

Trauma and Pain: A Fragile Link

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Rec date: Apr 18, 2017; Acc date: May 22, 2017; Pub date: May 24, 2017

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Abstract

There is a commonly held belief that the relationship between trauma and pain is strong. The more severe the trauma the more severe the pain. This short commentary demonstrates the fragility of the relationship between trauma and pain and suggests that healthcare professionals should not think of pain in terms of single causes or cures but should treat the person in pain with personalized pain management.

Keywords: Trauma; Injury; Pain; Biopsychosocial; Treatment; Pain management

Introduction

It is a commonly held belief in society that there is a strong relationship between trauma and pain. This is because life-experiences suggest that more serious trauma produces more severe pain. Scientific rationale suggests that serious injury produces a stronger activation of the nociceptive system than minor injury resulting in greater peripheral and central sensitization and more severe hyperalgesia and allodynia that serves to promote healing and prevent further tissue damage through guarding behaviors. As tissue heals pain and sensitization diminish. This relationship between trauma and pain is reinforced in medical and healthcare professional curricula. However, this apparently strong relationship between trauma and pain does not always hold true. We now know that for some individuals, pain persists despite healing of an original injury. This may happen if the nociceptive system becomes dysfunctional and remains in a state of persistent sensitization, i.e., pain become a disease entity in its own right. Thus, a person's final experience of pain is complex and not always a predictable response to trauma. Healthcare professionals should appreciate that individuals may experience pain in the absence of pathology or have pathology but an absence of pain. Thus, the relationship between trauma, pathology and pain may not be as strong as they first thought. The aim of this short commentary is to explore the fragility of the relationship between trauma and pain.

A condition where there may be extensive trauma yet no pain is congenital insensitivity to pain [1]. Individuals with congenital insensitivity to pain have mutations in the *SCN9A* gene that normally provides instructions for making alpha subunit of NaV1.7 sodium channel and this results in faulty nociceptive transduction [2,3]. Individuals with a normal functioning nociceptive system may experience serious trauma but an absence of pain, as commonly observed in competitive sporting events. Henry Beecher's seminal paper describes an extreme example of this phenomenon [4]. Beecher observed an absence of pain in 32% of 215 soldiers with serious combat zone injuries, including loss of limbs, with only 23.7% of soldiers reporting 'bad' pain. In these examples, pain experience has been modulated by being in a heightened state of fight, flight, and fright. It was Beecher's observations that ignited interest in the

physiology of descending pain inhibiting pathways that arise in the brain and utilise endorphins and other neuromodulators to reduce ongoing nociceptive transmission at various levels of the central nervous system.

A case report by Fisher et al. highlighted the possibility of experiencing severe pain in the absence of tissue damage [5]. A builder aged 29 presented at accident and emergency having accidentally jumped onto a 15 cm nail that had penetrated his work boot. The smallest movement of the nail caused so much distress that fentanyl and midazolam had to be administered so that the boot could be removed. Interestingly the nail had not penetrated the foot but had lodged between the toes resulting in no tissue damage. The builder's perception of threat of injury had activated ascending and descending pain facilitation systems within the central nervous system which had exaggerated cognitive, appraisal, expectation, fear, and catastrophizing processes and modulated the experience and expression of pain.

These examples demonstrate that a person's experience of pain is malleable and modulated by a variety of factors. Biological factors include genetics, sex, age, race, biochemical and physiological status of nociceptive and pain modulatory systems, body composition, and body status; psychological factors include depression, anxiety, worry, cognitions and coping; and social factors include socialization, culture, ethnicity, family, faith, economic. Pain is a subjective phenomenon and unique to each individual at any particular moment in time and this means it may vary considerably even in the presence of similar types and magnitude of trauma.

Recent evidence suggests that pain associated with pathology is not always predictable. For example, the MOON Shoulder Group have shown that symptoms do not correlate with the severity of rotator cuff tears in sporting populations [6-8]. A systematic review of imaging features spinal degeneration in asymptomatic (pain-free) individuals has shown that the prevalence of pathology is high across all adult age categories [9]. Such findings have influenced recommendations by clinical guideline panels. In the UK, the National Institute of Health Care Excellence (NICE) recommended that imaging should only be conducted in specialist care and only if it is likely to alter management (i.e., suspected serious sinister pathology) for low back pain and sciatica in over 16s (NG59) [10]. That said, a meta-analysis of studies of using ultrasound imaging of tendon abnormalities in asymptomatic pain free sports people was predictive of future tendinopathy

suggesting that imaging may help predict at risk of future problems [11].

Studies to identify risk factors for severe pain following surgical procedures are often inconsistent and suggest that a variety of biopsychosocial have a role including type of surgery, lack of analgesia, younger age, female, pre-existing chronic pain anxiety, depression, and catastrophizing [12]. Ruscheweyh et al. found that experimental pain tests, self-rated pain sensitivity and psychological variables were of limited value in predicting acute postoperative pain in 74 patients undergoing breast surgery [13,14].

Conclusion

In summary, healthcare professionals should not think of pain in terms of single causes or cures but should assess, diagnose and treat using a broad framework that considers biopsychosocial factors. Healthcare professionals should treat the person in pain with personalized pain management being the key to success. Each person's pain is unique to them.

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