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INCIDENCES OF COMPLEX REGIONAL PAIN SYNDROME FOLLOWING FOOT AND ANKLE SURGERIES

Orthopaedics

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ABSTRACT

Introduction: Complex regional pain syndrome (CRPS) is an uncommon complication of orthopedic surgery, and few investigators have considered the incidence in foot and ankle surgery. This study aimed to prospectively determine the incidence of complex regional pain syndrome following foot and ankle surgeries. **Materials and Methods:** This prospective study included 96 patients who had undergone foot and ankle surgery. Our outcome of interest was the identification of CRPS in the postoperative period of observation. The incidence rate was calculated based on the number of newly diagnosed cases of CRPS over this period. Each patient was examined using the Budapest sign categories. **Results:** Among 96 patients, 9 (9.37 %) had a diagnosis of CRPS postoperatively. 7 (77.78 %) patients with CRPS were females. 6 (66.67 %) patients had type 1 CRPS, and 3 (33.33 %) had type 2 CRPS. **Conclusion:** Middle-age females and those with a history of anxiety or depression have a greater risk of developing CRPS after foot and ankle surgery.

KEYWORDS

Foot, Ankle, Surgeries, Complications, Nerve Injuries, Budapest criteria, CRPS

INRODUCTION

Complex regional pain syndrome (CRPS) is a chronic neuropathic pain condition generally affects an extremity following surgery or trauma and can potentially spread to other extremities and become disabling. The disorder involves autonomic and inflammatory abnormalities. With CRPS, the afflicted person experiences pain that is greater in magnitude and/or duration than would be typically expected from the surgery or traumatic inciting event [1-3].

Complex regional pain syndrome (CRPS) was first described by Mitchell [4] in 1864 as a "burning pain" experienced by injured soldiers in a Civil War. Currently, it is known as a neuropathic pain syndrome that can occur postoperatively as a complication of surgery.

The pathophysiologic mechanism underlying CRPS is not fully known, but it is believed that the inciting Event considered an injury triggers abnormal processes in both the peripheral and central nervous systems, causing dysfunctional neuroplasticity and an excessive immune and inflammatory response [5-7].

The diagnosis of CRPS is made clinically, and no diagnostic tests are available. Little information is available in published studies regarding the types of patients who develop CRPS specifically in relation to foot and ankle surgery. Our main aim, therefore, was to determine the incidence of CRPS in patients who had undergone foot and/or ankle surgery.

MATERIALS AND METHODS

This prospective study included 96 patients who had undergone foot and ankle surgery from September 2020 to November 2022 at Postgraduate department of Orthopaedics, Govt. Medical College Srinagar.

Patients over the age of 18 were eligible for inclusion if they had undergone foot and/or ankle surgeries. Exclusion criteria were pain in the affected limb preceding injury, evidence of a major nerve injury, or bilateral fractures. For the purposes of the study, major nerve damage was defined as a loss of function of one or more peripheral nerves.

The enrolled patients had either documented "CRPS" (either CRPS Type I, reflex sympathetic dystrophy syndrome, or CRPS Type II, causalgia) within their clinical notes or documented signs and symptoms fulfilling the International Association for the Study of Pain diagnostic criteria. These include the presence of an initiating noxious event or a cause of immobilization; continuing pain, allodynia, or hyperalgesia in which the pain is disproportionate to any known inciting event; and evidence at some point of edema, changes in skin blood flow, and/or abnormal sudomotor activity in the region of pain.

The patients were followed for a minimum of 1 year. Our outcome of interest was the identification of CRPS in the postoperative period of observation, and the exposures (independent variables) of interest included age, gender, the onset of CRPS (pre-existing or new in the postoperative phase), type of CRPS (diagnosis type 1 versus type 2), anatomic site of surgery, clinical signs, and inflammatory marker levels. Our aim in this retrospective cohort study was simply to calculate the incidence of CRPS and to observe number of selected demographic variables associated with the diagnosis. The incidence rate was calculated based on the number of newly diagnosed cases of CRPS over this period.

