Abstracts

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Summary:
Allogeneic bone graft shows comparable results in tunnel filling and clinical outcome compared to the gold standard autologous bone graft in two-staged ACL revision surgery.

Data:
Introduction: With the increasing number of ACL reconstructions, the number of failures also rises. Often a two-staged treatment with tunnel filling and secondary ACL reconstruction is necessary in ACL revision surgery due to tunnel widening or poor tunnel placement. Aim of this study was to investigate if allogeneic bone graft is non inferior to autologous corticocancellous iliac crest graft in terms of radiological bone regeneration. Materials and Methods: The study was designed as a prospective, randomized trial. 41 patients who required 2 staged ACL revision surgery were included. In 17 patients, the void filling was performed using iliac crest corticocancellous autograft and in 24 patients with allogeneic femoral head graft, 3 months postoperatively a CT scan was performed. Tunnel filling was measured in the axial planes dividing the area of the bone graft by the area of the whole tunnel. Additionally, the Hounsfield units of the bone graft were compared to a representative native cancellous bone area of the proximal tibia. Clinical assessments with testing of knee function (ROM), stability (KT 1000) and PROM's

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Summary:
Patients with one or multiple ACL graft insufficiencies showed an overall high prevalence (35% (95% CI [29%; 42%])) of a PTS greater than or equal to 12 and the group of patients with a PTS greater than or equal to 12 showed a significant shorter survival of their first ACL graft.

Data:
Purpose A posterior tibial slope (PTS) greater than or equal to 12 is a well described important risk factor for recurrent anterior cruciate ligament (ACL) graft insufficiency. The primary aim was to determine the prevalence of an “increased PTS” (PTS greater than or equal to 12) in an ACL graft insufficient population. The secondary aims were to investigate if the prevalence of increased PTS and the absolute PTS increases with the increasing number of ACL graft insufficiencies, as well as to investigate the survival time of the first ACL graft. The main hypothesis was that there is a high prevalence of increased PTS in ACL graft insufficient patients. Further hypotheses were that the prevalence as well as the absolute PTS increases with the increasing number of ACL graft insufficiencies and that the survival of the ACL graft was shorter in patients with increased PTS. Methods Between January 2021 and March 2022, all patients with an ACL graft insufficiency were included. Exclusion criteria were previous multi-ligament surgery or new multi-ligament injury requiring multi-ligament surgery; previous ipsilateral septic knee arthritis; previous ipsilateral osteotomy; incomplete medical records; previous used ACL graft other than quadriceps, hamstring or patellar tendon autograft, or allograft tendon; previous ACL repair and no true lateral knee radiograph. The PTS was measured as the angle between the tibial plateau and a line perpendicular to the proximal anatomical tibial axis. Patients were divided into groups depending on number of ACL graft insufficiencies: group A, 1 graft insufficiency; group B, 2 graft insufficiencies; group C 3 or more graft insufficiencies. Chi-square, fisher’s exact or independent student T tests were used to compare the prevalence of increased PTS and absolute PTS between the groups. The Kaplan-Meier curve and Log-rank test was used to compare the survival of the first ACL graft between patients with or without increased PTS. Significance was set at p<0.05. Results In total 206 patients (147 men / 59 women) were included. 73 patients showed an increased PTS with an overall prevalence of 35% (95% confidence interval (CI) (29%; 42%)). 155 patients were included in group A, 42 patients were included in group B and 9 patients were included in group C. The prevalence of increased PTS for group A, B and C was, 32% (95% CI (25% ; 40%)), 38% (95% CI (23% ; 53%)) and 78% (95% CI (51% ; 100%)), respectively. The prevalence of increased PTS and mean PTS did not increase significantly between group A and B (p>0.05). However, both increases significantly between group A and C, and group B and C (p<0.05). The survival time of the first ACL graft in patients with an increased PTS was significantly shorter (p<0.001). Conclusion There is a 35% overall prevalence of increased PTS in the studied ACL graft insufficient patient population. The survival of the first ACL graft is shorter in patients with an increased PTS. Surgeons should be aware of the high prevalence of increased PTS when consulting patients for revision ACL reconstruction as it is an important risk factor for recurrent instability that may need to be addressed.

Abstract ID# 23306
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Summary:
In patients with ACL graft failure and increased tibial slope, anterior closing wedge high tibial osteotomy provides a safe and reliable technique to control ACL graft re-tear and offer good functional outcome on the midterm.

