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(Research Article)

Osteoarticular pathology in hemodialysis patients: A study about 22 patients

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Abstract

Background: Chronic kidney disease (CKD), particularly in its end-stage (ESKD), is associated with multiple systemic complications, among which osteoarticular disorders represent a major cause of morbidity. These complications are largely driven by CKD-related mineral and bone disorders (CKD-MBD), long-term dialysis exposure, and metabolic disturbances.

Objective: To describe the epidemiological, clinical, radiological, and therapeutic characteristics of osteoarticular complications in chronic hemodialysis patients, and to analyze the underlying pathophysiological mechanisms.

Methods: We conducted a retrospective, descriptive, single-center study including 22 patients on maintenance hemodialysis treated for osteoarticular disorders between 2018 and 2024. Data regarding demographics, clinical presentation, imaging findings, biological parameters, and management were analyzed.

Results: The mean age was 55 years with a slight male predominance. Fractures were the most frequent complication (68.2%), predominantly affecting the femur. Quadriceps tendon ruptures were observed in 22.7% of cases, frequently bilateral, and carpal tunnel syndrome in 9.1%. Radiological findings included fractures (75%), calcifications, and bone demineralization. Biological abnormalities were consistent with CKD-MBD, including hypocalcemia (67%), hyperphosphatemia (79%), and elevated parathyroid hormone levels (52.9%). Surgical management was required in most cases. One-year mortality following lower limb fractures was significant.

Conclusion: Osteoarticular complications in hemodialysis patients are frequent and severe, reflecting complex metabolic and structural bone alterations. Early diagnosis and multidisciplinary management are essential to reduce morbidity and improve functional outcomes.

Keywords: Chronic kidney disease; Hemodialysis; CKD-MBD; Osteoarticular complications; Fractures; Tendon rupture

1. Introduction

Chronic kidney disease (CKD) is a progressive disorder defined by an irreversible decline in kidney function and affects approximately 10% of the global population. Patients with end-stage kidney disease (ESKD) require kidney replacement therapy, most commonly maintenance hemodialysis, which is associated with multiple long-term complications.[1-2]

Osteoarticular manifestations, including disorders of mineral and bone metabolism (CKD–mineral and bone disorder, CKD-MBD), are highly prevalent in patients on hemodialysis and contribute to increased morbidity and mortality. [3]

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This descriptive study aims to characterize the epidemiological, clinical, and therapeutic features of osteoarticular disorders in patients receiving maintenance hemodialysis and managed in a trauma and orthopedic surgery department, with the goal of supporting early detection and multidisciplinary management.

2. Materials and Methods

This retrospective, descriptive, single-center study was conducted in the Department of Trauma and Orthopedic Surgery at Ibn Rochd University Hospital, Casablanca, from January 2018 to December 2024. Twenty-two adult patients on maintenance hemodialysis who were managed for osteoarticular disorders were included. Collected data comprised demographic characteristics, clinical presentation and type of osteoarticular involvement, radiological findings, and therapeutic management, classified as medical, surgical, and/or functional.

Data were entered and analyzed using Microsoft Excel®. Quantitative variables are presented as mean ± standard deviation, and qualitative variables as counts and percentages.

3. Results

A total of 22 patients were included in this study, with a slight male predominance (54.5% males vs. 45.5% females; sex ratio = 1.2). The mean age was 55 ± 21 years, ranging from 20 to 93 years. Approximately half of the patients (50%) were older than 55 years, while 31.8% were aged between 28 and 55 years, and 18.2% were younger than 28 years.

3.1. Patient history and comorbidities

Hypertension was the most common comorbidity, affecting 54.5% of patients, followed by diabetes (27.3%). Both conditions coexisted in 18.2% of cases. Other comorbidities included hyperparathyroidism (18.2%), cardiopathy (4.6%), epilepsy, and hemiplegia. Notably, 27.3% of patients had no prior medical history. Among female patients, 70% were postmenopausal. The mean body mass index was 21.8 kg/m^2.

Regarding surgical history, 54.5% of patients had no prior surgery, while 45.5% had at least one surgical history, mainly related to fractures or parathyroidectomy.

3.2. Hemodialysis characteristics

The mean duration of hemodialysis was 8.3 ± 4.8 years (range: 1–18 years). Most patients (45.5%) had been on dialysis for 5–10 years, while 31.8% had more than 10 years of dialysis. Hemodialysis was performed three times weekly in 54.5% of patients and twice weekly in 45.5%. All patients had a native distal arteriovenous fistula, predominantly radial.

