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Peritoneal Dialysis and Uremic Tumoral Calcinosis: A Case Report of an Atypical Presentation and Review of the Literature

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Abstract: Background: Uremic tumoral calcinosis (UTC) is a rare complication associated with chronic kidney disease (CKD) and is commonly observed in patients with end-stage renal disease (ESRD) on dialysis, particularly hemodialysis. UTC is characterized by the deposition of calcium phosphate in soft tissues, most notably around joints, and is typically seen in patients with hyperphosphatemia, hyperparathyroidism, and elevated calcium-phosphate product. However, atypical manifestations of UTC, particularly in patients on peritoneal dialysis (PD), are seldom reported.

Case Presentation: We report the case of a 62-year-old male with a history of ESRD on peritoneal dialysis who developed an unusual presentation of uremic tumoral calcinosis. The patient presented with an enlarging mass in the left shoulder, which was initially misdiagnosed as a soft tissue infection. Radiological and histopathological examination confirmed the diagnosis of UTC. The patient was managed with phosphate binders, adjustments to his dialysis regimen, and surgical debridement.

Conclusion: This case highlights the importance of considering uremic tumoral calcinosis in the differential diagnosis of soft tissue masses in ESRD patients, even those on peritoneal dialysis. Early diagnosis and management are essential in preventing severe complications. We review the current literature on UTC in dialysis patients, emphasizing the need for vigilant monitoring and individualized treatment plans.

Keywords: Uremic tumoral calcinosis, Peritoneal dialysis, Chronic kidney disease, Hyperphosphatemia, Tumoral calcinosis, End-stage renal disease, Soft tissue calcifications, Dialysis complications.

Introduction: Uremic tumoral calcinosis (UTC) is a rare but serious complication in patients with end-stage renal disease (ESRD) and chronic kidney disease (CKD), particularly those undergoing dialysis. The disease is characterized by ectopic calcification, where calcium phosphate deposits accumulate in soft tissues, usually around joints, leading to the formation of large, painful masses. The condition is most often associated with hyperphosphatemia, hyperparathyroidism, and an elevated calcium-phosphate product, which results from impaired renal excretion of phosphate in ESRD patients.

While UTC is a well-established complication in hemodialysis patients, its occurrence in patients on peritoneal dialysis (PD) is less commonly documented. The exact pathogenesis of UTC remains poorly understood, but it is believed to result from an imbalance between phosphate and calcium levels, as well as dysregulation of phosphate metabolism. The calcifications typically affect the periarticular soft tissues, leading to swelling, pain, and restricted mobility. However, the presentation can vary significantly from patient to patient, and atypical cases like the one presented in this report challenge our understanding of UTC.

This case report focuses on a 62-year-old male patient with ESRD on peritoneal dialysis, who presented with an unusual manifestation of UTC, which was initially misdiagnosed as a soft tissue infection. The review of the literature further explores the diagnosis,

management strategies, and complications associated with UTC in dialysis patients.

Uremic tumoral calcinosis (UTC) is a rare but significant complication seen in patients with chronic kidney disease (CKD) and end-stage renal disease (ESRD), particularly those undergoing dialysis. This condition is characterized by the deposition of calcium phosphate crystals in soft tissues, typically around joints, and can lead to painful, large masses. While more commonly observed in hemodialysis patients, there have been increasing reports of UTC occurring in individuals undergoing peritoneal dialysis (PD), albeit less frequently. The pathology of UTC is believed to stem from the imbalance in phosphate and calcium metabolism in CKD patients, exacerbated by renal insufficiency. However, the exact mechanisms leading to the development of UTC are not fully understood, and it remains a challenge to both diagnose and manage effectively.

Although the clinical features of UTC are typically associated with hyperphosphatemia, secondary hyperparathyroidism, and high calcium-phosphate products, the condition can present with atypical features. In some cases, patients may not exhibit the classic clinical manifestations of calcific deposits or joint pain, leading to a delay in diagnosis and inappropriate initial treatment. Additionally, UTC can sometimes be misdiagnosed as a soft tissue infection, abscess, or malignancy due to its radiological features. Given that the condition is often not considered in the differential diagnosis for soft tissue masses, physicians may overlook or misinterpret the symptoms, resulting in delayed or inadequate management.

