Acupuncture’s role in tendinopathy: new possibilities

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The term ‘tendinopathy’ describes a spectrum of disorders of tendon structure and physiology that result in significant pain and dysfunction in human beings of all ages and activity levels. Disorders include inflammatory conditions of the connective tissue (paratendinitis) or synovial tendon sheath (tenosynovitis), pathologies at the enthesis (insertion), or pathologies of the core tendon itself. The pathological findings in core midsubstance tendon pathologies are termed tendinosis. This is a variable condition but on the whole consists of fibre disruption and disorganisation, extracellular matrix changes, cell death, and the development of painful new vessels and accompanying sensory nerves, and in some cases hyper-cellularity of fibroblasts and formation of adhesions.

Fibroblast differentiation may in some cases lead to metaplasia with the formation of adipose tissue, bone and cartilage. These changes vary across patients, and tendons may differ in their response to injury, but on the whole they can be described as partly degenerative and partly disordered repair.

ROLE OF INFLAMMATION UNCLEAR

The role of inflammation in tendinopathies is still unclear, frequently debated, and most likely varies between patients and tendons and the circumstances of the injury. In most cases of tendon disease, the clinician is faced with a chronic injury at presentation, after the classical acute inflammatory phase has passed. Nevertheless, the presence of pro-inflammatory mediators in chronic tendinosis has been well-reported, although their role in advanced disease is not clear. Growth factors such as vascular endothelial growth factor (VEGF) and transforming growth factor β (TGFβ) are also frequently reported; some (such as TGFβ) may represent attempts at normal repair, while others (such as VEGF) may contribute to dysregulation of repair through the promotion of ingrowth of new vessels and nerves.

Our understanding of these pathological changes and their influencing factors remains limited. Indeed, there is little consensus on almost every aspect of tendon science and medicine, from the relevance of different pathophysiological changes in humans, through to management and prevention of injuries. This is partly due to the limitations of using animal models of tendinopathies to further our understanding of the complex overuse pathologies found in human tendon.

EFFECT OF MANUAL AND ELECTROACUPUNCTURE ON TENDON REPAIR

In two highly interesting papers in this issue of the journal, rat models are used to investigate the effects on tendon repair in response to manual (MA) and electroacupuncture (EA). The tendon injury model used is one of acute transection of a (presumed) previously healthy rat tendon. De Almeida et al6 examine the effect of MA and EA on the ultrastructure (fibril diameter and organisation) of collagen fibrils during healing after acute transection of tendons in rats during the first 3 weeks after injury. Inoue et al7 evaluate the effect of EA on early tendon repair—represented by cellularity, presence of growth factors and tensile strength—after iatrogenic rupture of healthy tendon in rats. Control groups (but no shams) were included in each study.

De Almeida et al6 demonstrated that MA and EA may lead to increase in collagen fibril diameter and reorganisation at certain stages after acute injury. Inoue et al7 reported increases in cellularity, expression of fibroblast growth factor and TGFβ, and tensile strength in those tendons exposed to EA compared to controls.
Animal models—commonly rats—are frequently used in tendon research and allow evaluations that cannot easily be done in human. For these to be useful, it is important to use those that represent valid models of the human tendon pathologies we commonly confront in clinical practice. This is challenging, but rat models of tendinosis in patellar and supraspinatus tendons, and a rabbit model of flexor digitorum profundus tendinosis, exist. What might we learn from this useful research? Acutely injured rat tendons show changes that are associated with enhanced healing in response to MA and EA. The rat models used are not representative of tendon pathologies seen in humans. It is impossible to postulate whether these changes occur in humans, or whether they are relevant to the most common forms of tendinopathies where changes are complex and under physiological and mechanical stresses not present in the laboratory.

ACUPUNCTURE MAY PROMOTE CELL FUNCTION

Nevertheless, the studies do raise the possibility that acupuncture may promote cell function and through this effect enhance soft tissue repair after injury. Are such changes due to mechanical influence of the acupuncture needle? Is there an electrophysiological effect, given the changes seen in the EA groups? Acupuncture may result in reduction in mechanical hypersensitivity through effects on neurotransmitters, neurotrophin expression, and neuromodulation. This may lead to heightened loading after injury, promoting the changes seen in the two studies published here.

It is not clear whether the acupuncture was intratendinous or peritendinous, and this may be difficult to control in such experiments without ultrasound guidance, but in seeking potential mechanisms of action this is important to standardise. Further research is warranted on the effect of forms of acupuncture on acute healing responses in different musculoskeletal tissues, and in chronic disease states such as tendinopathies.

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REFERENCES

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