

Variability in Osteochondral Fracture Treatment in Patients with Patellofemoral Instability: Data from the JUPITER Cohort

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INTRODUCTION:

A prospective, multicenter cohort study (JUPITER: Justifying Patellar Instability Treatment by Results) database was queried for patients who underwent a surgical intervention for patellofemoral instability from a period January 2017 through July 2022. Demographic variables were collected including age at the time of surgery, sex, body mass index (BMI). Pre-operative data included Beighton score to assess ligamentous laxity by physical examination, and skeletal maturity status as determined by physeal status on coronal MRI. Osteochondral fracture characteristics and treatment strategy was recorded. Results were analyzed descriptively.

METHODS:

A prospective, multicenter cohort study (JUPITER: Justifying Patellar Instability Treatment by Results) database was queried for patients who underwent a surgical intervention for patellofemoral instability from a period January 2017 through July 2022. Demographic variables were collected including age at the time of surgery, sex, body mass index (BMI). Pre-operative data included Beighton score to assess ligamentous laxity by physical examination, and skeletal maturity status as determined by physeal status on coronal MRI. Osteochondral fracture characteristics and treatment strategy was recorded. Results were analyzed descriptively.

RESULTS:

1615 surgeries for 1337 patients were eligible for inclusion in this study. Mean age was 16.7 ± 4.2 years and 63.2% (1021) were female. Mean BMI was 24.6 ± 6.3 kg/m² and 61.7% were skeletally mature at time of surgery. A total of 10.5% (169) of procedures included osteochondral fracture treatment. Patients who underwent osteochondral fracture treatment were significantly younger ($p < 0.0001$), more male ($p < 0.0001$), and more frequently skeletally immature at the time of surgery ($p = 0.0004$). There were no significant differences between patients who underwent osteochondral fracture treatment and those who did not with respect to BMI or Beighton score. Lesions were most frequently found on the lateral femoral condyle (47%), medial patellar facet (37%), both lateral femoral condyle and medial patellar facet (6%), inferior patella (4%).

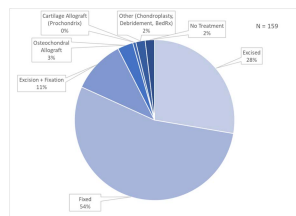
Treatment to address osteochondral fractures was performed in an open fashion in 48%, arthroscopically in 35%, and using a hybrid approach (open and arthroscopic) in 13%. The majority of osteochondral fractures were addressed with surgical fixation. Other treatment strategies included excision (28%), partial excision and fixation (11%), osteochondral allograft (3%), cartilage allograft (<1%), or other (i.e. chondroplasty) (2%). Lesions that were surgically fixed ($n = 86$) had a mean size of 1.658 cm² and were most frequently located on the medial patella (52%). The most frequent implant type was headless screw (50%). Implant material was most commonly bioabsorbable (51%) or metal (24%). The most frequent implant size was 1.5 (37%), and the mean number of implants used was 2.9. Lesions that were surgically excised ($n = 44$) had a mean size of 0.67 cm², and were most frequently excised from the lateral femoral condyle (57%), followed by the medial patella (23%).

DISCUSSION AND CONCLUSION:

In this large cohort of young patients undergoing patella instability surgery, the incidence of osteochondral fracture treatment was 10.5%. Osteochondral fracture treatment was more common in patients who were male and skeletally immature. The dominant treatment strategy for these fractures was open surgical fixation using headless bioabsorbable screws. Larger lesions >1cm² were more typically fixed while smaller lesions were excised. Longer-term follow-up of these patients will allow for additional information regarding surgical outcome, return-to-sport, and recurrence rates. This data will help to optimize treatment strategies for osteochondral fractures in patella instability patients.

| | n = 6115 | | On/underhand | | On/underhand | | p-value |
|----------------------------|----------|--------|--------------|-------|--------------|--------|---------|
| | | | n = 169 | | n = 1445 | | |
| Age | 16.72 | 15.91 | 2.56 | 14.88 | 2.56 | 0.680 | |
| Female Sex | 182.00 | 63.24% | 82 | 48.5% | 379 | 65.06% | 0.017 |
| HBM (mean, sd) | 24.57 | 63 | 24.00 | 5.7 | 24.64 | 64 | 0.2817 |
| Skillometry Measure | | | | | | | |
| Skillometry Accuracy | 99.8 | 61.8 | 86 | 37% | 123 | 83% | 0.0005 |
| Skillometry Inaccuracy | 49.04 | 30.79 | 73 | 43% | 123 | 79% | |
| 33% Inaccuracy | 33.0 | 16.2 | 46 | 27% | 61 | 42% | |
| Brightest Score (mean, sd) | 3.91 | 2.49 | 3.61 | 2.89 | 3.95 | 2.92 | 0.8428 |
| Brightest Score (%) | 36.9 | 24.9 | 36.1 | 28.9 | 39.5 | 29.2 | |
| CDP = 5% (n) | 54.01 | 33.5 | 50 | 29% | 491 | 14% | |
| CDP = 10% (n) | 66.00 | 41.2 | 87 | 51% | 379 | 39% | |
| CDP = 12.5% (n) | 73.00 | 45.1 | 119 | 62% | 428 | 42% | |
| CDP = 15% (n) | 25.70 | 45.01 | 41 | 22% | 45 | 0.28 | 0.930 |
| CDP = 17.5% (n) | 17.60 | 30.82 | 18 | 6.60% | 138 | 71% | 0.2774 |
| TTG (mean, sd) | 10.43 | 10.43 | 6 | 3.56 | 11 | 0.76 | 0.0001 |
| TTG = 20min (n) | 68 | 10.43 | 6 | 6.50% | 62 | 11.05% | 0.061 |

| | N | % |
|--------------|----|-----|
| Arthroscopic | 55 | 35% |
| Open | 77 | 48% |
| Combined | 20 | 13% |
| Unknown | 7 | 4% |



| Variable | n = 36 | mean size = 165.8 m ² |
|---|--------|----------------------------------|
| Location of Vascular | | |
| LFC | 32 | 37% |
| Medial Parietal | 45 | 52% |
| Other (contralateral parietal, inferior frontal parietal) | 2 | 2% |
| Implant Material | 6 | 7% |
| Bioabsorbable | 44 | 51% |
| Metal | 21 | 24% |
| Bath | 2 | 2% |
| Other | 10 | 12% |
| Unknown | 9 | 10% |
| Implant Type | | |
| Headless Screw | 45 | 50% |
| Pins | 14 | 16% |
| Suture Nails | 8 | 9% |
| Sutures | 4 | 5% |
| Suture Bridge | 2 | 2% |
| Push Lock | 2 | 2% |
| Combination Hardware | | |
| Suture + Screw | 5 | 6% |
| Push Lock + Suture | 1 | 1% |
| Track | 5 | 6% |
| Chondral Graft | 1 | 1% |
| Implant Size | | |
| 1.5 | 32 | 37% |
| 2.4 | 21 | 24% |
| Unknown | 9 | 10% |
| Other | 24 | 28% |
| No. of Implants Used (mean) | 2.9 | |

* Continuous variables are reported as mean \pm SD, while categorical variables are reported as No. (%).