3.3. Clinical presentation

Trauma was the main reason for consultation, with 86.4% presenting closed trauma. The hip was the most frequently affected site (36.4%), followed by the knee (27.3%) and forearm (9.1%).

Pain was universal (100%), and 90.9% of patients presented with total functional impairment. Among the 15 patients with fractures, all had severe pain and functional impotence, while 93.3% showed deformity or abnormal limb positioning.

Five patients (22.7%) presented with quadriceps tendon rupture, including 60% bilateral cases, all associated with pain, swelling, and extensor mechanism deficit. Additionally, two patients (9.1%) presented with carpal tunnel syndrome confirmed clinically and electrophysiologically.

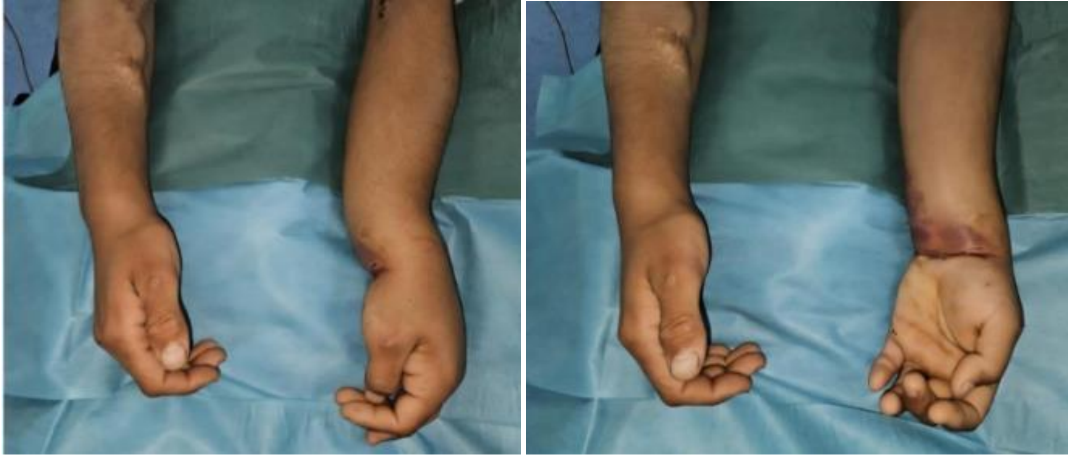

Figure 1 Forearm fracture in a 20-year-old patient

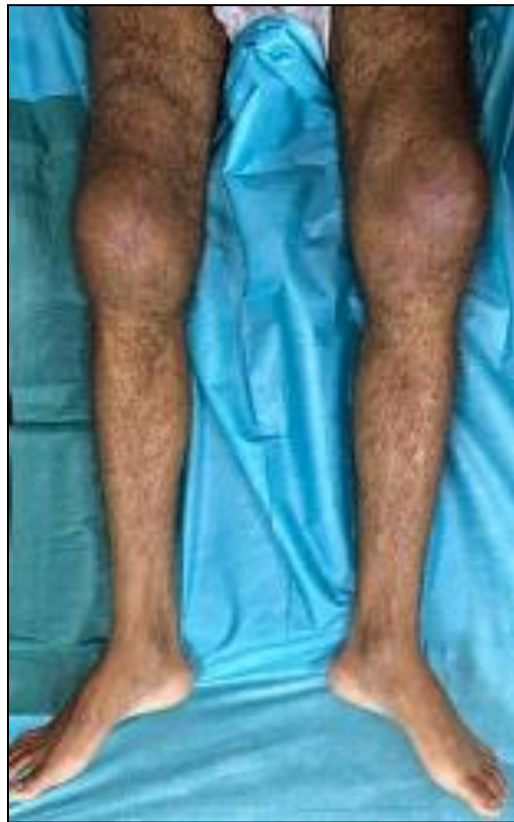

Figure 2 Bilateral quadriceps tendon rupture in a 28-year-old patient

3.4. Radiological findings

Standard radiography was performed in 91% of patients and revealed abnormalities in 95% of cases. Fractures were the most frequent finding (75%), predominantly involving the femur (66.7%). Other findings included vascular or soft tissue calcifications (35%), bone demineralization (35%), and osteoarthritis (35%).

MRI, performed in 22.7% of patients, confirmed tendon ruptures, with 60% bilateral quadriceps tendon ruptures. CT scans (13.6%) revealed complex fractures and features of renal osteodystrophy in one case. Cardiac ultrasound identified valvular calcifications in 9.1% of patients.

