ORIGINAL ARTICLE

Clinical analysis of transverse process fractures: A comprehensive study on patient characteristics, management, and outcomes in trauma care

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ABSTRACT

BACKGROUND: Transverse process fractures (TPFs) are commonly encountered in trauma patients and are often associated with polytrauma. While traditionally considered stable injuries, recent research suggests their significance in spinal trauma may be underestimated. This study aims to provide insights into the management and outcomes of TPFs, evaluating their predictive potential for identifying clinically significant spinal fractures and associated injuries.

METHODS: A retrospective review of trauma registry data from a Level I trauma center was conducted, encompassing patients with TPFs from September 2022 to September 2023. Inclusion criteria involved patients aged 18 or older with confirmed TPFs via computed tomography (CT) and magnetic resonance imaging (MRI), managed nonoperatively. Data on demographics, injury mechanisms, associated injuries, pain management, and treatment outcomes were analyzed. Pain severity and functionality were assessed using the Visual Analog Scale (VAS) and the Oswestry Disability Index (ODI).

RESULTS: A total of 190 patients, predominantly male (129 patients, 67.9%), with a mean age of 45.7 years, were included in the study. Motor vehicle accidents (MVA) were the leading cause of admission (44.7%). Thoracic injuries were the most common associated pathology. Of the study cohort, 88 patients (46.3%) presented with single-level TPFs, while 102 patients (53.7%) had multilevel fractures. Analysis revealed distinct differences between these groups, with multilevel TPF patients exhibiting a higher frequency of associated injuries and a notable proportion requiring hospitalization or surgical intervention. Multilevel TPF patients exhibited higher initial pain and disability scores compared to single-level TPF patients. Both groups showed significant reductions in VAS and ODI scores at the 3-month follow-up.

CONCLUSION: TPFs, previously considered minor injuries, demonstrate significant pain and functional limitations. They often accompany systemic pathologies, particularly in multilevel fractures, necessitating a multidisciplinary approach to management. The "Protection, Rest, Ice, Compression, Elevation" (PRICE) approach, including Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) and muscle relaxants, along with collar or brace support when necessary, proves effective in pain management and functional improvement. These findings emphasize the importance of recognizing TPFs as complex injuries requiring tailored management strategies. Further research and collaboration among healthcare providers are warranted to refine treatment approaches and optimize outcomes for patients with TPFs.

Keywords: Clinical outcomes; conservative management; pain management; transverse process fractures; thoracolumbar injury.

INTRODUCTION

Transverse processes (TPs) are protruding bony structures located on the sides of cervical, thoracic, and lumbar vertebrae.[1,2] Their primary role is to provide attachment points for paraspinal muscles and ligaments, rather than carrying a significant spinal load. Transverse process fractures (TPFs) are frequently encountered in polytrauma patients and can manifest

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as either isolated injuries or alongside other spinal fractures, which may affect the lamina, pedicle, facet, or vertebral body. Furthermore, transverse processes in the thoracolumbar region seldom exert pressure on adjacent neural structures, resulting in minimal neurological complications.

In the context of thoracolumbar injury classification, Denis initially classified TPFs as minor injuries.[3] Nonetheless, studies conducted in trauma centers have brought to light that TPFs, despite frequently being underestimated in terms of their impact on spinal dynamics, can actually be more severe than other types of spinal injuries.[4,5] These studies have shown that the Injury Severity Score tends to be higher for TPFs compared to other spinal injuries.[4,5] Additionally, other studies have observed that TPFs are often accompanied by pelvic and rib fractures, as well as injuries to the spleen, liver, and kidneys.[4,6]

In many cases, patients are discharged from the emergency department with a pain management prescription, commonly including medications like paracetamol.[7] It is crucial to underscore that TPFs can act as significant markers for high-energy injury mechanisms and may be linked to concurrent injuries, including thoracic trauma, injuries to abdominal solid organs, pelvic fractures, or injuries to the extremities. Identifying these connections can inform trauma assessments and bring attention to latent injuries.

In this article, we provide clinical insights into the management of TPFs at our institution, serving as both a Level I trauma center and a tertiary reference hospital. Our focus extends to investigating the predictive potential of TPFs in identifying clinically significant spinal fractures and associated injuries. Furthermore, we aim to enhance the understanding of TPF variations by including a comparative analysis between single-level TPF and multi-level TPF cases. This comparative approach allows for a more comprehensive exploration of the implications and management considerations associated with different extents of transverse process involvement in the all spine regions.

