Repeated Spontaneous Quadriceps Tendon Rupture in Hemodialysis Patient : A Case Report and Review of the Literature

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Abstract

A 43-year-old man experienced repeated spontaneous quadriceps tendon rupture after he had been on regular hemodialysis for 10 years. He had undergone a long period of secondary hyperparathyroidism as demonstrated by high serum parathyroid hormone and alkaline phosphatase level. He was successfully treated both times using the conservative method. The causes or risk factors, clinical character and appropriate management of this rare morbidity in hemodialysis patients are discussed with a literature review.

Key word : Quadriceps Tendon Rupture, Hemodialysis, Hyperparathyroidism

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Since dialysis was begun in the treatment of end-stage renal failure patients, patient survival rate has improved. However, the patients are still prone to common ailments such as cardiovascular disease and complications of long-term dialysis such as dialysis-associated amyloidosis and secondary hyperparathyroidism. Spontaneous tendon rupture is rare, but is reported occasionally. The author reports a case of repeated spontaneous quadriceps tendon rupture, and review of the literature to examine the causes or risk factors, clinical characteristics and appropriate management of this condition.

CASE REPORT

A 43-year-old man who had been on hemodialysis for 10 years came to the hospital complaining of right knee pain after a fall while walking. He felt pain in his knee with swelling and he could not

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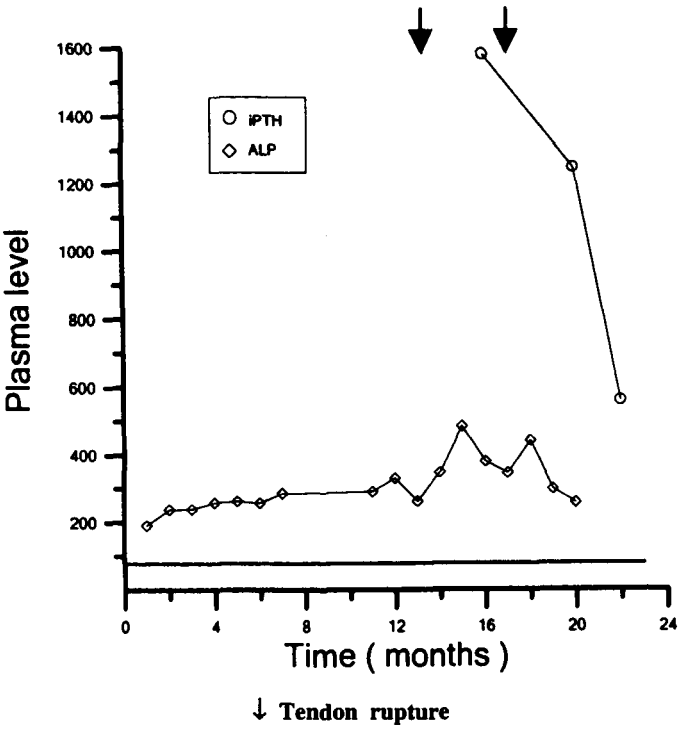

Fig. 1. Alkaline phosphatase (ALP) and intact parathyroid hormone (iPTH) changes during the last 2 years of dialysis. The solid horizontal line indicates the upper normal level of alkaline phosphatase.

