Platelet-rich plasma for calcific tendinitis of the shoulder: a case report

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ABSTRACT

We report a 44-year-old woman with calcific tendinitis of the shoulder treated with platelet-rich plasma injection. Prior to this, she had no improvement of the symptoms after 6 weeks of ultrasound treatment, Codman exercises, and anti-inflammatory treatment. Platelet-rich plasma was injected into the subacromial area 3 times at 2-week intervals. She had progressive improvement of pain after 2 weeks, and was asymptomatic at week 6. The patient then underwent the previous protocol of rehabilitation. At the one-year follow-up, the patient was pain-free and had complete resolution of calcific tendinitis. The patient had regained full range of movement and had resumed all her activities.

Key words: platelet-rich plasma; tendinopathy

INTRODUCTION

Calcific tendinitis of the shoulder occurs when calcium is deposited in the rotator cuff tendons, especially the supraspinatus tendon, often causing acute pain. This cell-mediated process can be chronic in nature, but is usually self-limiting. Tendinopathy of the supraspinatus tendon usually develops in the ‘critical area’ between 1.25 and 2.5 cm proximal to the insertion site, owing to vascularisation deficits when the arm is in abduction. The rotator cuff tendons, particularly the deepest portion of the supraspinatus, undergo a transient irrigation deficiency.

Non-operative management remains the treatment of choice, with a success rate of up to 90%. When conservative measures fail, needle puncture or surgical removal, mainly by arthroscopy, may be indicated. Acromioplasty should not be performed without radiographic signs of impingement. If a large rotator cuff defect is found after removal of the calcific deposit, the defect should be sutured to prevent progression of the cuff tear and to promote healing.

Treatments for calcific tendinitis entail physical therapy, kinesitherapy, application of ultrasound, extracorporeal shock wave therapy, and corticosteroids injection. Platelet-rich plasma has
not been used for this condition. The bioactivity of platelet-rich plasma is based on progressive, balanced release of a pool of proteins and growth factors known to stimulate tissue healing, including platelet-derived growth factor, transforming growth factor-β1, and insulin-like growth factor.7–9 We report a 44-year-old woman with calcific tendinitis of the shoulder treated with platelet-rich plasma injection.

CASE REPORT

In January 2008, a 44-year-old woman presented with a 3-month history of intense right shoulder pain necessitating manoeuvre abduction of >50° or anteversion of >80°. She had had similar symptoms 3 years previously that subsided somewhat. Radiographs showed calcification at the distal rotatory cuff in the area of the supraspinatus insertion (Fig. a).

The patient had no improvement of the symptoms after 6 weeks of ultrasound treatment, Codman exercises, and anti-inflammatory treatment. She was then treated with platelet-rich plasma, which has been used to treat cartilage lesions, muscle ruptures, non-union fractures, and Achilles tendon rupture. It was intended as a palliative treatment and not a clinical trial. Platelet-rich plasma was injected into the subacromial area (without any imaging guidance) 3 times at 2-week intervals.7 She had progressive improvement of pain after 2 weeks, and was asymptomatic at week 6. The patient then underwent the previous protocol of rehabilitation.

At the one-year follow-up, the patient was pain-free and had complete resolution of calcific tendinitis (Fig. b). The patient had regained full range of movement and had resumed all her activities.

DISCUSSION

The incidence of calcific tendinitis in asymptomatic patients is about 2.7% to 20%,10–13; 35% to 45% of these patients eventually become symptomatic.10,11 The incidence of calcific tendinitis in patients with painful shoulders is about 6.8%.12 Nearly 90% of the calcifications occur in the supraspinatus and infraspinatus tendons.10,11,14,15 This ‘stress area’ is hypervascularised, and calcium tends to deposit in 1.5 to 2 cm from the tendon insertion in the major trocar.16,17 Calcific tendinitis has a predilection for women (60 to 77%).10–12,15 The mean age at presentation is 47 (range, 31–60) years in women and 51 years in men.12,15 It rarely occurs before the age of 40 years,1 as calcium tends to deposit only in degenerate tendinous fibres.18–19 There was no correlation between calcific tendinitis and trauma.20 Nonetheless, others consider tenocyte necrosis is the cause of calcium deposition.21 The process of calcification is actively mediated by cells in a viable environment.21–23

Calcific tendinitis develops in 3 stages. In the pre-calcification stage, tenocytes become metaplastic and transform into chondrocytes, and then fibrocartilage. In the calcification stage, calcium phosphate is deposited and then resorbed, which increases regional vascularisation. In the post-calcification stage, calcium...
is resorbed and the area is remodelled.\textsuperscript{17,24} Based on the pathogenesis of histic hypoxia,\textsuperscript{1} the hypoxic state produces a lack of irrigation of the ‘critical area’ near the insertion of the supraspinatus tendon and induces calcified deposits.\textsuperscript{1,2}

The main symptom of calcific tendinitis is pain, which increases in the beginning of the resorptive stage. There is no increase in vascularisation or pressure in the beginning of calcium deposition, and thus symptoms are mild. Further accumulation of calcium can lead to compression of the coracoacromial ligament. In the resorptive stage, vascularisation increases, and this increases intratendinous pressure, which exacerbates the pain.\textsuperscript{25} Symptoms usually last 2 to 3 weeks in the acute phase, 8 weeks in the subacute phase, and >3 months in the chronic phase.

