



Difficulties in the Management and Prognosis of Cervical Spine Trauma in a Regional Neurosurgery Unit in a Developing Country: The Example of Senegal

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Abstract

Introduction: Traumatic injuries of the cervical spine are frequent and are complicated in 15 to 30% of spinal cord injuries. The prognosis depends on the initial spinal cord injuries and the speed of management. We report our experience in order to evaluate our results and to reveal the difficulties of managing these injuries in our work context.

Materials and methods: over a period of 5 years from January 2015 to December 2019, we retrospectively studied 107 cases of cervical spine trauma in the neurosurgery unit of the regional hospital of Thiès (Senegal).

Results: The mean age was 35.7 years with a sex ratio of 12.3. The frequency was 67.7% of all vertebro-medullary traumas. The etiologies were dominated by road accidents (69.2%) with only 10.28% of medicalized transport and an average admission time of 50.28 hours. Neurological signs were present in 77 patients (71.9%) with an ASIA A score in 35.5% of cases and an ASIA B in 18.7% of cases. Dislocations were the dominant lesions (60.7%). Surgery was performed in 75 patients (70%) with complete improvement of motor deficit in 7 cases. The average delay was 34 months.

Conclusion: This study shows the difficulties of management in our context of patients suffering from cervical spine trauma, due to the failure of the emergency management system and the absence of specialized rehabilitation structures for follow-up care.

Keywords: Trauma; Spine; Cervical; Thies

Abbreviations

RHC: Regional Hospital Center; MRI: Magnetic Resonance Imaging; UCS: Upper Cervical Spine; A-A: Anderson and Alonzo's Classification; ODB: Oblique Down and Back; ODF: Oblique Down and Forward; LCS: Lower Cervical Spine; NCC: Narrow Cervical Canal.

Introduction

Traumatic lesions of the cervical spine are frequent and potentially serious [1]. They are observed in 2-3% of polytraumatized patients and up to 45% of severe head injuries [2]. In Europe, cervical spine trauma accounts for 45% of vertebro-medullary trauma [3]. They are complicated in 15 to 30% of cases of spinal

cord injury [2,4]. The prognosis depends on the initial spinal cord injuries and the speed of treatment [5]. While upper cervical spinal cord injury is often life-threatening, lower cervical spinal cord injury can sometimes result in serious neurological sequelae that require a multidisciplinary medical and paramedical approach to avoid complications. The final outcome is then the result of several factors, ranging from the efficiency of the spine trauma emergency management system to the rehabilitation structures [5]. In our context, this chain of care is deficient at various levels, especially in the areas of collection, transport and follow-up care, including rehabilitation with complications of often lethal decubitus.

We report our experience in order to evaluate our results and to reveal the difficulties encountered in the management of these injuries in our work context.

Material and Methods

This was a 5-year retrospective study from January 1, 2015 to December 31, 2019, at the neurosurgery unit of the Regional Hospital Center (RHC) of Thiès, covering 107 cases of cervical spine trauma treated in the said unit. The parameters studied were frequency, age, sex, circumstances of the trauma, mode of transport, admission mode, admission delay, ASIA score, associated lesions, paraclinic (standard radiography, CT scan and magnetic resonance imaging), type of treatment, in case of surgical treatment: delay, approach, osteosynthesis material used, length of hospitalization, anatomical reduction, neurological evolution, complications, fusion rate. The data were analyzed using SPSS version 18 software.

Results

During the study period, 158 cases of spinal trauma were recorded, among them there were 107 cases of cervical spine trauma, a frequency of 67.7% with 12 cases of upper cervical spine trauma (11.2%) and 95 cases of lower cervical spine trauma (88.8%). The mean age was 35.7 years (extremes: 10 and 65 years) with a clear male predominance, 99 men (92.5%) and 8 women (7.5%), i.e. a sex ratio of 12.3. The etiologies were variable, dominated by road traffic accidents. Table 1 summarizes the etiologies. Patient transport was non-medicalized in 89.71% of cases compared to 10.28% medicalized transport. Patients were transported directly from their accident sites to the emergency room of the Thiès RHC in 28.9% of cases, while 71.2% of patients were transferred from another health facility. The average admission time after the trauma was 50.28 hours with extremes of 2 hours and 408 hours (17 days).

Etiologies	Staff	Percentage
Road accident	74	69,2
Falls	28	26,2
Others	5	4,7
Total	107	100,0

Table 1: Distribution of patients by etiology.

On admission all patients had a spinal syndrome. Torticollis was observed in 35 patients (32.7%) and cervico-brachial neuralgia in 3 patients (2.8%).

Neurological signs were varied and present in 77 patients (72%) with ASIA score A or B in 54.2%, sphincter disorders 29.9%,

priapism 15.5%, Babinski’s sign 79.2% and respiratory distress with hemodynamic instability in 19.6%.