MATERIALS AND METHODS

After obtaining approval from the Institutional Review Board, we conducted a retrospective review of our trauma registry database to identify patients with evidence of TPF who presented between September 2022 and September 2023. Evaluation and treatment of patients took place at our Level I trauma center, which also functions as a tertiary reference hospital. Notably, our hospital accepts patients transferred from other medical facilities.

Inclusion criteria for this study involve patients who were either assessed and treated at our Level I trauma center or referred to our hospital. Eligible participants must have confirmed evidence of TPF, as documented in our trauma registry database. Additionally, individuals included in the study must be 18 years of age or older. Notably, the study focuses on patients who did not undergo surgery specifically due to spinal fractures, ensuring a cohort that has been managed nonoperatively. The study excluded patients under 18 years of age, those without a confirmed diagnosis of TPF via computed tomography

Table 1. Demographics, clinical presentations, radiologic findings, and associated features of patients

	n (%)
Demographics	
Total Number	190
Age (mean±SD)*	45.7±16.9
Male	129 (67.9%)
Female	61 (32.1%)
Inpatient	90 (47.4%)
Outpatient	100 (52.6%)
Length of Stay, Days (mean, range)*	3.8 (0.4-42.5)
Mechanism of Injury	
MVA	85 (44.7%)
Fall (same level)	49 (25.8%)
Fall (from height)	40 (21.0%)
Assault	13 (6.8%)
Other	3 (1.7%)
Level of Injury	
Cervical (C7)±	8 (4%)
Thoracic±	20 (10%)
Lumbar±	176 (88.4%)
Single Level	88 (46.3%)
Multilevel	102 (53.7%)
Fractures, n§	
1	88 (46.3%)
2	61 (32.1%)
3	31 (16.3%)
4	11 (5.8%)
≥5	5 (2.6%)
Associated Vertebra Fractures	
Pars Interarticularis	24 (12.1%)
Lamina	9 (4.5%)
Spinous Process	20 (10%)
Vertebral Body (Compression)	36 (18.1%)
Nationality	
Turkish Citizens	141 (70.8%)
Refugees	47 (23.7%)
Other	11 (5.5%)

*Mean±Standard Deviation/Median (Min-Max). ±Number of patients with single or multiple TPFs in the indicated region. §Total number of TPFs (unilateral/bilateral and single-level/multilevel). CT: Computed tomography; MVA: Motor vehicle accident; SD: Standard deviation.

Table 2. The correlation between transverse process fracture numbers and factors such as fracture levels, laterality, and the use of collar, brace, or corset for spinal support

Distribution of TPFs	Single Level n (%)	Multiple Level n (%)	Unilateral n (%)	Bilateral n (%)	Collar, Brace, or Corset Use n (%)	Collar, Brace, or Corset Using Duration, Days (Mean±SD)
Cervical (C7)	5 (2.6%) (C7+thoracic, C7+thoracolumbar, C7+lumbar)	3 (1.5%)	8 (4%)	0	8 (4%)	12.4±3.5
Thoracic	9 (4.7%)	11 (5.5%)	14 (7%)	6 (3%)	11 (5.5%)	25.9±13.5
L1	23 (12.1%)	50 (25.1%)	53 (26.6%)	21 (10.5%)	62 (31.1%)	28.9±18.5
L2	18 (9.5%)	77 (38.7%)	39 (19.6%)	57 (28.6%)	81 (40.7%)	23.3±12.8
L3	10 (5.3%)	62 (31.1%)	28 (14%)	44 (22.1%)	50 (25.1%)	26.8±15.1
L4	12 (6.3%)	39 (19.6%)	32 (16%)	20 (10%)	32 (16%)	28.2±22.1
L5	11 (5.8%)	20 (10%)	30 (15%)	1 (0.5%)	12 (6%)	35.2±10.5

SD: Standard deviation; TPF: Transverse process fracture.

(CT) imaging, and individuals requiring surgical intervention for other spinal fractures. These criteria are carefully designed to define a targeted and relevant study population.

