Prosthetic Indications in Patellofemoral Osteoarthritis

25

Johan Bellemans

Contents

25.1 Introduction

Since the first successful attempt by McKeever in 1955 to replace the patellar surface using a Vitallium shell and since the results of the first artificial patellotrochlear replacements by Blazina et al. were published in 1979, the enthusiasm of surgeons towards artificial replacement of the patellofemoral joint has gone through ups and downs [1, 2].

The results of these implants were initially considered as unpredictable and inconsistent by most surgeons, contrary to what was observed for total knee replacements. Shortcomings in the available designs, difficulty in obtaining correct implant positioning, and failure to address correctly the underlying pathology were the main reasons for this lack of enthusiasm.

Recently, however, there has been a renewed interest in the use of patellofemoral arthroplasty, and there is a growing tendency to believe that artificial patellofemoral replacement has a well-defined place in the treatment of end-stage patellofemoral osteoarthritis.

The recent trend towards less invasive surgery as well as the revival of selective, unicompartmental resurfacing options has aroused the orthopaedic industry towards increasing the efforts in designing better and more anatomic patellofemoral prostheses.

In the meantime, a better understanding of patellofemoral physiology and pathology allowed surgeons to gain a better understanding on how and when patellofemoral arthroplasty should be

J. Bellemans
Knee and Sports Orthopaedics,
Ziekenhuis Oost-Limburg, Genk, Belgium
e-mail: johan.bellemans@uz.kuleuven.ac.be

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Table 25.1 Literature overview on isolated patellofemoral joint replacement

Series	Implant	Number of cases	Follow-up (years)	Good/excellent results (%)	Revision rate (%)
Blazina et al. (1979) [2]	Richards I/II	57	2	NA	35
Arciero and Toomey (1988) [3]	Richards II	25	5.3	85	12
Cartier et al. (1990) [4]	Richards II/III	72	4	85	10
Argenson et al. (1995) [5]	Autocentric	79	5.5	84	13
Krajca-Radcliffe et al. (1996) [6]	Richards I/II	16	5.8	88	6
De Cloedt et al. (1999) [7]	NA	45	6	NA	18
Tauro et al. (2001) [8]	Lubinus	62	7.5	45	28
de Winter et al. (2001) [9]	Richards II	26	11	62	19
Smith et al. (2002) [10]	Lubinus	45	4	69	19
Kooijman et al. (2003) [11]	Richards II	45	15.5	86	25
Board et al. (2004) [12]	Lubinus	17	1.5	53	12
Merchant et al. (2004) [13]	LCS	15	3.7	93	0
Lonner (2004) [14]	Lubinus	30	4	84	33
Lonner (2004) [14]	Avon/Nexgen	25	0.5	96	0
Argenson et al. (2005) [15]	Autocentric	66	16.2	NA	51
Ackroyd et al. (2005) [16]	Avon	306	2	NA	4
Cartier et al. (2005) [17]	Richards II/III	79	10	72	13
Leadbetter et al. (2006) [18]	Avon	30	2	83	7
Sisto and Sarin (2006) [19]	Kinamatch	25	6	100	0
Ackroyd et al. (2007) [20]	Avon	109	5.2	78	17
Gadeyne et al. (2008) [21]	Autocentric	43	6	67	24

performed in order to lead to consistent clinical results.

Like in any other operation, a successful clinical outcome depends on the correct patient selection and indication, as well as surgical technique and postoperative care. In this chapter we try to address the issue of patient selection and indication, based upon the evidence available in literature. Over the last few years, several reports have indeed been published on the results of patellofemoral arthroplasty as well as total knee arthroplasty for patellofemoral disease, and based upon these data, it is becoming increasingly clear what the exact place is of prosthetic patellofemoral surgery.

Review of the literature shows that all of the published studies on patellofemoral replacement are retrospective in nature and provide only level 3 or level 4 evidence [3–21] (Table 25.1).