The present report details an unusual case of uremic tumoral calcinosis in a 62-year-old male patient undergoing peritoneal dialysis for end-stage renal disease. The patient initially presented with a rapidly enlarging mass in the left shoulder, which was misdiagnosed as a soft tissue infection. Despite initial treatment with antibiotics, the mass continued to grow, prompting further investigation. Radiological imaging and histopathological examination eventually led to the correct diagnosis of UTC. The report also reviews the pathophysiology, risk factors, clinical presentation, and management strategies of UTC, with a focus on peritoneal dialysis patients.

Background of Uremic Tumoral Calcinosis (UTC)

Uremic tumoral calcinosis (UTC) is often associated with longstanding CKD or ESRD, conditions in which kidney function is sufficiently impaired to cause disturbances in the body’s regulation of calcium and phosphate. The kidneys play a critical role in maintaining calcium and phosphate balance, but when renal function declines, phosphate retention occurs, often leading to hyperphosphatemia. When phosphate levels exceed the kidney's ability to excrete it, calcium-phosphate crystals may form and deposit in soft tissues, leading to calcifications. In patients with ESRD, elevated parathyroid hormone (PTH) levels—due to secondary hyperparathyroidism—further contribute to this imbalance, intensifying the deposition of these crystals in soft tissues.

Typically, UTC manifests as large, palpable masses around joints, particularly the elbows, shoulders, and hips. These calcified masses are often painful and can restrict joint mobility, leading to significant morbidity. The condition is most commonly seen in patients undergoing hemodialysis; however, peritoneal dialysis patients are not immune to this complication, though it has been less frequently reported in this population.

Peritoneal dialysis, while offering a more physiologic form of renal replacement therapy compared to hemodialysis, still carries the risk of phosphate retention, particularly when dietary phosphate intake is not adequately controlled, or when phosphate binders are insufficiently prescribed. Despite these challenges, there is limited research on the specific pathophysiology and risk factors for UTC in the peritoneal dialysis population. This case report highlights the occurrence of UTC in a peritoneal dialysis patient, adding to the growing body of evidence that this condition should be considered in the differential diagnosis of soft tissue masses in dialysis patients.

Rationale for Case Report

This report underscores the importance of considering UTC as a potential diagnosis in patients with ESRD, especially those undergoing peritoneal dialysis, even when the clinical presentation is atypical. Our case presents a rare instance of UTC that was initially misdiagnosed as a soft tissue infection due to the lack of typical symptoms such as joint pain or erythema. It highlights the necessity for vigilance and the use of advanced diagnostic tools, including radiological imaging and histopathological examination, to accurately diagnose this rare complication in dialysis patients.

In addition to documenting this unique case, this report aims to contribute to the understanding of UTC in peritoneal dialysis patients. Given the complexity and potential for misdiagnosis, we also review the literature on the diagnosis, pathophysiology, and treatment strategies for UTC, offering insight into the management of this condition in dialysis patients. This review serves to inform clinicians about the possibility of UTC, particularly in patients who exhibit symptoms like soft tissue masses but lack the typical presentation

of joint involvement or severe hyperphosphatemia. Furthermore, this report aims to emphasize the importance of individualized management strategies, including phosphate control and dialysis optimization, to prevent further calcification and improve patient outcomes.

In conclusion, UTC remains a significant and under-recognized complication in ESRD patients, and its atypical manifestations may lead to diagnostic delays. By increasing awareness and understanding of UTC in peritoneal dialysis patients, we can better manage these patients, minimizing the risks of morbidity associated with this condition.

METHODS

The case was managed at a tertiary care hospital, and patient data were collected through a combination of clinical observation, radiological imaging, laboratory tests, and histopathological examination. A detailed review of the patient's medical history was undertaken, including dialysis-related parameters, laboratory findings, and previous treatments. Additionally, a comprehensive literature review was conducted to assess the current understanding of UTC, particularly in the context of peritoneal dialysis.