A consistent and standardized diagnostic approach was employed for all cases included in the study. The diagnosis of TPF was primarily based on thorough clinical evaluation and confirmed by imaging studies. This uniform diagnostic methodology ensures consistency and reliability in identifying and documenting TPF across the entire study population. For patients with TPF, the following information was recorded: history of trauma, mechanism of injury, location and intensity of pain, examination and imaging findings, associated injuries, and treatment outcomes. Pain severity was assessed using the Visual Analog Scale (VAS), while functionality was evaluated using the Oswestry Disability Index (ODI), a patient-completed questionnaire that provides a subjective percentage score for the level of disability in daily activities among patients with low back pain.[8] For patients experiencing C7 transverse process fractures, a modification was made by replacing the ODI with the Neck Disability Index (NDI), which specifically evaluates the impact of neck pain on daily life.[9] The results were expressed as a percentage score by transforming the score through the formula 'Score/50 x 100 = % points,' aligning them with ODI assessments. Medical treatment was administered to the patients, and bracing was applied to those with TPFs involving multiple levels and/or accompanying spinal fractures. Patients without contraindications were mobilized. VAS and ODI were reassessed upon the patient's arrival and at a 3-month follow-up after discharge. All results were analyzed retrospectively.

Statistical Analysis

Data analysis was performed using IBM Statistical Package for the Social Sciences (SPSS) version 25.0. A comprehensive set of statistical techniques was applied, including descriptive statistics, Chi-Square tests, Kolmogorov-Smirnov tests, skewness-kurtosis tests, and various graphical methods. Furthermore, the Mann-Whitney U test and Independent Samples t-test were employed for comparing normally and non-normally distributed quantitative data between different groups, respectively. The relationships between variables were evaluated using Spearman's rho correlation test. Descriptive statistics were reported in terms of means, standard deviation (SD), percentages, and 95% confidence intervals (CI) at each time point. A significance level of ≤0.05 was considered to indicate statistical significance.

RESULTS

Out of the 333 patients who presented to our hospital with either single or multiple TPFs during the specified period, a total of 190 were considered for inclusion in the study. Among the 134 patients excluded from the study, 48 were under the age of 18, 9 did not provide consent, 9 did not have a CT-confirmed diagnosis, 21 did not attend follow-up appointments, and 56 underwent surgery for other spinal fractures. Among the participants included in the study, 129 individuals (67.9%) were male, while 61 patients (32.1%) were female. Their ages ranged from 18 to 85 years, with a mean age of 45.7±16.9 years. Among the patients, 90 (47.4%) required hospitalization due to associated injuries, while 100 (52.6%) were discharged with appropriate treatment. The average duration of hospitalization was 3.8 days, with a range from 0.4 to 42.5 days (Table 1).

The leading causes of admission were motor vehicle accidents (MVA) for 85 (44.7%) patients, falls from the same level for 49 (25.8%) patients, falls from heights greater than 2 meters for 40 (21.0%) patients, and assaults for 13 (6.8%) patients. Of

the patients, 88 (46.3%) had single-level transverse process fractures, while 102 (53.7%) had multilevel fractures (Table 1). The distribution of TPFs by level, laterality, single/multilevel distribution, and collar/brace/corset usage rates and mean collar/brace/corset usage times are presented in Table 2.

The most commonly affected vertebra was L2 (96 patients), followed by L1 (74 patients) and L3 (72 patients) (Table 2). All patients experienced severe neck, back, or lumbar pain and limited motion at the affected levels, either on the right or left paraspinal region.

At the time of emergency admission, the mean VAS score was 6.9±1.5 for single-level patients and 8.7±1.3 for multilevel TPF patients, with a statistically significant difference between these results ($p \leq 0.05$). When NDI/ODI scores were assessed at the time of emergency admission, they were 31.9±18.1 for single-level patients and 45.8±18.7 for multilevel patients, with a statistically significant difference between these results ($p \leq 0.05$).

