

Case Report

The dark side of wrist fractures

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Resumen

Introduction: distal radius fracture is one of the most common reasons for consultation in rehabilitation and mainly affects elderly women.

Case report: we present the clinical case of a 78-year-old woman with a slow-healing distal radius fracture. After a detailed medical history and examination, reflex sympathetic dystrophy is suspected. Speckled osteoporosis was observed on plain wrist radiography, as well as laboratory abnormalities (hypovitaminosis D) and densitometric abnormalities (osteopenia in the femur/osteoporosis in the spine).

Discussion: the goal of rehabilitation treatment is to achieve maximum functionality of the affected limb, accelerate recovery, and prevent complications such as joint stiffness and pain. There are nosological entities that may initially go unnoticed, leading to an unfavorable clinical course. Early diagnosis and treatment are essential to minimize complications and long-term sequelae.

Keywords:

Distal radius fracture. Complex regional pain syndrome. Reflex sympathetic dystrophy. Early treatment. Osteoporosis.

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INTRODUCTION

Distal radius fracture (DRF) is a metaphyseal fracture that occurs in the distal 3 to 5 cm of the radius and primarily affects active and functionally independent adults. It is considered the second most frequent fracture, second only to hip fractures, and the most prevalent upper limb fracture in adults. According to sex, from the age of 65 years onward, women are 85 % more likely to sustain a DRF than men (1). According to the literature, DRFs account for 17.5 % of all fractures (2).

Stability is a critical parameter that dictates not only the immediate course of treatment but also the long-term prognosis of these fractures. Treatment of DRFs may be non-surgical, recommended for nondisplaced or stable fractures, whereas unstable or displaced fractures usually require surgical intervention. Treatment choice should be individualized, considering patient comorbidities and fracture characteristics, in order to ensure optimal and effective recovery (3).

Complex regional pain syndrome (CRPS) has received numerous designations, such as "algodystrophy," "algoneurodystrophy," "causalgia," or "Sudeck dystrophy," terms that are still used to refer to this frequent complication occurring in patients recovering from a DRF, with a reported incidence of up to 37 %. This condition is defined by the distal manifestation of a triad of symptoms (sensory, autonomic, and motor) in the affected limb, and its diagnosis is nonspecific, with uncertain utility and value (4).

There is no specific test for the diagnosis of CRPS. Complementary tests such as infrared thermography, three-phase bone scintigraphy, bone densitometry, Doppler flow studies, magnetic resonance imaging, or other autonomic function tests—such as the quantitative sudomotor axon reflex test and the thermoregulatory sweat test—are commonly used to rule out differential diagnoses (5).

Despite its low sensitivity and specificity, plain radiography remains one of the most accessible and easily obtainable tests. It may show signs of heterogeneous bone demineralization in painful regions and can help exclude other musculoskeletal conditions (6).

CASE REPORT

A 78-year-old woman was referred from the Trauma Department to the Rehabilitation Clinic for a left distal radius fracture.

Personal history: no known drug allergies. Dyslipidemia and hypothyroidism. No previous surgical inter-

ventions. Regular pharmacological treatment: simvastatin and levothyroxine.

Baseline status: independent in activities of daily living, living at home with her husband, walking without assistive devices.

Current illness: the patient sustained a fall from standing height with forced dorsal flexion of the left hand and was diagnosed with a left distal radius fracture by the Trauma Service in the Emergency Department of her referral area. Initial management consisted of closed reduction and immobilization with a dorsal forearm splint, which after one week was replaced by a circumferential cast that was removed after 30 days. During this period, the patient used a sling, removing it only for hygiene purposes.

She attended the Rehabilitation Clinic referred from Traumatology two weeks after cast removal. She had initiated wrist exercises at home but reported severe functional limitation and pain, requiring analgesia with ibuprofen 600 mg every 12 hours.

Initial assessment scales:

- VAS: 9/10
- LANSS: 19/24 (Table I).