Each patient was examined using the Budapest sign categories (Table 1, criteria three). The Budapest criteria indicate that a decision rule for the clinical diagnosis of CRPS has been validated with sensitivity of 0.85 and specificity of 0.69.

Table 1: The Budapest criteria

S.No.	Criteria
1	Continuing pain that is disproportionate to any inciting event
2	Must report at least one symptom in three of the four following categories:
	Sensory: Reports of hyperesthesia and/or allodynia
	Vasomotor: Reports of temperature asymmetry and/ or skin color changes and/or skin color asymmetry
	Sudomotor/Edema: Reports of edema and/or sweating changes and/or sweating asymmetry
	Motor/Trophic: Reports of decreased range of motion and/ or motor dysfunction (weakness, tremor, dystonia) and/or trophic changes (hair, nail, skin)
3	Must display at least one sign at time of evaluation in two or more of the following categories:
	Sensory: Evidence of hyperalgesia (to pinprick) and/ or allodynia (to light touch and/or temperature sensation and/or deep somatic pressure and/or joint movement)
	Vasomotor: Evidence of temperature asymmetry (>1 _C) and/or skin color changes and/or asymmetry
	Sudomotor/Edema: Evidence of edema and/or sweating changes and/or sweating asymmetry
	Motor/Trophic: Evidence of decreased range of motion and/or motor dysfunction (weakness, tremor, dystonia) and/or trophic changes (hair, nail, skin)

RESULTS

A total of 96 patients were included in this study, who under gone foot and ankle surgery during the study period. The mean age of the study

population was 43.8 (range 23-65) years. There were 37 (38.54 %) males and 59 (61.46 %) were females. 42 (43.75 %) patients were with ankle surgeries and 54 (56.25 %) were with foot surgeries.

Among 96 patients, 9 (9.37 %) had a diagnosis of CRPS postoperatively. All patients had pain and 7 (77.78 %) had skin changes.7 (77.78 %) patients with CRPS were females. 6 (66.67 %) patients had type 1 CRPS, and 3 (33.33 %) had type 2 CRPS (Figure 1). Of all the patients who developed CRPS, 5 (55.56 %) had undergone surgery of the foot, of these 1 (11.11 %) at hind-foot, 1(11.11 %) at mid-foot, 3 (33.33 %) at forefoot and 4 (44.44 %) had undergone surgery at the ankle. Regarding the relevant medical history of the patients with CRPS, 4 (44.44 %) had a medical history of anxiety or depression, and 1 (11.11 %) were smokers.

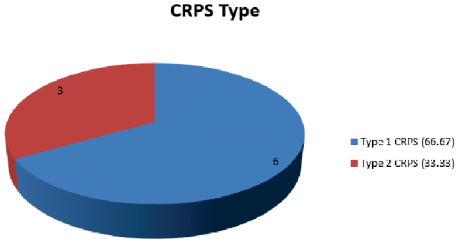

Figure 1: Distribution of patients on the basis of CRPS Type

DISCUSSION

CRPS is an uncommon complication in foot and ankle surgery, and it is characterized by severe pain, skin changes, and swelling [8]. The natural history has been characterized by chronicity and relapses that can result in disability. CRPS has had many synonyms, which has led the International Association for the Study of Pain to define 2 types of CRPS [9]. Type 1 (formerly known as reflex sympathetic dystrophy syndrome) results from a noxious event or a cause of immobilization. Patients experience continuing pain, allodynia or hyperalgesia disproportionate to the initiating stimulus. Edema, changes in skin blood flow, or abnormal sudomotor activity will be present. However, other diagnoses should be excluded. Type 2, formerly termed causalgia, refers to the presence of pain, allodynia, or hyperalgesia specifically after a nerve injury but not specifically in the distribution of that nerve and includes the features of type 1 [10].

The pathophysiology includes different mechanisms of motor, sensory, and autonomic dysfunction and is not entirely clear. However, no evidence has shown that the pathophysiology differs for the different CRPS types. The main hypotheses have included peripheral and central sensitization, inflammatory changes, altered sympathetic and catecholaminergic interaction, reduced somatosensory representation in the brain cortex, genetic components, and psycho physiologic components [11, 12].

