



ELSEVIER

Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

## Trauma Case Reports

journal homepage: [www.elsevier.com/locate/tcr](http://www.elsevier.com/locate/tcr)

## Case Report

# Thoracolumbar fracture-dislocation in a two-year-old female child following child abuse: A case report and literature review

Nilesh Barwar, Param Jit Singh\*, Tarun Goyal, Pankaj Kumar Sharma, Sanjay Jain, Lakshman Das

Department of Orthopaedics, All India Institute Of Medical Science, Bathinda, India

## ARTICLE INFO

## Keywords:

Thoracolumbar translational injury  
Spinal cord injury  
Child abuse  
Sublaminar wiring

## ABSTRACT

Child abuse is a matter of serious concern that can often result in devastating injuries. Incidence of spinal injuries from child abuse has been reported in <1–3 % of spinal injury cases. In the present study, a case of thoracolumbar translational injury (AO type C) is presented following an incidence of child abuse in a 2-year-old female. After successful management with operative fixation, the child showed a remarkable recovery in her neurological function with ambulatory power.

## Introduction

According to WHO, child maltreatment is defined as neglect and abuse occurring in children aged below 18 years, consisting of various types of neglect, emotional or physical maltreatment, and sexual abuse that causes harm. WHO states that maltreatment of children is widespread in the world with around one in every four adults being abused physically as a child [1]. India accounts for around 20 % of the total population of children in the world. But nationwide there is still very little information available on the trends and extent of child maltreatment because of a lack of longitudinal and cross-sectional studies [2].

Several children are exposed to other adversities like political instability, community violence, conflict, and other traumatic experiences of life in low and middle-income countries (LMICs) like India. Adversities like child neglect and abuse, associated with other habits like drinking or smoking being underage; have been found associated with a poor range of mental as well as physical health outcomes, which can finally cause an increased rate of mortality [3]. In high-income countries, the rate of prevalence of child sexual abuse (CSA) is observed to be 8 % for males and 20 % for females; but in India, the prevalence varies between 4 and 57 % and 4 to 66 % for males and females respectively [4]. In a report presented by the Ministry of Women and Child Development, it was observed that children aged 5–12 years revealed an increased level of abuse as compared to individuals of other age groups [5]. It has been stated that >70 % of the involved children have never mentioned the abuse to anyone and it is left unreported. In many cases, the abusers are parents themselves [6].

In patients aged less than two years old, a significant mechanism of injury is non-accidental trauma (NAT), with around 38 % of pediatric patients being abused [7]. To date, there are only a few cases being reported with thoracolumbar fractures affecting infants and toddlers. Because of the scarcity of literature in this age group with this type of injury, there always exists uncertainty about the best treatment intervention and its long-term outcomes.

Here we report a case of child abuse leading to thoracolumbar translational injury with complete paraplegia. The child was

\* Corresponding author.

E-mail address: [drparamjitsing@gmail.com](mailto:drparamjitsing@gmail.com) (P.J. Singh).

<https://doi.org/10.1016/j.tcr.2024.101014>

Accepted 2 April 2024

Available online 3 April 2024

2352-6440/© 2024 Published by Elsevier Ltd.

This is an open access article under the CC BY-NC-ND license

(<http://creativecommons.org/licenses/by-nc-nd/4.0/>).



(caption on next page)

← **Fig. 1.** Preoperative sagittal T2 weighted MRI of spine showing the extent of damage to spinal cord and posterior ligamentous complex.

successfully managed with an operative procedure. In the follow-up, the child showed a remarkable neurological recovery. The relevant literature review is also presented.

## Case report

### Patient information

A 2-year-old female was brought to the emergency department with a complaint of inability to move both lower limbs for the last 24 h. A detailed history revealed that the child's stepfather, who was in an inebriated condition, had inflicted the injuries.