In the 3rd-month follow-up, the VAS value was 1.4±0.9 for single-level TPF patients, representing a statistically significant decrease when compared to the initial VAS assessment in the emergency room ($p \leq 0.05$). For multilevel TPF patients, the VAS value at the 3rd month follow-up was 2.2±1.8, with a similar statistically significant decrease compared to the initial VAS assessment ($p \leq 0.05$). However, when comparing the VAS scores between single-level and multilevel TPF patients at the 3rd month follow-up, no statistically significant difference was observed ($p > 0.05$). This pattern was also observed when assessing NDI/ODI scores. Multilevel TPF patients showed a statistically significant decrease in NDI/ODI values when comparing the initial examination at emergency admission with the 3rd-month follow-up ($p \leq 0.05$). However, in single-level patients, there was a decrease in NDI/ODI values between the initial examination and the 3rd-month follow-up, although it was not statistically significant ($p > 0.05$).

Additional injuries and comprehensive clinical information about the patients are provided in Table 3. TPF were diagnosed using computed tomography (CT) with a 1 mm slice upon their arrival at the emergency department (Fig. 1). Furthermore, necessary imaging was employed to identify associated injuries (Fig. 2).

DISCUSSION

Following the widespread adoption of routine CT scans for trauma patients, TPFs have been detected with increasing frequency, making them the most prevalent spinal pathology in a comprehensive trauma center study.[10] TPFs, often overlooked as stable fractures, are now recognized as indicators of severe trauma.[3,11] Recent research has shed more light on this injury, involving biomechanical and anatomical studies of the region surrounding the thoracolumbar processes, aided by electrophysiology and microscopy.[7,11,12] These studies have focused on the attachment of muscular and ligamentous structures to the thoracolumbar processes, exploring their relationships with low back pain and their impact on spinal stability.[1,12] In this particular study, 190 patients with TPFs were examined by emergency physicians, analyzing clinical characteristics, radiological data, pain management, the influence of pain on daily life, and patient outcomes.

Consistent with earlier findings, TPFs were most frequently observed in the lumbar vertebrae, particularly in males. Notably, 90 patients (47.4%) were hospitalized with additional systemic pathologies, a higher rate compared to existing literature. According to Gültekin et al., the rate of TPF accompanied by additional pathology is reported to be 30%.[13] This disparity can be attributed to the fact that our clinic functions as both a level 1 trauma hospital and a level 3 reference hospital, tending to attract a higher number of patients with associated injuries. Consequently, 31 (15.6%) patients required surgery for additional pathologies.

Among the 88 patients with single-level TPFs, 57 (64.8%, based on single-level TPFs) had associated pathologies, while

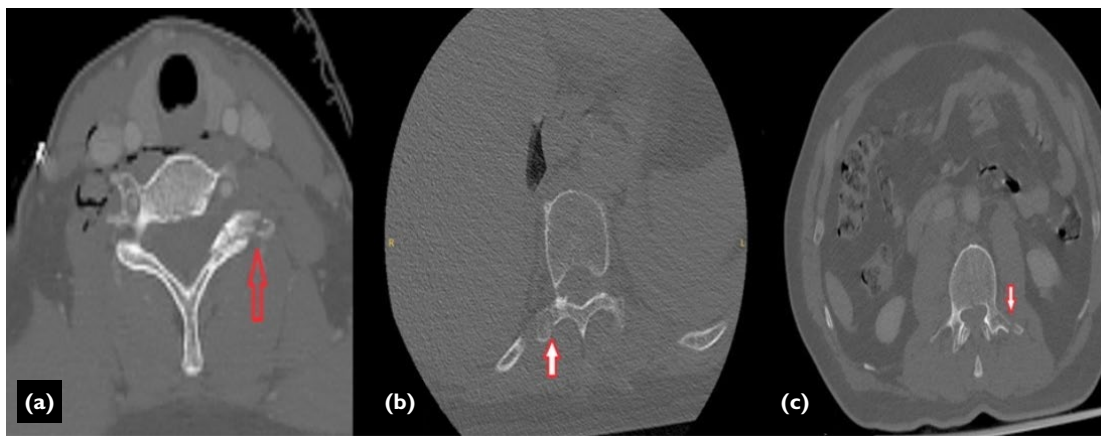

Figure 1. Examples of fractures in the transverse processes of various vertebrae: **(a)** Fracture of the left transverse process of C7 (indicated by the arrow pointing to the fracture line), **(b)** Fracture of the right transverse process of T9 (indicated by the arrow pointing to the fracture line), **(c)** Fracture of the left transverse process of L2 (indicated by the arrow pointing to the fracture line).

