Use of Fast Setting Bone Graft Substitute to Allow Single Stage Revision Anterior Cruciate Ligament Reconstruction

Shehzaad A Khan[1], Alastair Stephens, Gheorghe-Adrian Davidescu, Nick Smith, Tim Spalding[2], Peter Thompson
[1]Trauma and Orthopaedics, Wexham Park Hospital, Frimley Health NHS Trust, [2]University Hospital Coventry

INTRODUCTION:

The overall revision rate for primary anterior cruciate ligament reconstruction (ACLR) has increased over the last decade, with the commonest mode of failure being a combination of traumatic, technical, and biological factors. The challenge in revision ACLR is the need to address malpositioned or widened tunnels with the ideal scenario being single stage revision, with widened and type 2 tunnels being the most difficult scenarios to deal with. Tunnels can be filled using autograft, allograft and more recently described bone graft substitute (BGS). In this video we describe a technique using fast setting BGS to fill the problem of malpositioned tunnel or tunnels to allow single stage revision ACLR.

We present a technique that is indicated in patients undergoing revision ACLR where tunnels are nearly right (type 2) with no widening at the joint surface aperture.

METHODS:

Following preparation of the notch, the femoral tunnels are prepared in the normal fashion to remove all the previous graft and to create fresh bleeding surfaces. The fluid in the knee is completely drained and the femoral tunnel is repeatedly dried with ribbon gauze that is left in place until ready to inject. The BGS, genex (Biocomposites Ltd, Staffordshire, UK) is mixed and loaded into the delivery syringe before injecting arthroscopically. After 15 mins, the new anatomical femoral tunnel is then prepared in routine fashion. The same steps are repeated for the tibial tunnel.

Prospective data was collected in a cohort of patients undergoing single stage revision ACLR using this technique. Patients were followed at regular intervals for clinical examination until 2 years post-operatively with additional telephone review annually. They underwent radiographic evaluation at 6 and 12 months.

RESULTS:

Twenty patients underwent single stage revision ACLR using this technique - 15 male, 5 female. Mean age was 37.2 years (16-59). Mean follow up was 22 months (6-68). BGS was used in the femur in 5 patients, tibia in 10 patients and both in 5 patients. Grafts used included hamstring in 13 patients, bone-patellar-bone in 4 patients and tendoachilles allograft in 3 patients.

Four patients had concomitant procedures along with the revision ACLR, 3 high tibial osteotomy and 1 distal femoral osteotomy. Thirteen patients underwent a lateral extra-articular tenodesis. There have been no re-ruptures in this series. All eligible patients at 12-month follow-up had grade 0 or 1 laxity on clinical examination when performing lachmann and pivot shift. There was full incorporation of the BGS on radiographs in 100% of eligible patients. There were no complications related to the BGS during the intra or post-operative period. One patient developed a deep vein thrombosis in the contralateral leg, not related to the BGS.

DISCUSSION AND CONCLUSION:

In summary, we have described a technique that allows revision ACLR to be performed as single stage in a subset of patients with type 2 tunnels. We have shown successful short to mid-term results in our case series.

We have found many advantages using this technique. Although using the BGS requires some attention to detail, it makes the procedure more expeditious. We have shown the BGS stability and strength allows re-drilling of overlapping tunnels and satisfactory fixation, including the use of interference screws. It also remodels to normal bone over 12 months. As with any single stage technique, the overall recovery is quicker, and surgery is more cost effective.

There are some limitations to this technique. Firstly, it is not appropriate for every revision ACLR. We have not used this technique for cases with significant widening at the joint surface tunnel aperture where re-drilling would leave a 360 degree surround of BGS.

Secondly, we have a small cohort of patients with only short to mid-term results but failure of fixation or biological incorporation are likely to occur in the first 12-18 months, so we believe late failures specifically due to the BGS are unlikely.

We would be cautious about using BGS to reposition a tibial tunnel that is too posterior and re-drilling an anatomical tunnel would result in very high loading of GeneX at the back of the new tunnel.

The technique has a learning curve and particular attention should be taken when preparing the femoral tunnel and injecting the BGS. Our top tip using the suction tube extension helps alleviate the difficulty in arthroscopic delivery of the BGS. Tunnels need to be meticulously dried before injecting the GeneX to allow it to set.

In conclusion, revision ACLR is becoming a frequent surgical procedure, with tunnel malposition being a difficult problem to contend with. There are many described techniques to help achieve a successful outcome in revision ACLR but not all allow single stage surgery. We have demonstrated a technique utilising a synthetic graft to deal with slightly malpositioned tunnels, which can be performed in a single stage. Although longer term follow-up would be useful, we have found this to

be a safe and effective way to avoid two stage surgery in a subgroup of cases who have a challenging problem for surgeons to manage. This seems a better option for both surgeons and patients.