International Journal of Osteopathic Medicine 25 (2017) 30–41

Contents lists available at ScienceDirect

International Journal of Osteopathic Medicine

journal homepage: www.elsevier.com/ijos

Masterclass

Integrating osteopathic approaches based on biopsychosocial therapeutic mechanisms. Part 1: The mechanisms

Gary Fryer, B.Sc.(Osteopathy), Ph.D. [a, b, *]

[a] College of Health and Biomedicine, Victoria University, Melbourne, Australia
[b] A.T. Still Research Institute, A.T. Still University, Kirksville, MO, USA

ARTICLE INFO

Article history:
Received 3 February 2017
Received in revised form
4 May 2017
Accepted 5 May 2017

Keywords:
Biopsychosocial
Therapeutic
Manual therapy
Osteopathic manipulative treatment

ABSTRACT

This article reviews and discusses the biological and psychological mechanisms that may be responsible for therapeutic effect in an osteopathic therapeutic encounter. Although many of the reviewed mechanisms require additional high-quality evidence, osteopathic treatment may reduce pain and improve movement and function from a 'bottom-up' influence on tissues and tissue receptors and from a 'top-down' influence on cognitive and psychological states. Osteopathic models and manipulative technique have traditionally emphasized tissue and biomechanical mechanisms, but this emphasis is misplaced given the paucity of clinical evidence for these effects. In recent decades, growing evidence supports the importance of neurological and psychosocial factors in musculoskeletal pain, making the 'biopsychosocial' model of pain management a mainstream consideration for the management of pain. This article proposes that both biological and psychosocial therapeutic mechanisms may contribute to therapeutic effect and that tissue and neurological effects on pain and motion, albeit small and temporary, may complement cognitive reassurance and education to promote improved confidence and control in movement. Judgement of the dominating factors will help determine the clinical approach. Part 2 will explore the clinical approaches that arise from an understanding of the mechanisms likely involved in manual therapy.

1. Introduction

Osteopathic manipulative treatment consists of a wide range of manual therapy techniques that are used to optimise function and reduce pain. Osteopaths typically treat people for musculoskeletal pain, most commonly back and neck pain, and for the promotion of general health and treatment of some health conditions [1,2]. Manual therapy is the mainstay of osteopathic treatment for most patients, but osteopaths may also offer advice on posture, ergonomics, exercise, and lifestyle in conjunction with reassurance and encouragement to be active. This paper will refer to osteopathic treatment as the entire therapeutic encounter. Although more high-quality research is needed to verify the effectiveness of osteopathic treatment for many conditions, growing evidence suggests clinically relevant effects for the osteopathic treatment of low back and neck pain [3,4] and for other conditions [5].

The biopsychosocial framework for treating chronic pain has gained wide acceptance and has largely replaced the biomedical framework. The biopsychosocial framework refers to the interaction of physical, psychological, and social influences which contribute to pain and disability, and a biopsychosocial approach to treatment should address these factors [6–8]. In recent decades, evidence supports the influence of the central nervous system (CNS) and psychological influences on chronic pain, whereas the evidence for tissue, postural, or biomechanical causes of chronic pain is scant.

Osteopathy has a biomedical heritage, and osteopathic manipulative treatment developed within a biomechanical paradigm. This cultural and philosophical heritage is likely to still be strong in the profession, both for practicing osteopaths and in osteopathic educational institutions. For example, osteopathic texts typically describe manipulative techniques in terms of altered biomechanics and restricted motions to be corrected [9–11], and osteopaths are more likely to explain a person's pain in pathological and biomechanical terms rather than in neurological or even psychosocial terms.

* College of Health and Biomedicine, Victoria University, PO Box 14428, MCMC, Melbourne, 8001, Australia.
E-mail address: gary.fryer@vu.edu.au.

http://dx.doi.org/10.1016/j.ijosm.2017.05.002
1746-0689/

The current article aims to provide an overview of the likely therapeutic mechanisms responsible for improvement in somatic pain and function following osteopathic treatment. Pain and impaired movement in most people will be associated with a combination of biological and psychosocial origins, and osteopaths need to consider the balance and dominance of these factors and construct a management plan that addresses the physical and psychosocial components. Clinical evidence of changes to the tissues following treatment is scarce, and available evidence mostly provides a rationale for potential tissue therapeutic mechanisms. Given this, the tissue effects of treatment likely play a smaller role in the therapeutic effect than the neurological and psychological influences for most people. The current article will present a case for the potential influence of mechanisms affecting the tissues, nervous system, and psychology of the person, where the relatively small tissue influence may help modify pain and increase movement in the short-term and achieve longer lasting improvement in pain and movement largely by neurological and psychological mechanisms that desensitize the painful movement and promote improved motor control.