Initial physical examination:

- *Left wrist and hand:* edema of the wrist and hand; pain on palpation of the radial styloid and radiocarpal joint line. Active range of motion: palmar flexion 70°, dorsal flexion -20°, ulnar deviation absent, radial deviation absent, pronation 50 %, supination 20 %. Unable to make a fist; finger-to-palm distance 8 cm. Terminal lateral opposition to the second finger without digital dissociation. Vascular and neurological examination showed vasomotor changes, stiffness of metacarpophalangeal and interphalangeal joints, neuropathic pain (hyperalgesia and allodynia in the palmar/digital region) with digital stiffness. Passive mobility was limited and difficult to assess due to pain (Fig. 1).
- *Left elbow:* no edema or joint deformity; no pain on palpation. Active range of motion: flexion 130°, extension -40°, limited pronosupination (previously assessed).
- *Left shoulder:* pain in the anterolateral aspect of the shoulder. Active range of motion: flexion 100°, abduction 100°, internal rotation reaching the sacrum with difficulty, external rotation reaching the nape with anteriorized elbow; passive capsular end-feel.

Complementary tests:

- Plain radiograph of the left wrist, two projections: left distal radius fracture with intra-articular involvement, degenerative changes, and patchy osteoporosis (Fig. 2A).

Differential diagnosis:

After a detailed history and complete physical examination supported by complementary tests, in

Table I. LANSS scale: the LANSS scale is a simple and valid 7-item tool used to identify patients with neuropathic pain. Scores above 12 points indicate a probable presence of neuropathic pain. The maximum score is 24 points. Initial and final follow-up results of the scale in the described case are shown

LANSS scale		Initial	Final
Pain questionnaire	1. Does your pain feel like an unpleasant and strange sensation on your skin? The following words might describe this sensation: pricking, tingling, pins and needles. • NO, I do not really feel my pain this way (0) • YES, I often have these sensations (5)	5	0
	2. Does the appearance of the skin in the painful area look different from normal? The following words might describe this sensation: redness, blotchy, mottled. • NO, my pain does not affect the color of my skin (0) • YES, I have noticed that pain makes my skin look different (5)	0	0
	3. Does your pain make your skin abnormally sensitive to touch? These unpleasant sensations may be provoked by lightly stroking the skin or by clothing. • NO, pain does not make the skin in that area more sensitive (0) • YES, my skin feels abnormally sensitive when I touch that area (3)	3	3
	4. Does your pain suddenly come on like electric shocks without any apparent reason? The following words might describe this sensation: electric current, jolts, stabbing. • NO, I do not feel my pain that way (0) • YES, I often have these sensations (2)	2	0
	5. Does the temperature in the painful area feel different from usual? The following words might describe this sensation: heat, hot, burning. • NO, I do not really have these sensations (0) • YES, I often have these sensations (1)	1	0
Sensory testing	1. ALLODYNIA: examine the response to lightly stroking the skin with cotton wool over a non-painful area and the painful area. If the sensation is normal in the non-painful area but painful or unpleasant (tingling, nausea) in the painful area, the test is positive. • NO, normal sensations in both areas (0) • YES, allodynia presents only in the painful area (5)	5	5
	2. PAIN THRESHOLD: determine pinprick threshold by comparing the response to a 23-gauge needle mounted on a 2-mL syringe, gently applied to the skin in a non-painful area and a painful area. If pressure is felt in the non-painful area but produces a different sensation in the painful area (e.g., no sensation or pressure only [high threshold], or very painful sensation [low threshold]), pain threshold changes are present. If the needle is not felt in either area, change the syringe to increase weight and repeat the test • NO, same sensation in both areas (0) • YES, changes in pain threshold present in the painful area (3)	3	0
Total		19/24	8/24

addition to the left distal radius fracture, conditions such as thrombophlebitis, cellulitis, lymphedema, peripheral or compressive neuropathies (thoracic outlet syndrome, carpal tunnel syndrome), and inflammatory, rheumatic, or infectious arthropathies were ruled out.

Diagnosis:

- There is no specific test for diagnosing CRPS; diagnosis is mainly based on the observation of signs and symptoms. In this case, the Budapest Criteria (Table II) for the diagnosis of complex regional pain syndrome type I were fulfilled (5).
- CRPS type I – left shoulder–hand syndrome secondary to left distal radius fracture.

Therapeutic approach:

- *Pharmacological treatment:* analgesia with naproxen/esomeprazole (500 mg/20 mg) every 12 hours was initially prescribed, together with a nucleotide complex enriched with vitamins (uridine 5-monophosphate 300 mg and cytidine 5-monophosphate 100 mg, vitamin B1 1.1 mg, vitamin B12 2.4 mg) administered orally, one tablet every 24 hours, to reduce pain, facilitate neuronal regeneration, and improve overall nervous system function.
- *Physiotherapy treatment:* motor kinesiotherapy was prescribed to improve the range of motion of the left shoulder, elbow, wrist, and hand.
- *Additional tests requested:* bone densitometry (DXA) and blood tests.