No therapeutic level 1 or level 2 studies have indeed been performed in order to compare patellofemoral replacement to total knee replacement or any other treatment options for patellofemoral pathology.

25.2 Isolated Patellofemoral Arthroplasty

The typical indication for the use of a patellofemoral prosthesis has traditionally been the patient with disabling, isolated end-stage patellofemoral degeneration that has failed to respond to conservative or other surgical treatment options. Usually this means that the patient has full-thickness cartilage loss as documented by radiographic, arthroscopic, or other investigations.

In cases of subtotal cartilage damage without exposed bone, one should always consider alternative, more conservative surgical options first. Arthroscopic debridement may be helpful in cases of mechanical symptoms caused by unstable cartilage flaps. Microfracture, mosaicplasty, or even autologous chondrocyte transplantation may have a place in the younger patient with a fresh, posttraumatic lesion. Lateral retinacular release, soft tissue realignment of the extensor mechanism, and/or anteromedialization osteotomy of the tibial tubercle may all help to unload the damaged patellofemoral cartilage.

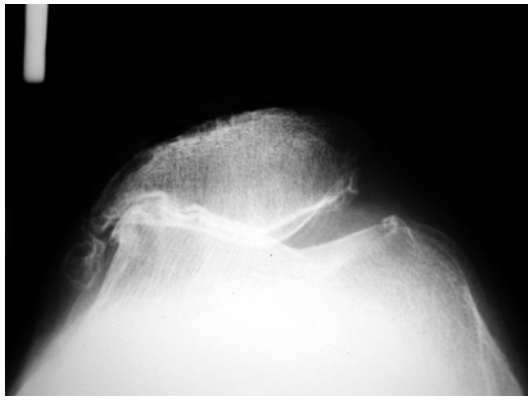

Fig. 25.1 End-stage patellofemoral osteoarthritis with full cartilage loss and lateral maltracking is a potential indication for isolated patellofemoral replacement but will require correction of the maltracking intra-operatively. Usually a limited lateral release or facetectomy will be sufficient to obtain this

In cases of erosive full-thickness damage, these options are however frequently inappropriate or insufficiently effective, requiring further and more drastic care. Patellectomy may be a theoretical option, but it is a mutilating operation, and history has taught us that the results are unpredictable with respect to both the subjective and functional outcome [22–24].

A more conservative approach with excision of just the eroded lateral facet, while leaving the patellar body in situ, may be a better alternative [22, 25–28].

Patellofemoral joint replacement effectively replaces the damaged cartilage layers and therefore provides a more logical solution for the predominant problem of the patient. This implies that concomitant issues such as underlying patellar malalignment or maltracking should be absent or corrected (Fig. 25.1). Likewise, there should be no evidence of other pathology in the knee such as tibiofemoral arthritis or an inflammatory arthropathy.

In view of this, Leadbetter et al. have recently outlined the optimal indications and contraindications for patellofemoral arthroplasty [18, 29]. Degenerative osteoarthritis limited to the patellofemoral joint and causing severe symptoms affecting daily activity is the primary indication, at least in case a lengthy period of nonoperative treatment was unsuccessful.

Posttraumatic osteoarthritis; extensive grade 3 chondrosis affecting the entire trochlea, the medial facet, or the proximal half of the patella; and failure of previous extensor unloading surgical procedures are additional indications according to these authors. In their opinion, contraindications to the procedure are the presence of tibiofemoral arthritis, systemic inflammatory arthropathy, patella infera, uncorrected patellofemoral malalignment, tibiofemoral malalignment, psychogenic pain, and loss of range of motion greater than 10° [18, 29].

Interestingly, factors that are known to be associated with the development of tibiofemoral pathology are indeed associated with inferior results after patellofemoral arthroplasty. Obesity, tibiofemoral malalignment, and limited range of motion fall in this category.

In most published series, the most frequent reason for revising a patellofemoral arthroplasty to a total knee replacement was the progression of the arthritic disease in the femorotibial compartments.

