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Trauma of the spine: Epidemiological aspects and tomodensitometric in Niamey

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Abstract

Introduction: The trauma of spine is a frequent pathology. It is a pathology of young male adults. Medical imaging in particular CT scan is essential in the precise assessment of traumatic bone lesions of the spine.

Aim: Study the epidemiological and computed tomography aspects of spine trauma in radiology and medical imaging services at the Niamey National Hospital and the Niamey Reference General Hospital.

Materials and methods: This is a retrospective and prospective study about 73 cases collected at Niamey National Hospital and Niamey Reference General Hospital from January 1, 2016 to October 31, 2019.

Results: In this study, male sex was largely predominant. The age group 20-30 was the most represented.

The cervical and back spinal floors were the most explored. The fracture was the most found lesion. The compact fracture is the most recorded fracture in the vertebral body. The cervical spine was the seat of the majority of fractures. The anterior luxation was notified, and like the fracture, it was mainly located at the level of the cervical spine more precisely at the level of C5-C6. The post-traumatic disc hernia was mainly cervical and the location was majority C5-C6. Note the spinal channel was mostly normal.

Conclusion: The trauma of the spine is a frequent pathology which most often affects young male adults. Computed tomography allows a balance of traumatic bone lesions of the spine.

Keywords: Trauma; Rachis; Tomodensitometry; Niger

1. Introduction

The trauma of the spine brings together the lesions of the osteo-disco-ligament system of the spine with or without neurological disorders which occurred following a vulnerable action [1].

They represent surgical emergency and are a reason for regular admission to hospitals, particularly in radiology and medical imaging services. They most often occur in the context of a public road accident or a work accident and are frequently associated with other traumatic pathologies.

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Medical imaging is essential in the balance sheet of traumatic bone lesions of the spine. It intervenes both in diagnosis and in therapeutic surveillance.

Several medical imaging methods are available in particular radiography, computed tomography, and magnetic resonance imaging.

A choice must be made among these available terms in order to best adapt the practice.

Magnetic resonance imaging is systematically requested before the existence of spinal and root signs. This is the ideal examination for the study of the marrow and the perish spaces, making it possible to seek compression or a spinal flow.

The CT scan is increasingly easy to obtain, even in an emergency. Its realization requires few manipulations of the injured. It allows a bone assessment, and is useful for confirming a corporeal fracture or damage to the questionable posterior vertebral wall on standard radiographic shots.

It represents the examination of choice in the event of a bone fragment displaced in the spinal canal [2].

2. Materials and method

The study was carried out in the radiology and medical imaging services of the National Hospital of Niamey and the General Reference Hospital located in Niamey Capital of Niger.

It was a retrospective and prospective, transversal, analytical and descriptive study over 46 months about 73 cases collected from January 1, 2016 to October 31, 2019. The retrospective period extended from January 1, 2016 to February 03, 2017 and the prospective period from 04 February 2017 to October 31, 2019.

The study had focused on patients, of two sexes, of all ages having been addressed to the radiology and medical imaging services of the national hospital of Niamey or the general hospital of reference for computed tomography in a context of trauma of the spine.

3. Results

3.1. Epidemiological aspects

3.1.1. Sex

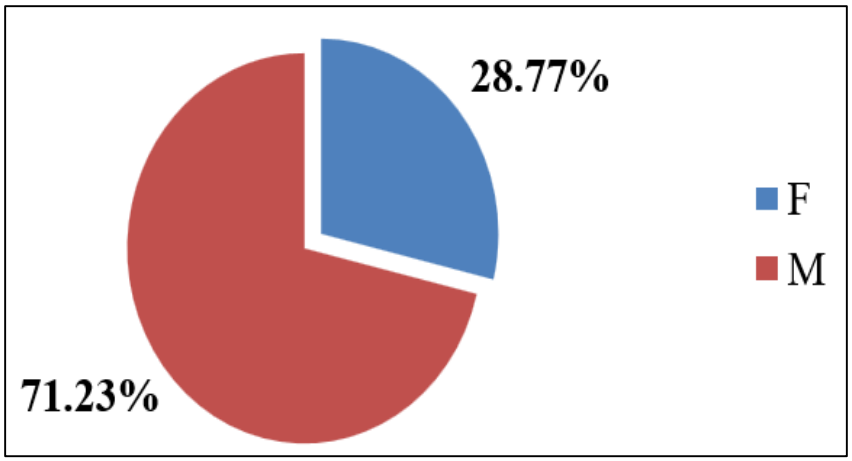

Figure 1 Distribution of patients according to sex

Male sex was most represented with 71.23% against 28.76% for female sex, a ratio sex of 2.47.

