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Clinical Overview of Chronic Osteomyelitis Complications

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Abstract

Introduction: Chronic osteomyelitis is a hematogenous infection of the bone that often leads to disabling orthopedic complications. This study aimed to describe the anatomical, clinical, and radiological aspects of the sequelae of this pathology observed at Idrissa Pouye Hospital. **Materials and Methods:** We report a continuous retrospective descriptive study of 36 patients collected over an 11-year period (from January 1, 2005, to December 31, 2016). **Results**: We noted 185 cases of chronic osteomyelitis. Thirty-six of them (36) had presented complications and/or orthopedic sequelae. The average age was 15.8 years, with a clear male predominance (75%; sex ratio = 3). The main reason for consultation was chronic fistula (44.4%). Sickle cell disease was found in 16.7% of cases. Sequelae mainly affected the lower limbs, with leg length discrepancy (19.4%), axial deviations (30.6%), and joint stiffness (54.3%). Radiological osteocondensation (91.7%) and bone sequestration (77.8%) were the predominant abnormalities. Staphylococcus aureus was isolated from 9 patients. **Conclusion:** Chronic osteomyelitis causes significant functional disabilities, highlighting the need for early diagnosis and appropriate management to limit its impact.

Keywords

Chronic Osteomyelitis, Complications, Handicap

1. Introduction

Chronic osteomyelitis (COM) is a hematogenous infection of the bone that predominantly affects the metaphysis of growing long bones [1]-[3]. It is defined as chronic if it persists beyond one month, exposing patients to complications such as pathological fractures, fistulas, sequestration, septic pseudarthrosis, and major

orthopedic sequelae, including axial deformities, limb length discrepancies, joint stiffness, and, more rarely, cancerization [4]. Despite established management protocols, chronic osteomyelitis remains challenging due to its recurrent and debilitating nature, particularly in children. In developing countries, delayed treatment can lead to these complications, which affect schooling and socio-professional prospects. The treatment of complications and sequelae is a major and fastidious challenge, necessitating multiple surgeries, and eradication of the infection is never certain [5]. Recent studies in Niamey [6] also show that COM continues to be particularly prevalent in children with sickle cell disease. In Senegal, different studies on COM have been carried out [7]-[9], but none of them have focused specifically on the complications and sequelae. In this context, a retrospective study of 36 cases was conducted at Idrissa Pouye Hospital in Dakar over 12 years. The study aimed to describe the anatomical, clinical, and radiological aspects of the disease.

2. Materials and Methods

This was a continuous, retrospective, descriptive study conducted in the orthopedics and traumatology department of the Idrissa Pouye Hospital over a 12-year period (January 2005 - December 2016). Thirty-six patients were followed up in the department for major complications and/or orthopedic sequelae of osteomyelitis. Patients (n = 2) whose files were incomplete or missing, as well as those who did not present sequelae and/or complications, were excluded (n = 2). Major complications included fractures, fistulas, sequestration, and septic pseudarthrosis. Major orthopedic sequelae included axial deformities (bone deviation), limb length discrepancies (consequent difference between the lengths of the arms or legs), joint stiffness (severely limited motion of a joint), and, more rarely, cancerization.

Data collected included:

- Epidemiological aspects: (age according to World Health Organization classification and sex);
- Clinical aspects: reasons for consultation, clinical history, symptom duration, and physical signs;
- Biological aspects (complete blood count and bacteriology/mycology);
- Radiological aspects.

Recovery from infection was assessed clinically by the absence of a productive fistula or inflammatory swelling; biologically, by the normalization of white blood cells; and radiologically, by the absence of sequestra and collection. Bone healing was assessed through clinical examination of the affected limb and successive radiographs. Axial deviation was assessed by measuring the radiological angulation of the affected segment. Joint stiffness was assessed by comparing the mobility of the affected joints. Statistical data were analyzed using Sphinx + software (version 5.2). The graphs were produced using Microsoft Office Excel 2013.

