

A Case of Patella Alta with Patellofemoral Arthritis: Patellofemoral Joint Replacement with Tibial Tubercle Transfer and Patellar Tendon Tenodesis

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Introduction

Patellofemoral arthritis is defined as the loss of articular cartilage on the patella facets, the trochlear groove, or both. The incidence of isolated patellofemoral arthritis has been reported in patients older than 55 as anywhere from 2% to 11% in men and 8% to 24% in women. Patients older than 40 have nearly a 10% incidence of isolated patellofemoral arthritis. Women account for 75% of patients with isolated patellofemoral arthritis. The higher incidence in women is likely related to malalignment and dysplasia, which are more common in women (1-3).

The etiology of patellofemoral arthritis is multi-factorial. Many congenital or developmental factors also play a role. It can be caused by any combination of patella alta, trochlear dysplasia, increased Q angle, weak or hypoplastic vastus medialis oblique, a contracted lateral retinaculum, and absent or redundant medial patellofemoral ligament. These factors eventually result in secondary degenerative changes to articular surfaces (4, 5).

Patella Alta, or a "high riding" patella, is proposed to be a risk factor for patellofemoral pain and OA (6-8). Patella alta is measured by the Insall-Salvati ratio (ISR), a ratio between the length of the patellar tendon and the length of the patella (9), with a ratio ≥ 1.2 indicating patella alta. Ward et al. (8, 10, 11) found subjects with patella alta to have increased PFJ malalignment, decreased PFJ contact area, and increased PFJ stress. These findings suggest that persons with patella alta may be at increased risk for damage of the PFJ cartilage and underlying bone. Similarly, in studies using dynamic knee simulators and cadaveric knees, PFJ contact forces were higher in knees with patella Alta compared to knees with normal patellar position (7, 12).

Patellofemoral Arthroplasty: Indications and Contraindications

A prerequisite for the success of PFA is a proper patient selection to avoid complications (14, 16, 17-19). The most common indication for PFA is severe primary isolated PFOA that affects daily activities without relief from conservative treatment. PFA is also indicated in patients with posttraumatic PFOA, isolated trochlear dysplasia, patellar subluxation, or failure of previous extensor mechanism unloading procedures (14, 15, 19-21). Moreover, the ideal patient age ranges from 40 to 60 years (22, 23).

The presence of iliofemoral OA is the most common contraindication and the most common cause of PFA failure (14). PF malalignment, with an increased Q angle, severe uncorrected coronal plane deformity (valgus > 8 or varus > 5 degree alignment) or sagittal plane deformity (120 degree flexion with < 10 degree flexion contracture) (13, 15, 22), active infection and evidence of chronic regional pain syndrome are also contraindications to PFA (11, 23). Quadriceps atrophy, patellar tendon scarring, patella baja, and

excessive BMI (>30) represent relative contraindications to PFA, as have been correlated to poorer outcome (15, 17).

Hence, the ideal candidate for PFA is a middle age patient affected by isolated, debilitating noninflammatory PFOA not responsive to conservative treatment and with normal limb alignment.

Patellofemoral Arthroplasty: Advantages and reasons for failures

Advantages of PFA over TKA were less blood loss (24), shorter hospital stay (24), preservation of bone stock and ligaments (25), and higher functional outcome scores (26) and better stair climbing abilities (26). In spite of these advantages and improvements, several studies have reported PFA failure rates up to 20% (27-29).

OA progression was found as the most common failure mode in PFA, followed in order by pain, aseptic loosening and patellar maltracking. Stratifying by length of follow-up and year the study started, OA progression was more commonly encountered with late failures and older studies while unexplained pain was more common in early failures and recent studies. Several possibilities may explain the high frequency of OA progression in PFA of which appropriate patient selection seems to play a major role. Pain, OA progression and patellar maltracking were the most common early failure modes while OA progression and aseptic loosening were more commonly seen in late failures (30).

Case report

A 43-year-old woman was presented to our hospital with signs of painful bony impingement of the right patellofemoral joint. Six months before presentation, she underwent diagnostic arthroscopy of right knee for anterior knee pain. There was patella alta (figure 1). Conservative treatment with physical therapy, activity modification, and taping had failed to relieve the patellofemoral instability. There was no history of any previous surgical procedures or trauma.

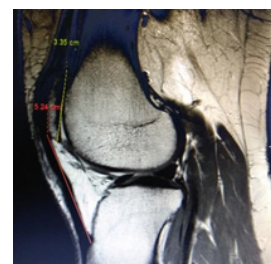


Figure 1 Image showing patella alta:

Six months later she still had persistent pain on the anterior aspect of the right knee without a history of trauma or patellar dislocation since the procedure. She also had difficulty in climbing stair case, sitting down, squatting which affecting her day to day activities.