Evolution and results:

The patient underwent specific kinesiotherapy of the shoulder, elbow, wrist, and hand to improve upper limb function.

- *DXA*: osteopenia at the proximal femur (T-score -1.9) and osteoporosis at the spine (T-score -3.0) (Fig. 2 C1 and C2).
- *Blood tests*: complete blood count with erythrocyte sedimentation rate; serum biochemistry including calcium, phosphorus, alkaline phosphatase, liver

transaminases, urea and creatinine, estimated glomerular filtration rate, TSH, and PTH were within normal ranges. Vitamin D (25-hydroxyvitamin D) level was 25.3 ng/mL.

Therapeutic adjustment:

Oral treatment with alendronic acid 70 mg weekly was added, together with calcium 600 mg plus 2000 IU of cholecalciferol in a single daily oral dose (one orodispersible tablet every 24 hours) to improve treatment adherence.



Figure 1. Complex regional pain syndrome (CRPS) type I following left distal radius fracture. Dorsal view of the affected limb with comparison to the contralateral healthy side (A), and palmar view of the affected limb (B).

Table II. Budapest diagnostic criteria for complex regional pain syndrome (adapted from cite 5)
1. Continuous pain, disproportionate to the inciting event.
2. At least one symptom must be reported in three of the following four categories:
• <i>Sensory</i> : hyperesthesia and/or allodynia
• <i>Vasomotor</i> : asymmetry of skin temperature and/or skin color changes and/or skin color asymmetry
• <i>Sudomotor</i> : edema and/or sweating changes and/or asymmetric sweating
• <i>Motor</i> : decreased range of motion and/or motor dysfunction (tremor, dystonia, weakness) and/or trophic changes (skin, hair, nails)
3. At least one sign must be present in two or more of the following four categories:
• <i>Sensory</i> : evidence of hyperalgesia (to pinprick) and/or allodynia (to light touch/thermal stimulation/deep pressure/joint movement)
• <i>Vasomotor</i> : evidence of skin temperature asymmetry > 1 °C and/or skin color asymmetry and/or skin color changes
• <i>Sudomotor</i> : evidence of edema and/or asymmetric sweating changes
• <i>Motor</i> : evidence of decreased range of motion and/or motor dysfunction (tremor, dystonia, weakness) and/or trophic changes (skin, hair, nails)
4. Exclusion of other diagnoses that could better explain the above signs and symptoms

The patient continued physiotherapy and treatment with bisphosphonate, calcium, and vitamin D, with good clinical and radiological evolution (Fig. 2B). At the 3-month follow-up from the first visit, scale outcomes were as follows:

- VAS: 2/10.
- LANSS: 8/24 (Table I).

Final physical examination:

- *Left wrist and hand:* mild pain at the radiocarpal joint line; no edema or sudomotor changes. Active range of motion: palmar flexion 70°, dorsal flexion 40°, ulnar deviation 20°, radial deviation 10°, pronation 95 %, supination 95 %. Able to make a fist including the thumb; digital opposition to the fourth finger with functional digital dissociation; persistent stiffness of interphalangeal joints in the final degrees of extension.
- *Elbow:* no deformities or tenderness; active range of motion: flexion 140° with hand reaching the shoulder, extension 0°, functional pronosupination.
- *Shoulder:* no tenderness; active range of motion: flexion 130°, abduction 130°, internal rotation to the waist, external rotation to the contralateral ear.

After the therapeutic approach, pain was reduced and a functionally adequate global range of motion of the left upper limb was achieved, allowing correct performance of basic and instrumental activities of daily living.

Finally, the patient was discharged from Rehabilitation with recommendations to continue the exercise program learned at home to maintain limb function. Adherence to therapy was emphasized, with continued follow-up of osteoporosis by her primary care physician. After three months of treatment with oral calcium and cholecalciferol at the prescribed dosage, serum 25-hydroxyvitamin D levels increased to 43.3 ng/mL.

DISCUSSION

It has been estimated that an initial DRF increases the risk of future fragility fractures by 86 % in the presence of osteoporosis (7).