3. Results

Epidemiological Data

We recorded 185 patients with chronic osteomyelitis, 36 of whom had orthopedic complications and/or sequelae. This represents a frequency of 19.45%. Our patients were divided into four age groups according to the world health classification. Orthopedic complications and sequelae of OMC were more prevalent in older children and young adults (37.4% each), followed by adolescents (13.88%) and children (11.11%). The mean age was 15.77 ± 8.78 years. Males predominated, accounting for 75% (n = 27). The sex ratio was 3:1. Four patients (11.1%) had sickle cell disease with an SS profile, and two patients (5.56%) had an AS profile. Trauma was reported in 38.89% of cases (14 patients).

Clinical Manifestations

The average symptom duration was 446.32 days (14.8 months), ranging from one week to 12 years. Functional signs were dominated by fistula (44.4%), pain (38.9%), functional impotence (19.4%), deformities (16.7%), and fever (5.6%). Thirteen patients (36.1%) were asymptomatic. Complications and orthopedic sequelae were more prevalent in the lower limbs (72.5%), particularly in the leg (20%) (Figure 1(a), Figure 1(b)) and thigh (27.5%). In the upper limbs, the forearm was the most affected (15%). The diaphysis was the most common location, affecting 80.54% of patients (n = 29), followed by the metaphysis, affecting 5.56% of cases (n = 2). Simultaneous metaphyseal-epiphyseal involvement was found in 13.9% of cases (n = 5).

(a) (b)

Figure 1. Clinical and radiological illustration of Tibia pandiaphysitis.

Complications (Figure 2)

Chronic osteomyelitis in its sequestering form with a fistula was the most common complication. This complication was observed in 77.7% of cases (28 pa-

tients). An abscess collection was found in 8.33% of cases (3 patients). Sclerotic radiological forms with sequestration predominated (78%), followed by lytic and abscessed forms (2.78%). Staphylococcus aureus was the most common bacterium identified in cytopathological and histopathological examinations (25%) (Figure 3). Co-infection with other bacteria (Citrobacter freundii and Enterobacter spp.) was found in two patients. Two patients (11.76%) had negative cultures. The most common sensitivity was to ciprofloxacin (n = 7).

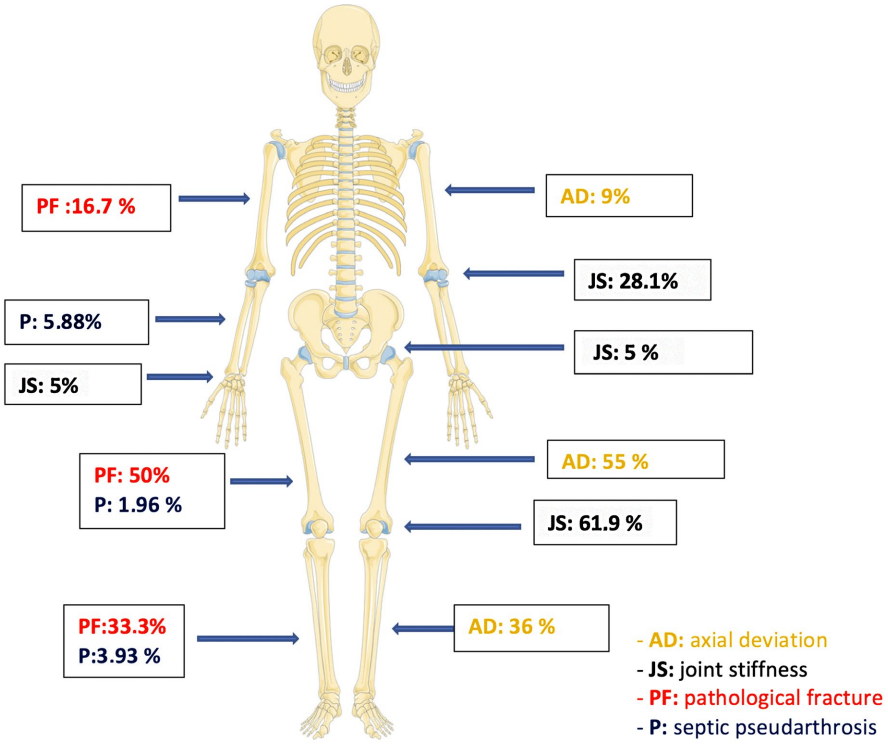

Figure 2. Distribution of chronic osteomyelitis complications according to bone site.