Case Presentation:

The patient was a 62-year-old male with a history of hypertension, diabetes, and chronic glomerulonephritis. He had been on peritoneal dialysis for 18 months due to ESRD. The patient presented to the emergency department with complaints of progressively enlarging mass in the left shoulder, which was painful and associated with mild swelling and erythema. He also reported a limited range of motion in the affected joint.

Initial examination suggested a soft tissue infection, and the patient was started on broad-spectrum antibiotics. However, despite the initiation of treatment, the mass did not improve and continued to grow over the following days. The patient's serum calcium and phosphate levels were mildly elevated, and his calcium-phosphate product was found to be significantly elevated, which raised the suspicion of an underlying metabolic issue.

Radiological Assessment:

A radiograph of the left shoulder showed a well-defined mass in the soft tissues, with calcifications around the joint. A computed tomography (CT) scan confirmed a large, lobulated mass with calcific deposits located around the glenohumeral joint, consistent with UTC. There was no evidence of infection or abscess formation.

Histopathological Examination:

A biopsy of the mass was performed to rule out infection or malignancy. Histopathological examination revealed large deposits of calcium phosphate crystals within the soft tissue, confirming the diagnosis of uremic tumoral calcinosis.

Treatment and Management:

The patient was initially managed conservatively with phosphate binders, and his dialysis regimen was adjusted to improve phosphate clearance. Surgical debridement of the mass was performed to alleviate the pressure on the joint and reduce pain. The patient's hyperphosphatemia was controlled with dietary modifications and increased doses of phosphate binders.

Postoperatively, the patient's symptoms improved, and he was followed up with regular monitoring of his calcium and phosphate levels. No further progression of UTC was observed, and the patient remained stable on peritoneal dialysis.

RESULTS

The patient demonstrated significant improvement in both symptoms and laboratory parameters following management. His serum phosphate levels were normalized after initiating phosphate binders and adjusting the dialysis regimen. The mass decreased in size following surgical debridement, and there was no recurrence of UTC over the 12-month follow-up period. Regular monitoring of calcium-phosphate metabolism, along with adjustments in dialysis, helped to prevent further calcification.

The case highlights the importance of considering UTC in the differential diagnosis of soft tissue masses in patients with ESRD on peritoneal dialysis. It underscores the need for a thorough workup, including radiological imaging and histopathological examination, to accurately diagnose the condition and differentiate it from other potential causes of soft tissue masses, such as infection or malignancy.

DISCUSSION

Uremic tumoral calcinosis (UTC) is a rare complication in ESRD patients, most commonly seen in those undergoing hemodialysis. It is caused by disturbances in calcium and phosphate metabolism, leading to the deposition of calcium-phosphate crystals in soft tissues. The pathogenesis of UTC is not fully understood, but it is thought to be related to the prolonged imbalance between calcium and phosphate levels in the blood, often worsened by hyperparathyroidism and impaired phosphate excretion.

Although UTC is more commonly reported in hemodialysis patients, there are increasing reports of

UTC in peritoneal dialysis (PD) patients, as seen in our case. This shift suggests that while peritoneal dialysis may offer a more physiological approach to dialysis, it may not entirely mitigate the risk of UTC, particularly in the presence of poor phosphate control.

The classic presentation of UTC involves large, painful masses that often develop near major joints, such as the hips, shoulders, or elbows. These masses can cause significant morbidity due to restricted mobility and discomfort. However, the presentation of UTC can vary widely, and in some cases, the masses can be soft, non-tender, and without erythema, as seen in our case. This atypical manifestation may lead to diagnostic delays or misdiagnosis as seen in our patient, where the initial suspicion was for a soft tissue infection.

The role of hyperphosphatemia in the development of UTC cannot be overstated. Elevated phosphate levels, particularly in the presence of secondary hyperparathyroidism, are the primary drivers of calcification. Dialysis patients, whether on hemodialysis or peritoneal dialysis, are at risk for phosphate retention due to impaired renal function, and this can exacerbate the development of UTC. Treatment options for UTC are focused on managing the underlying metabolic disturbances. This includes controlling phosphate levels using phosphate binders, optimizing dialysis, and addressing secondary hyperparathyroidism with medications or surgery. In some cases, surgical excision of calcific masses may be required to alleviate symptoms.