Table 3. Clinical findings, treatment, and follow-up results of patients with TPF

Distribution of TPFs	Associated Injuries	Treatment	VAS at Admission (Mean±SD)	Control VAS at 3rd Month (Mean±SD)	p value	ODI (or NDI) at Admission (Mean±SD)	Control ODI (or NDI) at 3rd Month (Mean±SD)
Single Level (n=88)	Spinous process fracture in 10 (5%) patients, compression fracture in 6 (3%) patients, stable pars interarticularis fracture in 4 (2%) patients, stable pelvic fracture in 3 (1.5%) patients, traumatic subarachnoid hemorrhage in 2 (1%) patients, thoracic pathology (pulmonary contusion, hemo-/pneumothorax, or rib fracture) in 12 (6%) patients, orthopedic fractures in 20 (10%) patients.	70 (36.8%) patients were treated and discharged with injectable NSAIDs and muscle relaxants. 18 (9.5%) patients were hospitalized for other pathologies. No surgery was needed.	6.9±1.5	6.9±1.5	≤0.05	31.9±18.1	19.3±9.1
Multilevel (n=102)	Spinous process fracture in 10 (5%) patients, lamina fracture in 9 (4.5%) patients, stable pars interarticularis fracture in 20 (10%) patients, compression fracture in 30 (15%) patients, thoracic pathology (pulmonary contusion, hemo-/pneumothorax, or rib fracture) in 33 (16.5%) patients, temporal contusion in 4 (2%) patients, sacral and scapular fractures in 6 (3%) patients, zygomatic fracture in 4 (2%) patients, abdominal injury (spleen, bladder, or major vascular injury) in 16 (8%) patients, traumatic subarachnoid hemorrhage in 4 (2%) patients, non-surgical subdural hematoma in 2 (1%) patients, additional extremity/pelvic fractures in 56 (27.6%) patients.	Surgery was performed on 31 (15.6%) patients for thoracic and abdominal pathologies, plastic surgery interventions, and orthopedic reasons. 38 (19.1%) patients were hospitalized and followed up for similar reasons. 39 (19.6%) patients were discharged from the emergency department with appropriate medication. Collars, braces, or corsets were recommended for patients without contraindications.	8.7±1.3	2.0±1.8	≤0.05	45.8±18.7	≤0.05
p value			≤0.05	≤0.05	>0.05	>0.05	

NDI: Neck disability index (used for C7 TPFs); NSAID: Nonsteroidal anti-inflammatory Drugs; ODI: Oswestry disability index; SD: Standard deviation; TPF: Transverse process fracture; VAS: Visual analog scale.

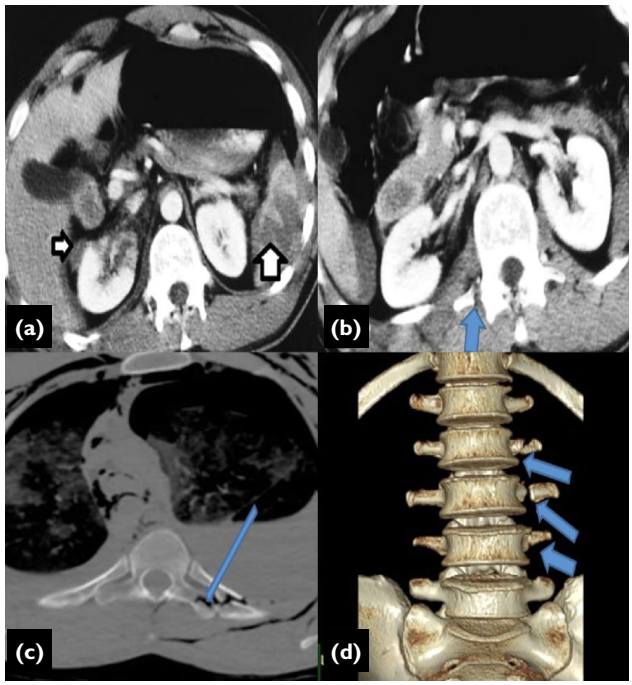

Figure 2. This figure illustrates additional pathologies accompanying transverse process fractures (TPFs) in a 36-year-old man who fell from a height. **(a)** A CT scan of the upper mid abdomen reveals a right renal contusion and a perirenal hematoma (small arrow), along with an intrasplenic laceration (large arrow) and perisplenic blood. **(b)** At the L2 level, a CT scan displays a non-displaced vertically oriented fracture (arrow) of the right transverse process. **(c)** This fracture is accompanied by rib fractures. **(d)** A 3D CT image showcases fractures of the right transverse processes at L2, L3, and L4.