3.1.2. Age

The average age of our series was 38 years old with extremes aged 12 and 75.

Table 1 Distribution of patients according to the age group

Age (Year)	Effectifs	Frequency (%)
<20	10	13.71
20-30	17	23.28
31-40	15	20.54
41-50	13	17.80
51-60	10	13.71
>60	8	10.96
Total	73	100.00

The frequency peak was represented by the age group ranging from 20 to 30 years or 23.28%.

3.2. Computed tomography aspects

3.2.1. Explored spinal level

Table 2 Distribution of patients according to the explored spinal level

Spinal Level	Effective	Frequency %
Cervical	37	50.68
Dorsal	14	19.17
Lumbar	13	17.82
Dorso-lumbar	8	10.97
Sacral	1	1.36
Total	73	100.00

The cervical floor was the most explored in 50.68% of our patients followed by the back floor at 19.17%.

3.2.2. Type of lesions

Lesions were found in the scanner in 62 patients or 85% of cases.

Table 3 Distribution of patients according to the type of lesions

Type of lesions	Effectives	frequency %
Fracture	41	66.12
Luxation	4	6.45
Post-traumatic disc herniation	1	1.61
Fracture-luxation	6	9.67
Fracture et luxation	2	3.76
Fracture and herniated disc	4	6.45
Luxation and herniated disc	3	4.33
Fracture, luxation and herniated disc	1	1.61
Total	62	100.00

The fracture was the most found lesion with 66.12%.

The cervical spine is the spinal level most affected by lesions with 50.00%.

3.2.3. Fracture

Table 4 Distribution of patients according to the vertebral part reached by the fracture

Fracture	Effective	Frequency %
Posterior arc	17	31.50
Vertebral body	26	48.14
Vertebral body and posterior arc	6	11.11
Odontoid apophysis	4	7.40
Fracture of the left lateral mass of the Atlas	1	1.85
Total	54	100.00

The vertebral body fracture was largely represented with 48.14%. On the vertebral body, the fracture of the vertebral body was the most observed with 50.00%. On the posterior arc, the fracture of the joint apophyses was the most found with 26.08%.

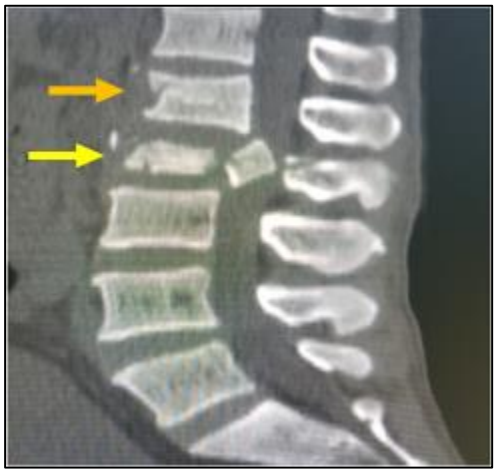

Figure 2 TDM Sagittal cut of the lumbar spine in a bone window. There is a fracture of the vertebral body of L1 (orange arrow) and L2 (yellow arrow). There is a decline in the posterior wall in L2 and a reduction in the canal diameter

3.2.4. The Siege of the Fracture at the Level of the Spinal

Table 5 Distribution of Patients according to the fracture Seat at the level of the spinal level

Set of the fracture	Effectives	Frequency%
Cervical	23	42.59
Dorsal	13	24.09
Dorsal et lumbar	1	1.85
Lumbar	16	29.62
Sacré	1	1.85
Total	54	100.00

The Majority of Fractures Sat at the Level of the Cervical Spine with 42.59%. In the Cervical Spine, C2 and C6 Fractures Were the Most Frequent with 30.43 % and 17.39 % respectively. In Terms of the Dorsal Spine, D12 Fractures Were the Most Representatives or 28.57%. At the Lumbar Spine, L1 Fractures Were the Most Found with 41.17%. In Our Series, Only One (1) Fracture was observed at the level of the Sacred Floor, and this fracture Sat at the Level of S5.

