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Slow Non-Traumatic Spinal Cord Compression in Children: Diagnosis and Management in Sub-Saharan Africa, Case of Senegal at the Fann National University Hospital Center (Dakar)

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Abstract

Introduction: Slow non-traumatic spinal cord compression in children is a diagnostic and therapeutic emergency. In our milieu the arrival of new imaging techniques such as magnetic resonance imaging, has considerably improved the diagnosis and prognosis of this condition. The aim of this work is to give the first view of Slow non-traumatic spinal cord compression in children by describing the epidemiological, clinical, therapeutic aspects and to know the etiologies in our context. **Patients and Methods:** This study is a retrospective, concentric study involving 57 children under 18 years old, collected at the Neurosurgery department of the National University Hospital Center (CHNU) of FANN, from January 1, 2010, to December 1, 2022. **Results:** The annual frequency was 4.38 cases. The average age was 9 years old. Adolescents represent 65% of the population. There was a male predominance with a sex ratio of 1.85 (37/20). Clinically, motor deficit, vesico-sphincteric disorders and lower back pain were the main reasons for consultation. The predominant FRANKEL classification stages were stages A. Standard radiography and spinal CT were performed in 4 and 31 children respectively. Only 26 children received spinal cord MRI. Topographically, the lesions predominated at the dorsal (34 cases) and cervical (10 cases) levels. Etiologically, infectious causes predominated with 27 cases followed by tumor causes (16 cases). 52 children (91.22%) benefited from surgical treatment. The evolution is favorable for 80% and stationary for 5%. Four children presented complications of recumbency: 2 cases of suppuration of the operating wound and 2

cases of thrombophlebitis. 20 children benefited from post-operative physiotherapy. **Conclusion:** Slow non-traumatic spinal cord compression in children remains a diagnostic emergency. In Senegal, infectious etiologies remain predominant. It would be important to strengthen primary and secondary prevention and improve the socio-economic conditions of the population.

Keywords

Slow Non-Traumatic, Spinal Cord Compression, Child, Senegal

1. Introduction

Non-traumatic slow spinal cord compression (SCC) is defined as a pathological process that, through mechanical and/or vascular phenomena, leads to a progressive loss of spinal cord function in the absence of trauma [1] [2]. In children, it remains a rare [3] [4] and under-evaluated pathology. Etiologies vary depending on the region. Treatment is mainly surgical. The prognosis is essentially functional and depends on early diagnosis and medical-surgical treatment. However, when discovered late, SCC in children presents neurological complications that are sometimes irreversible and sometimes fatal. In sub-Saharan Africa, few studies are devoted to it [3]. The scarcity of scientific work is an argument that motivated us to conduct this study.

2. Materials and Methods

This is a retrospective study of 57 children under 18 years of age collected at the neurosurgery department of the National University Hospital (CHNU) of FANN, from January 1, 2010, to December 1, 2022. All were included in our study. Children presenting clinical signs of spinal cord compression as well as signs of radiological compression. The etiological diagnosis was made on the basis of biological examinations and samples taken in the operating room. All children benefited from a follow-up of at least twelve months. In this study, we describe the epidemiological factors, including age and sex, clinical presentation with Frankel classification, imaging to identify the site of injury by spine CT and MRI, injury management including surgery, indication, time before surgery, associated therapies such as physiotherapy, etiologies and deficit in recovery progression. Data collection was performed on medical records using a survey form.

3. Results

During this study, the annual frequency was 4.38 cases. Pediatric CML accounted for 9.1% of all CML treated during our study period. The mean age was 9 years. Adolescents represented 65% Population. There was a male predominance with a male-to-female ratio of 1.85 (37/20). The average consultation time was 3 weeks, with extremes of 2 days and 8 weeks. Clinically, motor deficit, bladder-sphincter

disorders and lower back pain were the main reasons for consultation. The most common FRANKEL classification was stages A in 52.3%, C and D in 14.3% each and finally stages B and E which were found in 9.5% each. Spinal CT was performed in 31 children and spinal MRI in 26 children, of which the following are some examples.

Topographically, the lesions predominated at the dorsal level with a percentage of 59.6% (n = 34 cases) followed by the cervical level with a percentage of 17.5% (n = 10 cases). The dorsolumbar location was found in 14% (n = 8 cases), and cervico-dorsal in 8.7% (n = 5 cases).

Fifty-two children, or 91.2% of patients, received surgical treatment. This consisted of laminectomy in most children and sometimes combined with osteosynthesis, mainly in adolescents, or orthopedic retention in younger children. The outcome was favorable in 80% of patients, with recovery of walking in 65% of patients, and 15% of patients remained stationary.

In 15% of patients, there were complications of decubitus with two cases of suppuration of the surgical wound and two cases of thrombophlebitis which were treated. All patients received physiotherapy.

Etiologically, infectious causes predominated with 71.93% (n = 41 cases), followed by tumor causes which represented 28.07% (n = 16 cases). The main germs found were Mycobacterium tuberculosis, Proteus mirabillis and Staphylococcus aureus. Pott's disease alone was found in 61.4 (n = 35) of these infectious etiologies.

4. Discussion

The frequency of non-traumatic slow spinal cord compression in children is difficult to assess in the literature due to the lack of studies specifically concerning this age group. The annual frequency was 4.38 cases in our series and adolescents represent 65% of the population. This is consistent with the results of some authors [5]. The male predominance observed in our series is consistent with the literature [3] [5].