among the 102 patients with multilevel TPFs, 89 (87.2%, based on multilevel TPFs) had concurrent pathologies. In this study, thoracic injuries, including pulmonary contusion and hemothorax, often accompanied by rib fractures, were the most common additional pathology observed in 55 patients. These findings align with existing literature, as similar results have been reported in numerous studies.[4,5,13]

The observed differences between single-level and multilevel TPFs highlight the need for nuanced clinical considerations and tailored management strategies. In the single-level TPF group, which mainly consisted of uncomplicated fractures, conservative treatments such as medication and non-surgical interventions were successful in the majority of cases. Among these patients, 70 (79.5%) out of 88 had no additional pathology and were managed with injectable nonsteroidal anti-inflammatory drugs (NSAIDs) and muscle relaxants before being discharged. This rate aligns with findings reported in the literature.[5,14] The lower percentage of hospitalizations and the absence of surgical interventions in this group underscore the generally favorable outcomes associated with single-level TPFs. However, attention should be paid to monitoring and addressing potential thoracic pathologies, as a noteworthy percentage of patients presented with such conditions.

On the other hand, the multilevel TPF group presented a more intricate clinical scenario, characterized by a higher frequency of associated injuries and a notable proportion requiring hospitalization or surgical interventions. Out of 102 patients with multilevel TPFs, 31 (30.4%) underwent surgery due to additional pathology, while only 39 (38.2%) were discharged from the emergency department with appropriate medication. This surgery and hospitalization rate exceeds what is typically reported in the literature,[13,14] which may be attributed to the dual role of our clinic as both a primary trauma center and a reference hospital. This highlights the necessity of a thorough assessment in cases of multilevel TPF, given the potential involvement of various anatomical regions and organ systems. Clinicians should remain vigilant for indications of thoracic and abdominal pathologies, as well as traumatic subarachnoid hemorrhage, necessitating a multidisciplinary approach to address the diverse spectrum of injuries. The significant enhancement in pain and disability outcomes observed in both groups over the 3-month period underscores the effectiveness of the implemented management strategies. Overall, these findings emphasize the significance of personalized care tailored to the extent and complexity of TPF-associated injuries, underscoring the importance of meticulous evaluation and suitable interventions aligned with each patient's distinct clinical presentation.

Upon analyzing the mechanisms of injury, it was noted that MVAs were the most common, with a notable male gender predominance among TPF patients admitted to the hospital due to MVAs. This observation aligns with findings reported in the literature.[5,13,14] For instance, Bui et al. reported a 76.7% male dominance and 62.8% dominance of MVAs in their published article.[5] After MVAs, falls from the same level accounted for 49 cases (25.8%). This mechanism generally entails less velocity and force compared to MVAs. However, the higher incidence in this group may be attributed to the older average age of individuals affected by this mechanism. Factors such as movement disorders that become more prevalent with age, neurological diseases, and metabolic disorders like osteoporosis could contribute to this trend.[15,16] Despite the average age of 42.5±11.1 in the MVA group and 48.2±9.9 in the fall from the same level group, mathematical calculations indicated no statistically significant difference between these two groups in this study. In the "fall from the same level" group, there was a substantial number of patients (74.5% within the group) using braces or corsets. This higher usage can be attributed to the older age and the increased prevalence of osteoporosis affecting the vertebrae in this particular group. The third most common cause of TPFs was falls from a height, accounting for 42 cases (21.1%). Among this group, a majority of 27 patients were refugees. Refugees are often engaged in informal and insecure employment, particularly in hazardous sectors like construction, transportation, and fruit picking from trees. This concentration in the "fall from height" group reflects the risky work environments and conditions that many refugees find themselves in.