In a recent literature analysis, Leadbetter et al. have reported an overall average reoperation rate of 24 % after patellofemoral joint replacement [18]. Revision to total knee arthroplasty was necessary in 9 % (range 5–18 %) of the published cases, with progression of osteoarthritis in the remaining compartments as the most important cause. Uncorrected extensor malalignment with patellar maltracking or instability, knee joint stiffness, and patellar component loosening were the other reasons for conversion to total knee replacement.

Recent data available from international knee arthroplasty registries seem to confirm these findings. In the annual 2008 report of the Australian Hip and Knee Arthroplasty registry, 1,057 patellotrochlear replacements were reported, accounting for 0.5 % of all knee procedures [30].

Nine different designs were used, with the Avon, LCS, Lubinus, and RBK being the most frequent and accounting for 86 % of all procedures. Again, the revision rate was found to be relatively high compared to total or unicondylar

knee arthroplasty, with 3.1 revisions per 100 observed component years and a 5-year cumulative percent revision of 13.8 % (versus 12.1 % at 7 years for unicondylar knee replacements and 4.3 % at 7 years for total knee replacements).

The main reason for revision of patellotrochlear replacements was progression of disease in 24 %, pain in 22 %, and loosening in 17 %. Interesting to note was that the outcome depended on age, with the 5-year cumulative percent revision declining with increasing age. Patients aged less than 55 years at surgery had a 5-year cumulative revision percent of 17 % versus 13 % for the age group 55–64, 12 % for age 65–74, and only 7 % for those over 75 years old. Males had a doubled risk of revision compared to females. Finally, revision rates were highly influenced by the type of prosthesis used [30].

In a recent German, nationwide survey, a total of 195 patellofemoral replacements were reported, accounting for 0.37 % of all knee replacements. Again, the main reason for failure was progression of tibiofemoral degeneration of the affected knee [31].

Careful patient selection is therefore crucial, and the clinical challenge is to select the patient with isolated patellofemoral full-thickness cartilage wear, absent or correctable malalignment, and absence of risk factors for developing tibiofemoral disease (Fig. 25.2). Such is not an easy task and requires careful clinical and technical investigation [18, 22, 24, 29, 32].

While interrogating and examining the patient, it should become clear that the pain is exclusively located in the anterior compartment and secondary to severe wear of the patellofemoral joint. Patellofemoral crepitus, retropatellar pain while squatting or while performing open chain extension against resistance, and pain during retropatellar palpation should be present. Femorotibial joint line tenderness or other signs of femorotibial or meniscal pathology should not be present. Also, other causes of anterior knee pain such as prepatellar bursitis, pes anserinus tendonitis, patellar tendonitis, or referred hip pain should be excluded. Patellar tracking should be closely examined, and maltracking should be corrected preferably before or at the latest during the patellofemoral replacement.

Fig. 25.2 Patellofemoral joint replacement in situ

Technical investigations should include standing AP and lateral knee radiographs in both extension and 30° flexion (Rosenberg or schuss view), in order to exclude tibiofemoral degeneration. On the lateral views, the presence of patella alta or baja can be noted. A patellar skyline (axial or Merchant) view should be taken to document cartilage loss as well as patellar tracking. Standing full-leg radiographs may be necessary to rule out tibiofemoral malalignment. CT scan or MRI may be helpful to further document cartilage status and to evaluate the tibiofemoral compartment.

Finally, patellofemoral arthritis can be the first, subtle indication of an otherwise subclinical inflammatory condition, and serum analysis may therefore be warranted in doubtful cases [24].

Based upon all these clinical and technical investigations, one should be able to determine

Table 25.2 Indication criteria for isolated patellofemoral arthroplasty

Isolated patellofemoral osteoarthritis (documented loss of patellofemoral joint space with osseous deformation)
Severe patellofemoral symptoms affecting activities of daily life
Nonresponsive to nonoperative treatment for at least 3–6 months
Absent patellofemoral malalignment (or corrected intra-operatively)
Absent tibiofemoral disease
Neutral tibiofemoral alignment
No obesity
No evidence of inflammatory arthritis

whether the patient fulfils the criteria for isolated patellofemoral replacement as shown in Table 25.2.

