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Short Communication

Do fascial perturbations contribute to oxidative stress?

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Migratory fascia – A role in ovarian dysfunction and oncogenesis?

The existing paradigm for understanding the pathogenesis of both breast and ovarian cancer is that a small percentage of these neoplasias involve a genetic predisposition. The balance is lacking an attribution. The author proposes that the function of the lymphatic system in both areas is influenced by changed muscle strain patterns. When the muscle activity changes in the presence of altered strain patterns, there is a diminution of lymphatic drainage function affecting those tissues. The drainage function is augmented by muscle activity and the distribution of lymph node aggregation sites is weighted toward shoulder, knee and hip joints. The activity of these joints produces waste matter and thus a heightened need for fluid transfer. The efferent channels contain one-way valves. The motion of the lymph network in conjunction with muscle movement induces a syphon effect reliant on the extension and contraction of each lymphatic vessel, in unison with surrounding fascial matrix. The lymph nodes in high density areas of skeletal muscles function as a pump. Gravitational pooling of lymphatic fluid in the lower thoracic quadrants, in the cervical neck and femoral muscle compartmente, is serviced by the increase in size and number of lymph nodes in those areas.

Recent research [1], shows the presence of Myofibroblasts (MFB) in the lymphatic structure conferring a contractibility. Under changed loading, the connective tissue changes character, becoming stiffer and less extensible, This could clearly lead to lymph congestion, an hypoxic local environment and subsequent lymph node oxidative stress [2], inflammation, swelling and pain. Chronic lymphadenopathy and neoplasia have a strong correlation. A broad review of published investigations reveals restricted bloodflow creating hypoxia which can affect the cytophysiological response [3] to mechanical strain damage, resulting in modified gene expression and tumour formation. Oxidative stress is implicated in the pathogenesis of several malignancies including ovarian cancer. Epithelial ovarian cancer is characterized to manifest a persistent pro-oxidant state through alteration of the redox balance, which is further enhanced in their chemoresistant counterparts. Forcing ovarian cancer cells to undergo oxidative phosphorylation rather than glycolysis has been shown to be beneficial for eliminating cells via apoptosis . Collectively, there is evidence that indicated a causal relationship between the acquisition of chemoresistance and chemotherapy-induced genetic mutations in key redox enzymes, leading to a further enhanced oxidative stress in chemoresistant EOC cells. This concept was further confirmed by the observation that induction of point mutations in sensitive EOC cells increased their resistance to chemotherapy. Also, a combination of antioxidants with chemotherapy significantly sensitized cells to chemotherapy. Identification of targets for chemoresistance with either biomarker and/or screening potential will have a significant impact for the treatment of this disease.

How do the strain patterns in the inguinal fossa lose homeostatic tension, thus inhibiting blood/lymph flow?

One scenario commonly encountered in clinical practice is an innominate upslip. If, for example, there is an upslip on the left side, this generates a compensatory tightening on the contralateral side. In addition, the superficial fascia around the lumbodorsal area is potentially unsecured by dislocation of the ligament which follows the iliac crest. This ligament under pressure from excess caudad shear force and/or distortion can dislocate from its normally secure position at the PSIS and/or ASIS (Lelean, P) The gluteal fascia is then able to migrate posteriorly, thus disturbing the strain balance across the gluteal area. The effect is to allow the ITB to lie posteriorly to the trochanter, altering its buttressing function. The external

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rotators then compensate for the lack of overall strength by tightening in response. Sustained contractions often result in trigger points, which should be resolved beforee proceding with treatment.

The combined effect of this gluteal fascial shift with the compensatory global hypercontraction on the thoracic right side limits the correct articulation of the right femoral head. This hypercontraction is most readily palpable on ® ITB and ® external oblique The focus of movement in walking is then transferred cephelad to approximately L4/L5 level. This induces a modified recruitment pattern, altering the tension in the inguinal fossa. The extra load through L4/L5 promotes rotational variation of lumbosacral elements, generating a twist through the spine, and imbalanced quadratus lumborum muscles.

The fascial migration potentially affects the neurological control of the lumbodorsal area and can give rise to cluneal nerve tension across the iliac crest. This presentation of cutaneous representation of deep tssue nerve conduction is a foundational aspect of Connective Tissue.

Manipulations (Ebner)

How to correct the imbalance?

Firstly, the pelvic structure needs to be adjusted to its correct alignment. Secondly, the surrounding fascia needs to be located correctly with the securing ligament in place. Thirdly, the strain patterns that were induced by the misalignment should now be resolved through stretches and soft-tissue manipulations.

Migratory Fascia - a role in ductal carcinoma in situ?

Remedial treatment of shoulder pain symptoms in mature females revealed common myofascial misalignments in the shoulder girdle and upper thoracic areas. The altered strain patterns involving the shoulder girdle were thought to be potential inhibitors of lymphatic function, becoming a risk factor in Ductal Carcinoma In Situ (DCIS). The focus was on the pectoral group, combined with the ipsilateral biceps and triceps, and fascial linkages between all of them.

The structure of the shoulder girdle takes its myofascial support and control from many different angles. Accordingly, dysfunction may arise from distant connections as well as from local lesions. This paper attempts to describe one particularly common scenario and its possible influence on lymphatic drainage via the axilla, thereby possibly becoming a risk factor in DCIS.