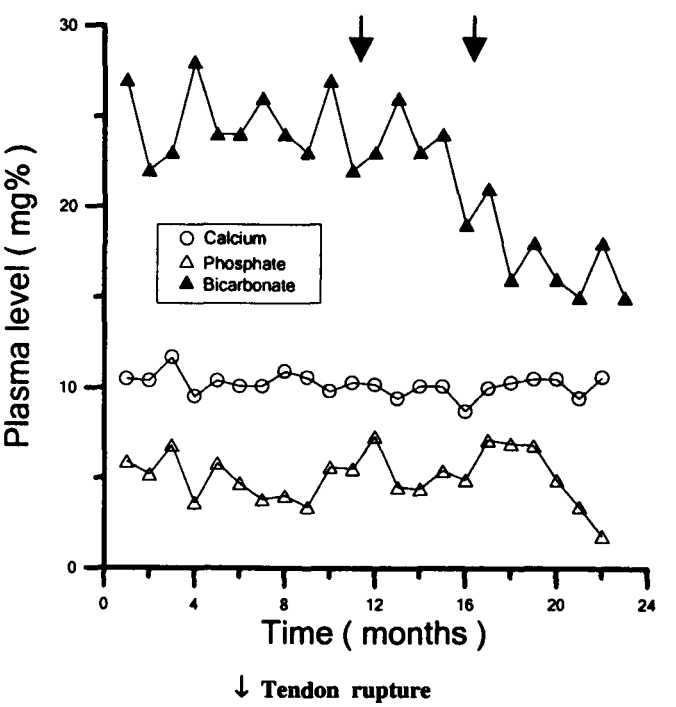

Fig 2. Calcium, phosphate and bicarbonate changes during the last 2 years of dialysis.

extend the joint. Physical examination revealed an abnormal indentation in the pre-patella region with swelling and inability to straighten the joint. Arthrocentesis showed bloody effusion, and quadriceps tendon rupture was diagnosed. Conservative treatment was successful, and he could soon walk with little difficulty. Five months later he experienced a second episode of bilateral quadriceps tendon rupture while walking upstairs. The management was again conservative. A blood review revealed persistent high alkaline phosphatase and a very high parathyroid hormone level (Fig. 1). Changes of serum calcium, phosphate and bicarbonate levels are shown in Fig. 2. There was an intermittent high serum phosphate level and a decreased serum bicarbonate level during the last year of hemodialysis. He was treated with oral one-alpha vitamin D_3 1 mcg twice weekly. The parathyroid hormone level decreased. At this time the patient had a kidney transplant, and has had no further tendon ruptures to date.

DISCUSSION

Spontaneous tendon rupture is a rare complication in hemodialysis patients, occurring in from 0.3 per cent to 15 per cent of cases[1-3]. The difference in prevalence between reports may be due to different durations of survey. For example, Jones and Kjellstrand[1] reviewed their cases for 10 years while Spencer[4] surveyed for 5 years. Tendon rupture has been reported at many sites such as quadriceps[1,3-8], achilles[4], patellar[5], triceps[8], and digital extensor [3,5]. The most common site was quadriceps, about 65 per cent[1].

The studies of quadriceps tendon rupture and patients data are shown in Table 1. Most have few patients. Most patients had been on hemodialysis for many years before spontaneous tendon rupture occurred. The most persistent associated finding was hyperparathyroidism, followed by previous steroid use and dialysis-associated amyloidosis.

Some studies tried to show an association between hyperparathyroidism and tendon rupture. Although the study of Jones and Kjellstrand[1] and Menghello and Bertoli[4] were case-controlled, the patients included extra-quadriceps and quadriceps tendon ruptures. Jones and Kjellsrand[1], Menghello and Bertoli[5], Ryuzaki et al[6] and Franco et al[8] also showed the time relationship between hyperparathyroidism and spontaneous tendon ruptures. They demonstated that all cases had a tendon rupture after a few to many years of hyperparathyroidism status,

Table 1. Case reports and patient data.

Report	Patients (n)	Time of event after hemodialysis (years)	Associated condition	Histology of ruptured tendon	Management
Jones and Kjellstrand[1]	3	4.2	Hyperparathyroidism, previous steroid use	NP	NP
Morein et al[3]	3	6.6	Hyperparathyroidism	NP	Surgery
Menegnello and Bertoli[5]	3	4.5	Hyperparathyroidism	NP	NP
Spencer[4]	2	10	NP	NP	Surgery
Ryuzaki et al[6]	3	10	Hyperparathyroidism	Minute fragments of bone and cartilage, degenerated tendon tissue with hemorrhage, fibrosis and granulation, no elastosis or amyloid substance	Surgery
Bhole et al[7]	2	4	Hyperparathyroidism	Nonspecific degeneration and calcification, no elastosis or amyloid substance	Surgery
Franco et al[8]	2	7.5	Hyperparathyroidism	Degenerative change and hemorrhage, no elastosis or amyloid substance but positive for β_2-microglobulin	Surgery
Kurer et al[9]	1	NP	NP	Positive for amyloid substance	Surgery

NP : not presented

which was shown by elevation of the serum alkaline phosphatase level, prior marked bone erosions and serum parathyroid hormone level. These indicate that spontaneous tendon rupture in both quadriceps and extra-quadriceps sites have the same risk or cause, hyperparathyroidism.