25.3 Total Knee Arthroplasty

Proponents of patellofemoral arthroplasty argue that despite the significant incidence of femorotibial degeneration necessitating revision to total knee arthroplasty, this argument does justify the systematic use of total knee replacement for the treatment of end-stage patellofemoral disease. In their point of view, total knee arthroplasty is an extreme and overly aggressive treatment for this indication (Table 25.3).

Despite this, several studies have been published indicating that total knee arthroplasty is an effective and reliable procedure for the treatment of isolated patellofemoral disease, with very little reoperation or revision rates, contrary to what is known for isolated patellofemoral replacements. Although no comparative studies exist, the mere fact that the revision and reoperation rate in published series is definitely lower for total knee replacement compared to published data on patellofemoral joint replacement is a strong argument in favour of TKA.

According to those in favour of TKA, the results after patellofemoral arthroplasty should at least become as good as those after TKA with respect to longevity and pain relief, in order to justify its use as a reasonable treatment option for isolated patellofemoral osteoarthritis.

Table 25.3 Contraindications for isolated patellofemoral arthroplasty

Presence of tibiofemoral disease
Inflammatory arthropathy
Uncorrected patellofemoral malalignment or instability
Tibiofemoral malalignment
Gross obesity
Fixed flexion contracture >10°
Evidence of psychosomatic component/chronic regional pain syndrome

Table 25.4 Total knee arthroplasty performed for isolated patellofemoral osteoarthritis: literature overview

Series	Number of cases	Follow-up (years)	KS score	Revision rate (%)
Dalury et al. (1995) [34]	33	5.2	96	0
Laskin and van Stejn (1999) [36]	53	7.4	96	0
Parvizi et al. (2001) [38]	31	5	89	3
Mont et al. (2002) [37]	33	6.8	93	0
Meding et al. (2007) [39]	33	6.2	88	0

Several authors have reported on the results after TKA for isolated patellofemoral osteoarthritis [33–39] (Table 25.4).

Laskin et al. have reported on 53 patients with an average follow-up of 7.4 years and noted a better subjective and functional outcome comparing this group with a matched series of patients with tricompartmental osteoarthritis [35]. Meding et al. retrospectively compared the outcomes of 33 TKAs with patellofemoral osteoarthritis with a matched group of primarily tibiofemoral osteoarthritis and noted similar results for both groups [36]. In their analysis of the literature, they pointed out that of the 167 TKAs performed for the treatment of isolated patellofemoral osteoarthritis, only one knee was revised and two knees underwent reoperation. Three of the studies reported no revisions or reoperations, and the highest revision rate was 3 % (one of 31 TKAs) (Table 25.4).

In view of these data, total knee arthroplasty can therefore be considered as an acceptable treatment option for the treatment of isolated end-stage patellofemoral disease and is the treatment of choice in case concomitant early tibiofemoral degeneration is present or in case risk factors for the development of such tibiofemoral degeneration exist.

Conclusion

The ideal indication for isolated patellofemoral joint replacement is the patient with end-stage patellofemoral osteoarthritis that has been non-responsive to prolonged conservative treatment, causing him or her severe problems in activities of daily life. Underlying patellar maltracking should not be present or corrected during the procedure. Tibiofemoral degeneration or risk factors for developing tibiofemoral degeneration, such as obesity, tibiofemoral malalignment, or inflammatory arthropathy should not be present. In case they are, total knee replacement is the standard of choice. Progression of femorotibial degeneration is indeed the most frequent reason for failure of isolated patellofemoral replacements and occurs relatively common. Total knee replacement can avoid this and is justified under these conditions.

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