and vertebra or the affected tissues was based on functional assessment, palpation and knowledge of the anatomy. The most sensitive and injury-related tissues were recorded based on the assumption that most sensitive tissues will be most correlated with the presented pain.

The muscles were diagnosed by applying a 3-4 fingers pressure and a rolling motion back and forth across the muscles. Diagnosis of the affected spine was done by applying a “spring-test”, which involves a pressure by a thumb on the inter-spinosus processes spaces and comparing the sensitivity level between them, whether one inter-spinosus processes space was sorer than the other. The pain source was not always on the same spot between treatment sessions for a given patient and rarely was strictly local.

**DEFINITIONS**

“Low back pain” was an expression used by patients locating the pain source during an initial visit and typically was in the area defined as a circle placed on the back where its diametrical edges span between Th12 and S3.

**Fascia Lata** is attached, above and behind, to the back of the sacrum and coccyx; laterally, to the iliac crest; in front, to the inguinal ligament, and to the superior ramus of the pubis;

**Gluteus** includes Glutæus maximus, Glutæus medius, Glutæus minimus.

**Iliocostalis Lumb-M** - Iliocostalis Lumborum is inserted, into the inferior borders of the angles of the lower six or seven ribs.

**IT Band**- the ligament that runs down the outside of the thigh from the hip to the shin

**L4-5** – Lumbar vertebra

**Long Lumborum** - Lumborum part of Longissimus spinalis - attached to the whole length of the posterior surfaces of the transverse processes and the accessory processes of the lumbar vertebrae, and to the anterior layer of the lumbodorsal fascia. In the thoracic region it is inserted, by rounded tendons, into the tips of the transverse processes of all the thoracic vertebrae.

**Long Thoracis** - Thoracis part of Longissimus spinalis.
**Lumbar Fascia** - Lumbodorsal fascia which is deep tendinosus membrane which covers the deep muscles of the back of the trunk.

**Multifidus** - fills up the groove on either side of the spinous processes of the vertebrae L₄-S₁ in the study.

**Piriformis** - originates from the front of the sacrum and inserts the greater trochanter of the femur.
RESULTS
The location of pain changed from one treatment session to the next, and therefore goals for the next session were based again on the subjective pain proprioception of a patient. Therefore, every subsequent visit was influenced by the previous treatment and the most sensitive tissues could be different from visit to visit and correlated with the patient’s improvement.

We observed that, in the cases reported by patients as “low back pain”, there was a defined set of muscles implicated as a source of pain, there was a chartable frequency for the muscles initially and through the progress of treatment, and there was a traceable shift of the pain location between the sessions. The summary for each tested tissue was calculated with Excel and presented as charts.

INITIAL VISIT MALES & FEMALES
The most frequently affected tissues at the initial visit regardless of the age and gender were Long Thoracis, Iliocostalis Lumborum, Multifidus and L4-5 vertebra (“spring test”) with scores above 30 in “Initial Visit Males/Females”

All males at the initial visit with scores above 3 reported Long Thoracis, Iliocostalis Lumborum and Multifidus as a major pain source with the age group “24-45” being the most affected. Multifidus
involvement was not presented at “18-24” age category, peaked at “25-34” and showed a reduced involvement at “45-54” category.

At the initial visit, all females were diagnosed with most-frequently involved and above level 3 tissues as Iliocostalis Lumborum, Long Thoracis, L₄₋₅ and Multifidus with an increased involvement of L₄₋₅ in age groups of “25-34” and “45-54”.

**DISCUSSION**

The tested hypothesis confirmed that the majority of clients with NSLBP had conditions that were related to painful (injured or/and strained/or/and inflamed) soft tissues such as back extensors at the lumbar level. Such injuries are typically related to activities where back extensors are involved. The range of such activities varies from an incorrect posture, life style or work related bending, lifting, etc., to elite athletes’ extreme training.

The collected data shows difference between male and females: surprisingly, in the observed population L₄₋₅ involvement was more typical for females in the contradiction to previously published statistics (9).

*Possible explanations are:*

- Social behavior of males where they are less active in prevention of the problem and delay early stage treatment;
- Females’ past pregnancy that loaded the lumbar structures with an additional weight and shifted the balance;
- The anatomical hip joint differences between males and females: females are more prone to overloading muscles of the hip joint area;

The migratory pattern of soreness (or the sequential pattern of recovery, if looking at the corollary of the observed effect) can be explained by the treatment “catch up”. Whereby the initial treatment targets the sorest spots, as those spots are resolved, the spots less prominent in pain previously are coming to the forefront.

The performed retrospective study raised additional questions, and to answer them we have to continue the study with more data to be collected such as first-time or chronic occurrence of NSLBP, its initial cause, any performed imaging confirming existing spine problems, previous surgeries, use of anti-inflammatory medications, etc. Patient groups should be randomized according to the standard to provide more solid comparative data.

The study highlights the importance of soft tissues as a major pain source which is usually termed as “back strain” and is treated with anti-inflammatory medications. When speaking about the function of the spine and the back extensors, it makes sense to propose that muscle, being the most active part, is injured first and the vertebrae and joints succumb to an injury secondarily, after the muscles are already extensively damaged. Therefore, surgical procedures in cases of chronic NSLBP may look as a failed conservative treatment likely due to aiming at incorrect
treatment targets. The other question evoked in the study and shared also by other authors, is why NSLBP has a high reoccurrence rate? One of the answers is a functional impairment of the back extensors which never recovered to the pre-injury state, becoming fragile to a work or lifestyle activity and being regularly re-injured. There is an assumption that an accumulated muscle stiffness may be a main reason for it, but there are no measurement tools or imaging technique able to detect the muscle state except by a physical examination and a functional diagnostic.

**SUMMARY**

The collected data demonstrates the importance of better understanding of a role of the soft tissues injuries as one of the major pain sources in NSLBP. There are multiple reasons to suggest that NSLBP is a lot more likely to originate from the muscle strain and muscle inflammation than from the vertebral pathologies. The migrating pattern of pain is one of the substantial pieces of evidence that in the majority of cases those are the muscles and not the vertebrae that are the cause of pain. It makes sense that muscle injuries to the back are more likely to precede the vertebral injuries by far, as it takes much less time and aggravation to cause muscle strain and inflammation than to ruin the vertebrae. Environmentally, there are many more causes in our habitual life for a muscle inflammation or strain to occur than that for the damage of vertebrae. Proper understanding will help with the development of an effective treatment protocol for the impairment at earlier pre-operative stages. The intervention at the earlier stages of NSLBP should reduce treatment costs and decrease the number of surgical procedures associated with low back pain.
REFERENCES