Figure 3 Cervical femoral neck fracture with associated vascular calcifications in a 63-year-old patient

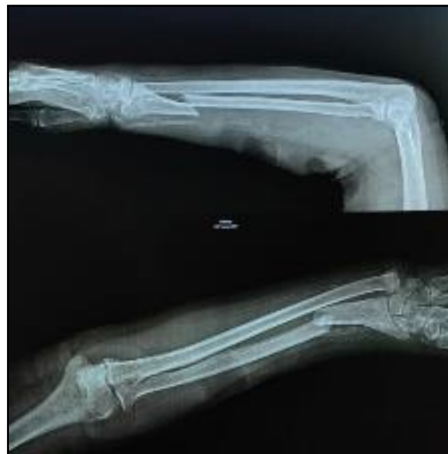

Figure 4 Galeazzi fracture with associated vascular calcifications in a 72-year-old patient

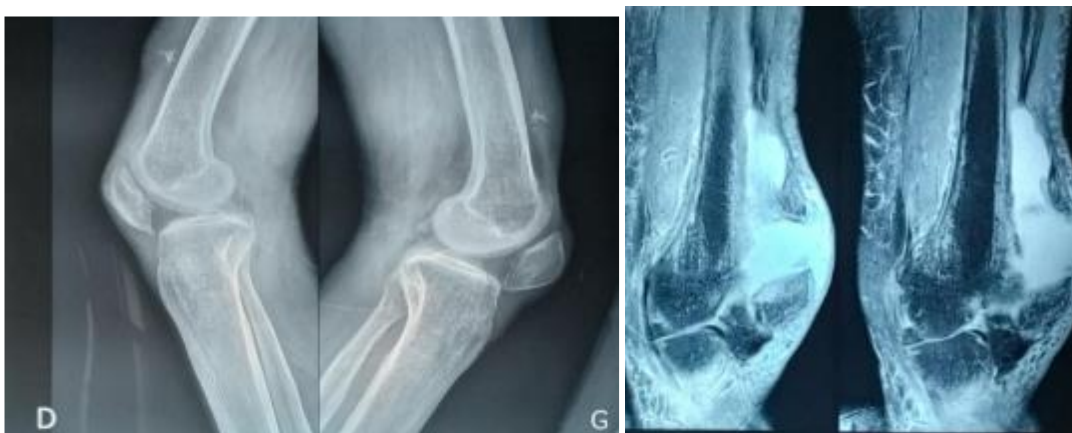

Figure 5 Bilateral quadriceps tendon rupture in a 55-year-old patient

3.5. Biological findings

Calcium levels were low in approximately 67% of patients, while 79% had hyperphosphatemia. The mean parathyroid hormone level was 738.2 pg/mL, with 52.9% of patients presenting hyperparathyroidism.

Vitamin D deficiency was common, with only one patient having normal levels. The mean hemoglobin level was 9.5 g/dL, indicating frequent anemia. Hypoalbuminemia was observed in 16.7% of patients.

3.6. Lesion distribution

Fractures were observed in 68.2% of patients, mainly affecting the lower limbs (73.3%), with a predominance of femoral fractures (66.7%). Quadriceps tendon ruptures accounted for 22.7%, and carpal tunnel syndrome for 9.1%. Degenerative arthropathy and vascular calcifications were each present in 31.8% of patients. Renal osteodystrophy was identified in 22.7% of cases.

3.7. Therapeutic management

Most fractures (80%) were treated surgically. Osteosynthesis techniques included intramedullary nailing and plate fixation, while three patients underwent total hip arthroplasty. The mean delay to treatment was 9 days, and the mean hospital stay was approximately 10 days.

All tendon ruptures were surgically treated, either by direct repair (60%) or transosseous reinsertion (40%). Both cases of carpal tunnel syndrome were managed surgically with favorable outcomes.

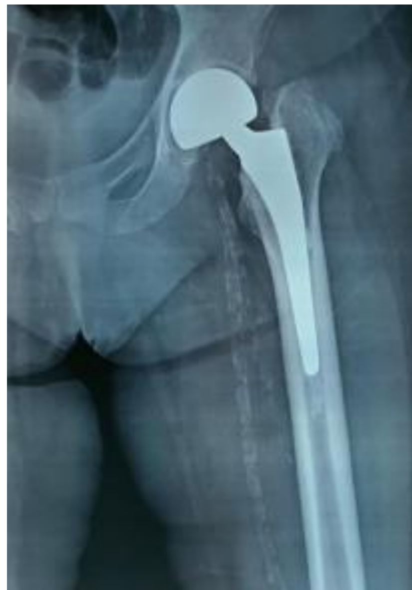

Figure 6 Cervical femoral neck fracture treated with a hemiarthroplasty of the hip.

