Who are suitable candidates for isolated patellofemoral arthroplasty?

Murat Bozkurt, Anil Pulatkan, Nikolai Komilov, Simon Coffey, Hatem Bakr, Badrul Shah Badaruddin, Peilai Liu, Nilo Paner, Christian Merle, Wenzel Waldstein, Peter Aldinger

Response/Recommendation: Patellofemoral arthroplasty (PFA) offers great functional results and bone/soft tissue conservation, but has a significantly higher revision rate when compared to total knee Arthroplasty (TKA). Patient selection has emerged as the most important element in delivering a satisfactory long-term outcome for patients with isolated patellofemoral osteoarthritis (PFJ-OA).

Level of evidence: Low

Rationale:

A narrative review of the literature regarding "Patellofemoral arthroplasty indications" was performed through Pubmed (1979-2024) for any relevant publications. From the 192 articles initially identified, abstracts were scanned and 16 full text articles satisfied criteria and were used to develop this systematic review.

Based on the review of the literature it appears that PFA should only be offerd to a select group of patients with patellofemoral arthritis who have failed nonoperative treatment[1,2]. Additionally, patients with knee pain with less than one year duration have a lower patient reported outcome measures (PROMs) after PFA[3]. In addition, preoperative psychosocial status, active smoking, the of use opioids or antidepressants before surgery were also identified as risk factors for reduced improvement in terms of functional outcomes[1,4].

Older patients with advanced patellofemoral arthritis(Ivano Grade 3-4) benefited more from PFA in terms of functional outcomes than those with early stages diagnosed on magnetic resonance imaging (MRI)[5-8].

The role for preoperative MRI in patients with patellofemoral arthritis is controversial[2,9]. Although MRI is useful in excluding associated knee pathology, such as tibiofemoral joint arthritis or patellofemoral dysplasia as well as tibial tuberosity-trochlear groove (TT-TG) distance, it may over-report the severity of PFJ-OA and lead to inappropriate indications for PFA[2]. Interestingly, preoperative technetium bone scanning may be used to predict the progression of the TFJ-OA through increased subchondral bone turnover in patients with OA, and it has been shown that this examination can exclude TFJ-OA more reliably than MRI[7,10].

The main concern about performing PFA at an early age is fear of failure and progression to tricompartmental OA[2,7,9,11,12]. However, the ideal age for PFA remains controversial and the heterogeneity in the literature prevents us from drawing a concrete conclusions [1,2,5,7,13]. It is, however, clear that expectations of younger and active patients is different to the elderly patients. The literature reveals a higher failure rate of PFA and poor functional outcomes in obese patients because of progression of PFJ-OA to TFJ over time[1,2,4,9,12,14]. Therefore, caution should be exercised when considering PFA in patients with a body mass index over 30 kg/m^2 [1, 2,4,6,7,12,14].Since flexion contracture exceeding 10º is related to TFJ-OA, PFA should not be offered to these patients. In addition, it is recommended that a minimum of 110º should be present, if PFA is being contemplated [2,6].

Patellar component height planning is an important consideration for PFA in patients with isolated PFJ-OA[3,15]. However, there is little objective data in the literature confirming that patella baja is a valid contraindication to PFA[2,15].

The information in the literature about the effect of anterior knee instability on the results of PFA is still unclear[1]. In a few studies, patellar tracking due to anterior cruciate ligament (ACL) insufficiency has indicated changes in patellofemoral cartilage pressure. In addition, there are sources indicating that there is a high risk of developing TFJ-OA secondary to ACL injury[1,2,7]. Although prior meniscectomy and ACL reconstruction are not contraindications for PFA, these patients may be at high risk for progression of TFJ-OA[1,2]. Therefore, a shared decision with the patient may be appropriate for stable knees with a prior surgery but no radiographic or clinical evidence of TFJ-OA[7,9].

Trochlear dysplasia has been identified as a strong risk factor for PFJ-OA[2]. A positive crossing sign can be detected on x-rays up to 78% of PFJ-OA patients[2,3,5]. In addition, it has been shown that PFA performed for trochlear dysplasia provides better functional outcomes in the long term compared to other aetiologies[2,3,14].

Historically, isolated PFJ-OA occurring after patella fracture is another ideal indication for PFA[2,5]. However, these patients should be evaluated carefully to ensure absence of any deformities and arthritis in the TFJ. It is agreed that patients with posttraumatic arthritis, bone defects, scarring in soft tissues, and possible infection who have undergone many prior surgeries are poor candidates for PFA[2]. In addition, PFA should not be performed in patients with deformity in the coronal plane due to high risk of progression of arthritis in TFJ[1,2,5,7]. However, there is no consensus data about the quantitative degree of deformity that increases the risk of TFJ-OA and worsens functional outcomes and at what degree of deformity PFA should not be performed[1,7]. While there are authors who advocate not performing PFA in cases where valgus is greater than 8° and varus is greater than 5º, there are also those who consider deformities greater than 3° as a relative contraindication[2,5]. Additionally, in cases of extreme deformities, simultaneous femoral or tibial osteotomy or unicondylar knee arthroplasty combined with PFA surgeries have also been discussed.