On physical examination there was limited range of knee flexion

with crepitus felt throughout the range of motion. Tenderness present on palpation of medial and lateral facets of patella. No signs of infection were observed. X ray and Magnetic resonance imaging(MRI) of right knee showed grade 4 cartilage degeneration of right patellofemoral joint with normal iliofemoral joint (figure 2 ,3).

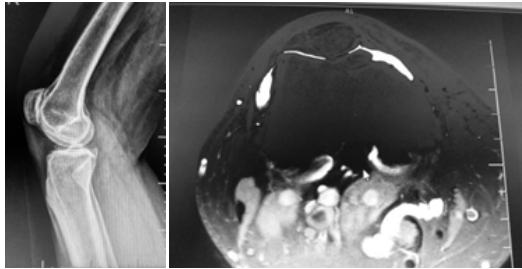


Figure 2 and 3: X ray and MRI image showing patellofemoral arthritis

Because of incapacitating pain that affecting day to day activities and grade 4 cartilage degeneration changes on MRI, patellofemoral joint replacement was advised. Using a medial parapatellar incision, the knee joint was inspected. The anterior aspect of the femoral condyles was deformed with grade 4 cartilage degeneration. Inspection of the patella showed no clear medial and lateral facets, with only the odd facet readily visible (figure 4). The femorotibial compartments showed no degenerative changes. Patellofemoral Arthroplasty was performed using the Journey PFJ (Smith & Nephew, Memphis, Tennessee) (Figure 5). The anterior femur was resected using the standard cutting blocks. Condylar support for the prosthesis was adequate. And patella alta was corrected by medialization of tibia tubercle and patellar tendon tenodesis. Postoperative rehabilitation was uneventful, and at last follow-up at 1 year (figure 6) the patient demonstrated good function of the left knee with 140 degrees of flexion (figure 7). There were no signs of patellofemoral instability.



Figure 5: post-operative x ray of patellofemoral arthroplasty

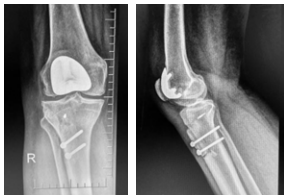


Figure 6: X ray images after 1 year follow up

Conclusion

Patellofemoral instability may result from anatomical deficiencies in one of three anatomical structures that stabilize the patellofemoral joint: the trochlear groove geometry, the medial and lateral retinacula including the medial patellofemoral ligament (MPFL), and the alignment of the extensor apparatus including

the quadriceps muscles, patellar tendon and tibial tuberosity. If nonoperative treatment fails, surgical treatment should aim to correct the identified anatomical deficiencies (31).

Patella alta, or a "high riding" patella, is a distinct feature of PFJ alignment that has been proposed to be a risk factor for patellofemoral pain and OA (32). Patella alta is measured

by the Insall-Salvati ratio (ISR), a ratio between the length of the patellar tendon and the length of the patella (33), with a ratio ≥ 1.2 indicating patella alta. Ward et al. (34) found subjects with patella alta to have increased PFJ malalignment, decreased PFJ contact area, and increased PFJ stress. These findings suggest that persons with patella alta may be at increased risk for damage of the PFJ cartilage and underlying bone. Similarly, in studies using dynamic knee simulators and cadaveric knees, PFJ contact forces were higher in knees with patella alta compared to knees with normal patellar position (35).

Kalichman et al. they found a U-shaped relationship between the ModISR and lateral BMLs ($p=0.007$) (36). Conversely, study by J J Stefanik et al demonstrated a strong linear relationship ($p<0.0001$) between quartiles of the conventional ISR and outcomes in the lateral PFJ.

Contrary to study by JJ Stefanik et al findings that patella alta was strongly associated with cartilage damage in the medial and lateral PFJ measured on MRI, several studies have shown no association between patella alta and cartilage damage on MRI (37) and arthroscopy (38). These differences in results may be attributed to different methods of cartilage assessment and to differences in study populations. Ali et al. (37) did not clearly define cartilage damage on MRI, nor damage in specific anatomic regions of the PFJ (i.e. medial vs. lateral, patella vs. trochlea).

Our patient had patella alta with ISR value of 1.5, which lead to PFJ malalignment and cartilage damage in the patellofemoral joint. Patellofemoral joint preserving surgery was considered

inadequate in our patient because patient had persistent pain even after surgery. Total knee arthroplasty was considered too aggressive treatment, for a disease confined to the anterior compartment. Patellofemoral arthroplasty is a successful treatment option for patients with isolated patellofemoral osteoarthritis, with long-term outcomes in young patients similar to those achieved in older patients .

We consider patellofemoral arthroplasty with correction of patella alta by tibial tubercle transfer a salvage procedure for isolated patellofemora arthritis with atella alta.

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