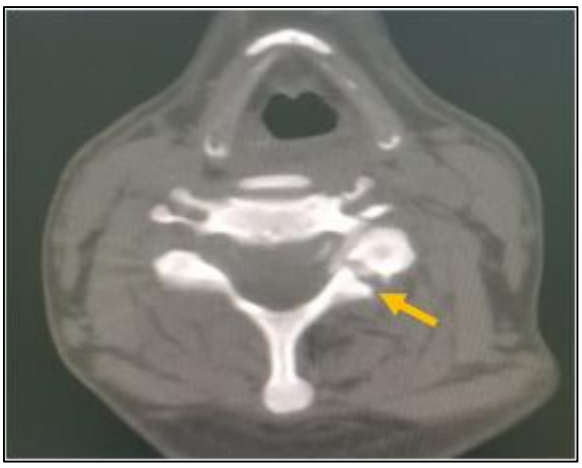

Figure 3 Axial CT cut from the cervical spine at C6 height in bone window. There is a fracture of the leftist articular massif of C6 (orange arrow)

3.2.5. Luxation

Table 6 Distribution of patients according to the type of dislocation

Type of luxation	Effectives	Frequency %
Anterior Luxation	15	93.75
Others luxation (costovertebral luxation of d12 on the left)	1	6.25
Total	16	100.00

The previous dislocation was largely the most common with 93.75%. No later dislocation has been found. Cervical dislocation was the most found with 87.50 %. In cervical dislocations, C5-C6 dislocation was the most observed with 42.85%. In terms of the dorsal spine, the D4-D5 and costo-vertebral dislocations of D12 left had been found with the same proportion, or 50.00% of back dislocations. No lumbar dislocation has been observed.

Figure 4 Sagittal cutting upstream of the cervical spine in a bone window. There is an anterior dislocation in C5C6

3.2.6. Post traumatic disc herniated

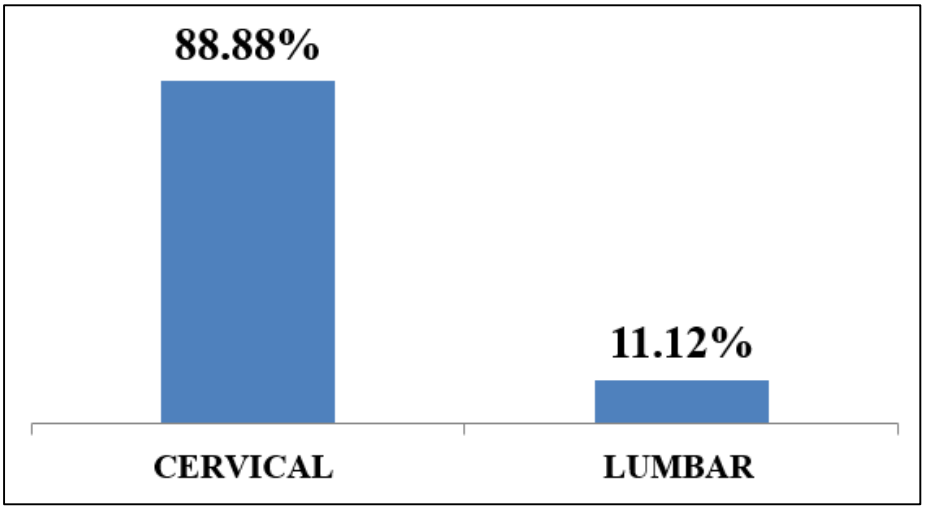

Figure 5 Distribution of patients according to the seat the hernia post traumatic disc

In this series, the hernia post traumatic cervical was the most represented with 88.88% of the cases. Post traumatic disc hernia C5-C6 was the most frequent with 50% of the cervical location. No dorsal hernia has been recorded. A single case of post-traumatic disc hernia was found at level L1-L2.

3.2.7. Stew of the spinal canal

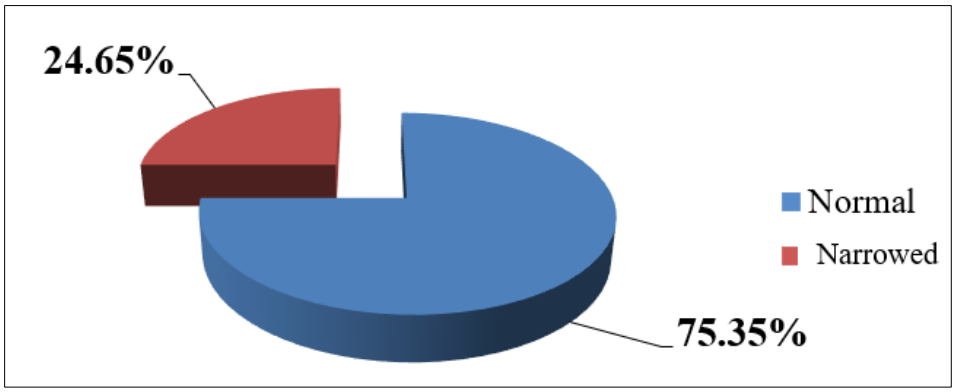

Figure 6 Distribution of patients according to the state of the spinal canal

Alone in 24.65% of cases the spinal canal was narrowed

4. Discussion

During the study period, we collected 73 cases of spine trauma.