Spinal surgery literature has traditionally characterized TPFs as stable injuries with no associated neurological deficits, thus recommending conservative treatment.[17,18] Numerous studies have supported the idea that TPFs can be managed without the need for spinal surgery consultation.[5,17] For instance, Boulter et al. reported that none of their TPF patients required admission to the spine surgery service, and no bracing or surgical interventions were deemed necessary.[18] In our study, we observed that patients presented to the emergency room with high VAS and NDI/ODI values, which significantly decreased at the three-month follow-up. Moreover, patients with multilevel TPFs exhibited significantly higher VAS and NDI/ODI scores compared to those with single-level TPFs. While multiple TPFs are commonly associated with increased pain, the presence of concomitant injuries in multilevel TPF patients complicates the evaluation. Nevertheless, Gültekin et al. have shown that TPF ranks among the most severe sources of pain in their study.[13] Also, CT scans revealed thickening of the quadratus lumborum (QL) and multifidus (MLF) muscles, loss of tension, and deformation of the psoas, while magnetic resonance ımaging (MRI) showed edema in the muscles and fascia surrounding the TPs.[10,19] This muscle and ligament damage leads to mobility limitations in patients, contributing to the elevated NDI/ODI values reflecting the impact of pain on daily life.

TPFs should be viewed and managed as comprehensive muscle and fascia injuries rather than minor bony fractures. Following the "PRICE" approach (Protection, Rest, Ice, Compression, Elevation) commonly used for muscle injuries, our treatment protocol involves short-term use of NSAIDs and muscle relaxants, typically for one week unless contraindications arise.[20,21] For patients with C7 fractures, we recommend collar use for two weeks to address accompanying neck muscle damage and provide psychological reassurance. In cases of thoracic and lumbar TPFs, particularly with multiple fractures, steel-supported lumbosacral or thoracolumbar flexible support braces are applied for 3-4 weeks. Mobilization is encouraged early on, unless contraindications exist, aligning with the elevation component of the "PRICE" protocol. Flexible supportive braces are preferred over more rigid options like Thoracolumbosacral Orthosis (TLSO) or Jewett TLSO, as they promote mobility in patients with TPFs only. Rigid braces and corsets are reserved for patients with vertebral body compression fractures and pars interarticularis fractures.

When assessing outcomes, a statistically significant reduction in VAS and NDI/ODI values was observed in all patient groups during the 3-month follow-up following their emergency admission. This indicates that the pain associated with TPFs tends to subside, and patients typically regain their normal daily life activities within a span of three months.

Limitations

Several limitations should be acknowledged in this study. Firstly, it was conducted at a single healthcare center, which raises concerns about the generalizability of the findings to broader healthcare settings and diverse patient populations. Additionally, the study's sample size was relatively small, encompassing 190 patients. Larger sample sizes would enhance the statistical power and bolster the reliability of the results.

Furthermore, despite the article's comprehensive discussion of various factors related to TPFs, the presence of uncontrolled or unaccounted-for confounders may have impacted the study's outcomes. Variables such as patients' comorbidities, lifestyles, and socioeconomic status could introduce additional complexity and potential bias to the results. These limitations should be taken into consideration when interpreting and applying the study's findings to clinical practice.

CONCLUSION

This study sheds light on the management and outcomes of patients with TPFs in the context of emergency care. Our findings reveal that TPFs, previously considered stable injuries, are associated with significant pain and functional limitations. The study underscores the importance of recognizing TPFs as comprehensive muscle and fascia injuries, emphasizing the need for a multidimensional approach to their management. The results demonstrate that, irrespective of the mechanism of injury, patients experience a substantial reduction in pain and an improvement in their functionality within three months of emergency admission. The utilization of the "PRICE" approach, including NSAIDs and muscle relaxants, along with collar or brace support when necessary, has proven effective in enhancing patients' well-being. Moving forward, we encourage continued research and collaboration among healthcare providers to enhance our understanding of TPFs and refine treatment approaches, ultimately improving the quality of care and outcomes for patients with this often-overlooked injury.

Ethics Committee Approval: This study was approved by the Ankara Bilkent City Hospital Ethics Committee (Date: 06.09.2023, Decision No: E1/3874/2024).

Peer-review: Externally peer-reviewed.

