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Scientific/Clinical Article

The incidence of idiopathic musculoskeletal pain in children with upper extremity injuries

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ABSTRACT

Introduction: Children with upper extremity injuries may report persistent pain beyond the period of acute injury. In the published literature, it is unclear whether these children develop idiopathic musculoskeletal pain (IMP) such as complex regional pain syndrome (CRPS). The purpose of this study was to determine the incidence rate of IMP after upper extremity injury in school-aged children over a 5-year period and to describe the characteristics of these children.

Methods: A retrospective case series was conducted of all children aged 8–18 years with an upper extremity injury who attended the outpatient hand clinic in a tertiary care pediatric hospital.

Results: A reported incidence rate of IMP was 1.9% over a 5-year period in the 879 children reviewed. Girls were more likely to have IMP. The categorical distribution of the type, etiology and anatomical location of injury was proportionately different for those with IMP compared to those without documentation of IMP. In comparison, a higher percentage of children with IMP reported disproportionate pain and hypersensitivity or neuropathic pain symptoms compared to the children who had pain from a known etiology.

Conclusion: The incidence rate of IMP after upper extremity injury in school-aged children is low. Some common characteristics of this population that may help clinicians identify these children and make timely referrals for treatment include female gender, disproportionate pain, previously seen by multiple specialists, generalized injury in the hand, unspecific etiology or type of injury and unremarkable x-rays.

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Introduction

Injury to the upper extremity, especially hand fractures, are common in childhood.¹ The incidence rate of isolated hand fractures has been reported as 24.2 per 100,000 children per annum.² Effective pain management is important to the treatment of an acute upper extremity injury. A child's pain is most severe at the time of injury or the first 48 h after medical management.^{3,4} The intensity of pain or need for analgesics substantially decreases after the second day post injury.^{3,4} Drendel et al demonstrated that pain has no effect on daily functioning in areas of play, sleep, school and eating 7 days after the injury.⁴ Persistent pain after an acute upper extremity injury is rare. However, clinicians who work with children with upper extremity injuries will encounter cases where pain

persists or becomes the chief complaint even after the acute symptoms subside.

What is unclear is which children who present with pain post upper extremity injury develop idiopathic musculoskeletal pain (IMP) syndromes. A diagnosis of IMP includes diffuse conditions such as juvenile fibromyalgia, chronic pain related to childhood hypermobility, complex regional pain syndrome (CRPS), chronic back pain and pain related to childhood disease.⁵ Children with chronic pain have limitations in their activities of daily living, school performance, participation in physical activities and social functioning.^{5,6} Increased rate of psychopathology, psychosocial stressors and sleep disturbances also negatively impact functioning in this population.^{7,8} Disruption in the child and family's social interactions, structure and functioning are also reported.⁹

IMP diagnoses such as CRPS, that was formally and commonly referred to as reflex sympathetic dystrophy, are well known to hand surgeons and therapists who work with adults. The International Association for the Study of Pain diagnostic criteria for CRPS have been developed to unify our understanding of this disease.¹⁰ More

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Table 1
Budapest Clinical Diagnostic Criteria for CRPS

1. Patient has continuing pain that is disproportionate to any inciting event and,
2. Patient has at least one sign* in two or more of the four below categories and,
3. Patient reports at least one symptom* in three or more of the four below categories and,
4. No other diagnosis can better explain the signs and symptoms.
Categories (*signs are reported and symptoms require evidence)
a) Sensory: hyperesthesia and/or allodynia
b) Vasomotor: temperature asymmetry and/or skin color changes and/or skin color asymmetry
c) Sudomotor/edema: edema and/or sweating changes and/or sweating asymmetry
d) Motor/trophic: decreased range of motion and/or motor dysfunction (weakness, tremor, dystonia) and/or trophic changes (hair, nail, skin)

Adapted from Harden et al.¹¹

recently, 'the Budapest Criteria' were developed to improve the specificity of these initial criteria.¹¹ (Table 1) However, these criteria were developed in the adult population, and children with CRPS differ greatly from their adult counterparts.¹² CRPS is a relatively newly accepted and under-reported diagnosis in children.^{12–14} There is a consensus in the literature that children present with allodynia, or disproportionate pain, as well as other hallmark signs of CRPS including edema, sudomotor or trophic changes and loss of mobility of the affected part of the body.^{12–14} Unlike adults, the incidence of CRPS is greater in the lower extremity than upper extremity in children.^{12–14} It occurs more often in female patients and is often precipitated by a minor traumatic event.^{5,12–14} The lack of consensus regarding the pathophysiology and etiology of CRPS also brings to question how to best diagnose these children.¹⁵ Despite the development of diagnostic tools, CRPS is still a poorly diagnosed condition.^{16,17}