Our case underscores the importance of early diagnosis and the need for a multidisciplinary approach to managing UTC. Given the rare and often nonspecific presentation, healthcare providers should maintain a high index of suspicion for UTC in ESRD patients, especially those with poorly controlled phosphate levels or who present with unexplained soft tissue masses.

Uremic Tumoral Calcinosis (UTC) is a rare but clinically significant complication in patients with end-stage renal disease (ESRD), particularly those undergoing dialysis. The condition is characterized by the deposition of calcium phosphate crystals in soft tissues, usually around joints, leading to the formation of large, painful masses. In most cases, UTC is associated with hemodialysis patients, where the imbalance between phosphate and calcium, combined with secondary hyperparathyroidism, leads to the formation of these calcifications. However, as demonstrated by this case, UTC can also present in patients undergoing peritoneal dialysis (PD), albeit less commonly.

Pathophysiology and Risk Factors

The underlying pathophysiology of UTC is closely tied to abnormalities in calcium-phosphate metabolism in ESRD patients. The kidneys, which play a pivotal role in regulating phosphate levels and calcium balance, are unable to excrete excess phosphate in patients with impaired renal function. This results in hyperphosphatemia, which, in turn, promotes the formation of calcium-phosphate crystals. Additionally, secondary hyperparathyroidism, a common feature in ESRD, further contributes to calcium mobilization from bones and the development of hypercalcemia, aggravating the calcium-phosphate imbalance and encouraging deposition in soft tissues. In many cases, the calcification occurs around periarticular soft tissues, such as the elbows, hips, and shoulders, causing significant pain, discomfort, and loss of mobility.

The occurrence of UTC in patients undergoing peritoneal dialysis suggests that while peritoneal dialysis offers certain advantages over hemodialysis, including more continuous renal replacement therapy and preservation of residual renal function, it does not fully mitigate the risk of phosphate retention. Studies have shown that phosphate retention is not entirely resolved in PD patients, and depending on the type of dialysis solution used, phosphate removal may be suboptimal. This can result in phosphate buildup, creating an environment conducive to the formation of calcium-phosphate crystals, thus increasing the risk of UTC.

However, the specific mechanisms by which phosphate is retained in PD patients remain less understood. While studies have shown that PD does not necessarily prevent phosphate overload, it is also known that PD patients may be more likely to experience suboptimal phosphate control due to the limited ability of peritoneal dialysis to remove phosphate compared to hemodialysis. This limitation may exacerbate the risk of UTC in patients, particularly those with inadequate adherence to phosphate binders or insufficient dialysis.

Atypical Presentation of UTC in Peritoneal Dialysis Patients

The presentation of UTC can vary widely between patients. While it is typically associated with large, palpable, painful masses around joints, the clinical manifestations may not always conform to the classic presentation. The most common sites of involvement include the elbows, shoulders, and hips, but the disease can affect other areas as well. In some cases, the masses may be soft, non-tender, and devoid of erythema, making the diagnosis more challenging. As was seen in this case, where the patient initially presented with an enlarging mass that was mistaken for a soft tissue infection, UTC can easily be

misdiagnosed, particularly when it does not fit the typical clinical picture.

In our case, the patient exhibited a painless, gradually enlarging mass in the left shoulder without the characteristic erythema or joint inflammation typically associated with UTC. This atypical presentation resulted in a delay in the correct diagnosis. The initial assumption was that the patient had a soft tissue infection, which prompted the administration of antibiotics. However, despite a lack of improvement following the antibiotic therapy, the patient's condition worsened, which led to further investigation and ultimately the correct diagnosis of UTC. This case illustrates the challenge of diagnosing UTC, especially in dialysis patients, as the condition can easily be mistaken for other more common diseases such as infections or soft tissue tumors.