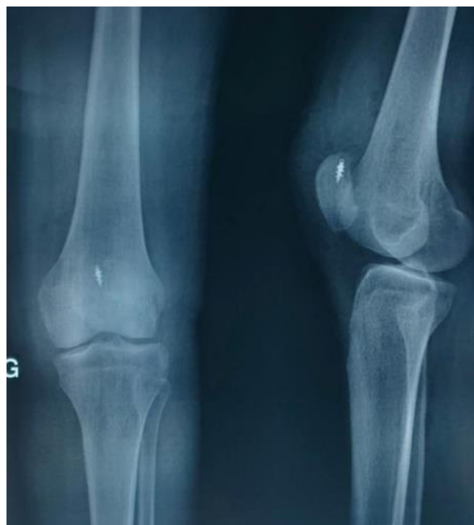

Figure 7 Treatment of a quadriceps tendon rupture by bone reisertion

3.8. Outcomes

Upper limb fractures had favorable outcomes in most cases, with only one complication (infection and delayed union). Among lower limb fractures, one patient died before treatment, and 36.4% died within one year.

The mean time to regain walking ability was 112 days. Tendon rupture outcomes were favorable in most cases, although 40% required walking assistance. No complications or recurrences were observed in patients treated for carpal tunnel syndrome.

4. Discussion

Chronic kidney disease and end-stage renal disease are associated with a high burden of systemic complications in hemodialysis patients, largely driven by CKD-related mineral and bone disorders (CKD-MBD) [4,5]. These disorders lead to renal osteodystrophy, vascular and soft tissue calcifications, bone fragility, and an increased risk of pathological fractures. Osteoarticular complications are highly prevalent and result from multiple mechanisms, including metabolic disturbances, uremic toxicity, comorbidities, β2-microglobulin amyloidosis, and long-term dialysis exposure [6]. Patients have a markedly increased risk of fractures, tendinopathies, tendon ruptures, carpal tunnel syndrome, infections, and compressive neuropathies [7]. Major risk factors include dialysis duration, comorbidities, malnutrition, and sarcopenia, and management relies on KDIGO recommendations aimed at correcting mineral imbalance, controlling hyperparathyroidism, and preventing musculoskeletal complications [8].

Fractures represented the most frequent osteoarticular pathology in our series, with a prevalence markedly higher than that reported by Doussou-Yovo et al. [9] and Rafi et al. [10]. Femoral fractures, particularly hip fractures, were predominant, in line with the findings of Coundoul et al. [11] and Šimunović et al. [12], although other authors have described different fracture distributions depending on study populations [13]. Radiographic abnormalities were mainly fractures, followed by calcifications, bone demineralization, and degenerative joint disease, with higher rates of fractures and calcifications compared with Belmoughit et al. [14]. Tendon ruptures were more frequent than in the series of Doussou-Yovo et al. [9] and Koundach et al. [15], while quadriceps tendon rupture rates were comparable to those reported by Malta et al. [16]. Overall, the frequencies of carpal tunnel syndrome, degenerative arthropathies, calcifications, and renal osteodystrophy were similar to those reported by Rafi et al. [10] and Koundach et al. [15], supporting a shared CKD-MBD–related pathophysiology

Surgical management of fractures in dialysis patients mainly involved intramedullary nailing, plate fixation, or total hip arthroplasty, with a high one-year mortality rate comparable to that reported in the literature. Tendon repairs achieved satisfactory functional outcomes when performed early, whereas delayed interventions were associated with poorer recovery. Surgical treatment of carpal tunnel syndrome was effective, with no recurrences observed. Parathyroidectomy was required in a significant proportion of patients. Overall, these findings highlight the high prevalence of osteoarticular complications related to CKD-MBD in dialysis patients, underscoring the importance of early detection, prevention, and timely surgical management to reduce morbidity and preserve functional independence.

5. Conclusion

Osteoarticular complications are common and often underestimated in chronic hemodialysis patients. In our study of 22 patients, fractures, tendon ruptures, carpal tunnel syndrome, renal osteodystrophy, and degenerative changes were frequent and linked to mineral metabolism disorders. Early detection, correction of biochemical abnormalities, fall prevention, and timely surgical management are essential to reduce morbidity, preserve autonomy, and improve quality of life.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

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

References

[1] A. Francis et al., “Chronic kidney disease and the global public health agenda: an international consensus,” Nature Reviews Nephrology, vol. 20, no. 7, pp. 473–485, Jul. 2024, doi: 10.1038/s41581-024-00820-6.