Figure 3. Cytopathological and histopathological examination.

Joint stiffness was found in 21 patients (52.78%). The location was the knee in 13 patients (61.9%), the hip in one patient (5%), the elbow in six patients (28.57%), and the wrist in one patient (5%). The average range of motion in knee flexion was 78.20˚ ± 36.10˚. In the elbow, it was 82.50˚ ± 26.03˚.

Pathological fractures were found in 16.67% of cases (n = 6 patients). The most commonly affected bone was the femur (n = 3), followed by the tibia (n = 2) and the humerus (n = 1). (Figure 4). Diaphyseal fractures were the most common (83.33%), followed by epiphyseal-diaphyseal fractures (16.67%).

Malunion was found in 30.55% of cases (n = 11). The most common radiological diaphyseal deformities were valgus-antecurvatum and varus-antecurvatum, each occurring in 36.36% of cases (four out of 11). Isolated antecurvatum was found in two patients (18.18%). Radiological S-shaped curvature of the femur was found in 1 patient (Figure 5). Septic pseudarthrosis was found in 16.67% of cases (6/11) (Figure 6).

Figure 4. Pathological proximal humerus fracture.

Figure 5. Thigh incurvation.

Figure 6. Septic tibia pseudarthrosis.

4. Discussion

In our study, 19.45% of patients with OMC experienced one or more complications. The most affected group was older children and young adults, with a mean age of 15.77 ± 8.78 years, ranging from 3 to 35 years of age. The high proportion of complications in this age group can be explained by the lack of awareness regarding the initial diagnosis and traditional treatment of acute osteomyelitis in childhood. Males predominated at 75%, with a sex ratio of 3.

These results are consistent with those of Bahebeck *et al.* (3.4) [10], Niang *et al.* (4.26) [7], Habibou *et al.* (2.23) [4], and Gamedzi *et al.* (2.2) [11].

In our study, fistulas were the most common reason for consultation, accounting for 44.40% of cases. Higher frequencies were reported in the studies by Niang [7] and Dolo [12], at 72.6% and 44.8%, respectively. Pain, deformities, and lameness motivated patients to seek consultation in 11.1% of cases each. Niang [7] and Souna [13] found a higher number of lameness cases, at 11% and 34.84%, respectively. Their studies reported a higher frequency of pain, at 50.68% and 56.06%, respectively. These results can be explained by the fact that patients often consult at an advanced stage of the disease, after traditional treatments have typically failed. In our study, sickle cell disease was the main cause, accounting for 16.70% of cases. These results are similar to those of Niang [7], who found that 16.66% of his patients had sickle cell disease. Most studies on bone infections in Africa agree on the significant role of sickle cell disease in the overall mortality of African subjects [4]-[6] [10] [11].

The high frequency of bone infections in patients with sickle cell disease is primarily due to splenic hypofunction caused by splenic infarcts and vaso-occlusive

