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Tibial Blowout"- A Complication of Arthroscopic Anterior Cruciate Ligament Reconstruction

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Authors' contributions

This work was carried out in collaboration between all authors. All authors have contributed equally in the study and writing of the protocol. All authors read and approved the final manuscript.

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Case Study

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ABSTRACT

The reconstruction of anterior cruciate ligament (ACL) has become the standard of care for a torn ACL in active, young athletes. Various technical complications during the surgery are documented. Of the complications pertaining to the bony tunnel preparation, the posterior femoral blow out is common. In this report we describe a complication that can occur while preparing the tibial tunnel – "tibial blow out". This is a complication of anterior placement of the tibial tunnel and this has not been reported in the literature. We describe the identification, the possible mechanism, prevention and management of such an intraoperative complication.

Keywords: Knee; ACL; complications; Tibial blow out.

1. INTRODUCTION

ACL reconstruction is a fairly common procedure and the annual volume of which keeps on increasing. A complication rate of 1.8% is reported after ACL reconstruction [1]. Fractures of patella [2], Distal femur [3] and Tibial plateau [4] all have been reported. This has been attributed to the stress riser effect of the bone tendon bone graft harvesting or because of multiple passes of the pin in the femur [5]. The other etiology is stress riser effect of the hole of

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the suspensory devices / tendodesis site [6-8] or rapid absorption of bioabasorbable screw in femoral tunnel without bone regeneration leading to a delayed fracture [9]. There have been few case reports of tibial plateau fracture in which the proposed mechanism was either the stress riser effect of tibial tunnel [10] or because of complete resorption of the bio absorbable screw with resultant widening of the tibial tunnel [11].

We report a single case of Tibial blow out which to the best of our knowledge has not been previously reported in English literature. We explain the plausible technical errors and the bail out for this rare complication.

2. CASE

A 32 years old male had injury to his right knee and sustained a complete ACL tear while playing soccer. He presented to us 6 weeks after the injury for arthroscopic ACL reconstruction. He was planned reconstruction using quadrupled hamstring graft using semitendinosus (ST) and gracilis (SG) tendons.

The surgical procedure involved: Standard anteromedial (AM) and anterolateral (AL) portals and the torn ACL was shaved using a shaver. The femoral attachment area was cleared using a radiofrequency probe. Diagnostic arthroscopy was performed to rule out any associated meniscal injuries and the menisci were found normal. Tibial foot print was prepared. The ST SG tendons were harvested. The grafts were doubled. The diamond tip guide wire was passed in the lower and posterior aspect of the medial surface of the lateral femoral condyle as in a standard anatomical single bundle ACL reconstruction.

The graft was measured 8 mm in diameter and hence 8 mm x 30 mm femoral tunnel was made using a cannulated reamer over the guide wire. The ACL jig was adjusted to 55 degrees and was placed just lateral to the medial tibial spine. Foot print guide was placed over the foot print of the native tibial ACL attachment. Under arthroscopic guidance, the guide pin was centered in the tibial footprint and was accepted (Fig. 1).

The reaming of the tibial tunnel was performed to 8 mm. The graft was passed from the tibial tunnel into femoral tunnel and was secured on lateral femoral condyle cortex with the tightrope (Arthrex). While introducing the tibial screw we found that: the screw was going easily and there was absence of the usual bony resistance. To assess the same, an intra- operative image intensifier was used. We found that the tibial tunnel was too anteriorly placed and had "blown out" with a flake of anterior tibial bone (Fig. 2).

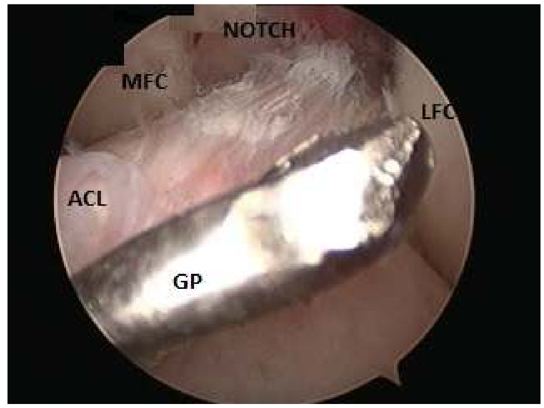

Fig. 1. Arthroscopic view of anterior placement of the guide pin in the tibial footprint. The guide pin can obliquely enter the native tibial footprint if due care is not taken by the surgeon while drilling the guide wire in tibia. This increases chances of tibial blow out secondary to anterior tunnel positioning

MFC – Medial Femoral Condyle; LFC- Lateral Femoral Condyle; GP- Guide Pin; ACL- Anterior Cruciate Ligament

