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Pre-tibial reaction to biointerference screw in anterior cruciate ligament reconstruction

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ABSTRACT

Background: We aim to report a series of cases that presented as pre-tibial swelling and pain following anterior cruciate ligament (ACL) reconstruction using bioabsorbable fixation devices.
Methods: All ACL reconstructions done between 2007 and 2010 were reviewed retrospectively to identify complications related to bioabsorbable fixation devices. We performed 273 ACL reconstructions over a period of three years from 2007 to 2010 using a bioabsorbable screw for tibial fixation of the quadrupled hamstring autograft.
Results: Fourteen patients (5%) at mean age of 30 (range 16–47) years, presented to us at a mean post-operative period of 26 months (range 12–39) with pre-tibial pain and swelling over the tibial screw site. All of them had normal inflammatory markers. All of these patients underwent surgical debridement, which revealed remnants of screw and reactive material. There was no evidence of infection in the intra-operative specimen cultures. Histopathology revealed a reactive appearance and surrounding myxoid changes. Removal of screw debris and curettage of the tunnel resulted in complete recovery of all patients at a mean follow up of 12 (range 8–16) months.
Conclusions: Pre-tibial cyst along with other adverse biological response should be considered as a possible complication in ACL reconstruction. We report an incidence of 5% of pre-tibial reaction in patients undergoing ACL reconstruction with bio-absorbable interference screw fixation for the proximal tibia.

1. Introduction

Anterior cruciate ligament (ACL) reconstruction is one of the commonly performed surgical procedures. Autograft reconstruction using the patellar tendon or quadrupled semitendinosus/gracilis tendons has become the most popular method in ACL surgery. The original graft fixation devices were staples, screw and washer posts and sutures tied directly to bone. The most common complication of using these devices was pain over any prominent hardware. More serious were early fixation failures, fractures secondary to a stress riser at the fixation device site, and damage to surrounding soft tissue structures [1]. Currently interference, suspensory, or transtunnel fixation devices are used. These implants are composed of metal, bioabsorbable, biocomposite or plastic materials. The bioabsorbable screws are advantageous over the metallic implants in causing less graft damage, not interfering with the subsequent radiological imaging and facilitating revision surgery [2,3]. There are isolated case reports in the literature mentioned about pre-tibial cyst formation following ACL reconstructions [4–9]. We aim to report a series of cases that presented as pre-tibial swelling and pain following ACL reconstruction using bioabsorbable fixation devices.

2. Method

We reviewed all ACL reconstructions performed by two specialist knee surgeons in our hospital between 2007 and 2010. Both surgeons used the same surgical technique for tibial fixation of the graft. We have a prospectively maintained database of all ACL reconstructions performed in our hospital. A review of the case notes was carried out to identify patients with bioabsorbable screw related complications.

All ACL reconstructions were performed arthroscopically. All patients were mobilized full weight bearing with crutches, without any brace. The patients after ACL reconstruction were reviewed in a knee clinic at week 2, week 6 and then further follow up was with the physiotherapist. All patients were reviewed at 12 months in the knee clinic for the final time. We identified patients who had problems with the bio-interference screw from our database and a detailed review of their case notes were carried out. We have been using Bilok interference screws for fixation of the graft on the tibial side. The Bilok interference screw is manufactured by Biocomposites Ltd. and distributed by Arthrocare. It is a headless, cannulated, biocomposite screw made of low molecular weight Poly-L-lactide (PLLA) and synthetic beta-tricalcium phosphate (TCP).

We included all patients who had primary ACL reconstructions using Hamstring grafts and bioabsorbable screw fixation for the tibia. We excluded revision ACL reconstructions, using allografts and tibial side graft fixation other than with a bioabsorbable screw.

We had performed 280 primary ACL reconstructions in the same number of patients during the three-year period from Jan 2007 till

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Table 1
Pre-tibial reaction case series.

