



Implications of Isolated Transverse Process Fractures: Is Spine Service Consultation Necessary?

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■ **BACKGROUND:** Acute traumatic isolated transverse process fractures (ITPFs) are increasingly identified in trauma patients owing to the increased use of routine computed tomography imaging. Despite repeated demonstrations that these fractures are treated only symptomatically, patterns of consultation with a spine service have not changed. We aim to provide information on long-term outcomes following conservative treatment to help clarify the role of the spine service in the treatment of ITPFs.

■ **METHODS:** A retrospective chart review of 306 patients presenting with ITPFs was conducted to identify both short-term and long-term patient outcomes. A subsection of patients was identified with no other traumatic injuries besides isolated ITPFs (iITPFs).

■ **RESULTS:** No patient required surgical intervention for an ITPF, and 97.7% of all patients and 100% of the patients with iITPFs did not require bracing. At last follow-up, all patients were neurologically intact, 97.8% were fully ambulatory, and 87.9% had no ITPF-related back pain. When only patients with 6 or more months of follow-up were considered, all patients were fully ambulatory, and only 1.1% of all patients and none of the patients with iITPFs had persistent back pain.

■ **CONCLUSIONS:** ITPFs can be treated conservatively without concern for long-term outcome sequelae such as pain, neurologic deficits, or ambulatory difficulties. Consequently, a spine service consult is not required for patients with ITPFs.

INTRODUCTION

Acute traumatic isolated transverse process fractures (ITPFs) are common in patients presenting to the emergency department. In the past decade, the sensitivity for detecting ITPFs has increased dramatically with the routine use of computed tomography scanning in patients presenting to emergency departments after experiencing trauma.^{1–3} However, research demonstrating that these fractures rarely require surgical intervention has called into question the utility of consulting a spine service for treatment recommendations for patients with ITPFs.^{4–7} In addition, reflexive consultation of a spine service for ITPFs has been correlated with delayed clearance of spinal precautions, longer emergency department stays and hospitalizations, and adverse events, including deep vein thrombosis and decubitus ulcer formation.⁴

Nonetheless, consultations with a spine service remain common for patients with ITPFs. Given that previous work has focused predominantly on evaluating patients with ITPFs during hospitalization, the purpose of this study was to clarify the role of the spine service in ITPF care by assessing the management and long-term clinical outcomes of patients with conservatively treated ITPFs.

METHODS

Patient Population

This Institutional Review Board–approved retrospective chart review was performed in all patients who presented to the emergency department at our level I trauma center with an acute traumatic ITPF during the 30-month period between October 2012 and February 2015. Patients who had a transverse process fracture concomitant with any other acute spinal fractures, as well as those with a remote or healed ITPF, were excluded. In addition, patients

Key words

- Outcomes
- Quality improvement
- Spinal fracture
- Spine trauma
- Transverse process

Abbreviations and Acronyms

ITPF: Isolated transverse process fracture
iITPF: Isolated, isolated transverse process fracture
NSAI: Non–spinal-associated injury
SNF: Skilled nursing facility

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with ITPFs related to nontraumatic disease processes, such as neoplastic or infectious etiologies, were excluded as well.

Trauma and emergency department notes in the medical records of the patients meeting the inclusion criteria were reviewed for sociodemographic, clinical, radiographic, and outcome information. The number and location of ITPFs and the presence of other non-spinal-associated injuries (NSAIs) to the viscera, axial skeleton, or proximal appendicular skeleton were collected from the first computed tomography images of the cervical spine, chest, abdomen, and pelvis obtained on admission. Patient age, sex, and mechanism of injury were recorded from the trauma center notes. A subset of patients with ITPFs without other visceral or orthopedic injuries (iITPFs) was identified to remove confounding injuries when evaluating final outcomes.

Outcomes

Outcomes of interest during the initial hospitalization included surgical intervention, spinal bracing, and discharge disposition. Patient management in the form of surgical intervention or any form of bracing for the ITPFs was identified from dedicated consult notes from the spine service. In those patients for whom the spine service was not consulted or the consultation note could not be located, this information was obtained from the patient's discharge summary. Long-term outcomes of interest included neurologic deficit, ambulatory status, and back pain at the last follow-up. Back pain was assumed to be secondary to the ITPF

unless the clinical note stated otherwise. In patients who were lost to follow-up after discharge, these data were obtained from the last clinical examination while in the hospital. Patients were censored in individual outcome measures if their clinical status made assessment of these outcomes impossible (i.e., back pain in a uncommunicative patient, spinal neurologic deficits in an intubated and sedated patient, and ambulatory difficulties in the setting of a known orthopedic injury).

Statistical Analysis

Statistical analyses were conducted using SPSS version 22 (IBM, Armonk, New York, USA). Descriptive statistics were calculated for all variables of interest and included means with standard deviations and medians with interquartile ranges for continuous variables and counts and percentages where appropriate. Continuous variables were compared using one-way analysis of variance, and categorical variables were compared using the χ^2 test. Statistical significance was set at 0.05, and the Bonferroni correction for multiple comparisons was used where appropriate.

RESULTS

Patient Population

During the 30-month study period, a total of 306 patients presented to the emergency department or trauma center with an acute traumatic ITPF, of which 59 (19.3%) were determined to be

Table 1. Demographic Data and Clinical Information for All Patients and the iITPF Cohort

| Variable | All Patients | iITPF Cohort | P Value |
|------------------------------------------|-----------------------|---------------------|---------|
| Demographic data | | | |
| Number of patients | 306 | 59 | |
| Age, years, mean (SD) | 41.6 (16.5) | 40.5 (16.2) | 0.57 |
| Sex, male/female, <i>n</i> (%) | 202 (66.0)/104 (34.0) | 35 (59.3)/24 (40.7) | 0.23 |
| Fracture information | | | |
| Total ITPFs | 663 | 106 | |
| ITPFs per patient, mean (SD) | 2.17 (1.68) | 1.80 (1.23) | 0.06 |
| Number of ITPFs, <i>n</i> (%) | | | |
| 1 | 157 (51.3) | 36 (61.0) | |
| 2 | 63 (20.6) | 10 (16.9) | |
| 3 | 29 (9.5) | 5 (8.5) | |
| 4 | 26 (8.5) | 6 (10.2) | |
| 5+ | 31 (10.1) | 2 (3.4) | |
| NSAIs per patient, mean (SD) | | | |
| Visceral | 1.48 (1.73) | — | |
| Orthopedic | 3.44 (3.81) | — | |
| Total | 4.91 (4.80) | — | |
| Follow-up, months, mean (SD) | 6.0 (8.5) | 5.5 (8.0) | 0.65 |
| Patients without follow-up, <i>n</i> (%) | 89 (29.1) | 22 (37.3) | 0.12 |

ITPF, isolated transverse process fracture; NSAI, other non-spinal-associated injury; SD, standard deviation.

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