BIOABSORBABLE INTERFERENCE SCREW FOR TIBIAL HAMSTRING GRAFT FIXATION ON ACL RECONSTRUCTION – A POSSIBLE CAUSE OF PRE-TIBIAL INFLAMMATORY REACTION

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Keywords: *anterior cruciate ligament (ACL) reconstruction, interference screw, inflammatory reaction*

Abstract: *We retrospectively reviewed the records of 170 patients in whom the same team of 2 surgeons have performed arthroscopically ACL reconstructions with semitendinosus and gracilis graft in our clinic during 2011-2014. The fixation was with button in the femur and with bioabsorbable interference screw in the tibia. After the surgery, the patients were clinically assessed. The clinical evaluation was performed at 2 weeks, 1, 3 and 6 months and at this time, they were performing a specific recovery programme. This article illustrates the clinical results after our reconstructive technique and some complications caused by the biomaterials. A small number of patients suffered inflammatory reactions in the neighbouring soft tissues and in the bone structure. Bioabsorbable interference screws are a common choice among surgeons. However, there are some disadvantages, such as undesirable biological response of the neighbouring tissues, even though rarely occurring, but when this happens, the patients' recovery might be compromised.*

INTRODUCTION

One of the most encountered sports-related injuries is anterior cruciate ligament (ACL) damage.(1,2) The method of choice for the treatment of ACL rupture became over the last 4 decades, plasty with autologous transplantation.(3,4) The surgery is indicated and performed to prevent knee instability, otherwise, complication like meniscus tear and chondropathy appear and conduct to early osteoarthritis.(5)

Two main types of autograft are used for ACL reconstruction: the autologous bone–patellar tendon–bone graft (BPTB) and the hamstring tendon graft and for fixation. Many surgeons use bioabsorbable aperture interference screw and/or endobuton. The bioabsorbable devices market is growing and the research is ongoing for the ideal bioabsorbable material that provides the best desired function with no adverse reactions. A usual complication is the pain, but, we can also encounter surrounding soft tissue injury, early fixation failure or secondary fractures.(6,7)

In the present paper, there are used interference screw, suspensory, or transtunnel fixation devices. These implants are made of various bioabsorbable or biocomposite materials. Some of the advantages of bioabsorbable screws over the metallic implants are: lesser graft damage, a decreased chance of implant removal and the non-interfering properties with radiological procedures.(8,9) Isolated case reports are mentioned in the literature about pre-tibial cyst formation following ACL reconstructions.(10-15)

PURPOSE

In this paper we present our results after ACL reconstruction and one the most frequent complication that we encountered, which is pre-tibial swelling and pain due to using bioabsorbable fixation devices.

MATERIALS AND METHODS

We retrospectively reviewed the records of 170 patients in whom the same team of 2 surgeons has performed arthroscopically ACL reconstructions with semitendinosus and gracilis graft in our clinic, during July 2011- March 2014 using the anatomical reconstruction. Femoral fixation was with endobutton and tibial fixation with interference screw. We used a screw with 30% biphasic calcium and 70% Poly-L/D-lactide composition. After the surgery, the patients were clinically evaluated. The clinical evaluation was performed at 2 weeks, 1, 3 and 6 months and at this time, they were performing a specific recovery programme. The patients have been evaluated by measuring the degrees of flexion and extension of the knee and using the Lyshom score. The same rehabilitation protocol was applied to all patients. The patients were encouraged to begin active exercises: contracture of the lower extremity and movement of the ankle joint. Knee flexion was started on the second day after surgery; 90° of flexion and complete extension should be acquired within 2 weeks after the operation, and 120° should be achieved at 4 weeks, running at 3 months and preoperative habitual activities after 6 months. All patients were performing recreational sport activities pre-operatively.

The *including criteria* in the study were: absence of osteoarthritis, use of the bioabsorbable interference screw for the fixation in tibial tunnel and the primary ACL reconstruction. All the patients presented before intervention knee instability, positive Lachman, positive drawer test, positive MRI. We exclude the patients who we lost contact of, and those who refused to participate in the study. Of the 170 patients who underwent ACL reconstruction in our hospital, from July 2011-March 2014, 150 patients fulfilled the inclusion criteria.