CRPS is a complication of DRFs characterized by chronicity and progressive worsening of fracture-related symptoms, which may lead to significant functional disability in affected patients. Diagnosis of this condition is based on a thorough analysis of the clinical history and, most importantly, on a comprehensive physical examination (8).

Three-phase bone scintigraphy is a valuable imaging tool for the diagnosis of CRPS. When combined with a multimodal analgesic approach, it allows monitoring of disease progression and response to treatment (9).

With regard to the present case, according to certain international guidelines (Bone Health & Osteoporosis Foundation), our patient would already have been eligible for DXA assessment, as these guidelines recommend performing this test from the age of 65 years onward even in the absence of additional risk factors (10). However, according to the 2022 update of the SEIOMM guidelines, DXA is recommended when risk factors strongly associated with osteoporosis or fractures are present (11) (Table III). In this case, DXA complemented the assessment of the patient's bone status and constitutes a useful tool for subsequent follow-up and treatment adjustment. If the patient's FRAX score had been calculated prior to the fracture, it would have shown an 8.5 % risk of major osteoporotic fracture and a 2.9 % risk of hip fracture; therefore, antiresorptive treatment could already have been considered even before the fracture occurred. Moreover, calcium and vitamin D supplementation should certainly have been evaluated, even with vitamin D values close to 30 ng/mL (12).

Along with anti-inflammatory treatment, bisphosphonate therapy was added, as these agents have been shown to improve inflammatory signs and mobility, although dosage, treatment duration, and route of administration vary across studies (13). Although osteoporotic status is independent of post-fracture complications, weekly alendronic acid treatment may help address both conditions by inhibiting osteoclastic bone resorption (14).

Of note, the cutoff values considered normal for serum 25-hydroxyvitamin D levels vary slightly among guidelines. SEIOMM considers it appropriate to maintain serum levels > 25-30 ng/mL in patients receiving pharmacological treatment for osteoporosis. In patients with osteoporosis or high fracture risk, levels between 30 ng/mL and 50 ng/mL are recommended to ensure efficacy without additional risks (11). Our patient had levels between 25 ng/mL and 30 ng/mL; however, given her classification as high risk, it was necessary to maintain serum 25-hydroxyvitamin D levels > 30 ng/mL.

There is near-unanimous agreement, supported by guidelines such as those of the Spanish Society of Rheumatology (SER, 2018), that when initiating any antiresorptive therapy, adequate calcium and vitamin D supplementation should be ensured (1000-1200 mg/day of calcium and 800 IU/day of vitamin D). This supplementation is essential for two reasons: first, to prevent hypocalcemia induced by the antiosteoclastic effect of these drugs; and second, because the proven efficacy of antiresorptive treatments in fracture reduction depends on maintaining optimal calcium and cholecalciferol levels (15).

Considering the ambiguity in defining therapeutic targets for osteoporosis and the short follow-up period, a long-term management strategy aligned with the SEIOMM continuation algorithm has been proposed (11).

