Outcomes In Patients With Severe Trochlear Dysplasia Undergoing Sulcus-Deepening Trochleoplasty: A Minimum 2-Year Follow-Up Prospective Study

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Introduction/Background: Sulcus-deepening trochleoplasty has been established as an effective treatment for patellar instability due to trochlear dysplasia. While there have been several studies supporting this procedure in Europe, no large studies to date have examined outcomes after this procedure in the United States.

Methods: A total of 67 patients (76 knees) with severe trochlear dysplasia were prospectively enrolled and underwent sulcus-deepening trochleoplasty using the DeJour method from 2011-2018. The trochlea was undermined to create a thick shell (shingles) that were osteotomized and molded to form a new trochlear shape fixed with absorbable suture anchors. Radiographic analysis, physical examination, and clinical follow-up were obtained for all patients. At the time of enrollment, patients completed preoperative Visual Analog Scores (VAS) and International Knee Documentation Committee (IKDC) and Kujala scores, which were repeated at 6 months, 1 year, and subsequent annual follow-up visits. Patients reported on their return to work and sport, if applicable, as well as any instances of recurrent instability. Preoperatively, the patellotrochlear index (PTI), trochlear spur height, and trochlear depth were all measured. The patient's sulcus angle was measured and patellofemoral arthritis was graded preoperatively and postoperatively on sunrise (merchant) view x-ray.

Results: Of the entire cohort, 37 patients (41 knees) had at least two year complete follow-up and were included in the study. 48.8% had prior surgery and failed prior surgical management for patellar instability. Concomitant procedures during trochleoplasty included medial patellofemoral ligament reconstruction (MPFL) (100%), lateral release or lengthening (51.2%), tibial tubercle osteotomy (39.0%), and some type of cartilage procedure (48.8%) to include shaving chondroplasty (34.1%), chondral allograft (14.6%), microfracture (4.9%), and removal of loose body (22.0%). The majority of patients were female (80.5%) with a mean age of 19.3 years (SD 6.8; range 13.2-47.0). Follow-up ranged from 24.0 months to 81.4

months (mean 42.3, SD 15.8). At the time of enrollment, mean BMI was 27.3 kg/m^2 (SD 6.7) with one current smoker and one patient with diabetes mellitus. Mean duration of symptoms, including apprehension or a positive J-sign, prior to surgery was 69.9 months (SD 71.7; range: 4-370). All knees were either DeJour B (80.5%) or D (19.5%) with a mean Caton-Deschamps index (CDI) of 1.21 (SD 0.22). Mean spur height preoperatively was 7.66mm (SD 1.93) with a mean trochlear depth of -0.40mm (SD 2.92). Mean patellotrochlear index (PTI) was 0.37 (SD 0.18). 27.5% had an additional operation following trochleoplasty. One knee required irrigation and debridement. One patient had a loose body removal and shaving chondroplasty. One patient had posterior pigmented villonodular synovitis (PVNS) predating trochleoplasty that required reoperation following trochleoplasty. One patient had a shaving chondroplasty and removal of hardware. Seven knees required manipulation under anesthesia, five of which underwent simultaneous arthroscopic lysis of adhesions. No patients had fixation failure. Progression of patellofemoral arthritis was not significant comparing imaging at preoperative and most recent follow-up visits. There were zero episodes of recurrent instability. Mean preoperative VAS improved from 3.60 to postoperative 2.60 ($p = 0.066$). Radiographic analysis of the sulcus angle demonstrated a significant decrease from 143.1 degrees (SD 8.2) preoperatively to 132.8 degrees (SD 9.2) postoperatively ($p < 0.001$). Patient reported outcomes showed clinically significant improvement. The mean preoperative IKDC score was 50.9, which improved to 78.3 ($p < 0.001$), and the mean preoperative Kujala score of 57.2 improved to 86.3 ($p < 0.001$). Patients reported high satisfaction rates (mean 9.1 out of 10, SD 1.9). 100% of patients returned to work while 88.6% returned to sport when applicable.

Conclusion: Sulcus-deepening trochleoplasty is a reliable and effective treatment for recurrent patellar instability due to severe trochlear dysplasia, even in this difficult group with many revision procedures. Two year minimum follow up demonstrated no recurrence of instability, improved radiographic parameters, and encouraging clinical outcomes.