

Minimum Two Year Follow Up of Patellofemoral (PF) Osteochondral Allograft (OCA) Implantation With or Without Concomitant Tibial Tubercle Osteotomy (TTO):

Sagittal Tibial Tubercle Trochlear Groove (sTT-TG) Distance as a Predictor of Outcomes

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Intro: This prospective cohort study aimed to compare clinical outcomes in patients undergoing osteochondral allograft (OCA) transplantation in the patellofemoral (PF) joint with and without concomitant tibial tubercle osteotomy (TTO) and determine whether a correlation exists between OCA clinical outcomes and sagittal tibial tubercle trochlear groove (sTT-TG) distance as measured on preoperative MRI.

Methods: This is a prospective cohort study of patients who underwent primary PF OCA transplantation at a single institution from 2015 to 2022. We assessed knee pain and functional outcomes with the Patient-reported Outcome (PRO) scores International Knee Documentation Committee (IKDC), Knee Injury and Osteoarthritis Outcome Score for Joint Replacement (KOOS, JR), and Veterans RAND 12-Item Health Survey Physical Component (VR-12P). Reoperation due to chondral damage included OCA revision procedures, conversion to joint replacement, and PF cartilage debridement. sTT-TG distance was measured on the preoperative axial T₂ magnetic resonance imaging (MRI) sequence as previously described by our research team. We excluded patients with a TTO before their OCA procedure from the sTT-TG analysis.

Results: 42 patients met the inclusion criteria for the study, with 35 available for follow-up. The cohort had 25 female (71%) and 10 male (29%) patients (mean age 34 ± 8 years). 22 patients (69%) underwent concomitant TTO. 7 patients underwent reoperation due to chondral damage: 1 revision OCA, 1 joint replacement, and 5 PF cartilage debridements. No statistically significant association existed between reoperation and concomitant TTO ($p=0.65$). There was a significant increase ($p<0.05$) for all three types of preoperative compared to post-operative PROs at final follow-up in both the TTO and non-TTO groups, with no significant difference in the post-operative PRO scores between groups. There were 21 patients with available preoperative MRIs. They had an overall mean sTT-TG of 6.98mm, with those who underwent reoperation due to chondral damage having a significantly higher sTT-TG ($p=0.02$) than those who did not, 11.78mm to 5.04mm respectively. There was also a significant negative correlation ($p=0.03$) between sTT-TG distance and KOOS, JR score at final follow-up.

Discussion: In consideration of the findings of the present study relative to the existing body of literature, it appears reasonable to accept that the sagittal alignment of the tibia and femur contributes to the rate of clinical success or failure of patellofemoral cartilage restoration procedures as the sagittal alignment, and therefore patellofemoral contact pressures, would influence a biomechanical environment that would be more or less favorable for graft survivorship. Despite this, there remains a paucity of literature directly evaluating success rates of patellofemoral cartilage restoration procedures relative to the sTT-TG distance, or how changing the sagittal alignment of the patellofemoral joint through osteotomies influences the success rates of these procedures. The power of our results is limited by a small sample size.

Significance/Clinical Relevance: Patients who underwent PF OCA with concomitant TTO demonstrated a significant improvement in PRO scores postoperatively and no significant difference in PRO scores or reoperation rate compared to those without concomitant TTO. This study demonstrates how there remains a lack of evidence of the clinical benefits of concomitant TTO with PF OCA for treating symptomatic chondral lesions. Conversely, mean sTT-TG distance was significantly greater in patients who experienced reoperation due to chondral damage compared to those who did not, further supporting the predictive value of this novel preoperative measurement.

