

Chronic Post Fracture Pain

Makgabo J Tladi

Part Time Lecture Orthopaedic Department University of Pretoria, Private Orthopaedic Surgeon Louis Pasture, Jakaranda and Medikin Hospitals, Pretoria, South Africa

Abstract

Bone fractures are among the most common injuries managed by healthcare professionals and are typically associated with acute pain at the time of injury. Although pain usually improves as the fracture heals, some patients continue to experience pain even after radiographic union has been achieved. This persistent pain, referred to as chronic post-fracture pain (CPFP), can have a significant impact on function and quality of life. Early, appropriate, and effective fracture management is therefore essential to minimise the risk of CPFP. Healthcare professionals should recognise that a substantial proportion of patients may develop persistent pain despite successful fracture healing. Evidence indicates that, in certain fracture populations, more than 50% of patients may continue to experience long-term pain following fracture union.

Keywords: Fracture; Chronic pain; Tibial fracture; Post fracture pain

Introduction

CPFP is pain that persists beyond the expected period of fracture healing. Fracture union generally occurs within approximately three months, and pain that continues beyond this period may be regarded as chronic. CPFP is characterised by severe pain during physical activity, mechanical allodynia, and cold hyperalgesia [1,2]. The long-term consequences of CPFP can be substantial. Persistent pain may result in work disability and increased utilisation of healthcare services, leading to significant economic costs for individuals, healthcare systems, injury compensation programmes, and society. Patients with CPFP may also experience depression, anxiety, cognitive impairment, and Complex Regional Pain Syndrome (CRPS) [3].

Pathophysiology

The pathophysiology of CPFP appears to involve an abnormal and prolonged response to tissue injury. Following a fracture, the body initiates a

neuroinflammatory response and excitatory synaptic plasticity processes involving chemokine production, secretion of pro-inflammatory mediators, caspase activation, neurotransmitter release, and neuron-glia interactions. These mechanisms contribute to the initiation and maintenance of synaptogenesis, increased synaptic strength, and enhanced signal transduction, all of which play important roles in central sensitisation and the persistence of pain [3]. Nerve injury is considered a significant risk factor for the development of CPFP. Both the periosteum and bone marrow are richly innervated by sensory

unmyelinated and thinly myelinated nerve fibres with nociceptive functions, making them particularly susceptible to prolonged pain responses following injury [1,4].

Risk Factors

It remains difficult to predict which patients will develop CPFP following a fracture. A systematic review by Clay et al. identified several prognostic factors associated with an increased risk of chronic pain, with varying levels of evidence (Table 1) [3].

Table 1: Prognostic factors [3].

Strong Evidence	Moderate Evidence	Inconsistent Evidence
Older age	High injury severity score	More education
Female sex	Treatment in intensive care unit	Compensation-related injury
High pain intensity	Lower-limb injury	Hazardous alcohol consumption
Untreated mental illness (depression and anxiety)		Substance abuse
Narcotic pain treatment		Mechanism of injury
		Injury profile
		Pre-injury limitations in activities of daily living
		Post-injury depression or anxiety

Clinical Outcomes

Using the Somatic Preoccupation and Coping (SPOC) questionnaire, studies have demonstrated that 55.1% of patients experienced CPFP 12 months after sustaining a tibial fracture [5,6]. Following lower-limb and pelvic fractures, persistent pain is frequently associated with limping. Rauer et al. [7] reported that

57.3% of patients continued to experience pain ten years after the initial injury. CPFP may occur following diaphyseal fractures. Bot et al. [2] reported that chronic pain was present in both children and adults 21 years after forearm fractures, regardless of whether treatment was conservative or surgical. Assessment of CPFP remains challenging because commonly used pain-scoring systems do not

adequately account for individual differences in pain perception and functional demands. Patients engaged in sedentary occupations may report persistent pain more frequently than those involved in non-sedentary

work. Furthermore, approximately 50% of patients may experience loading-dependent pain following femoral fractures despite fracture healing (Table 2) [7].

Table 2: Prevalence of chronic fracture pain following different fracture site.

Fracture Site	Follow-up Period	Prevalence of CPFP	Treatment Method
Tibia	12 months	55.1% [5]	Surgical
Ankle and wrist	12 weeks	18.9% [9]	Surgical
Forearm	21 years	72% reported no pain [8]	Conservative and surgical
Lower-limb and pelvic fractures	10 years	57.3% [7]	Not specified
All fractures	1 year	42.7% [4]	Surgical

Conclusion

Early and effective fracture management is essential to minimise the risk of CPFP. Healthcare professionals should recognise that a substantial proportion of patients may develop CPFP despite radiographic fracture healing. Evidence suggests that in certain fracture populations, more than 50% of patients may continue to experience persistent pain. Awareness of the potential long-term physical, psychological, and socioeconomic consequences of CPFP is crucial for improving patient outcomes and reducing the burden on healthcare systems and society.

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