The evidence for psychosocial influences on pain largely draws on evidence from low back pain (LBP); however, the current article aims to provide a framework for the treatment mechanisms relevant to pain of somatic origin from any region. Thus Part 1 will explore and discuss the likely mechanisms for therapeutic effect of osteopathic treatment, and Part 2 will explore the clinical approaches when identifying and treating the pain processes underlying a person's complaint with somatic pain and movement impairment.

2. Mechanisms of pain

Osteopaths should understand the mechanisms of pain because acute and chronic pain involve different processes. Acute pain is defined as pain of three months or less duration that is predominately of nociceptive origin from the tissues, where tissue injury creates inflammation that activates nociceptors producing the experience of nociceptive pain [12,13]. Pain is a conscious perception that is modified by fear, anxiety and previous experience. The brain responds to the perception of danger or threat, rather than the actual stimulus, and will enhance perception of pain when a noxious stimulus is perceived as a threat [14].

With chronic pain, the source of pain shifts from nociceptive pain to pain produced by sensitization of CNS pathways. When the nociceptive stimulus is intense or persistent, neuroplastic changes occur in the second order neurones of the spinal cord dorsal horn and in the higher centres of the CNS, producing a prolonged increase in the excitability and synaptic efficacy of neurons in central nociceptive pathways [12]. Functional and anatomical reorganisation in the dorsal horn and higher centres of the CNS produce prolonged nociceptive pathway amplification. The exaggerated pain response to stimuli may outlast the original tissue injury, resulting in the pain transitioning from a nociceptive basis to a purely CNS origin. The underlying neuroplastic processes of central sensitization have been well described elsewhere [12,13]. Although central sensitization may be the dominant process in chronic pain, there may still be peripheral noxious drivers present. Central sensitization is a significant component of pain in subgroups with osteoarthritis [15] and shoulder pain [16]. The experience of chronic pain likely involves a mix of nociceptive and central sensitization input for many people.

As pain becomes chronic, brain representation of pain shifts from nociceptive and discriminatory sensory to emotional circuits [17]. Activity in pain-related areas of the brain, such as the insula, anterior cingulate gyrus, and thalamus, diminishes and emotion-based brain circuits involving the medial prefrontal cortex, amygdala, and basal ganglia grow in strength [17,18]. Together with sensitization, cortical disinhibition, where intracortical inhibition is lost or reduced, affects the organisation of the cortex and the sensory and motor representation of body parts to potentially disturb proprioception and motor control [14]. Further, psychosocial factors play an important role in acute LBP [19] and in the transition to chronic pain and may contribute at least as much to chronicity as other clinical factors [20].

Osteopaths should recognise that chronic pain may be the product of long-lasting changes in central sensitization of the spinal cord and no longer have any tissue or nociceptive origin. There may also be a mix of central sensitization and peripheral nociceptive inputs, and although the sensitization changes may be difficult to reverse, there is evidence from hip and knee replacement studies that once the peripheral nociceptive driver is removed central sensitization can diminish [21]. The clinical features of central sensitization pain are widespread hyperalgesia, where normally painful stimuli produce exaggerated pain; allodynia, where normally non-painful stimuli, such as light touch or motion, produce pain; and a general increase in responsiveness to a variety of other stimuli [22]. These changes may become persistent and pose major challenges for patients and osteopaths alike, particularly if both are convinced that the source of symptoms is due to tissue damage and requires a biomechanical approach to treatment.

3. Potential therapeutic mechanisms

Osteopathic treatment may influence a variety of biological and psychosocial factors to help patients with acute or chronic somatic pain and impaired movement (Fig. 1). Lederman [23] described the effects of osteopathic treatment as occurring in three dimensions: tissue, neurological, and psychological dimensions. The current author believes that this model is useful to conceptualise key areas of potential influence, where the 'bio' of biopsychosocial relates to tissue and neurological dimensions and the 'psychosocial' relates chiefly to psychological dimensions. Many of the following proposed therapeutic mechanisms are speculative and based on a rationale with supporting laboratory, but not clinical, evidence. In general, mechanisms affecting the tissues and biomechanics have the most tenuous evidential support and are largely speculative, in contrast to the emphasis of most technique texts on osteopathy [9–11].

The potential influence of manual therapy on tissue mechanisms includes promoting tissue healing, movement, and tissue fluid drainage. In the neurological dimension, osteopathic treatment may produce 'bottom-up' changes by stimulating tissue receptors and ascending afferent activity to promote pain modulation at the dorsal horn or higher CNS and facilitate sensorimotor integration, interoception, proprioception, and motor control. In the psychological dimension, osteopathic treatment may reduce pain and encourage function through reassurance, education, psychological approaches to pain management, improved confidence, and empowerment. These changes in cognition and psychological state produce 'top-down' changes in pain modulation from the higher CNS and are likely to be important in desensitizing painful behaviours and movements for long-term change. The biological and psychological spheres of influence are interrelated, and treatment that affects mechanisms in one area will likely produce changes in others (Fig. 1).

4. Biological mechanisms

Biological therapeutic mechanisms include those mechanisms that affect the peripheral tissues, such as muscles, connective