The atypical presentation of UTC also highlights the importance of a high index of suspicion in ESRD patients, particularly those with poorly controlled phosphate levels or who present with unexplained soft tissue masses. In cases where the diagnosis is uncertain, imaging studies such as radiography and CT scans, as well as histopathological examination, are essential in confirming the diagnosis.

Diagnosis of UTC: Radiological and Histopathological Approach

The diagnostic workup for UTC involves a combination of clinical assessment, radiological imaging, and histopathological examination. Radiological imaging is often the first step in identifying calcifications in soft tissues. In this case, radiographic studies revealed a well-defined mass with calcifications around the left shoulder joint. A computed tomography (CT) scan further confirmed the presence of a large mass with calcific deposits, which was consistent with the diagnosis of UTC.

Radiological imaging can be quite useful in diagnosing UTC, as it typically reveals well-circumscribed, calcified masses located around joints. These masses often show a characteristic "lobulated" appearance, which helps differentiate them from other causes of soft tissue masses such as infections or tumors. Additionally, in some cases, bone involvement may also be noted, further supporting the diagnosis of UTC.

Histopathological examination, as performed in this case, is crucial in confirming the diagnosis. Tissue biopsy reveals the presence of calcium phosphate crystals in the soft tissue, typically in the form of large deposits. The crystals appear as basophilic deposits under light microscopy and can be visualized using special stains, such as von Kossa or Alizarin red stains, which are commonly used to identify calcified tissue.

Management of UTC in Peritoneal Dialysis Patients

Managing UTC in dialysis patients requires a multifaceted approach that focuses on correcting the underlying metabolic disturbances, alleviating symptoms, and preventing further calcification. The cornerstone of treatment includes phosphate control, which can be achieved through the use of phosphate binders and adjustments to the dialysis regimen. In our case, phosphate binders were introduced, and the patient's dialysis regimen was optimized to improve phosphate clearance. Additionally, dietary restrictions, especially limiting phosphate-rich foods, were advised to further reduce phosphate intake.

Phosphate binders, such as calcium-based or non-calcium-based agents, are essential in controlling serum phosphate levels in dialysis patients. By preventing phosphate absorption from the gastrointestinal tract, these medications help lower serum phosphate levels and reduce the risk of calcification. In some cases, when phosphate binders are insufficient, further interventions such as vitamin D analogs, calcimimetics, or even parathyroidectomy may be considered to manage secondary hyperparathyroidism.

In cases where calcifications have already formed and are causing significant symptoms, surgical excision may be necessary. Our patient underwent surgical debridement to remove the mass and alleviate the pressure on the affected joint. Surgical removal is particularly important in cases where the calcified mass is large, causing pain, restricting movement, or leading to tissue necrosis.

Although surgical excision may offer symptomatic relief, it does not address the underlying metabolic disturbances that contribute to the formation of UTC. Therefore, ongoing management of phosphate levels and careful monitoring of dialysis patients is crucial to prevent recurrence. Regular follow-up, including serum phosphate monitoring and imaging, can help detect any early signs of UTC and allow for prompt intervention.

Prognosis and Recurrence

The prognosis for UTC in dialysis patients depends largely on the severity of the calcifications, the effectiveness of phosphate control, and the timeliness of intervention. In this case, the patient's condition improved significantly after phosphate management and surgical debridement, with no recurrence of the calcifications over a 12-month follow-up period. However, in some cases, UTC may recur if the underlying metabolic abnormalities are not adequately controlled.

Long-term management of UTC in dialysis patients requires a comprehensive approach that includes regular monitoring of calcium-phosphate metabolism, strict control of serum phosphate levels, and optimizing the dialysis prescription. As our case demonstrates, early detection and intervention can lead to a favorable outcome, but careful monitoring is necessary to prevent complications and recurrence.

Uremic tumoral calcinosis is a rare but serious complication of end-stage renal disease and dialysis therapy. The condition is typically associated with hemodialysis, but as this case illustrates, it can also occur in patients undergoing peritoneal dialysis. Early recognition and accurate diagnosis of UTC are critical in preventing severe morbidity. This case underscores the importance of considering UTC in the differential diagnosis of soft tissue masses in dialysis patients, particularly those with hyperphosphatemia or secondary hyperparathyroidism.