Data:
Background: Increased tibial slope is correlated with increased tibial translation and higher failure rates of ACL reconstruction. Cadaveric studies have shown that slope-reducing high tibial osteotomy (SR HTO) decreases ACL-graft forces and anterior tibial translation under axial load. However, the effect of SR HTO on ACL revision outcomes has not been comprehensively analyzed on the midterm. Purpose: To evaluate the midterm functional outcomes after slope-reducing osteotomy associated with revision ACL reconstruction. Study design: prospective cohort study; level of evidence, 2. Methods: 41 consecutive patients with ACL reconstruction failure and increased tibial slope (18±2.7 degrees) were included. Tibial slope was calculated from full length standing lateral views using the tibial mechanical axis as a reference. Age 25±5.9 years, sex ratio 1,4, BMI 24.6±4.4 kg/m2. Revision was staged in two procedures in all cases: first surgery for SR HTO and tunnels bone grafting; second for reimplantation of ACL graft. The amount of slope reduction was measured with a target of slope at 6 to 8 degrees. The SR HTO was performed by an anterior approach with a tibial tubercle osteotomy for access. It was guided by a 3D printed patient-specific cutting jig to avoid alteration of coronal plane alignment and it was fixed with staples. Patients were followed for 3±1.4 years. Adverse events occurred in 9.7%: secondary displacement (2/41), deep infection (1/41), delayed union (1/41). At the time of follow-up: ACL-RSI 48.8±22.6, IKDC 60.1±14.9, no recurrence in ACL graft failure. We observed no iatrogenic coronal plane alterations and no tibial slope over/under correction on postoperative EOS long standing AP and lateral x-rays. Secondary knee hyperextension was not reported. Return to sport was observed in 70.7% (29/ 41) with half of these patients (15/29) involved in level I sports according to Hefti et al. Conclusion: In patients with ACL graft failure and increased tibial slope, anterior closing wedge high tibial osteotomy provides a safe and reliable technique to control ACL graft re-tear and offer good functional outcome on the midterm.

Category: Knee - ACL Revision

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Tunnel filling showed comparable results for autologous and allogenic grafts. The mean percentage of tunnel filling for allogenic bone graft was 82.61% to 84.94% (p=0.4415) for autologous corticocancellous graft. Hounsfield units differed in both groups significantly (p<0.0001) compared to a representative native bone area of the proximal tibia. There was also a significant difference between the Hounsfield units with a mean of 630.5 for allograft and 431.7 for autograft (p=0.0015). KOOS score was significantly higher 6 months postoperatively with a mean of 80 in the autograft group compared to 68 in the allograft group. Whereas there was no significant difference between the two study groups in IKDC score 6 months postoperatively. In the clinical examination, no relevant differences in range of motion or ligamentous stability (KT 1000) were found. Conclusion: Allogeneic bone graft is non inferior to the gold standard autologous corticocancellous bone graft in terms of tunnel filling, knee function, IKDC and stability 6 months postoperatively. The difference in the KOOS score at 6 months postoperatively below the minimally clinically important difference (MCID) and substantial clinical benefit (SCB). Both allograft and autograft showed Hounsfield units of cortical bone, however autologous bone graft was closer to normal cancellous bone than the allogeneic graft.

Category: Knee - ACL Revision

Increased Tibiofemoral Rotation Angle is Associated With Graft Failure After Anterior Cruciate Ligament Reconstruction

Summary:
Increased tibiofemoral rotation angle was associated with increased odds of ACLR failure particularly if the angle is higher than 4.5 degrees.

Data:
Purpose: Coronal and sagittal malalignment of the knee are well-recognized risk factors for failure after anterior cruciate ligament reconstruction (ACLR). However, the effect of axial malalignment on ACLR graft survival is yet to be determined. In this study we aimed to evaluate if increased tibiofemoral rotational malalignment, namely tibiofemoral rotation angle (TFA) and tibial tubercle-trochlear groove (TT-TG) distance, is associated with ACLR graft failure. Methods: this is a matched-control study in which 151 patients who underwent revision ACLR due to graft failure (failure ACLR group) were compared to a matched-control group of 151 patients who underwent primary ACLR with no evidence of failure after at least 2-years follow-up (intact ACLR group). Patients were matched by sex, age, and meniscal injury during primary ACLR. Assessment of axial malalignment was performed on preoperative magnetic resonance imaging (MRI) through the TFA and the TT-TG distance. Sagittal alignment was measured through posterior tibial slope (PTS) on MRI. Optimal TFA cutoff associated with graft failure was identified by a receiver operating characteristic (ROC) curve. Kaplan-Meier curve with log-rank analysis was performed to evaluate the influence of TFA on ACLR longevity. Results: In the failure ACLR group, mean TFA was 5.8 ± 4.5 degrees while for the intact ACLR group this mean was 3.0 ± 3.3 degrees (p<0.001). Neither TT-TG distance nor PTS presented statistical differences between the groups. ROC curve suggested an optimal TFA cutoff of 4.5 degrees for ACLR graft failure. Considering this threshold, patients who presented TFA higher than 4.5 degrees had 6.6-times greater likelihood of graft failure in comparison to patients with TFA < 4.5 degrees (p<0.001). A 5-years survival of 81% was found in patients with TFA < 4.5 degrees, while it was 44% for TFA greater than 4.5 degrees (p<0.001). Conclusion: Increased TFA was associated with increased risk of ACLR failure when the TFA was higher than 4.5 degrees. Measuring the TFA in patients with ACL tears undergoing reconstruction may inform surgeons about additional factors that may be considered prior to ACL reconstruction for a better outcome.

Category: Knee - ACL Revision