Clinically, motor deficit, bladder-sphincter disorders, and low back pain were the main reasons for consultation. In general, clinical symptoms differ little from those in adults, but it is more difficult to demonstrate spinal or radicular pain in young children. The appearance of gait disturbances, more specifically motor deficits, remains the most worrisome sign for parents. Low back pain associated with sphincter disorders in a child should prompt a diagnosis. In our environment, the absence of local health structures and the lack of financial means to pay for a consultation are responsible for a delay in diagnosis which makes the treatment ineffective and thus compromises the functional prognosis of the patient.

Spinal cord imaging remains the fundamental diagnostic examination [6] [7]. It was performed in 84% of cases in Morocco [5]. In our series, 45.6% of patients had recourse to spinal cord MRI because it is still very expensive in our regions. This partly explains the numerous indications for CT in our series. The latter

remains the first examination of our spinal sphere due to its emergency availability and its excellent qualities concerning the visualization of the bone. However, standard frontal or profile radiography retains its place in infectious pathologies. It provides an etiological orientation by showing a bone modification. In our series, the dorsal site remains predominant. This is in line with pediatric studies where infectious lesions predominate [8].

Unlike in northern countries where tumor causes predominate [2], in sub-Saharan Africa, infectious etiologies remain predominant [3] [4]. Tuberculosis remains a public health problem. Treatment of Pott's disease is medical and/or surgical with anti-tuberculosis drugs for at least 12 months. Several other rare etiologies have been reported in children in recent years. Aka *et al.* [9] reported acute myeloid leukemia in a 14-year-old adolescent while AK Doléagbénou *et al.* [10] [11] found cervical spine involvement in Langerhans histiocytosis in an 8-year-old child.

The treatment of spinal cord compression remains essentially surgical. It relies on relieving radiculomedullary compression as quickly as possible. In our series, it was performed in all children at the dorsal level. This is explained by the difference in the etiologies of the studies. However, laminectomy remains the treatment of choice. It is performed in an emergency context. This is low compared to the literature [1] [9] [10]. Laminectomy allowed tumor excision in 3 patients, biopsy and cystectomy in three patients each. While several authors agree on the role of laminectomy, it can be discussed if the diagnosis is late, as cure is uncertain. We noted no cases of surgical revision. Medical treatment was initiated in all patients for analgesic and inflammatory purposes. Five children did not benefit from surgery. This is partly explained by the fact that the predominant infectious causes in our series sometimes require medical treatment with antibiotics or antituberculosis drugs. Postoperative complications were mainly decubitus complications occurring in tetraplegic patients. The two children with lower limb thrombophlebitis received curative-dose anticoagulant therapy with good progress. Mobilization and verticalization remain the best prevention of limb complications. Suppuration occurred in patients with dorsal potitis and poor postoperative home hygiene. Treatment consisted of debridement combined with appropriate antibiotic therapy.

The prognosis is generally good when treatment is administered early. Surgical treatment achieved decompression and halted the progression of the compression. It promoted the regression of concomitant disorders. Recovery of walking was satisfactory in 65% of cases. The outcome is more favorable in children than in adults. Children have a high capacity for bone marrow recovery. In our series, rehabilitation is indicated in all patients with deficits and within a short period after surgery.

5. Illustrative Case

4-year-old child complaining of dorsal hump and progressive paraplegia. The

Figure 1 shows the presentation aspect of the deformation causes by kyphosis.

Figure 1. Illustration of a dorsal kyphosis with humpback, probably suggesting Pott's disease.

Computed tomography imaging of the spine reveals a discovertebral osteolytic lesion at D9D10 with kyphosis as shown in Figure 2.

The surgery was performed with two levels of laminectomy plus fixation, after physiotherapy during the temporal follow-up, it recovers the neurological deficit.

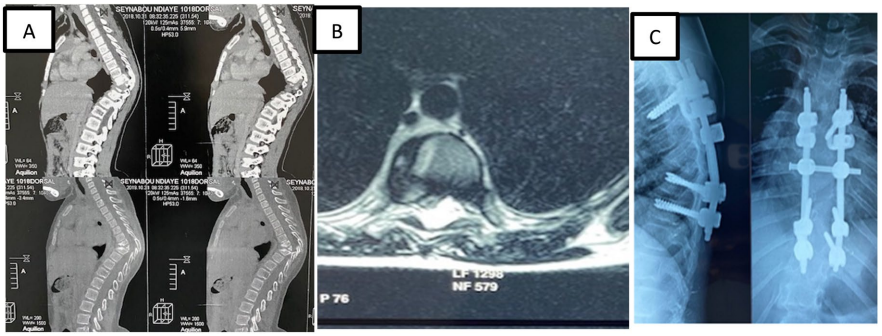

Figure 2. (A) Sagittal section CT scan of the spine and (B) Axial section MRI showing a discovertebral osteolytic lesion suggestive of dorsal spondylodiscitis at the level of D9-D10 with significant kyphosis and compressive epiduritis on the spinal cord, (C) Post-operative fixation radiograph.

6. Conclusion

Slow non-traumatic spinal cord compression in children is an emergency diagnosis. In Senegal, infectious etiologies remain predominant, with Pott's disease at the forefront. It is important to strengthen primary and secondary prevention and improve the socioeconomic conditions of the population.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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