The Budapest criteria are an excellent guideline and provide consensus in diagnosis, however, in a hand clinic setting the use of these criteria may overlook some children who demonstrate early signs of this condition. The benefit of early identification and the detrimental effects of delayed diagnosis in children with CRPS have been documented.¹⁵ It is typical that these children will undergo multiple medical appointments, consultations and investigative procedures and even surgery before they receive the appropriate diagnosis and treatment.^{16,17} Murray et al (2000) report a 12 week median time to diagnosis, but further describe that 15% of the 46 children studied had symptoms for over 12 months before diagnosis.¹⁷ Delay in identifying CRPS may lead to more chronic pain and disability as well as contributing to personal, financial and social burdens for the child, family and society.^{5,18,19} Timely diagnosis and initiation of appropriate treatment is imperative. The hand surgeon and therapist can play a critical role in early identification of this condition.

The primary objective of this research was to determine the incidence rate of IMP in school-aged children with upper extremity injuries who were treated at an urban tertiary care children's hospital over a 5-year period. The secondary objective was to describe the characteristics of these children.

Materials and methods

The Research Ethics Board at the authors' institution approved this study. A retrospective review of the Electronic Patient Chart (EPC) of children aged 8–18 years who attended the Plastic Surgery Outpatient Clinic between April 1, 2007 and April 1, 2012 with a diagnosis of an upper extremity injury was undertaken. Patients who were coded with a diagnosis of hand injury, finger injury, laceration, fracture and other in the clinic registration system were

Table 2
Demographic information

		Pain-free group (N = 862)		IMP group (N = 17)	
Age at time of injury (years)	Mean	12.1	2.4 SD	12.2	2.3 SD
	Median	12.0		12.0	
	Range	2–18		8–16	
Age at time of assessment in plastic surgery (years)	Mean	12.2	2.3 SD	12.4	2.3 SD
	Median	12.0		13.0	
	Range	8–18		8–16	
Gender	Male	589	68%	2	12%
	Female	273	32%	15	88%
Affected limb	Right	446	52%	11	65%
	Left	415	48%	6	35%
	Bilateral	1	0.1%	0	0%
Surgical intervention	Yes	132	15%	1	6%
	No	730	85%	16	94%

included in the initial chart review to capture the full cohort of patients. The study excluded children under 8 years of age because the literature indicates that IMP occurs most often in children greater than 8 years of age.^{20,21} All patient charts were reviewed by the second author to collect preliminary data regarding each case and determine which cases presented with pain. This author was also not involved in the treatment of any of these cases to avoid bias in the interpretation of reports. Pain was initially defined as any case where pain in the injured upper extremity was documented by the surgeon or therapist as the child or caregiver's chief complaint after the initial 48 h following injury management. This broad definition was used to ensure that all patients who had pain that persisted after the acute period were identified, and patients who received a diagnosis of IMP after being seen in the hand clinic would be captured in the first round of chart review. Next, the charts of the children identified with pain were reviewed by the first and second authors to record the details of symptoms, diagnosis and management. The descriptive characteristics of the patient's pain documented in the chart were transcribed. Two researchers reviewed the descriptions and categorized the qualitative data into the types of pain experienced by the child. For the purpose of this study, the patients in the IMP group had been assigned a diagnosis of CRPS or were identified as patients with musculoskeletal pain of unknown etiology. The incidence rate was calculated as the number of new cases of IMP after an upper extremity injury over the total cases of upper extremity injuries over the 5-year period.

Results

One thousand and fifty-two patients were eligible for review using the above defined search parameters in the clinic registration system. After the initial review, 174 patients were excluded who did not have a diagnosis of an upper extremity injury. The majority of these excluded patients were found under the code "other" or "laceration" in the system that encompassed a broader range of diagnoses. A total of 879 children older than 8 years of age attended the plastic surgery clinic during the 5-year period with an upper extremity injury. Twenty-five children were identified where the patient's chief complaint was pain in the upper extremity. At the time of initial assessment in the Plastic Surgery Clinic, the range of specified duration of pain experienced was between 2 weeks and 24 months, with two cases of unspecified duration. The comparative demographic information is represented in Table 2. The mean age of time of injury and referral were 12 years of age for both groups. The diagnoses of the patients in the pain group are represented in Fig. 1. The percentage of girls with IMP ($n = 15$) was significantly higher than boys ($n = 2$) (two-tailed Fisher's Exact Test, $p < 0.0001$, 95% CI).

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