phenomena. According to Ndoye M. [10], the outcome for children with sickle cell disease and osteomyelitis depends on two factors: the severity of their condition, which affects their life expectancy, and the progression of their osteomyelitis, which affects their ability to function. The duration of complications/sequelae ranged from one week to 12 years, averaging 14.8 months. In Niang's study [6], the average duration was 36 months, ranging from six months to 33 years. This long delay could be explained by underdeveloped contexts and the use of traditional medicine. Functional signs were dominated by pain (38.9%) and functional impotence (19.44%). Fever was observed in two patients (5.56%) with purulent collections. In his study, Souna [9] noted a higher number of cases with pain (56.06%), functional impairment (25.75%), and fever (31.81%). Complications and orthopedic sequelae predominantly affected the lower limbs (n = 29/40), with the thigh (27.5%, n = 11/40) and knee (22.5%, n = 9/40) being the most affected areas. The metaphyseal fertility of the knee largely explains this predilection. In the upper limb, the forearm was the most affected, at 15%. This preferential localization in the long bones of the lower limbs has been reported in the literature [4] [7] [10] [14]. We observed pandiaphysitis in 13.88% of patients. Similar results were reported by Niang (17.28%) [7].

In our study, the fistulous form was present in 83.33% of cases. This result is similar to those reported in the literature. For example, Niang S. [7] noted a fistulous form in 72.6% of cases; Korsaga A. S. [15] noted an 80.7% prevalence; and Kouamé B. D. *et al.* [16] found a fistulous form in 76% of cases.

In our study, 19 patients (52.77%) presented with joint stiffness. Joint stiffness in cases of osteomyelitis is rarely reported in the literature. Ndoye M. [8] reported in his study that eight patients (53.33%) presented with joint stiffness. This joint stiffness can be explained by the primary metaphyseal location of the osteomyelitis, which is close to the joint and causes the patient to use it very little. It may also be secondary to treatment, such as prolonged immobilization, adhesions after debridement of necrotic tissue, or immobilization with external fixators.

Seven patients (19.44%) presented with ILMI, averaging 2.78 cm ± 1.80. These data are similar to those reported in previous studies, particularly those of Habibou (8.25%) [4] and Niang S. (12.32%) [7]. In osteomyelitis, ILMI is more often due to shortening than lengthening of the affected limb. Shortening is due to bone loss, cartilage disorder, or pathological fracture. The axial deviation rate in our study was significantly higher (30.55%) than rates found in previous studies, particularly in those by Habibou (5.5%) [4] and Niang (15%) [7].

We observed a biological inflammatory syndrome in 27.78% of patients, reflecting the progressive nature of osteomyelitis. Staphylococcus aureus (*S. aureus*) accounted for 69.23% of the bacteria isolated in our study. These results are similar to those reported by Niang (68.35%) [7]. Other authors have isolated Staphylococcus in varying proportions [4] [14].

The prevalence of staphylococcal infections can be explained by the fact that *S. aureus* is a commensal bacterium of human skin and mucosal flora that is ubiqui-

tous and possesses several virulence factors that contribute to bone localization.

In our study, pathological fractures were observed in six patients (16.7%). A similar result was noted by Habibou [4] with 15.33% of patients. Kouamé [16] found many more cases of pathological fractures in his series of 43 patients (31%), unlike Niang [7], who found 4.1%. In our series, septic pseudarthrosis was noted in six patients (16.7%). Niang S [7] and Kouamé B D [16] noted lower rates of 2.73% and 2.38%, respectively, in the literature.

This observational and retrospective study has its limitations. In particular, it is a retrospective monocentric study and all information such as incomplete laboratory data may be missing. Also, not all cases may be detected and all of this can reduce the robustness of our conclusions.

5. Conclusion

In conclusion, chronic osteomyelitis remains a common and serious condition in our regions, primarily affecting children and adolescents in specific circumstances, such as sickle cell disease. Our study of 36 cases collected over 12 years highlights the predominance of lower limb involvement with a high incidence of fistulas, sequestration, and axial deformities. These lead to major functional sequelae, such as joint stiffness, limb length discrepancies, and septic pseudarthrosis. Preventing complications requires early diagnosis of acute forms, appropriate treatment, and rigorous follow-up, preferably multidisciplinary, to reduce morbidity and improve functional prognosis.

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Avoid the stilted expression, “One of us (R. B. G.) thanks…” Instead, try “R. B. G. thanks”. Do NOT put sponsor acknowledgements in the unnumbered footnote on the first page, but here.

Conflicts of Interest

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

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