Male sex was largely predominant at 71.23%, a ratio sex of 2.47. Our result is in accordance with the data of the literature according to which male sex is the most affected by the trauma of the spine. Indeed, our result is superimposable to those of other authors [3;4] with 80.55% and 69.78% respectively. Men are the most active in our society and they are the ones who use the two -wheeled machines (motorcycles) most often in public road accidents.

One of the characteristics of our series was its young age. Indeed, the age group of 20-30 was the most represented with a frequency of 23.28%. The average age of our series was 38 years with extremes of 12 and 75 years.

The trauma of the spine is a pathology of the young subject. This predominance of young male adult victim of spinal trauma is comparable to the data of the literature [5]. It is the most active layer of the population and the most exposed

to accidents of the public highway with high velocity. In addition, the African population in general and Nigerian in particular is young. Indeed, the average age in Niger is 22.6 years.

In the study, the cervical and dorsal spinal floors were the most explored with 50.68% and 19.17% respectively. The circumstances of the occurrence of trauma of the spine were the accidents of the public road which are rather responsible for cervical lesions. By cons in the event of a fall, the backward lesions predominated [6].

In the study, the CT of the spine had returned pathological with 84.93% of cases, while it was normal with 15.07%.

The fracture was the most recorded lesion in our series with a frequency of 66.12% followed by fracture-luxation with 9.67%, dislocation, and fracture with hernia post traumatic disc or 6.45% each. The considerable mobility of the spine and the varied mechanisms according to the etiological context. In the study, the fracture and the fracture were the most frequent lesions at the cervical level, as much as in the dorsal and lumbar level it was the fracture. These results are different from those of the literature with regard to the cervical spine where there was a predominance of dislocations and fractures, while they are identical at the dorsal and lumbar level where the fracture was the most frequent lesion. Indeed, this high frequency of fractures in our study could be justified by the fact that our study had concerned the spine in its entirety.

The cervical spine is the spinal floor most affected by lesions with 50.00%.

This same predominance of cervical spine lesions was also reported by Obame et al [7] in Gabon with 77.3%. This unequal distribution of lesions at the different cervical, dorsal and lumbar spinal stages would be linked to the physiological characteristics of these different spinal segments. Indeed, the cervical segment of the spine has the greatest amplitude of mobility. Due to its static function, the spine supports body weight and is subject to compression forces which become increasingly important from the cervical region to the lumbar region.

In this series, the fracture of the vertebral body was the most represented fracture, i.e. 48.14% of fractures, followed by the fracture of the posterior arc with 31.48% of fractures. This result remains superimposable to that of Obame et al in Gabon which had found 41% of fractures of vertebral bodies [7]. The vertebral body is the anterior part of the vertebra. This position could justify that it is the most affected vertebral part in case of spine trauma because of the cervical and dorso-lumbar stages, the most involved mechanisms are respectively the hyper flexion and the flexion-compression [8] Particularly in accidents of the public highway.

Within the vertebral body, it is the fracture of the vertebral body which is the most frequent with 50.00% of the fractures followed by the fractional fracture of the vertebral body and the fracture of the vertebral body with fracture of the posterior wall or 21, 87% each. In case of traumas of the spine, the fracture compassionate of the vertebral body is the most frequent lesion at the dorso-lumbar level whose lesional mechanism is flexion-compression. This explains that it is the fracture of the most represented vertebral body in the study.

For the posterior arc, it was the fracture of the articular apophyses which was the most rated or 26.08% of the arc fractures, followed by the blades fracture with 17.39%.

In the study, 42.59% of fractures sat at the level of the cervical spine followed by lumbar spine with 29.62%. This could also be explained by the fact that the cervical spine is the most mobile spinal segment, but also in our context the accidents of circulation pathways are the most frequent causes of trauma of the spine.

In the cervical spine, C2 fractures were the most frequent or 30.43%. On the other hand, fractures of the lower cervical spine were the most frequent. These results are identical to those of the literature which shows a predominance of fractures of the lower cervical spine [9].

This predominance could be linked to the great mobility of the lower cervical spine compared to the rest of the spine and it is the most exposed part of the spine during public road accidents.

