Tumoral calcinosis is a rare clinical and histopathologic syndrome characterized by calcium salt deposits in periarticular soft tissue.\textsuperscript{1,2} Soft-tissue of juxta-articular upper limb (shoulder and elbow) and hip regions are the most commonly involved; however, spinal\textsuperscript{3-5} and temporomandibular joint\textsuperscript{6,7} involvement has also been reported. The extensor aspect of the joint is the usual site of the lesions, often connected with a synovial bursa.\textsuperscript{8,9} The rarest localization is in the popliteal space, with only one monolateral case reported in the literature.\textsuperscript{10}

This article describes a rare localization of tumoral calcinosis in a patient with chronic renal failure on long-term hemodialysis therapy without metabolic phosphorus and calcium disorders. The lesions were bilateral and symmetrical in the popliteal space with neurovascular involvement and functional limitation.

CASE REPORT

A 70-year-old woman presented with bilateral gonalgia, inability to move or walk, and severe edemas in the legs. Medical history was significant for chronic renal failure and hemodialysis for 16 years. The patient reported ingravescent pain in the knees when walking, which began 2 years prior to presentation, and swelling in the popliteal space, which worsened within a few months. After approximately 1 year, walking was limited to only a few meters with the aid of two forearm crutches.

Clinical examination revealed flexed knees (10°) and two masses located in the popliteal spaces. The largest, in the left knee, measured 9×8 cm and was of stiff-elastic consistency. The patient reported areas of paresthesia in excess skin and irregular peripheral hypoesthesia in previous months. The overlying skin was intact.

Plain, lateral radiographs showed a large periarticular mass, wide and homogeneously calcified, with the joint spaces maintained (Figure 1). Sonography showed a thickening of the synovial membrane with areas involved by microcalcification. Computed tomography (CT) showed the homogeneous consistency of the lesion, consisting of multiple cavities alternating with calcified areas, which were com-
pressing the surrounding muscular structures and touching the neurovascular structures without directed involvement (Figure 2).

Laboratory examination showed serum calcium and phosphorus levels within normal limits and was repeated during hospitalization. All laboratory data were normal.

An excisional biopsy confirmed the diagnosis of tumoral calcinosis. The lesion of the left popliteal space was surgically removed. The soft mass was encircled by a thin woven layer of fibrous tissue that seemed to arise from the medial-posterior articular capsule (Figure 3). Karyotypic evaluation showed aneuploid DNA content. Histologically, the excised tissue contained calcified areas in which brown papillary vegetations referable to synovia were seen.

At final follow-up, 18 months after surgical excision, no clinical signs of lesion recurrence were noted (Figure 4). The patient reported marked clinical improvements. Physical examination revealed normal range of motion, with no recurrence of pain or edema in the treated leg. Due to the satisfactory result, the mass in the right popliteal space was excised.

**DISCUSSION**

Tumoral calcinosis is a rare disease characterized by tumor-like lesions composed of calcium salt identified as calcium phosphates, calcium carbonates, pyrophosphates, hydroxyapatites, or a combination of these substances, often periarticular and large.

Tumoral calcinosis can subdivided into several categories: idiopathic, dystrophic, and secondary. Idiopathic or primitive tumoral calcinosis, the most common form, has a familiar correlation in 30% of cases, which prevalently affects the black population of Africa in the first or second decade of life. The pathogenesis is unclear; however, several authors have assumed the cause to be abnormalities in calcium metabolism. Recent studies, however, have revealed normal calcium levels in most patients, whereas phosphorus levels were increased in relation to an altered process of resorption in the renal tubule. Prince et al proposed an abnormality in the metabolism of calcitriol and hyperphosphoremia for the failure of its feedback.

Dystrophic calcification occurs in tissue previously involved by chronic diseases such as chronic recurring multifocal osteomyelitis or manifestation of degenerative joint disease.

The secondary form, the rarest, is associated with a wide variety of metabolic failures of calcium and phosphorus, such as primary or secondary hyperparathyroidism, scleroderma, prolonged therapies of calcitriol or calcium carbonate, and clinical features that often compose the complex outline of chronic renal failure on long-term hemodialysis (which can be defined as uremic tumoral calcinosis).