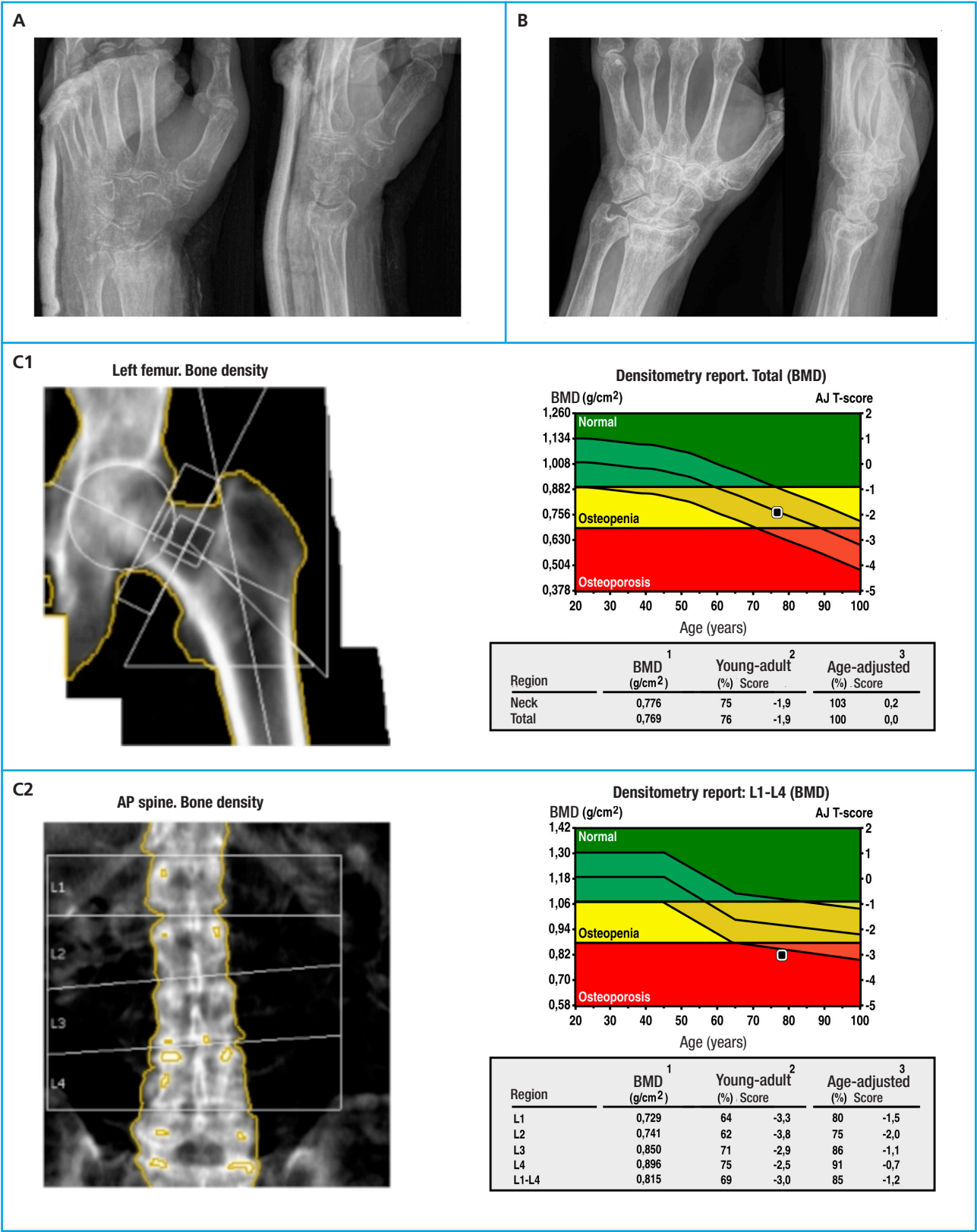


Figure 2. A. Plain radiograph of the left wrist, two projections, follow-up prior to removal of dorsal forearm plaster splint immobilization: distal radius fracture with intra-articular involvement, degenerative changes, and indirect signs of radiocarpal osteoporosis. B. Follow-up radiographic control after three months of treatment: consolidated distal radius fracture. C1. DXA: proximal femur results (osteopenia). C2. DXA: lumbar spine results (osteoporosis).

Table III. Risk factors for osteoporosis (11)

Factors clearly associated with osteoporosis	
• Advanced age	
• Female sex	
• Personal history of fracture	
• Family history of hip fracture	
• Increased risk of falls	
• <i>Diseases:</i>	
– Hypogonadism	
– Early menopause, amenorrhea	
– Anorexia nervosa	
– Malabsorption	
– Rheumatoid arthritis	
– Diabetes (particularly type 1)	
– Immobilization	
– Cushing disease	
• <i>Treatments:</i>	
– Glucocorticoids	
– Aromatase inhibitors	
– Gonadotropin-releasing hormone agonists (and other androgen deprivation therapies in men)	
Other factors associated with less consistent evidence	
• Hyperparathyroidism, hyperthyroidism	
• Calcium deficiency	
• Vitamin D deficiency	
• <i>Drugs and toxins:</i>	
– Selective serotonin reuptake inhibitors	
– Proton pump inhibitors	
– Anticonvulsants	
– Antiretrovirals	
– Alcohol, tobacco	

This individualized strategy includes weekly alendronate administration together with calcium and vitamin D for a total of five years. Treatment will be monitored between the second and third year, and based on response and individual patient profile, the need to continue, interrupt, or switch therapy to other agents—such as the antiresorptive denosumab or the osteoanabolic agent teriparatide—will be determined.

Early, individualized, and multidisciplinary treatment—based on pharmacological pain control, rehabilitative therapy, and comprehensive assessment of the patient and associated comorbidities—is crucial to achieve the greatest possible functional recovery while minimizing long-term sequelae.

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