Case	Age at primary surgery in years	Side	Graft	Femoral implant	Tibial implant	Symptoms	Timing of repeat surgery in months	Operation	Findings	Culture
1	47	Right	Hamstring	Bilok ST screw	Bilok interference screw	Recurrent effusion, pre-tibial pain	22.5	Arthroscopic wash out, removal and curettage	Screw remnants in joint	No growth
2	16	Left	Hamstring	Arthrex biotransfix pin	Bilok interference screw	Pre-tibial swelling	35.5	Removal and curettage	Remnants of screw, white granuloma	No growth
3	33	Left	Hamstring	Arthrex biotransfix pin	Bilok interference screw	Pre-tibial swelling	38.5	Removal and curettage	Partial degraded screw	No growth
4	27	Right	Hamstring	Arthrex biotransfix pin	Bilok interference screw	Pre-tibial swelling	26.5	Removal and curettage	Screw debris, gelatinous fluid	No growth
5	31	Left	Hamstring	Arthrex biotransfix pin	Bilok interference screw	Pre-tibial swelling	25.5	Removal and curettage	Screw debris, gelatinous fluid	No growth
6	20	Right	Hamstring	Arthrex biotransfix pin	Bilok interference screw	Pre-tibial swelling	31.5	Removal and curettage	Remnants of screw, gelatinous fluid	No growth
7	39	Right	Achilles	Bilok ST screw	Bilok interference screw	Pre-tibial swelling	30.5	Removal and curettage	Partially resorbed screw	No growth
8	37	Right	Hamstring	Arthrex biotransfix pin	Bilok interference screw	Pre-tibial swelling	28.5	Removal and curettage	Degraded tibial screw	No growth
9	32	Left	Hamstring	Bilok ST screw	Bilok interference screw	Pre-tibial swelling	22.5	Removal and curettage	Screw degraded to soft cheesy material	No growth
10	22	Left	BTB	Bilok grub screw	Bilok interference screw	Pre-tibial swelling	34.5	Removal and curettage	Screw remnants	No growth
11	23	Left	Hamstring	Arthrex biotransfix pin	Bilok interference screw	Pre-tibial swelling	26.5	Removal and curettage	Screw remnants, encapsulated	No growth
12	38	Left	Hamstring	Endobutton	Bilok interference screw	Recurrent effusion, pre-tibial swelling	11.5	Arthroscopy, removal and curettage	Screw remnants in joint	No growth
13	24	Right	Hamstring	Bilok ST screw	Bilok interference screw	Pre-tibial swelling	25.5	Removal and curettage	Screw remnants	No growth
14	24	Left	Hamstring	Arthrex biotransfix pin	Bilok interference screw	Pre-tibial swelling	29.5	Removal and curettage	Screw remnants	No growth

Dec 2010. Seven patients had a bone block fixation in the tibia for bone patella tendon graft, hence were excluded from our study. Two hundred and seventy-three patients had an ACL reconstruction using a bioabsorbable interference screw fixation in the tibia. A hamstring graft was used in all of the 273 patients. Out of these, three patients had an Arthrex PEEK interference screw and two patients had a Calaxo screw (Smith and Nephew). This gave us a cohort of 268 patients with Bilok interference screw fixation in the tibia for the final analysis.

3. Results

We identified 14 patients of mean age 30 (range 16–47) years with pre-tibial swelling and pain over the tibial screw site after primary ACL reconstruction using Bilok interference screw in the tibia. The male–female ratio was 1.8:1. The results are summarized in Table 1. The presenting symptoms in these patients were pain and swelling over proximal tibia. They were investigated with blood tests to check ESR and CRP and were within normal limits. The plain X-ray and MRI scan of the knee were also performed. The MRI scans (Figs. 1 and 2) showed abnormal signal related to the tissues anterior to the tibia and focal marrow oedema around the tibial metaphysis. All the 14 patients were symptomatic enough to warrant surgical debridement. They were still symptomatic at the time of surgery, which was after a mean period of 20 (range 12–24) weeks following their clinic review. Surgery involved local debridement with removal of the screw remnants and curettage of the tibial tunnel. Examination under anesthesia revealed negative Lachman's and anterior drawers test on all patients and none had pivoting. Two of these patients presented with recurrent knee effusions in addition to the pre-tibial swelling hence underwent arthroscopic assessment, which did not identify any intra-articular pathology and the ACL graft was intact. The debridement was carried out between 12 and 39 months (mean of 26 months) following the primary procedure. Surgical exploration revealed remnants of the screw and reactive material. There was no evidence of infection in the intra-operative specimen cultures. Histopathology revealed reactive appearance and surrounding myxoid changes (Figs. 3 and 4). Removal of screw debris and curettage of the tunnel resulted in complete recovery of all patients at a mean follow up of 12 (range 8–16) months. They had a mean Lysholm score of 86.3 (range 74–100) and Cincinnati score of 78.1 (range 54–91) at their final follow-up. All patients went back to their preoperative activity level on their final review.

We could not identify any significant medical co-morbidity in any of these patients and only 4 of them were smokers at the time of surgery. There was no significant difference in the size of the screw used in these patients. Eleven patients had size 9 screws and three patients had size 10 screws; this was proportionately similar to the rest of the patients.

Fig. 1. MRI of the knee sagittal section showing high signal changes in the pretibial area and the screw tunnel.