

## SPINAL FRACTURES: EPIDEMIOLOGY AND TREATMENT

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**Abstract:** OBJECTIVE: To carry out an epidemiological survey of spinal fractures and their respective treatment. METHODS: A retrospective bibliographic review study analyzing clinical and epidemiological data from 2010 to 2020. Data such as: age, sex, origin, admission Frankel scale, mechanism of trauma, type of fracture, treatment and complications were evaluated. medical records of 1,917 patients undergoing treatment for spinal fractures. Sites such as SCIELO, LILACS and GOOGLE ACADEMICO were used for research. RESULTS: Most of the patients were male, aged 34 years, from urban origin, where the mechanism of trauma was a fall from a height. Caused by diving in shallow water, it is associated with lesions in the cervical region, younger patients and tends to produce neurological deficit and limits movement. Isolated fractures occurred in 75.6% of the cases, affecting the L1 level more (11.4%), and surgical treatment was indicated in 88.2%, with no postoperative complications in most cases (61.7%). CONCLUSION: spine fractures are a major problem for young people, where they cause many limiting injuries, guidance on the risks of practicing risky sports is very important, as well as the use of protective equipment, there must be preventive educational campaigns for young people who like to practice sports and recreational activities, surgical treatment was the most indicated for spinal fractures, being the main choice for acute treatment.

**Keyword:** Fractures; Surgery; Column

## INTRODUCTION

Spinal fractures are major causes of morbidity and mortality today. The number of patients who arrive at the emergency room suffering from serious injuries is growing, which may evolve with irreversible sequelae, which affect not only the patient, but also the family and society, leading to high costs for

the country. (Zanielli EM et al 2015). With the improvement of training in the initial conduct of the emergency team and prehospital care, the number of patients with severe fractures of the spine that do not evolve to immediate death in large Brazilian centers has increased.

The incidence of neurological injury in spinal cord trauma is 40% in cervical fractures, 20% in thoracic fractures and 15% in lumbar fractures<sup>1,3,4-9</sup>. It is more frequent in male patients, as they are more exposed to high-energy car accidents, urban violence such as gunshot wounds, falls from heights and diving in shallow water. (Koch A. et al 2006)

In the USA, 40 inhabitants per million suffer spinal trauma, and 15% to 20% of these patients evolve with neurological injuries, with a gradual increase in this number each year<sup>1</sup>. These numbers, associated with the high economic and social cost, make spinal injuries one of the most critical public health problems. The existing scientific literature in Brazil provides little information on epidemiological data on vertebral fractures in their various aspects; this fact makes it difficult to implement prevention and care policies for patients affected by this trauma. The objective of this study was to review the studies and clinical-epidemiological profile of spinal trauma in patients, and the main type of treatment performed, conservative or surgical.

NICOL, in 1949, studied 152 patients with 166 fractures of the thoracic and lumbar spine and found that 2/3 of the injuries occurred in the segment between T12 and L2, and that the main injury mechanism was hyperflexion. He also reported that 15% of his patients presented with paraplegia, mainly caused by fracture-dislocations.

National statistics are still very poor in relation to epidemiological data regarding trauma to the thoracic and lumbar spine, but in the USA, according to Montesano

& Benson, 11,000 new spinal cord injuries require treatment each year, with 15 to 20% of patients with fractures of the thoracic and lumbar spine suffer neurological damage. (Montesano, P.X. & Benson, D.R.:)

According to Bracken et al., 40.1 US inhabitants in every one million suffer trauma to the thoracic or lumbar spine each year. This gives a total government expenditure, between direct and indirect costs, of US\$ 250,000.00 per patient per year.

In a study carried out by Gehrig & Michaelis, cases of traumatic paraplegia have been increasing year after year, at a rate of 4% per year. These data demonstrate the importance of studying and preventing trauma to the thoracic and lumbar spine.

Males were the most affected, with 84.74% of cases, in a ratio of 4:1. With regard to etiology, falls from heights, mainly falls from trees, were the main cause, with 26 cases, making a total of 44.06%. Then came traffic accidents, including being run over and motorcycle accidents, in addition to car accidents, with 17 cases (28.81%). The most fractured level was between T10 and L2, with 39 (66.1%). L1 was the most fractured vertebra, with eight cases. More than one vertebra was injured in 22 cases (37.28%), occurring mainly between T12 and L2, with eight cases.