The gender distribution was male-female 1.5-1, the average age was 29 years (range 14-45), left knee was involved in 81 cases, right knee in 69 cases, all patients suffered the rupture during recreational sport activities.

RESULTS

All patients included in this study at the 3-month evaluation were able to flex the knee 120^0 and full extension was obtained.

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Article received on 30.06.2015 and accepted for publication on 10.08.2015
ACTA MEDICA TRANSILVANICA September 2015;20(3):119-121

Table no. 1. Details on the patients with inflammatory reaction

Case	Age	Side	Graft	Time	Symptoms	Lyshom score at 6 months	Culture
1	19	Left	Hamstring	4 months	Pain, rash, swallow	90	Negative
2	32	Right	Hamstring	5 months	Pain, rash, swallow	85	Negative
3	36	Right	Hamstring	6 months	Pain, rash, swallow, cyst	80	Negative
4	41	Right	Hamstring	4 months	Pain, rash, swallow, cyst	85	Negative

We have 4 patients with an average age of 32 years old with pre-tibial swelling and pain over the tibial screw site after primary ACL reconstruction. This reaction was observed between 3 and 6 months. The male–female ratio was 1:1. The results are presented in table no 1.

The patients presented the following symptoms: pain, rash, swelling and pre-tibial cyst formation over proximal tibia. We investigated the patients with blood tests which were within normal limits and we performed MRI scan of the knee. The MRI scans showed abnormal signal in the tissues anterior to the tibia and focal marrow edema around the tibial metaphysis. We send to the laboratory the content of the cyst but the result was negative.

The patients were told to stop or decrease the intensity of the recovery programme in order to diminish the complications and prevent the appearance of greater problems and they all went well on conservative treatment. These measures resulted in a prolonged convalescence period. At 6-month evaluation, these patients had a Lysholm score of 85 (range 80-90). No significant medical co-morbidity was identified in any of these patients and only 2 of them were smokers at the time of surgery.

DISCUSSIONS

The most important role of the interference screw is to hold the graft in the tibial tunnel with the strength needed to resist to the loads applied during early rehabilitation.(16,17).

The most common complication of these devices is screw breakage, which can be avoided by adjusting surgical technique (19) and also, by using bigger diameter screws. In the literature, there are some complications reported: local bony lyses, cyst formation, soft tissue inflammation and release of implant fragments into the joint space.(7,10-15,19,26)

The expected stages in the natural evolution of the biomaterial are the gradual degradation and its progressive incorporation into the bone structure and replacement by bone tissue. In some cases, a severe inflammatory reaction within the bone structures caused by biomaterials can also cause a reaction in the neighbouring soft tissues because of the immune reaction triggered, with excessive local cytokine production.(20,21) This process may lead to cyst formation, either inside the bone around the screw or around its fragments, in the superficial opening of the fixation tunnel or in the neighbouring soft tissues.(22)

The biomaterials degradation is affected by many factors like material composition, biochemical properties and patient factors, such as age, site of implantation, rate of blood flow and stress on the implant. This makes it difficult to identify the cause of adverse effects with the implants.(8,23,24,25)

Our study reveals the clinical results after the reconstructive technique that we use and some complications caused by the biomaterials.

A small number of patients, 6%, suffered inflammatory reactions in the neighbouring soft tissues and in the bone structure, they were observed between 3 and 6 months. They were forced to diminish the recovery programme and to prolong their convalescence. Fortunately, there was no need for second interventions and the patients who suffered these inflammatory reactions returned to their pre-operative activity with a delay of 2-3 weeks.

CONCLUSIONS

In conclusion, the patients with the ACL reconstruction performed in our clinic have returned to their preoperative activities within 6 months, with the exception of 4 cases who were forced to extend their recovery period due to the inflammatory reaction.

The bioabsorbable interference screws are a popular choice among orthopedic surgeons. However, they must know the possible disadvantages, especially potential adverse biological responses. The search for the ideal bioabsorbable material continues and future work in orthopedic biomaterials should be focused at engineering the material properties and degradation characteristics to improve fixation and integration.

Acknowledgement:

This paper is supported by the CRONEX-CD contract no. POSDRU/159/1.5/S/133377, project financed from the European Social Fund through the Sectoral Operational Programme Human Resources Development 2007-2013.

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