Rotational adjustment of the femoral implant cannot be expected to overcome malalignment and accompanying maltracking, when performing PFA in patients with patellar malalignment syndrome. Therefore, PFA is traditionally contraindicated in patients with isolated PFJ-OA with patellar malalignment syndrome and increased Q angle (>15° in men or >20° in women), and TT-TG distance (>20 mm) [9,13]. Situations where the TT-TG distance is between 15-20 mm are defined as borderline[9]. The survival of a PFA has a strong positive association with a neutral Q angle[1]. Worse outcomes are associated with malalignment or an increased Q angle[1,8]. The additional cartilage lesions, patellofemoral dysplasia, or patellar maltracking might be poor prognostic factors for PFA. As the underlying pathological changes are often secondary to anatomical abnormalities in the PFJ, resurfacing through the joint surface cannot correct patellofemoral mechanics and tracking. Additional intervention is necessary both to relief patient symptoms related to maltracking after PFA and to extend the survival of the implant[1].

The AGA Patellofemoral Committee advocates that to perform additional procedures if there is patella patellar maltracking or a severe lateral patella tilt is noted after implantation of the PFA[16]. However, to overcome this deformity, a realignment procedure such as tibial tubercle anteromedialization or medial patellofemoral ligament (MPFL) reconstruction can be performed before or simultaneously with PFA[16]. There is no clear evidence as to whether staged or simultaneous extensor mechanism realignment surgery is associated with better results in patients with PFJ-OA and extensor mechanism malalignment[1,2,9,16].

Based on detailed review of the literature, we conclude that the key to success with PFA is to offer this surgery in carefully selected patients who do not meet any of the above mentioned contraindications. PFA should ideally be offered to middle-aged, active, and symptomatic patients with isolated PFJ-OA. Relative contraindications to PFA include severe obesity, coronal deformity, past meniscectomy, distal femoral osteopenia, patellar instability and

inflammatory arthritis. Due to the technical demand of PFA, this procedure should only be performed by surgeons with appropriate expertise.

References

1.Bond EC, Stauffer TP, Hendren S, Amendola A. Modern Patellofemoral Arthroplasty. JBJS Reviews. 2023;11(9):e23.00071.

2. Batailler C, Libert T, Oussedik S, Zaffagnini S, Lustig S. Patello-femoral arthroplasty indications and contraindications. Journal of ISAKOS : joint disorders & orthopaedic sports medicine. 2024.

3.Dai Y, Diao N, Lin W, Yang G, Kang H, Wang F. Patient-Reported Outcomes and Risk Factors for Decreased Improvement after Patellofemoral Arthroplasty. The journal of knee surgery. 2023;36(4):382-8.

4.Desai VS, Pareek A, DeDeugd CM, Sabbag OD, Krych AJ, Cummings NM, et al. Smoking, unemployment, female sex, obesity, and medication use yield worse outcomes in patellofemoral arthroplasty. Knee Surg Sports Traumatol Arthrosc. 2020;28(9):2962-9.

5. Hoogervorst P, Arendt EA. Patellofemoral arthroplasty: expert opinion. Journal of Experimental Orthopaedics. 2022;9(1):24.

6. Smith JRA, Eldridge JDJ. Patellofemoral joint arthroplasty: patient selection, surgical technique and outcomes. Orthopaedics and Trauma. 2021;35(1):56-63.

7. Shatrov J, Coolican MR. Isolated patellofemoral arthroplasty-surgical technique and tips: current concepts. Journal of ISAKOS: joint disorders&orthopaedic sports medicine. 2023.

8. Morrison R, Mandalia V. Current outcomes of patellofemoral arthroplasty for isolated patellofemoral arthritis - A narrative review. Journal of orthopaedics. 2023;46:156-60.

9. Ennis HE, Phillips JLH, Jennings JM, Dennis DA. Patellofemoral Arthroplasty. JAAOS-Journal of the American Academy of Orthopaedic Surgeons. 2023;31(19):1009-17.

10. Dejour DH, Mesnard G, Giovannetti de Sanctis E. Updated treatment guidelines for patellar instability: “un menu à la carte”. Journal of Experimental Orthopaedics. 2021;8(1):109.

11.Tishelman JC, Pyne A, Kahlenberg CA, Gruskay JA, Strickland SM. Obesity Does Not Affect Patient-Reported Outcomes following Patellofemoral Arthroplasty. The journal of knee surgery. 2022;35(3):312-6.

12. Marullo M, Bargagliotti M, Vigano’ M, Lacagnina C, Romagnoli S. Patellofemoral arthroplasty: obesity linked to high risk of revision and progression of medial tibiofemoral osteoarthritis. Knee Surgery, Sports Traumatology, Arthroscopy. 2022;30(12):4115-22.

13.van der List JP, Chawla H, Villa JC, Pearle AD. Why do patellofemoral arthroplasties fail today? A systematic review. The Knee. 2017;24(1):2-8.

14.Liow MH, Goh GS, Tay DK, Chia SL, Lo NN, Yeo SJ. Obesity and the absence of trochlear dysplasia increase the risk of revision in patellofemoral arthroplasty. The Knee. 2016;23(2):331-7.

15. Bernard CD, Pareek A, Sabbag CM, Parkes CW, Krych AJ, Cummings NM, et al. Pre-operative patella alta does not affect midterm clinical outcomes and survivorship of

patellofemoral arthroplasty. Knee Surgery, Sports Traumatology, Arthroscopy. 2021;29(5):1670-7.

16. Keshmiri A, Dirisamer F, Liebensteiner M, El Attal R, Pagenstert G, Seitlinger G, et al. Operative Treatment Options for Patellofemoral Arthritis: An Expert Recommendation of the AGA Patellofemoral Committee. Orthopaedic journal of sports medicine. 2021;9:2325967121994849.