As for the classification of fractures, compression was the most common type, with 40.67% of cases. Next, burst fractures with 30.5% of the cases according to the initial neurological evaluation, 44.06% of the patients were Frankel A, and most of these injuries (53.84%) were produced by fracture-dislocations. Burst fractures were 38.88% in the thoracic spine and 61.11% in the thoracolumbar spine. Of the latter, 44.44% were Frankel A.

## METHOD

Bibliographic review, retrospective study analyzing clinical and epidemiological data from 2010 to 2020. Data such as age, sex, origin, admission Frankel scale, mechanism of trauma, type of fracture, treatment and complications were evaluated in the medical records of 1,917 patients undergoing treatment for spinal fractures. Sites such as SCIELO, LILACS and GOOGLE ACADEMICO were used for research.

## DISCUSSION

Spine injuries are common and diverse and their severity can range from a simple muscle spasm to a severe fracture-dislocation. The diagnosis of isolated soft tissue injuries can often be difficult and require the use of specific complementary tests. On the other hand, fractures, dislocations and fracture-dislocations are more visible on simple X-rays of the spine and perhaps for this reason they are studied more frequently.

The thoracic and lumbar spines present, in their transition, one of the most mobile segments of the spine, second only to the segment between C5 and C7 in the cervical spine. It is logical to admit that, presenting four directions of movement (flexion, extension, laterality and rotation), the thoracolumbar region is one of the most affected by trauma.

Nicoll, Westerborn & Olson and Schmorl & Junghnn (1993) demonstrated in their series that 60% of fractures of the thoracic and lumbar spine predominantly occur in three vertebrae: T12, L1 and L2. Our study confirms this fact, as we found 33 fractures in these vertebrae, making a total of 55.93%.

Aufdermaur concluded, in his study, that spinal injuries in patients under 18 years of age are more frequent than reported. However, Blount, Tachdjian and Hensinger (1959) described that traumatic spinal injuries in children are rare and, when present, are the

result of extremely violent traumas, and it is even rarer that they are accompanied by spinal cord injury. Rang (1953) pointed out that only 5% of cases of traumatic paraplegia occur in children and explained this low incidence by proposing that, as the child's spine is more mobile, the forces applied to it would dissipate more easily over a large number of segments and that the more common would be to find them in polytraumatized children.

In our review, we found no patient in the first decade of life and only ten cases (16.94%) in the second decade. Regarding sex, our data confirm those of the world literature in which men are four times more affected than women.

Pierce & Nickel (1977) identified car accidents and sports injuries as the cause of 70% of spinal injuries in the USA. Montesano & Benson (1993) highlighted that the most frequent cause of spinal injuries are automobile accidents (45%), followed by falls (20%), sports (15%) and acts of violence (15%). In older patients (ie, 75 years or older), falls account for 60% of spinal fractures.

In our review, 26 patients (44.06%) suffered a fall from a height, constituting the main cause in our setting. The second major cause was traffic accidents, with 17 cases (28.81%). We would like to point out here that a patient, after diving in shallow water, suffered a fracture of the cervical spine (C6) and the thoracic spine (T12). Another patient, with epilepsy, suffered a seizure, which resulted in a fracture of the transverse process of L5.

As for the classification of fractures of the thoracic and lumbar spine, we used the proposal by Denis (1983), following the concept of the three columns. Twenty-four patients suffered a compression fracture, which represents 40.67% of the cases. Then come burst fractures, with 18 cases (30.5%). Fracture-dislocations, which according to Holdsworth (1963) are very common in the thoracolumbar and lumbar regions, accounted

for 27.11% of cases, being commonly due to burial and invariably associated with paraplegia.

A total of 87.5% of the fractures-dislocations occurred in the thoracic spine, confirming data from the literature that indicate that this column requires great force to be broken, due to the protection of the rib cage, which gives it inherent stability. In the thoracolumbar passage, nine burst fractures occurred, and five patients evolved without any neurological injury or with a small motor deficit (Frankel D and E), which coincides with the world literature that shows that in this location the medullary canal is wider, allowing some degree of retropulsion, without injuring the medulla (BRADFORD, 1976).