Associated lesions were noted in 21 cases (19.6%), they were mainly head injuries.

The radiological assessment included a cervical spine CT scan in all patients, a cervical X-ray in 105 patients and a complementary magnetic resonance imaging (MRI) in 9 patients, which revealed a variety of lesions (Table 2, Figures 1, 2), dominated by dislocations in 45 cases (42%).

Treatment was orthopedic in 32 patients (30%), consisting of a foam cervical collar for 2 weeks in mild sprains and a rigid cervical collar for 2 to 3 months in other lesions. Surgery was performed on 75 patients (70%). Only 19 patients or 26% were operated on within one week of admission. Figure 3 summarizes the operating time after admission. Seventy-four patients underwent anterior surgery and one patient underwent posterior surgery, 70 patients underwent an iliac graft arthrodesis with targeted plate osteosynthesis, 4 patients underwent an iliac graft arthrodesis alone without plate and one patient underwent posterior screw fixation. Anatomical reduction was achieved in 99% of cases (74 patients) with a fusion rate of 89.3%.

Radiological injuries	Staff
UCS lesions	12
Type II A-A (ODB)	5
Type II A-A (ODF)	2
Jefferson Fracture	4
Hangman fracture	1
LCS injuries	95
Tear drop	8
Burst	2
Fracture and uniaxial dislocation	6
Mild sprain	27
Uni-articular dislocation	1
Herniated disc	1
Biarticular dislocation	45
Contusion on NCC	1
Severe sprain	4
Total	107

Table 2: Distribution of patients according to radiological lesions. UCS: Upper Cervical Spine; A-A: Anderson and Alonzo’s classification; ODB: Oblique Down and Back; ODF: Oblique Down and Forward; LCS: Lower Cervical Spine; NCC: Narrow Cervical Canal.



Figure 1

- a) Cervical MRI sagittal section T2 sequence: herniated C3-C4 disc.
- b) Cervical X-ray profile: C3-C4 interbody graft and screw plate osteosynthesis.



Figure 2

- a) Cervical CT scan sagittal section: Anderson and Alonzo's type II odontoid fracture (ODB)
- b) Profile occipito-cervical radiograph: occipito-cervical osteosynthesis.

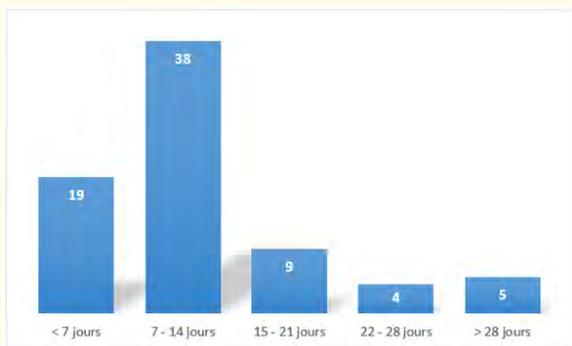


Figure 3: Operating time after admission.

The average length of hospitalization was 17.36 days with extremities ranging from 11 days to 34 days for surgical treatment and 9.5 days with extremities ranging from 2 to 18 days for orthopedic treatment. At discharge, nursing was provided mainly by the patient's family and friends. Rehabilitation was done on an outpatient basis regardless of the patient's neurological condition, usually two to three times a week.

Our average follow-up time was 34 months.

Neurological recovery was complete in 7 cases, partial in 66 cases, stationary in 33 cases and a worsening in one case. Table 3 shows the evolution of the ASIA score at admission and at the end of treatment.

	On admission Post-therapy			
	Frequency	Percentage	Frequency	Percentage
A	38	35,5	33	30,8
B	20	18,7	13	12,1
C	11	10,3	14	13,08
D	8	7,5	10	9,3
E	30	28	37	34,5
Total	107	100	107 ^a	100

Table 3: Distribution of Patients by ASIA Score at Admission and Post-Treatment.

^aIncludes deceased patients.

Complications were varied, and included 1 case of neurological aggravation by graft migration, 2 cases of pseudarthrosis, 2 cases of lower limb thrombophlebitis, 21 cases of pressure ulcers, 7 cases of surgical site infection, 13 cases of urinary tract infection, 2 cases of lung infection, 1 case of esophageal perforation, and 7 cases of death, representing a mortality rate of 6.5% of cases. We noted 2 cases of intra-hospital death secondary to respiratory distress and 5 cases of death at home following complications of decubitus (table of severe sepsis).