Authorship Contributions: Concept: G.G., E.Ç.; Design: G.G.; Supervision: M.G.G., E.Ç.; Resource: A.E.A.; Materials: A.E.A.; Data collection and/or processing: A.E.A.; Analysis and/or interpretation: G.G., E.Ç.; Literature search: G.G., E.Ç., A.E.A.; Writing: E.Ç.; Critical review: G.G., E.Ç.

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ORİJİNAL ÇALIŞMA - *ÖZ*

Transvers uzantı kırıklarının klinik analizi: Travma bakımında hasta özellikleri, yönetimi ve sonuçları üzerine kapsamlı bir çalışma

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AMAÇ: Transvers proses kırıkları (TPF'ler) travma hastalarında yaygın olarak görülür ve sıklıkla politravma ile ilişkilidir. Geleneksel olarak stabil yaralanmalar olarak kabul edilse de, son araştırmalar spinal travmadaki önemlerinin hafife alınabileceğini düşündürmektedir. Bu çalışmanın amacı, TPF'lerin yönetimi ve sonuçları hakkında bilgi sağlamak ve klinik olarak önemli spinal kırıkları ve ilişkili yaralanmaları tanımlamak için öngörücü potansiyellerini değerlendirmektir.

GEREÇ VE YÖNTEM: Eylül 2022'den Eylül 2023'e kadar TPF'li hastaları kapsayan, Seviye I bir travma merkezinin travma kayıt verilerinin retrospektif bir incelemesi yapılmıştır. Dahil edilme kriterleri, bilgisayarlı tomografi (BT) ve manyetik rezonans görüntüleme (MRG) ile doğrulanmış TPF'leri olan ve ameliyatsız tedavi edilen 18 yaş ve üstü hastaları içeriyordu. Demografik veriler, yaralanma mekanizmaları, ilişkili yaralanmalar, ağrı yönetimi ve tedavi sonuçları analiz edilmiştir. Ağrı şiddeti ve işlevsellik Görsel Analog Skalası (VAS) ve Oswestry Engellilik İndeksi (ODI) kullanılarak değerlendirildi.

BULGULAR: Ağırlıklı olarak erkek (129 hasta, %67.9) ve yaş ortalaması 45.7 olan 190 hasta çalışmaya dahil edilmiştir. Motorlu taşıt kazaları (MVA) en önde gelen başvuru nedeniydi (%44.7). Torasik yaralanmalar en yaygın ilişkili patolojiydi. Çalışma kohortunun 88 hastası (%46.3) tek seviyeli TPF ile başvururken, 102 hastada (%53.7) çok seviyeli kırıklar vardı. Analizler bu gruplar arasında belirgin farklılıklar olduğunu ortaya koymuştur; çok seviyeli TPF hastalarında eşlik eden yaralanma sıklığı daha yüksektir ve kayda değer bir oranda hastaneye yatış veya cerrahi müdahale gerektirmektedir. Çok seviyeli TPF hastaları, tek seviyeli TPF hastalarına kıyasla daha yüksek başlangıç ağrı ve sakatlık skorları sergilemiştir. Her iki grup da 3 aylık takipte VAS ve ODI skorlarında anlamlı bir azalma göstermiştir.

SONUÇ: Önceleri minör yaralanmalar olarak kabul edilen TPF'ler önemli ağrı ve fonksiyonel kısıtlılıklar göstermektedir. Özellikle çok seviyeli kırıklarda, sıklıkla sistemik patolojilere eşlik ederler ve tedavide multidisipliner bir yaklaşım gerektirirler. NSAİİ'ler ve kas gevşeticilerin yanı sıra gerektiğinde boyunluk veya korse desteğini de içeren "PRICE" yaklaşımının ağrı yönetimi ve fonksiyonel iyileşmede etkili olduğu kanıtlanmıştır. Bu bulgular, TPF'lerin özel yönetim stratejileri gerektiren karmaşık yaralanmalar olarak kabul edilmesinin önemini vurgulamaktadır. Tedavi yaklaşımlarını iyileştirmek ve TPF'li hastaların sonuçlarını optimize etmek için sağlık hizmeti sağlayıcıları arasında daha fazla araştırma ve işbirliği yapılması gerekmektedir.

Anahtar sözcükler: Ağrı yönetimi; klinik sonuçlar; konservatif tedavi; transvers proses kırıkları; torakolomber yaralanma.

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