Although 2 cases of dialysis-associated amyloidosis were reported by Kurer et al[9], possible hyperparathyroidism could not be excluded because serum parathyroid hormone level was not mentioned.

Other possible associated risk factors were chronic metabolic acidosis and β_2-microglobulinemia, a precursor of dialysis-associated amyloid substances. Finlayson et al[10] showed that collagen structure became more elastosic with chronic metabolic acidosis, and Murphy and Macphee[11] also reported a case of tendon rupture with this condition, neither commented on the parathyroid hormone status. There was no proof of quadriceps tendon rupture, which may have been due to the better care of metabolic acidosis.

In addition to being the precursor of amyloid substance, β_2-microglobuline may directly cause a tendon rupture. Franco et al[8] revealed β_2-microglobuline in ruptured quadriceps tendon in the absence of any amyloid substance. β_2-microglobuline has also been demonstrated to induce the synthesis of fibroblast collagenase, suggesting its role in modulating connective tissue breakdown[12]. Petersen and Kang [13] and Spraue and Moe[14] also demonstrated that β_2-microglobuline caused periosteal resorption in an experimental model. Both effects could possibly have weakened the tendon.

A strong relationship between spontaneous quadriceps tendon rupture and hyperparathyroidism has been found. It can also be caused by amyloid deposition. The additive effect of parathyroid hormone, β_2-microglobuline and amyloid should also be further tested.

The best treatment for spontaneous quadriceps tendon ruptures must be considered. It should prevent hyperparathyroidism and if or when hyperparathyroidism is diagnosed it must be treated aggressively. The ruptured tendon may be corrected conservatively or surgically. Although there is no controlled study to support a better success rate or an earlier recovery from surgical correction, previous case reports suggest surgery[1,3-9], however the present case demonstrates that conservative treatment can be successful.

In conclusion, the author presents one case of repeated spontaneous quadriceps tendon rupture in a patient who had hyperparathyroidism after a long period of hemodialysis. The risks for hyperparathyroidism are renal failure and intermittent hyperphosphatemia. From the literature review, the main risk factor of spontaneous quadriceps tendon rupture is hyperparathyroidism. In dialysis units that can't monitor the serum parathyroid hormone level, monitoring of serum level of alkaline phosphatase or surveying of the complete skeleton may be an alternative. In addition to parathyroidectomy, surgical correction may be the treatment of choice.

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เอ็นคว็อดริเซ็พส์ขาดเองซ้ำในผู้ป่วยฟอกเลือดด้วยเครื่องไตเทียม : รายงานผู้ป่วย 1 รายและทบทวนรายงานในอดีต

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ผู้ป่วยชายอายุ 43 ปีเกิดเอ็นคว็อดริเซ็พส์ขาดเองซ้ำหลังทำฟอกเลือดด้วยเครื่องไตเทียมนาน 10 ปี ผู้ป่วยมีภาวะต่อมพาราไธรอยด์ทำงานมากเกินแบบทุติยภูมิซึ่งตรวจพบมีระดับฮอร์โมนพาราธัยรอยด์สูงและแอ็ลคะไลน์ฟอสฟะทิสสูงนาน ผู้ป่วยตอบสนองต่อการรักษาด้วยวิธีไม่ผ่าตัดทั้งสองครั้ง ภาวะนี้พบน้อยในผู้ป่วยฟอกเลือดด้วยเครื่องไตเทียม ผู้รายงานได้นำเสนอสาเหตุ ลักษณะทางคลินิกและการรักษาที่เหมาะสมจากการทบทวนรายงานในอดีต

คำสำคัญ : เอ็นคว็อดริเซ็พส์ขาด, ฟอกเลือดด้วยเครื่องไตเทียม, ต่อมพาราธัยรอยด์ทำงานมากเกินแบบทุติยภูมิ

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