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Case report

Arthroscopic anterior cruciate ligament reconstruction in a patient with multiple hereditary exostoses.

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Abstract. *Background:* Multiple hereditary exostoses (MHE) also known as Multiple Osteochondromas is a rare benign bone tumour disease, characterized by multiple osteocartilaginous masses. The knee is one of the most affected sites. Anterior cruciate ligament (ACL) surgery is the most common and generally most successful surgical knee procedure; however, the association between MHE and ACL reconstruction is very rare and may represent a challenging procedure because of the anatomical anomaly related to presence of multiple masses around the knee. Here, we present a case report of ACL reconstruction in a patient affected by multiple exostoses. *Case report:* The patient was a 30-year-old woman affected by MHE, with an ACL tear arising after knee trauma. As the patient complained of pain, swelling and the knee "giving way", she successfully underwent arthroscopic-assisted ACL reconstruction using quadrupled hamstring tendon grafts, with femoral suspension and double tibial fixations. *Conclusion:* Symptomatic ACL tears in a patient affected by MHE should be considered for arthroscopic reconstruction, which requires that particular attention be paid to tendons harvesting, tunnel placement and the choice of graft fixation system, given the presence of multiple masses around the knee. (www.actabiomedica.it)

Key words: Multiple hereditary exostoses, osteochondromas, anterior cruciate ligament, reconstruction, arthroscopy, graft fixation.

Introduction

Multiple hereditary exostoses (MHE), also known as multiple osteochondromas, constitute a rare genetic disease, with an incidence of one in 50,000 individuals (1, 2). MHE is characterized by osteocartilaginous tumors formation in the metaphyseal of long bone, around the joints. The knee is the most affected joint, with a prevalence of distal femur and proximal tibia involvement ranging from 70% to 98% (1, 2). Multiple exostoses of the knee are generally asymptomatic, but complications may arise, such as neurovascular disorder and malignant degeneration, which is estimated to occur in 0.5–5% of cases. Anterior cruciate ligament (ACL) reconstruction is the most performed and generally most successful procedure in knee surgery (3, 4). The results of ACL reconstructions depend on several elements, including tendon harvesting, the tunnel placement, the tension applied to the graft during fixation, and the type of femoral and tibial fixations (3-5).

In a patient with MHE, ACL reconstruction is a challenge because of the presence of exostoses around the knee and the poor bone quality; such an anatomical anomaly can interfere with tendon harvesting, tunnel placement and implant fixation, and it can compromise the success of reconstruction. Here, we present a case of a patient with multiple hereditary exostoses, who successfully underwent arthroscopic ACL reconstruction.

Case report

A 30-year-old woman was referred to our orthopaedic department complaining of pain, swelling and her knee giving way. The patient was treated with medical therapy, a brace and physiotherapy, but this treatment did not eliminate her symptoms. Four months ago, the patient had suffered a twisting trauma to her right knee falling on a bicycle, and as a result, the patient had difficulty in carrying out her normal daily activities. The patient was affected by multiple hereditary osteochondromas, with multiple localizations. At the age of 13, the patient had undergone bilateral temporary tibial medial hemiepiphysiodesis for correction of knee valgus deformities.

On physical examination, the patient was found to be in generally good condition; her weight was 45 kg, and her height was 155 cm. The knee presented swelling with anterior pain. We found multiple exostoses on the medial and lateral side. The Lachman test, jerk test and anterior drawer test suggested a complete ACL tear.

A plain X-ray, with an anterior-posterior and lateral view, revealed the already known multiple osteochondromas around the knee (Fig. 1A and 1B).

Magnetic resonance imaging (MRI) confirmed the multiple exostoses and showed a complete ACL tear, while hamstring tendons appeared to have no damage (Fig. 2).

No further investigations were performed (i.e. bone scan, CT-scan etc.) since X-ray showed an unchanged characteristic with respect to the previous examination done eleven years ago.

Having given informed written consent and under spinal anaesthesia, the patient underwent an arthroscopic-assisted ACL reconstruction; a thigh tourniquet was applied. During the arthroscopic diagnostic phase, there was found to be a complete ACL tear. No further intra-articular lesions were present; a 2 mm notchplasty was carried out to improve visualization and to prevent graft impingement. Through a longitudinal 3-cm incision, we harvested the hamstring tendons. The graft diameter was 7 mm. A tibial tunnel was carried out by using a tibial aimer guide. We placed the tunnel in such a way as to avoid conflict between the entrance and the osteocartilaginous tibial medial mass. We carried out the femoral half-tunnel through a trans-tibial approach, whereas we fixed the graft with an Endobutton femoral device (Smith & Nephew, Watford, England, UK). Care was taken to avoid conflict between

Fig. 1 (A,B) Pre-operative X-ray images of the right knee showing the presence of multiple exostoses around the joint

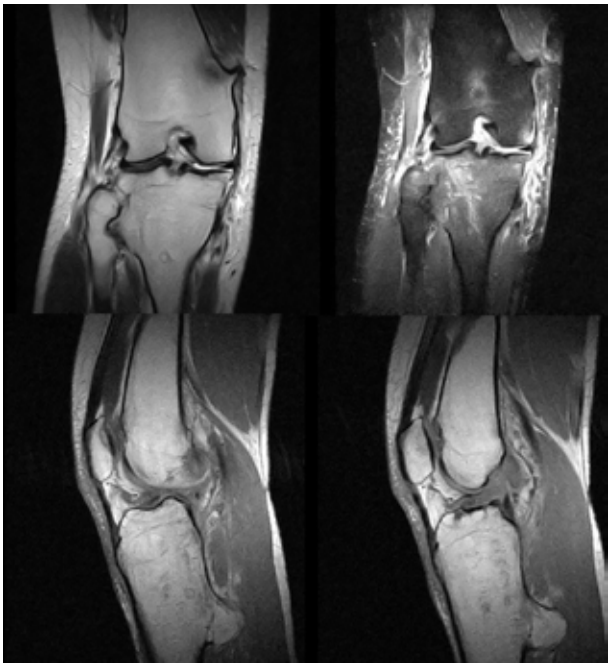

Fig. 2 Magnetic resonance image demonstrates the anterior cruciate ligament rupture and the presence of multiple exostoses.