Understanding the pathophysiology of CRPS can often be difficult and, therefore, identifying it in clinical practice and ultimately treating CRPS will be equally difficult. Recognizing the risk factors or patient characteristics predictive of CRPS could be key to prevention and treatment.

Different methodological approaches were used to examine CRPS. Few included appropriate controls and sufficient cohort size to enable suitable statistical analysis with appropriate power calculation [13, 14]. This made comparison and interpretation of CRPS studies difficult. Varied standardized criteria were used to confirm CRPS diagnosis but not all were evidence-based [13, 15]. This has led to over diagnosis and often excessive pharmacotherapy [15].

The clinical Budapest diagnostic criteria were chosen for this study rather than the research criteria in an attempt to increase the sensitivity of the screening process. This requires the presence of three out of four symptom criteria to produce a sensitivity of 0.85 for the diagnosis of CRPS. In contrast, the research criteria requires the presence of four out of four symptom criteria, resulting in a sensitivity of 0.70 [16]. In retrospect, the sensitivity of the screening process could have been increased further by clinically assessing participants who reported two or more symptoms of CRPS. This would have resulted in an additional 25 in-person reviews, and as such, we recommend this modification for future studies to mitigate the potential for misclassification bias.

Difficulty still remains in diagnosing CRPS, in part due to the often variable presentation. As expected, in this study, numerous patients were experiencing symptoms at the 3-month follow-up point that may be attributed to CRPS.

In this study 7 (77.78 %) patients with CRPS were females. Other evidence in published studies has indicated that it is often females who are affected. A 10-year population-based study of the incidence of CRPS type 1 also found females to be 4 times more likely than males to develop CRPS.

In our study the most common manifestation was type 1 CRPS. 6 (66.67 %) patients had type 1 CRPS. Anderson and Fallet [17] had similar findings specifically in their foot and ankle patients. Females were mainly affected, the most common manifestation was type 1, and the most common causative foot surgery was neuroma excision [17]. Moreover, McNerney [18] established that the most basic of elective surgical procedures of the lower limb can result in CRPS and, therefore, all patients must be made aware of the risk.

After studying medical history of our study cohort, we found that almost one half of the foot and ankle candidates who developed CRPS had had anxiety or a depressive history. A modest number of studies have attempted to identify patient characteristics indicative of developing CRPS but few specifically in the foot and ankle. Hemler et al [19] also reported that patients with a premorbid history of depression or anxiety were more likely to develop CRPS. Such patients should be identified preoperatively and counseled about the potential complication of CRPS [20].

In our study only 1 (11.11 %) patients with CRPS in the foot or ankle were smokers. However, other studies have found that smoking increases the risk of developing CRPS. Howard et al [21] reported that 68% of their patient cohort were smokers and believed the reason was the possible increased likelihood of peripheral vasospasm. Their study was not specific to foot and ankle patients, and our results contradict their findings.

In this study all our patients had pain, and most had erythema or edema surrounding the foot or ankle. These features were supported by another study that stated that differences in limb skin temperature could aid in the diagnosis and that this was dependent on spontaneous sympathetic activity [9]. Patients with CRPS experience intense pain but also significant functional disability and psychological distress [22].

There are some limitations in the present study included that all patients had undergone elective surgery, less number of patients and other limitations included the inherent problems with retrospective studies and that we relied on the documentation of CRPS from the clinical notes or signs and symptoms suggestive of CRPS.

CONCLUSION

We have clearly identified that middle-age females and those with a history of anxiety or depression have a greater risk of developing CRPS after foot and ankle surgery. We should, therefore, ensure that such patients are aware of the risks and other potential management options, because the chronic pain could be more debilitating than the reason they were planning to undergo elective surgery. Females and those with a history of anxiety or depression undergoing elective foot and ankle surgery should be counseled regarding the risks of developing CRPS during the consent process.

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