Discussion

Trauma in general, and spinal trauma in particular, is a public health problem in developing countries because it usually affects the most active population [6,7]. The cervical spine is affected in more than 50% of cases because it is the most mobile part of the entire spine [8]. Our series involved 67.7% of cervical segment

trauma over the entire spine trauma during the study period. Traumatic lesions of the cervical spine can affect either the upper cervical spine (C0-C2) or the lower cervical spine (C3-C7) or rarely both at the same time. However, data from the international literature show a predominance of lower cervical spine injuries [1,9,10]. In our series, the lower cervical spine was the most affected with 88.8% compared to 11.2% for the upper cervical spine. There were no recorded cases of mixed involvement.

The vast majority of cervical rachis trauma affects young adults between 15 and 35 years of age, with an average age of 30 years [11], 35.7 years in our series and 36.1 years in the Dakar series [5]. The male predominance noted in our series is consistent with data from the literature [3-5]. As in our series, by far the most frequent cause reported in the international literature remains road accidents [3-5].

In our work context, the conditions of pick-up and transport are still not well specified at the time of questioning, but in our series, it was non-medicalised transport in 89.71% of cases compared to 10.28% medicalised transport. This is due to the lack of personnel trained in the logistics of collecting patients and the low availability of medicalized means of transport. Nearly thirty percent of patients were transported directly from their accident sites to the emergency room of the Thiès Regional Hospital, compared to 71.2% of patients transferred from another health facility. This transit of patients through several hospitals before being transferred to our center, would explain on the one hand the longtime of admission of patients which was 50.28 hours on average in our series against 10 hours in South Africa [12] and 53 hours in Nigeria [13], probably this admission time is less long in developed countries, it is 1.9 to 6.5 hours in France [14]. This long admission time is also explained by the fact that the population is more isolated than the care structures.

When the traumatized patient was admitted to our hospital structure, the clinical examination began with the search for vital distress (circulatory, respiratory), 19.6% in our series. Once the vital emergency was eliminated, a detailed and meticulous clinical examination was carried out to guide the diagnosis of the lesion, the radiological assessment and consequently the therapeutic strategy.

In our series, all patients presented with spontaneous or induced cervical pain, 68.8-95% in series [15,16], 32.7% with tor-

ticollis, 15.9-63% in series [15,16], and 2.8% had cervico-brachial neuralgia.

More than half (54.2%) of our patients had a severe neurological deficit (ASIA A or B) at admission, predictive of a poor functional prognosis [8,17]. Computed tomography remains the first-line examination in the exploration of the neurological traumatic spine [18,19], performed in all patients in our series. Magnetic resonance imaging was performed in 8.4% of cases and only in cases of radio clinical discordance. The initial lesions were dominated by dislocations (42%) and tear drop (7.5%), which explains the severe neurological impairment in the majority of our patients.

Due to the predominance of unstable lesions, most patients received surgical treatment (70%). In some cases, this was mainly palliative to allow nursing. The waiting time for this surgery after the patient was admitted to our unit was also significant, with only 19 patients, or 26%, undergoing surgery within a week of admission. This would be linked to the combination of several factors (lack of financial means, unavailability of osteosynthesis equipment).

Cervical spine surgery can be performed anteriorly, posteriorly, or by double (mixed) approach [20]. However, as in our series, the anterior approach remains the most commonly used, as evidenced by the series of Ordonnez, *et al.* [21], Kalf, *et al.* [22] and P.M. Loembe, *et al.* [23]. It is most often an anterior osteosynthesis almost always involving a plate and a graft, 93.3% in our series, 62.21% in the series of P.M. Loembe, *et al.* [23].

The average length of hospitalization was 17.36 days with extremities ranging from 11 days to 34 days after surgery and an average follow-up of 34 months.

In the absence of hospitalization and rehabilitation facilities specialized in follow-up care for patients with major neurological deficits, at discharge nursing was provided mainly by the patient's family and friends who had no expertise in this field, which increased the risk of complications and compromised neurological recovery. Despite these hazards, the neurological evolution (complete recovery in 6.5% of cases, partial recovery in 61.6% of cases, stationary in 30.8% of cases and worsening in 0.9% of cases) and mortality (7 cases or 6.5%) were acceptable. The majority of patients died at home (5 cases) due to decubitus complications. The main causes of death were infections (urinary, respiratory) and pressure ulcers due to malnutrition.

Conclusion

This study shows the difficulties of managing in our context patients suffering from cervical spine trauma, illustrated by dysfunctions ranging from the failure of the emergency management system to the absence of rehabilitation structures specialized in follow-up care, transplanted from the low socio-economic level of most patients and the low availability of osteosynthesis materials. It is therefore important to develop a policy for the management of these patients based on the establishment of an efficient emergency system and the creation of specialized functional rehabilitation centers to receive patients with severe neurological deficits and especially the strengthening of preventive measures, especially for traffic accidents.

Conflict of Interest

The authors declare that there are no financial conflicts or conflicts of interest.

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