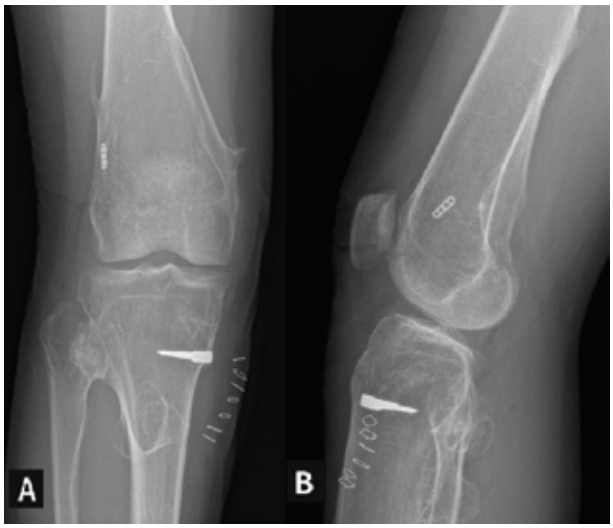

Fig. 3 (A,B) Post-operative X-ray showing the accurate placement of the tunnels and the devices fixation.

the femoral wire exit, the Endobutton device position and the tumour mass. At the tibial side, we fixed the graft with a 9 × 25 mm diameter intratunnel, bioabsorbable screw and an extra-tunnel application of a metallic staple. No intraoperative complications or adverse events were encountered.

On the first postoperative day, the drain was removed, and the patient began physiotherapy with quadriceps isometric exercises, constant passive knee motion and partial weight-bearing using two crutches. A plain X-ray showed the correct placement of the tibial and femoral tunnel, as well as the Endobutton device location over the lateral surface of the distal femur (Fig. 3A and 3B).

By the four-month follow-up, the patient had gained a full range of knee motion, and the anterior drawer, Lachman and jerk tests were negative. By the ten-month follow-up, the patient had become able to return to daily activities. The Lysholm score increased from 45 preoperatively to 90, and the Tegner level of activity increased from level 1 to 5.

Discussion

Multiple exostosis is a rare genetic disease characterized by multiple osteocartilaginous masses, which is very common around the knee, with possible axis deformities and early degenerative change (6); furthermore, MHE represents a challenge because it may complicate surgical knee management (7). In a case report with MHE and knee osteoarthritis with complex deformity, Patel (8) suggested utilization of a computer-navigated system to perform total knee replacement. Despite the high incidence of ACL reconstructions in the general population, only one case report of ACL reconstruction in a patient with MHE is described in the literature (9). The main difficulties are performing tendon harvesting, tunnel placement and graft fixation, due to the presence of multiple masses around the knee (9). In our case, we performed the ACL reconstruction with a double-stranded hamstring tendon, and femoral fixation with an extra-cortical Endobutton system, while the tibial fixation was made by an intratunnel, 2-mm oversized interference screw and an extra-tunnel staple implant.

There are a number of grafts available for anterior cruciate ligament (ACL) reconstruction, including autografts, allografts, and synthetic materials (10). In the literature, hamstring tendons account for between 33% and 53% of all performed ACL reconstructions (10). Compared to a patellar tendon graft, the utilization of hamstring tendons is associated with limited donor site morbidity; however, in the case of osteochondromas, hamstring tendons can be dislocated or damaged (11); therefore, in the preoperative planning, another graft choice must be taken into consideration. In our case, the preoperative MRI showed that the hamstring tendons were in situ and did not appear to be damaged; however, we made a wider incision for better tendon vision, which was slightly dislocated below the medial small mass.

The tunnel's position should be evaluated preoperatively with a standard X-ray and oblique view, MRI or CT-scan imaging (12); in selected cases, a navigation system can be helpful for performing tunnels (13). The tibia tunnel drill entrance and the femoral wire exit must avoid the position of exostoses. Intraoperative amplioscope control can be helpful. The tibial tunnel entrance should be changed to a more medial, lateral or proximal position, while the intra-articular exit of the tibial tunnel must maintain the posterior position regarding the line of Blumensaat. On the femoral side,

the surgeon must consider the anteromedial, the transtibial or the out-in technique relating to the desirable exit of the tunnel.

In the only case described in the literature, Tambe (9) reported a young male patient (aged 27 years), affected by multiple exostoses and treated with ACL reconstruction, where the hamstring tendons were fixed with a femoral Endobutton technique and interference tibial screw. Even in our case, We also decided to carry out femoral fixation using an Endobutton suspension device while at the tibial side, owing to the poor bone quality, we preferred a double fixation in order to strengthen the tibial fixation, which is considered to be the weakest link in all anatomic ACL reconstruction (14, 15).

Conclusion

The patient affected by multiple exostoses with symptomatic ACL tear should be considered for arthroscopic ACL reconstruction. In preoperative planning, care must be taken over tendon hamstring harvesting, the tunnels position and choice of fixation system, which should be based on the patient's own pathological anatomy.

Conflict of Interest: Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article

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