More specifically at the level of the upper cervical spine it was the fractures the odontoid apophysis which were the most frequent with 50.00%. In the literature, the frequency of odontoid fractures varies between 54.50% and 46.66% in favor of the odontoid fractures [6; 10]. It should be noted that the odontoid is the pivot around which is the majority of the movements of the cranio-cervical hinge. Odontoid fractures represent approximately 40 % of axis fractures. The most common fracture of the tooth occurs at its base, that is to say its junction with the body of the Axis. On the other hand, in our study, the fractures of the odontoid represented 57% of the fractures of the axis. As for the lower cervical

spine, C6 fractures were the most represented with 26.66%. Similarly, C6 is part of the C5-C6 hinge which is the most affected cervical part in the event of trauma of the spine and the most mobile area of this spinal segment [8; 9]. In terms of the dorsal spine, D12 invoices were in the majority of 28.57% followed by D5 in 14.28%. This predominance of fractures observed at level D12 is explained by the fact that D12 is located at the level of the dorso-lumbar hinge.

The latter, which designates by use the region located between the tenth dorsal vertebra and the first lumbar vertebra (D10-L1), is very vulnerable to fracture lesions with possible serious functional repetitions when they are associated with neurological disorders; Due to its pivotal position between a relatively small dorsal segment and a dynamic and mobile lumbar segment.

As for the lumbar spine, fractures were 41.17% at the L1 level. Those of L2, L3, L4 were represented at the equal frequency of 11.76%. This large predominance of L1 fractures is consistent with the explanation given at the D12 level according to which the thoracolumbar hinge represents a predilection location for trauma.

In addition, at the level of the thoracolumbar spine according to the literature the site of the most frequent lesions is at the level of the thoracolumbar hinge. It plays the role of a pivot around which the rib cage moves in all directions. Several authors agree on this topography [11;12].

Anterior dislocation was by far the most frequent with 93.75% of dislocations followed by other dislocations (left costovertebral) with 6.25%. No posterior dislocation was found. Dislocation constitutes a more severe damage to the mobile spinal segment manifested by the deaptation of one or both posterior joint masses. The radiological diagnosis is made by a characteristic image of ante-spondylolisthesis with attachment of the joints (the lower joints of the overlying vertebra come in front of the upper joints of the underlying vertebra).

The explanation for this large predominance of anterior dislocations would be given by the fact that the mechanism of cervical dislocations, which are the most frequent, is hyperflexion associated with distraction.

The dislocation was located at the cervical level in 87.50% followed by the dorsal level in 12.50%. Note that no lumbar dislocation was recorded.

Proof of this large predominance of cervical dislocations would be provided by the fact that the cervical spine is the most mobile spinal segment, therefore more exposed to trauma. Because their facet joints are oriented more horizontally than at the level of the other vertebrae, the cervical joints are less firmly interlocked than the others. Likewise, at the cervical level, the most common type of injury reported in the literature is dislocation or subluxation. It should be noted that at the dorsal and lumbar levels, dislocations are rare lesions. Indeed, dislocation of the vertebrae in the thoracic and lumbar regions is not usual due to the locking of their articular processes. At the cervical level, 42.85% of dislocations were located at the C5-C6 level. In the literature, it is the C5C6 hinge which is most affected in spinal trauma due to the fact that it is the most mobile area of this segment [9].

In the study, post-traumatic disc herniation occurred in 88.88% at the cervical level, and in 11.11% at the lumbar level, i.e. 8 cases and 1 case respectively. No dorsal disc herniation was found. However, it should be noted that post-traumatic cervical disc herniation is extremely rare (3.8% of cervical trauma) [13]. At the cervical level, the location of post-traumatic disc herniation C5-C6 was the most represented with 50% of all cervical disc herniations. In their study, Youssef K et al [14] described a case of post-traumatic C5-C6 disc herniation, the diagnosis of which was made on CT scan.

The spinal canal was narrowed in 24.65% during our study with signs of compression. The latter is independent of the traumatized spinal segment and remains very significantly linked to spinal instability. However, it should be noted that CT scanning is not the appropriate examination to explore the spinal cord; The ideal examination to accurately identify spinal cord injuries remains magnetic resonance imaging.

5. Conclusion

It emerges from this study that the trauma of spine is a frequent pathology which most often affects young male adults.

The CT scan carried out had most often concerned the cervical spine. In addition, it was mainly pathological, with the fracture as the most frequent lesion followed by fracture-luxation, dislocation, and fracture with hernia post-traumatic disc. The vertebral body was the vertebral part most affected by the fracture compared to the posterior arc, with as a predominant fracture respectively the complaint and the fracture of the joint apophyses. Anterior dislocation is the

most found type of dislocation, it frequently sat at the level of the cervical spine more precisely at the level of the lower cervical spine. It is the same for the post-traumatic disc hernia which was mainly cervical. Note that the spinal canal was normal in most cases.

Compliance with ethical standards

Disclosure of conflict of interest

The authors declare no conflict of interest.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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