In these conditions, the main pathogenetic mechanism would reach critical levels of serum calcium-phosphorus product of solubility (\(\text{Ca}^{2+} \times \text{P} > 70 \text{ mg/dL}\)), creating the conditions for the precipitation of calcium salt in the soft tissues. In approximately 50% of patients with uremic tumoral calcinosis, the most frequent cause of this increase is secondary hyperparathyroidism. In patients without hyperparathyroidism, an increase in plasma of \(\text{Ca}^{2+} \times \text{P}\) can be caused by iatrogenic hypercalcemia or severe hyperphos-
phemia of multifactorial etiologies, such as prolonged or excessive administration of calcium carbonate and calcitriol, inadequate phosphorus chelant therapy, and insufficient dialysis. Duration of dialysis has been cited as a predisposing factor to the development of uremic tumoral calcinosis, whose risk of occurrence increases with the number of years on hemodialysis, despite normal values of Ca^{2+} \times P.27

Gregosiewicz and Warda28 do not rule out the possibility of immunological factors. In some patients, they found high levels of immunoglobulin (Ig) A and IgE in serum and several lymphocytes and plasma cells in the center of lesions.

The lesions consist of masses of multilobulated tissue, of varying diameter, with fibrovascular septa that enclose areas of whitish calcifications with chalky firmness. They are multiple in two thirds of patients; firmly attached to muscles, underlying fascia, tendons, or the capsular joint; and may also infiltrate these structures, but are never related to bone.1,2,12,17,18,29-31 Only one case of iliac bone lesion involving a patient with uremic tumoral calcinosis on hemodialysis has been reported.32 The growth of lesions is slow and progressive, often over many years.33 Sometimes ulceration of the overlying skin occurs with secondary infection.22,34

The mass usually is asymptomatic in primitive tumoral calcinosis, whereas it is more frequently symptomatic in the secondary form. The main symptoms are discomfort, swelling, pain, and joint limitation.31,35 Neurovascular compression is rare, reported often in secondary tumoral calcinosis where the lesions tend to be larger, eg, compression of the ulnar nerve in Guyon’s canal,36,37 median nerve in carpal tunnel,38 and compression of the sciotic nerve.39,40 The main joints involved are the shoulder, elbow, and hip.12,17,18,29-31 However, rare localizations such as the spine,25 temporomandibular joint,6,7 hand and fingers,34,41,42 and knee extensor are also described. Only one other case in the literature is mentioned regarding poptiletal space tumoral calcinosis, which was monolateral.10

Radiographically, tumoral calcinosis is a calcified, lobulated, homogenous mass, with rounded opacity separated by thin radiolucent lines (fibrous septa) that give it a so-called “chicken wire” appearance. Magnetic resonance imaging shows multiple cavities of low-signal density on T1 and T2-weighted sequences.16,22 Scintigraphy is useful, especially in the identification of multiple lesions and for assessing therapy.

The literature reports various types of treatment of metabolic disorders and in the general symptomatology, and the progression of soft-tissue calcification has been halted after subtotal parathyroidectomy. However, some disagreement exists with regard to results. Sonin and Nance,50 Johnson et al,51 deFrancisco et al,52 and Thakur et al53 all report the complete regression of lesions, whereas Tezelman et al51 reported an arrest in the growth of the mass.2

**Tumoral calcinosis is a rare clinical and histopathologic syndrome characterized by calcium salt deposits in periarticular soft tissue.**

Symptomatology. Increased calcium-phosphorus serum product should be regulated. Regulation of phosphoremia must be the first target. It is lowered by dietary deprivation of phosphorus combined with phosphate-binding chelating agents, which provide satisfactory results, clinical improvement, and often a reduction in the mass,32,38,43-45 specifically in patients with poor diets (eg, children).32,46 The induction of a negative calcic balance may also be obtained by an increased number of dialysis sessions, with low Ca^{2+} dialysate concentration.47 The kidney transplant has made a marked improvement or brought about the complete regression of neof ormations.48 Alternative medical treatment includes the administration of steroids, diphosphonates, or calcitonin, but these have been unsuccessful.13,28,31,49

Patients with secondary hyperparathyroidism have experienced an improvement in symptomatology. Increased calcium-phosphorus serum product should be regulated. Regulation of phosphoremia must be the first target. It is lowered by dietary deprivation of phosphorus combined with phosphate-binding chelating agents, which provide satisfactory results, clinical improvement, and often a reduction in the mass,32,38,43-45 specifically in patients with poor diets (eg, children).32,46 The induction of a negative calcic balance may also be obtained by an increased number of dialysis sessions, with low Ca^{2+} dialysate concentration.47 The kidney transplant has made a marked improvement or brought about the complete regression of neof ormations.48 Alternative medical treatment includes the administration of steroids, diphosphonates, or calcitonin, but these have been unsuccessful.13,28,31,49

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**REFERENCES**