### Clinical findings

Physical examination of the child patient revealed signs of physical trauma with multiple bruises and abrasions, having a noticeable deformity and tenderness in the thoracolumbar region. She was maintaining her vitals. A detailed neurological assessment was done and the findings suggested a complete paraplegia below the L1 level (ASIS A). *Motor function:* Power was 0/5 around hips, knees, ankles, and toes. *Sensory function:* No sensory function could be found below her L1 dermatome. Deep tendon reflexes were not raised in the lower limbs. Perineal sensation and anal tone were absent, though the voluntary anal contraction couldn't be assessed. She was unable to pass urine and catheterised. A history of constipation was also documented. Neurological examination of her upper limbs was normal.

### Diagnostic assessment

Considering the deformity in the spine of the patient with the complaint of pain, the patient was evaluated using radiological investigations; X-rays, and MRI of the spine. The investigations confirmed translational injury at the T12-L1 level with cord compression. As per AO classification of the thoracolumbar fractures, the injury was - T12-L1: C, L1:A3, N4, M1 type (Figs. 1 and 2). The



**Fig. 2.** Preoperative radiograph (anteroposterior and lateral) of Thoracolumbar spine showing T12-L1 fracture dislocation.

neurological injury was also graded with the American Spine Injury Association (ASIA) score and ASIA impairment scale and it was found as ASIA- A grade. Thus, a diagnosis of Thoracolumbar T12-L1 translation fracture-dislocation injury with a complete spinal cord injury was made. The patient was then subjected to urgent surgical intervention to reduce and stabilize the spine.

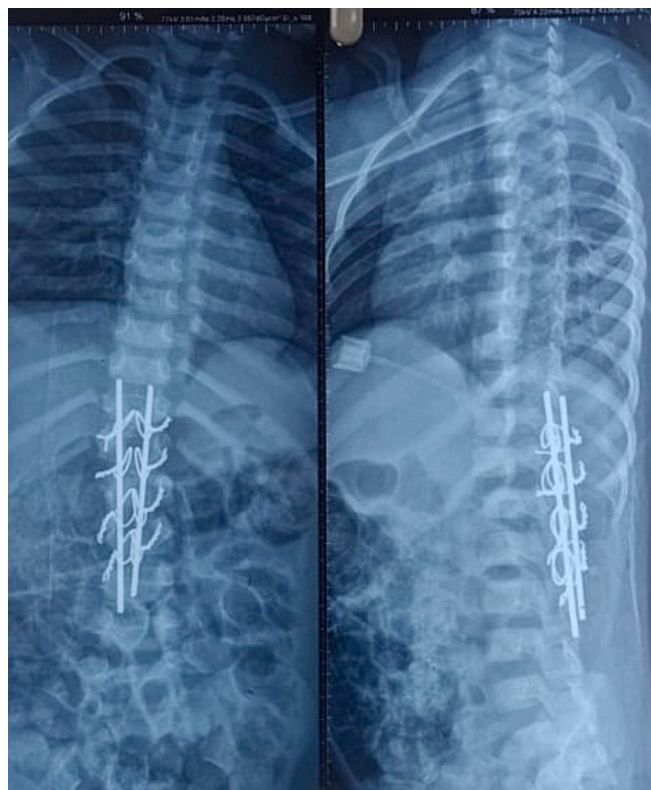
### *Operative management*

Given the severity of the injury with fracture dislocation, the patient underwent early surgery under general anaesthesia. The fracture was opened from the posterior side at the T12-L1 level. There was a bilateral facet joint dislocation observed at the level along with anterior and lateral translation. After a formal surgical dissection, the injury was first reduced by reversing the deformity with the help of towel clips in the spinous processes. (Fig. 3). Once the injury was reduced, it was stabilized using sublaminar wiring at two above and below levels using 3 mm k wires as rods. Wires were placed onto the lamina elements above and below the fracture site. The reduction and stabilization was fluoroscopically confirmed. In the postoperative period, the spine was protected in a TLSO brace for 2 months.

### *Follow-up and outcomes*

Comprehensive postoperative care including the close monitoring of the vital parameters of the patient was done along with consultation from the pediatric department. In the early postoperative period, the child suffered from severe constipation with abdominal distension. The problem was managed by the pediatrician by giving a combination of treatments like soap water enema and finger evacuation, etc. A multidisciplinary rehabilitation program including physical therapy, occupational therapy, and psychological support was started with the involvement of a physiotherapist. Regular follow-up assessments were conducted to evaluate the patient's recovery.