The neurological evaluation was performed following the "Norms for the Neurological and Functional Classification of Spinal Cord Injuries", proposed by the American Spinal Society of Paraplegia (BARROSO 1995). However, 18 patients (30.5%) did not have any sensory or motor deficit. Most paraplegias (53.84%) are due to fracture-dislocations, with cases also occurring in burst and compression fractures. This confirms Holdsworth and Nicoll's findings. In our midst, "seat belt" type fractures are not common, perhaps because we no longer use this type of infra-abdominal belt.

The diagnosis of a spinal cord injury, particularly one accompanied by spinal cord damage, was synonymous with death in the past. In the writings of ancient Egypt, quadriplegia was considered "an untreated condition". Growing advances in the treatment of these injuries have provided a greater expectation of survival in the most severe cases and also in the treatment of the main complications. It is important to emphasize the reports by Holdsworth 1970, who, after evaluating nearly a thousand patients with spinal fractures, concluded that 5% of spinal

injuries caused the patient's death.

## RESULTS

This study showed that most injuries were isolated fractures, which could or could not be associated with more than one level. There were few cases of myelopathy, Sciwora and isolated dislocations. In their study Sekon and Fehlings<sup>8</sup> showed a higher incidence of deviated fractures (40%), followed by burst fractures (30%) and few cases of Sicwora (5%). In 61.7% of the cases there were no post-surgical complications, and the main complications were pressure ulcers in the sacral region and urinary tract infection, important data for the spine surgeon.

The vast majority of fractures, after examination and assessment of the instability criteria, 88% of cases were surgically addressed. Since patients from 1991 were included in this study, older vertebral fixation techniques such as Hartshill and the modern therapeutic arsenal with pedicle screws were used. In their study, Koch et al. reported a predominance of surgical treatment in most cases, 51% for falls from a height and 32% for car accidents. In the study by Zaninelli et al. In 60.9% of their sample, the treatment performed was conservative with a Jewett vest or antigravity plaster immobilization, rest, analgesics and outpatient follow-up<sup>3</sup>.

Surgical treatment was indicated in 88.2% (n=1,691) of the cases, conservative treatment in 7.2% (n=138) and without information in 4.6% (n=88). The most frequent type is isolated fractures 75.6% (n=1,449) followed by cervical myelopathy 5.5% (n=106), dislocation without association with bone fracture 4.3% (n=83), sciwora 0.3 % (n=7), another 5.3% (n=102) and no information in the medical record 9% (n=172).

In 61.7% (n=1182) there were no post-surgical complications, and 12.2% (n=234) had pressure ulcers in the sacral region, 6.4%

(n=122) with urinary tract infection (UTI), 1.6% (n=30) with deep vein thrombosis (DVT), 1.3% (n=25) respiratory infections, 1.2% (n=23) surgical wound infections, 0.6% (n=12) died, 0.3% (n=5) associated fractures of other bones, 1.1% (n=22) and without information in the medical record 3.7% (n=262)

## CONCLUSIONS

Male patients aged between 20 and 40 years were the most affected, where the vast majority of trauma to the thoracic and lumbar spine can be avoided by observing safety items at work, in traffic and at home. The thoracolumbar transition, encompassing vertebrae T12, L1 and L2, was the most affected, representing 55.93% of the cases. Young patients, with a mean age of 34 years, male, from the urban area and victims of falls from heights or

car accidents are the population at risk for fractures and spinal cord injuries. When the cause was diving in shallow water, it is more associated with injuries in the cervical region and tend to present neurological deficit.

The most affected vertebral level were the vertebrae from T12 to L2 in the thoracolumbar transition and C5-C6 in the cervical. The L1 vertebra was most affected without neurological deficit (Frankel E) in most cases. In most cases, surgical treatment was necessary, with few postoperative complications. The authors suggest changes in public policies, especially in urban areas, with educational campaigns and prevention of falls from heights, caution in diving in shallow water and car and motorcycle accidents. Surgical treatment was indicated in most cases, being the main choice for the acute treatment of spinal fractures.

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