The options that we had at this stage to manage the problems were: Option 1- Removal of the tibial screw combined with removal of graft and, and redrilling a new tibial tunnel. Option 2- Removal the tibial screw, repeat preparation of the tibial tunnel without removal of the graft and securing the graft in the new tibial tunnel. The removal of the graft (option 1) would require the cutting of the flipped button on the posterolateral femoral cortex. This however required additional opening on the posterolateral aspect and dissection down till the cortical bone. The dissection has to be performed carefully to avoid the potential injury to the neurovascular structures. However retaining the graft and the button and salvaging the situation would mean using option 2 above with the advantage of no additional wound in the posterolateral aspect of the distal thigh and no risk of the potential injury to neurovascular structures and there is no additional cost of the implant (tight rope. Arthrex).However, this is technically demanding.

We retained the tightrope and the graft on the femoral side. We removed the tibial screw; the

AL portal was slightly increased in size. Using an arthroscopic probe, the each strand of the hamstring graft was delivered out through the AL portal. The tibial jig was repositioned in the native tibial footprint and the tibial cortical entry was confirmed under vision. The guide wire was passed. Additional check for the position of wire was performed using intraoperative image intensifier (Fig. 3) in anteroposterior and lateral images. Reaming of tibial tunnel was done for 8 mm and each strand of the quadrupled hamstring was delivered through tibial tunnel by using the arthroscopic probe and the the previously placed Ethibond sutures at the end of hamstring tendons. The graft was secured in the tibial tunnel using bio absorbable screw. The position of the graft was checked arthroscopically and was satisfactory.

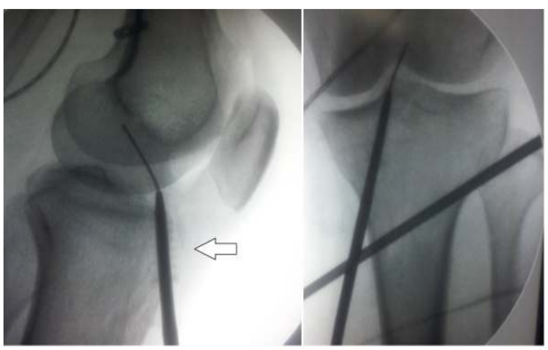

Fig. 2. Intra- operative image intensifier showing too anteriorly placed tibial tunnel. The tibia had "blown out" with a flake of anterior bone

Fig. 3. Intraoperative image intensifier showing the correct position of the guide pin for tibial tunnel preparation, in both anteroposterior and lateral views

3. DISCUSSION

ACL reconstruction is a relatively safe procedure and intraoperative complications are minimal [12]. Previously reported case reports pertain to a femoral tunnel blow out but to the best of our knowledge this is the first case report of a Tibial Tunnel blow out. Previously reported case relate to Tibial plateau fracture secondary to stress riser effects [10] or resorption of the bio absorbable screw with resultant expansion of the tunnel rendering it weak and susceptible to a fracture [11].

The "tibial blow out" is an intraoperative complication that takes place secondary to the technical error of anterior positioning of tibial tunnel during arthroscopic ACL reconstruction. We attribute the error to a small incision in the proximal tibia through which the sleeve is introduced to drill the guide wire, for making the tibial tunnel. If due care is not exercised while positioning the sleeve just medial to the medial collateral ligament (MCL) and sufficiently distal to the joint line, either a too medial or too anterior tibial tunnel can result in a tibial blow out.

Another error which can precipitate the above problem is a proximal incision for hamstring harvesting can result in the placement of drill sleeve on the tibial cortex close to the joint. As the surgeon is placing the tibial footprint jig in the native tibial foot print, the position in the coronal plane might have a tilt or offset depending on the AM portal. If the AM portal is slightly high the foot print jig may not sit flush with tibial ACL attachment. If due care is not taken by the surgeon while drilling the guide wire in tibia, can lead to anterior placement and the guide pin can obliquely enter the native tibial footprint. This gives a false seen on security as seen through the scope but increases chances of tibial blow out secondary to anterior positioning. By following critical steps of the procedure and respecting the anatomy one can avoid this pitfall.

4. CONCLUSION

The correct placement of the Tibial incision distal to the tibial tuberosity for hamstring harvesting, correct placement of the anteromedial portal can prevent mal positioning of the jig for tibial tunnel preparation. The tibial cortical entry of the guide wire should be assessed and should be medial to MCL and to be centered on the anteromedial tibial surface. The bone proximal to the guide wire and distal to the joint line has to be palpated and also visualized by retraction before reaming the tibial tunnel. The intra articular entry of the guide pin has to be in the center of foot print and very oblique entry even within the footprint should not be accepted.

INFORMED CONSENT

Informed consent was obtained from all individual participants included in the study.

ETHICAL APPROVAL

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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