After one and a half years of follow-up, the patient demonstrated a remarkable neurological improvement. At the latest follow-up, the paraplegia is partially resolved, allowing for increased mobility and function in her lower extremities. The patient can do active SLR with her lower limbs and is walking with the help of the bed or by holding her mother's hand (Fig. 4). Despite having a complete translational injury in the region, the child showed a great improvement in her neurological function by achieving power to the level of assisted ambulation without the use of spine braces and leg callipers (Fig. 5). The bowel function was also improved with partial improvement in her bladder function. Though the child was self-voiding, there have been episodes of urinary incontinence. The child showed good motor recovery around her hips, knees, and trunk with trunk stabilization ability, however, a residual weakness was observed in and around ankles and toes. Bladder function was also partially improved. Although the patient did not regain full



**Fig. 3.** Intra-operative photo.

neurological function, the observed improvement was remarkable. At the latest follow-up, the patient did not have any problem concerning her implant in the spine. Hence, the construct has not been removed yet.

## Discussion

In very young children, only very few case reports are available in the literature for managing thoracolumbar fracture-dislocations. The present case is a presentation of one of such rare cases that was managed using an open reduction technique that has been described a little in the medical literature. We described in detail the operative technique we used and we also did a relevant literature review. We did a thorough literature review using various inclusive search terms for identifying the reports on thoracolumbar fractures due to non-accidental trauma (Table 1).

In our case, a 2-year-old child suffered a fracture dislocation at the T12-L1 level from child abuse. Thornley P et al. [7] reported a case of a 2-year-old boy child who suffered from thoracolumbar fracture-subluxation. They advocated their case as the first reported case of complete treatment, along with the consequent removal of hardware for a pediatric thoracolumbar fracture-subluxation. They reported that after NAT they achieved an evident neurological recovery with complete reduction.

Sieradzki JP et al. [8] reported a case of a 14-month-old child who also suffered from a fracture dislocation at the T12-L1 level from nonaccidental trauma. They managed the patient under sedation by doing closed manual reduction and hyperextension casting. In our case, treatment consisted of surgical intervention, followed by sublaminar wiring. Thornley P et al. [7] reported a follow-up of one year, and revealed that the patient was neurologically stable with complete power and symmetrical sensation throughout the L2-S1 distribution. In our case, we did an 18-month follow-up and our patient displayed excellent clinical and radiographic results with good neurological improvement. Sieradzki JP et al. [8] reported that after 22 months of follow-up, the patient was neurologically intact and showed excellent clinical and radiographic outcomes. In studies by Carrion WV et al. [12], and Gabos PG et al. [13], it was observed that the neurological component didn't show much improvement.

Our patient presented with an improved degree of neurological features with good motor function recovery. Thus, we advocate the use of instrumented surgical intervention rather than non-operative means for a more successful outcome (Fig. 6).

## Conclusion

This case report highlights the grave consequences of child abuse when combined with the influence of alcohol, resulting in a thoracolumbar fracture dislocation and a complete spinal cord injury in a 2-year-old female. The successful surgical intervention involving an open reduction and sublaminar wiring along with a comprehensive rehabilitation program led to a remarkable neurological improvement. As a designated fixation instrument is not available for this age group, we used sublaminar and k wires for stabilizing the injury after the open reduction. A multi-disciplinary approach is needed for the best outcome of the patient, particularly in a case of child abuse including the psychosocial support from the patient's immediate family members. The report of the present case reveals the importance of early recognition, intervention, and multidisciplinary care for child abuse victims. We advise further research should be conducted to manage such kinds of injuries. Parents, guardians, and teachers should be made aware of child abuse which can cause devastating injuries like the fracture dislocation in the spine complicated with paraplegia amongst other lethal injuries. Such injuries should be prevented in the first place, and if they happen, should be managed with diligent care for the best outcome.