[2] C. P. Kovesdy, “Epidemiology of chronic kidney disease: an update 2022,” Kidney Int Suppl (2011), vol. 12, no. 1, pp. 7–11, Apr. 2022, doi: 10.1016/j.kisu.2021.11.003.

[3] Kidney Disease: Improving Global Outcomes (KDIGO) CKD-MBD Update Work Group, “KDIGO 2017 Clinical Practice Guideline Update for the Diagnosis, Evaluation, Prevention, and Treatment of Chronic Kidney DiseaseMineral and Bone Disorder (CKD-MBD),” Kidney Int Suppl (2011), vol. 7, no. 1, pp. 1–59, Jul. 2017, doi: 10.1016/j.kisu.2017.04.001.

[4] Kidney Disease: Improving Global Outcomes (KDIGO) CKD Work Group, “KDIGO 2024 Clinical Practice Guideline for the Evaluation and Management of Chronic Kidney Disease,” Kidney Int, vol. 105, no. 4S, pp. S117–S314, Apr. 2024, doi: 10.1016/j.kint.2023.10.018.

[5] S. Moe et al., “Definition, evaluation, and classification of renal osteodystrophy: a position statement from Kidney Disease: Improving Global Outcomes (KDIGO),” Kidney Int, vol. 69, no. 11, pp. 1945–1953, Jun. 2006, doi: 10.1038/sj.ki.5000414.

[6] F. Gejyo et al., “Beta 2-microglobulin: a new form of amyloid protein associated with chronic hemodialysis,” Kidney Int, vol. 30, no. 3, pp. 385– 390, Sep. 1986, doi: 10.1038/ki.1986.196.

[7] T. B. Drüeke and Z. A. Massy, “Changing bone patterns with progression of chronic kidney disease,” Kidney Int, vol. 89, no. 2, pp. 289–302, Feb. 2016, doi: 10.1016/j.kint.2015.12.004.

[8] Kidney Disease: Improving Global Outcomes (KDIGO) CKD-MBD Update Work Group, “KDIGO 2017 Clinical Practice Guideline Update for the Diagnosis, Evaluation, Prevention, and Treatment of Chronic Kidney DiseaseMineral and Bone Disorder (CKD-MBD),” Kidney Int Suppl (2011), vol. 7, no. 1, pp. 1–59, Jul. 2017, doi: 10.1016/j.kisu.2017.04.001.

[9] H. Doussou-Yovo et al., “Les complications rhumatologiques de l’hémodialyse à Cotonou (Bénin),” Rhumatologie Africaine Francophone, vol. 7, no. 2, Art. no. 2, Oct. 2024, doi: 10.62455/raf.v7i2.60.

[10] H. RAFI, “Troubles minéralo-osseux chez les hémodialysés chroniques au service de néphrologie de l’HALD.,” 2016.

[11] B. Coundoul et al., “Pathological Fractures in Chronic Hemodialysis Patients in a Teaching Hospital in Senegal: Prevalence and Associated Risk Factors,” Open Journal of Nephrology, vol. 13, no. 3, Art. no. 3, Jul. 2023, doi: 10.4236/ojneph.2023.133020.

[12] I. Šimunović, D. Pavlović, B. Kudumija, D. Mihaljević, V. Lovčić, and M. Jakić, “Bone fragility fractures in hemodialysis patients: Croatian surveys,” Coll Antropol, vol. 39, no. 1, pp. 71–74, Mar. 2015.

[13] N. Zenasni et al., “Fractures pathologiques chez l’hémodialysé,” Néphrologie & Thérapeutique, vol. 10, no. 5, p. 311, Sep. 2014, doi: 10.1016/j.nephro.2014.07.055

[14] BELMOUGHIT Achraf, “Etude des troubles minéraux et osseux chez les hémodialysés chroniques de la ville de Marrakech,” 2021.

[15] S. Koundach, G. Medkouri, A. Tahiri, and M. Mjaber, “PREVALENCE ET FACTEURS ASSOCIES AUX COMPLICATIONS OSTEOARTICULAIRES CHEZ LES HEMODIALYSES CHRONIQUES,” Revue Marocaine de Santé Publique, vol. 2, no. 2, Art. no. 2, 2015, doi: 10.34874/IMIST.PRSM/RMSP/3010.

[16] L. M. A. Malta, V. S. Gameiro, E. A. Sampaio, M. E. Gouveia, and J. R. Lugon, “Quadriceps tendon rupture in maintenance haemodialysis patients: results of surgical treatment and analysis of risk factors,” Injury, vol. 45, no. 12, pp. 1970–1973, Dec. 2014, doi: 10.1016/j.injury.2014.09.008.