Calcium deposits are formed within the tendon tissue and do not affect the bone. Their extension and density are visible on radiographs.\textsuperscript{26} The type I pattern has a velvety appearance with a poorly defined periphery, and is usually seen in acute cases.\textsuperscript{19} In type II, the density is homogeneous and the limits of the lesion are better defined.\textsuperscript{19} In the chronic stages, the deposit is dense and well-defined, with a homogeneous density. In the resorptive or acute stage, the deposit is hairy, misty, and undefined, and shows irregular density. Ultrasound is also useful for visualising calcific tendinitis, and has a diagnostic performance of 90%.\textsuperscript{27}

Patients with calcific tendinitis have no associated metabolic change in calcium or phosphorus concentrations in blood or urine. They do, however, have a high rate of HLA-A1 (50\%) genotypes, compared to patients with rotator cuff tears (27\%) and controls (26\%).\textsuperscript{28}

Calcific tendinitis must be differentiated from dystrophic calcification, which is part of a degenerative process of the enthesis. Its radiographic features include signs of arthrosis and rotator cuff disruption, which causes narrowing of the interval between the humeral head and acromion. Calcium deposits are evident as small dots, located above the greater tuberosity.

Conservative and surgical treatments achieve comparable outcomes.\textsuperscript{29} In the natural course of calcific tendinitis, calcium deposits disappear spontaneously in 9\% of patients over 3 years,\textsuperscript{30} which yields an annual resolution rate of 3\%.\textsuperscript{11} About 90\% of patients are treated conservatively.\textsuperscript{31} Treatment with extracorporeal shock waves achieves >75\% resolution of calcium deposits within <6 months.\textsuperscript{32}

Needle puncture and injection of local anaesthetics (corticosteroids) can also achieve favourable results in around 70\% of patients,\textsuperscript{33,34} as can needle lavage and irrigation.\textsuperscript{35} Ultrasound-guided puncture using 1 or 2 needles also provides favourable results in 70\% of patients after 6 months, even for calcium deposits of >5 mm.\textsuperscript{36-38} Radiotherapy also yields favourable outcomes.\textsuperscript{39,40} Platelet-rich plasma has been used as an adjuvant treatment in rotator cuff surgery.\textsuperscript{41}

Platelet-rich plasma is a concentrate of autologous human platelets in a small volume of plasma. It includes a high level of the growth factors,\textsuperscript{42} which enables healing and tissue formation. All stages of the repair process are controlled by cytokines and growth factors acting locally as regulators of basic cell functions, in conjunction with endocrine, paracrine, autocrine, and intracrine mechanisms.\textsuperscript{31,43-48} Platelet-rich plasma increases bone and wound healing and decreases rates of postoperative infection, pain, and blood loss. It has been applied in periodontal and oral surgery,\textsuperscript{42,49} maxillofacial surgery,\textsuperscript{42} cosmetic and plastic surgery,\textsuperscript{50} spinal fusion, coronary bypass surgery, and for the treatment of chronic skin and soft tissue ulcers.\textsuperscript{7} It is easy to prepare, biosafe, versatile, and cost-effective for stimulating tissue healing.\textsuperscript{7,45,47,48}

About 10\% of patients with calcific tendinitis do not respond to conservative treatment.\textsuperscript{31} Surgery is recommended in patients with progressive symptoms, especially for pain that interferes daily activities, and in those who fail conservative treatment.\textsuperscript{31} Surgery is the fastest and most reliable way of removing large calcifications in tendons.\textsuperscript{10,15,52}

In 22 patients with calcified tendinitis followed up for 2 years, their Constant scores improved from 52 to 89 after resection of the deposits and acromioplasty.\textsuperscript{53} Patients who waited at least one year until symptoms progressed achieved better results.\textsuperscript{53} Arthroscopic surgery enables easy access to the subacromial space and extraction of the calcifications.\textsuperscript{24,34-36} The calcic deposits disappear in 88\% of patients.\textsuperscript{56}

In our patient, the successful outcome may not have been due to platelet-rich plasma, as calcific tendinitis tends to recover spontaneously. Other factors may also have contributed to the pain relief. Nonetheless, our patient achieved complete pain relief and regained full joint mobility that had not resolved for 3 years. Disappearance of calcifications was also noted on radiographs.