Fig. 4. Photo of the child doing active SLR.



**Fig. 5.** Photo of the child walking with holding side of bed.

**Table 1**

Overview of relevant case reports and case series on treatment of thoraco-lumbar fractures/dislocations resulting from non-accidental trauma in pediatric patients.

Serial no.	Author	Year of publication	Number of patient	Age of patient	Level of injury	Neurological status at time of injury	Mode of injury	Management	Follow up	Final outcome
1.	Swischuk [9]	1969	–	2 years	L2–L3	Bilateral LL weakness	Child abuse	NA	NA	NA
2.	Renard et al. [10]	1978	1	13 months	Fracture-dislocation at the thoracolumbar junction	Paraplegic	Child abuse	Posterior spinal fusion	NA	NA
3.	Diamond et al. [11]	1994	1	12 months	Fracture-dislocation at the thoracolumbar junction	Lower limb power 0–1/5,	Child abuse	Open reduction and spica cast	1month	Regained lower extremity strength to 3/5 bilaterally
4.	Carrion et al. [12]	1996	2	12 months	T12/L1 fracture-dislocation	Paraplegic	Child abuse	Open reduction and hyperextension cast with only partial reduction.	2-year	No further neurologic recovery beyond bilateral 4/5 hip flexor strength
				9 months	Rotatory subluxation and canal stenosis of T11/T12	Flaccid paralysis of bilateral lower extremities	Child abuse	Right thoracotomy and anterior T11 corpectomy with rib autograft fusion from T10-T12. Postoperative hyperextension casting	20 months	No neurologic recovery
5.	Gabos et al. [13]	1998	1	15 months	L1-2 listhesis	Flaccid bilateral lower extremity paralysis	Child abuse	Posterior instrumented wiring and fibular strut allograft from T12 to L3, with postoperative molded casting	12 months	Neurologically improved but required bilateral ankle-foot-orthoses
6.	Levin et al. [14]	2003	7 cases	6 months to 7 years	Most commonly at l1/2, two children, thoracolumbar fl	2 patients paraplegic, rest neurological intact	Child abuse	NA	NA	NA
7.	Bode et al. [15]	2007	1	8 months	T12/L1 fracture-subluxation with conus level cord contusion	Neurologically intact, Decreased rectal tone	Child abuse	Posterior spinal fusion with pedicle. No postoperative bracing	14 months	Neurologically remain intact.
8.	Sieradzki et al. [8]	2008	1	14 months	T12-l1 fracture-dislocation.	Neurologically intact	Child abuse	Hyperextension casting under sedation	22-month	Excellent clinical and radiographic results and remained neurologically intact.
9.	Duffin et al. [16]	2018	1	13 months	Complete retropodylolist-hesis of T12 on L1	Bilateral lower limb paralysis	Child abuse	T11-L1–instrumented fusion	No neurologic recovery	No follow up
10.	Webb et al. [17]	2020	1	29 months	Fracture of the fourth lumbar (L4) vertebral body	NA	Child abuse	NA	Dead approximately two hours after arrival	NA
11.	Thornley et al. [7]	2021	1	2 years	Acute-on-chronic thoracolumbar fracture-subluxation	Progressive neurologic dysfunction	Child abuse	Short-segment pedicle screw instrumentation	12 months	Complete resolution of neurologic impairment



**Fig. 6.** Post-operative anteroposterior and lateral radiograph of patient demonstrating reduction of spinal deformity followed by stabilization with sublaminar K wire spanning, two level above and below the level of injury.

### CRediT authorship contribution statement

**Nilesh Barwar:** Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Supervision, Writing – review & editing. **Param Jit Singh:** Data curation, Investigation, Writing – original draft. **Tarun Goyal:** Conceptualization, Data curation, Formal analysis, Investigation, Project administration. **Pankaj Kumar Sharma:** Conceptualization, Investigation, Methodology, Writing – original draft. **Sanjay Jain:** Data curation, Visualization. **Lakshman Das:** Data curation, Formal analysis.

### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

### References

- [1] World Health Organisation, Country cooperation strategy at a glance: India, Available, [https://apps.who.int/iris/bitstream/handle/10665/136895/ccsbrief\\_ind\\_en.pdf?jsessionid=90BA4E2E08E57D23C4363B8FBDFC85AC?sequence=1](https://apps.who.int/iris/bitstream/handle/10665/136895/ccsbrief_ind_en.pdf?jsessionid=90BA4E2E08E57D23C4363B8FBDFC85AC?sequence=1), 2017 (Accessed 12 Dec 2023).
- [2] D.K. Damodaran, V.K. Paul, Patterning/clustering of adverse childhood experiences (ACEs): the Indian scenario, *Psychol. Stud.* 62 (2017) 75–84.
- [3] G. Fernandes, M. Fernandes, N. Vaidya, P. De Souza, E. Plotnikova, R. Geddes, et al., Prevalence of child maltreatment in India and its association with gender, urbanisation and policy: a rapid review and meta-analysis protocol, *BMJ Open* 11 (8) (2021) e044983.
- [4] V. Choudhry, R. Dayal, D. Pillai, et al., Child sexual abuse in India: a systematic review, *PloS One* 13 (2018) e0205086.
- [5] L. Kacker, S. Vardan, P. Kumar, Study on Child Abuse: India, Ministry of Women and Child Development, Government of India, 2007 (<http://indianet.nl/pdf/childabuseIndia.pdf>).
- [6] N.M. Rajan, J. Vati, Prevalence of child abuse: a review study, *Int. J. Sci. Res. (IJSR)* 10 (10) (2021) 1045–1048.
- [7] P. Thornley, D. Peterson, W. Kishta, Child abuse with thoracolumbar fracture-dislocation treated with pedicle screw fixation in a 2-year-old: a case report, *JBJS Case Connect.* 11 (4) (2021) (e21.0012e9).
- [8] J.P. Sieradzki, J.F. Sarwark, Thoracolumbar fracture-dislocation in child abuse: case report, closed reduction technique and review of the literature, *Pediatr. Neurosurg.* 44 (3) (2008) 253–257.
- [9] L.E. Swischuk, Spine and spinal cord trauma in the battered child syndrome, *Radiol* 92 (1969) 733–738.
- [10] M. Renard, P. Tridon, M. Kuhnast, et al., Three unusual cases of spinal cord injury in childhood, *Spinal Cord* 16 (1978) 130–134.
- [11] P. Diamond, C.M. Hansen, M.R. Christofersen, Child abuse presenting as a thoracolumbar fracture dislocation: a case report, *Pediatr. Emerg. Care* 10 (1994) 83–86.
- [12] W.V. Carrion, J.P. Dormans, D.S. Drummond, M.R. Christofersen, Circumferential growth plate fracture of the thoracolumbar spine from child abuse, *J. Pediatr. Orthop.* 16 (1996) 210–214.
- [13] P.G. Gabos, H.R. Tuten, A. Leet, et al., Fracture-dislocation of the lumbar spine in an abused child, *Pediatrics* 101 (1998) 473–477.
- [14] T.L. Levin, W.E. Berdon, I. Cassell, N.M. Blitman, Thoracolumbar fracture with lissithesis – an uncommon manifestation of child abuse, *Pediatr. Radiol.* 33 (2003) 305–310.
- [15] K.S. Bode, P.O. Newton, Pediatric nonaccidental trauma thoracolumbar fracture-dislocation: posterior spinal fusion with pedicle screw fixation in an 8-month-old boy, *Spine (Phila Pa 1976)* 32 (14) (2007) E388–E393.
- [16] T.S. Duffin, S.W. Thomas, Retrospondyloptosis of the spine secondary to non-accidental trauma, *Case Rep. Pediatr.* 2018 (2018) 4526560.
- [17] M. Webb, S. Sherman, L. Sung, C. Schmidt, L. Hlavaty, Abusive pediatric thoraco-lumbar fracture due to forced hyperextension: case report, biomechanical considerations, and review of the literature, *J. Forensic Sci.* 65 (6) (2020) 2023–2029.