In addition to phosphate control, the management of UTC may require surgical intervention to alleviate symptoms and prevent further complications. Multidisciplinary care, including nephrologists, radiologists, and surgeons, is essential in optimizing treatment and improving patient outcomes. Further research is needed to better understand the pathophysiology of UTC in peritoneal dialysis patients and to develop targeted strategies for its prevention and treatment.

CONCLUSION

This case report illustrates an unusual presentation of uremic tumoral calcinosis in a patient on peritoneal dialysis, emphasizing the need for awareness of this condition in the differential diagnosis of soft tissue masses in ESRD patients. Early identification and appropriate management, including phosphate control and, when necessary, surgical intervention, are critical to preventing the progression of UTC and improving patient outcomes. As the number of dialysis patients continues to rise, further research is needed to elucidate the pathophysiology of UTC, especially in patients on peritoneal dialysis, and to develop better strategies for its prevention and treatment.

REFERENCES

Fathi, I.; Sakr, M. Review of tumoral calcinosis: A rare clinico-pathological entity. World J. Clin. Cases. 2014, 2, 409–414. [Google Scholar] [CrossRef]

Olsen, K.M.; Chew, F.S. Tumoral Calcinosis: Pearls, Polemics, and Alternative Possibilities. RadioGraphics 2006, 26, 871–885. [Google Scholar] [CrossRef] [PubMed]

Cofan, F.; García, S.; Combalia, A.; Campistol, J.M.; Oppenheimer, F.; Ramón, R. Uremic tumoral calcinosis in patients receiving longterm hemodialysis therapy. J. Rheumatol. 1999, 26, 379–385. [Google Scholar] [PubMed]

Hamada, J.; Tamai, K.; Ono, W.; Saotome, K. Uremic Tumoral Calcinosis in Hemodialysis Patients: Clinicopathological Findings and Identification of Calcific Deposits. J. Rheumatol. 2006, 33, 119–126. [Google Scholar]

Chu, H.Y.; Chu, P.; Lin, Y.F.; Chou, H.K.; Lin, S.H. Uremic Tumoral Calcinosis in Patients on Peritoneal Dialysis: Clinical, Radiologic, and Laboratory Features. Perit. Dial. Int. 2011, 31, 430–439. [Google Scholar] [CrossRef]

Hiramatsu, R.; Ubara, Y.; Hayami, N.; Yamanouchi, M.; Hasegawa, E.; Sumida, K.; Suwabe, T.; Hoshino, J.; Sawa, N.; Amizuka, N.; et al. Occurrence of new bone-like tissue formation in uremic tumoral calcinosis. Bone 2013, 52, 684–688. [Google Scholar] [CrossRef]

Evenepoel, P.; Meijers, B.K.I.; Bammens, B.; Viaene, L.; Claes, K.; Sprangers, B.; Naesens, M.; Hoekstra, T.; Schlieper, G.; Vanderschueren, D.; et al. Phosphorus metabolism in peritoneal dialysis- and haemodialysis-treated patients. Nephrol. Dial. Transplant. 2016, 31, 1508–1514. [Google Scholar] [CrossRef]

Fatehi, M.; Ahuja, C.S.; Wang, S.; Ginsberg, H.J. Uremic tumoral calcinosis in the cervical spine: Case report. J. Neurosurg. Spine 2016, 25, 26–30. [Google Scholar] [CrossRef]

Maioli, M.E.; Delfino, V.D.A.; Guerra, A.C.D.Z.; Kunii, L.F.; Frange, R.F.N. Reversal of uremic tumoral calcinosis by optimization of clinical treatment of bone and mineral metabolism disorder. J. Bras. Nefrol. 2017, 39, 217–219. [Google Scholar] [CrossRef] [PubMed]

González, G.A.; Nadal, M.Á.; Patronelli, V.; Gnocchi, C.; Wainer, P.; Copa, A.; Gubergrit, A. Calcinosis tumoral en diálisis peritoneal. Rev. Nefrol. Dial. Traspl. 2015, 35, 81–84. [Google Scholar]