The windlass effect [4] is reported by Bolgla, et al. (2004) in relation to plantar tension responding to toe dorsiflexion in the propulsive phase. A windlass effect powered by walking with an oblique pelvis has the latissimus dorssi (usually the right side) drawing the rotator cuff anteriorly.

The external aspects of the underlying ribs, by virtue of their shape, act on the fascia like the ribs of an umbrella. The ribcage breathing cycle assists lymph flow through rhythmic matrix extension.

Inadequate lymph flow may generate palpable anomalies; fatty lumps, localised swelling, cysts and ductal accretions (sometimes intraductal). Thes accretions feel granular, with projections that may become irritated an inflamed. Exacerbation from tight undergarment pressure or associated osteophytic growth can cause unremitting pain, and ingrained antalgic posture.

In summary, the pectoral lymph flow may be affected by the following factors, which are described more generally by the author as a part of Migratory Fascia Syndrome.

a) Pelvic obliquity. In most cases, an hypercontraction of the right latissimus dorssi accompanies obliquity. Apparent leg length difference whilst a factor, is addressed elsewhere.

b) Proximal translation of the triceps/infraspinatus fascia, resulting in tightening across the scapula [5].

c) Misalignment of the Long Head of Biceps (LHB) and the contiguous pectoal head.

When the windlass effect dislodges the LHB anteriorly, the pec major tension drops to a lateral direction, easily palpable in supine with arm abducted . The relationship of pec major to the underlying pec minor is changed, compressing and dragging the interstitial lymph network caudally away from the axillary exit.

The author used two methods to achieve cuff de-rotation with the patient supine. With a little practice, the LHB drops neatly into the bicipital sulcus.

Simons and Travell (1983) describe [6] an effect of pectoral entrapment. "Lymphatic drainage from the breast usually travels in front of, and around, the pectoralis major muscleto the axillary lymph nodes.

Entrapment of this lymph duct by passage between tense fibers of an involved pectoralis major muscle, may cause edema of the breast. These signs of entrapped lymphatic drainage and breast tenderness are relieved by extinction of the related pectoralis major TPs. No nerve entrapments by this muscle have been observed."However, this author has noted such entrapment in some cases of Thoracic Uotlet Syndrome.

Pavlista, et al. (2007) found a hint of the "windlass" effect while mapping sentinel nodes [7], in 12 subjects, finding that.

"The axilla was divided into quadrants with regard to the intersection of the thoracoepigastric vein and the third intercostobrachial nerve. All SNs were located within a circle of 2-cm radius of this intersection in the fatty tissue at the clavipectoral fascia".

Another dimension to the puzzle

As a reaction to the windlass effect and compensating for the oblique pelvis, the right shoulder is often raised and tense

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through the trapezius, hinting at cervical rotation. The author often finds an associated flexed closed lesion on the left C7 joint, seeming to mirror the ipsilateral innominate upslip.

There are now two basic interacting strain patterns influencing breast lymph competence.

First strain pattern - usually on the right side, with misplaced rotator cuff fascia compressing and distorting thelymph/arterial network. Second strain pattern - usually on the left side - initiated and exacerbated by the first, compression of the medial nerve caused by a flexed closed lesion at C7/T1. These insults to the brachial plexus may alter smooth muscle regulation in the larger lymph vessels, and compromise blood flow to the lymph nodes. Myofascial function in the pectoral area may also suffer as a result, particularly in the presence of other stressors [5].

The essential difference is that one strain pattern can be seen as biomechanical, while the other is more a neurological deficit with implications for lymph/blood flow. These differences may contribute to DCIS laterality and zoning reported by Perkins, et al. [8].

This author proposes that where there is an oblique pelvis with an innominate upslip, the contralateral shoulder will be likely to exhibit the first strain pattern, and the corresponding second strain pattern will involve C7.

The author's experience is that innominate upslip occurs most often on the left, a view shared [9], by Henry Jellett in 1910, "The lateral articular surfaces of the sacrum are usually asymmetrical. Most frequently the right surface is more deeply concave than the left, and is more overlapped by an anterior projecting lip of the ilium. The general appearance suggests that more mutual moulding of sacrum and of ilium has occurred on this side, and the fact is of interest in connection with the transmission of the body weight."

As a noted gynaecologist, he may have been thinking more particularly about the weight of pregnancy, but the loads of modern day activity in work and sport are also implicated.

This paper is intended to create interest in the hypothesis that myofascial perturbance can influence many disease etiologies in ways that may alter current assessment and treatment protocols. The lesions described in this paperare congruent with recent identification of a fascial structural element in the iliolumbar area, Lelean's ligament [10].

This paper also attempts to add to the knowledge of potential myofascial behaviour under accidental provocation, and to encourage further research in that area. The inclusion of more references may detract from clarity of expression; those included here contain solid scientific observations which can in inform contemporaneous research. The potentially augmented paradigm for helping prevent oncogenesis does not entirely depend on current practice. Rather, it invites us to "see" strain patterns triggered by alignment issues as integral to a more useful assessment of a person's health. Using current examination techniques in conjunction with a three-point pelvic alignment assessment would immediately highlight risk factors.

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