The role of knee arthroscopy in managing common soft-tissue complications after total knee arthroplasty: a retrospective case series study

Yunfei Hou
Peking University People's Hospital
Jiaxiang Gao
Peking University People's Hospital
Jian Chen (chenji301@126.com)
Peking University People's Hospital
Jianhao Lin
Peking University People's Hospital
Lei Ni
Peking University People's Hospital
Tiezheng Sun
Peking University People's Hospital
Jun Jiang
Peking University People's Hospital

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Abstract

Background

To investigate the therapeutic efficacy of arthroscopy in 3 common soft-tissue complications, peripatellar impingement, arthrofibrosis and generalized synovitis, after total knee arthroplasty (TKA).

Methods

A retrospective review of patients undertaking arthroscopy for peripatellar impingement(PI), arthrofibrosis(AF) and generalized synovitis(GS) was conducted. Outcome measures included range of motion (ROM), and Knee Society Score (KSS). Intraoperative findings, surgical procedures and the existence of recurrence, prosthesis revision and/or complications were recorded. Paired t test, Fisher exact test, Kruskal-Wallis test and post hoc analysis with Bonferroni correction were used to for statistical evaluation.

Results

74 patients, including 35 patients peripatellar impingement, 25 with arthrofibrosis and 14 with generalized synovitis, with a mean age of 66.1 years were analyzed. The mean follow up(FU) duration was 81.3 months. Overall, patients acquired improvement on ROM from 81.7° to 96.8° ($p < 0.05$), on KSS knee score from 64.2 to 78.7 ($p < 0.05$), and on KSS function score from 61.1 to 77.3 ($p < 0.05$) postoperatively. Patients in all 3 groups had improvements on ROM ($p < 0.05$), KSS knee ($p < 0.05$) and KSS function score ($p < 0.05$). The overall recurrence rate was 22.9% (17/74) and revision rate was 14.9% (11/74). There were statistical differences on symptoms recurrence rate and the prosthesis revision rate among groups ($p < 0.05$). PI group had significant less symptom recurrence rate and revision rate of 11.4% and 8.6% respectively ($p < 0.017$), while GS group had the greatest recurrence rate (42.9%) and revision rate (35.7%) respectively ($p < 0.017$). There were 4 perioperative complications, including 1 acute myocardial infarction and 3 periprosthetic joint infections.

Conclusions

In the setting of symptomatic TKA, arthroscopic intervention could provide clinical improvement in most cases at an average 81.3 months follow-up. Patients with PI had the best outcome while patients with GS had the worst.

Background

Total knee arthroplasty (TKA) is successful for end-stage knee arthrosis. However there were approximately 20% dissatisfied patients following primary TKA[1]. Aseptic loosening, patellofemoral(PF) maltracking & instability, periprosthetic joint infection (PJI), wear and failure of the polyethylene (PE) insert, stiffness are common causes of failure for which revision may be indicated[2]. However compared to primary surgery, revision TKA was associated with a higher failure rate[3] and compromised outcome leading to great economic burden[4].

Arthroscopic surgery is more in line with the principles of contemporary minimally invasive surgery after which the patient recovers faster, with less pain. According to a recent systematic review(SR), peripatellar impingement(PI), arthrofibrosis(AF) and generalized synovitis(GS) were the most common identified soft tissue complications and indications which can be managed arthroscopically[5]. Results from previous studies varied, with relatively short follow up(FU)[6–8]. And most original research involved relatively few patients leading to a limited statistical power. The present study aims to investigate the therapeutic efficacy of arthroscopy in PI, AF, and GS after TKA with longer term of FU. We hypothesized that arthroscopy could provide clinical improvements to varying extents in different conditions.

Methods

Subjects

Following Institutional Review Board approval, a retrospective review was performed on 121 consecutive patients (121 knees) who underwent ipsilateral arthroscopy due to uncomfortable TKA from March 2005 to February 2020. The indications for arthroscopy were: (1) patients had a symptomatic TKA and couldn't recover from conservative treatment including physiotherapy, braces, medications and/or injections. (2) Preoperative history taking, physical exams, laboratory and imaging tests ruled out major abnormalities such as limb malalignment, components malposition, loosening, obvious patella maltracking, as well as PJI and fracture.

Exclusion criteria were: 1) Patients receiving arthroscopy for diagnostic purposes (n = 19) which can be categorized according to intraoperative findings into the following conditions: no major pathology identified (n = 8), suspected PJI and intraoperative tissue sampling (n = 4), loose body identified (n = 2), tibial prosthesis loosening (n = 2), femoral prosthesis debonding (n = 2), dissociation of the tibial metal component from its PE insert (n = 1); 2) patients with known preoperative etiology but the sample size was less than 5 including drainage removal (n = 1), popliteal tendon dysfunction and posterolateral corner reconstruction (n = 1), concurrent arthroscopy and medial collateral ligament(n = 1) or extensor mechanism repair (n = 3), recurrent patella dislocation (n = 3), as the sample size was too small for statistical reporting. 19 patients were lost to follow up (5 patients deceased, 14 patients could not attend). Thus, 74 knees in 74 patients were enrolled for statistical analysis (Fig. 1). Informed consent was obtained by each patient in the current research.

Patient demographics by intraoperative findings are demonstrated in Table 1. 74 patients, including 35 patients peripatellar impingement, 25 with arthrofibrosis and 14 with generalized synovitis, with a mean age of 66.1 years were analyzed. The original procedure was all TKA including 70 posterior stabilized(PS) and 5 cruciate retaining(CR) prosthesis. Before arthroscopy, the patients had suffered with symptoms for 11.3 months (range, 2 to 41 months) on average. Patients were followed for 81.3 months, (range, 6 to 118 months). The age and interval between arthroscopy and arthroplasty did not differ among groups($p > 0.05$). Preoperatively, patients with AF had significant less ROM ($p < 0.003$). Patients with GS had significantly less KSS knee ($p < 0.003$) and function score ($p < 0.003$) respectively (Games Howell post-hoc analysis).

Table 1
Patient demographics and outcomes measures according to indications

	Indications				P value
	Overall	PI	AF	GS	
Number of patients/knees	74	35	25	14	
Males:Females	8:66	4:31	2:23	2:12	$p < 0.05$
Age (Years)	66.1 ± 7.9	66.4 ± 6.2	63.9 ± 9.9	69.4 ± 7.1	0.322
Interval between 2 operations (Months)	16.5 ± 14.1	18.4 ± 15.1	15.6 ± 12.5	13.3 ± 14.3	0.381
ROM pre	81.7 ± 23.1	101.3 ± 6.6	56.4 ± 8.3	78.1 ± 21.6	$p < 0.05$
ROM post	96.8 ± 20.5	110.4 ± 8.5	82.8 ± 16.8	87.9 ± 25.9	$p < 0.05$
Δ ROM	15.1 ± 12.2	9.1 ± 6.5	26.4 ± 12.5	9.8 ± 8.3	$p < 0.05$
KSS knee preop	64.2 ± 9.6	69.8 ± 3.3	62.7 ± 6.4	52.6 ± 13.5	$p < 0.05$
KSS knee postop	78.7 ± 12.1	82.3 ± 7.2	78.5 ± 11.7	69.9 ± 17.6	0.235
Δ KSS knee	14.5 ± 9.1	12.5 ± 7.7	15.8 ± 8.7	17.3 ± 12.1	0.160
KSS function pre	61.1 ± 7.4	64.1 ± 3.0	60.3 ± 6.1	55.0 ± 12.4	$p < 0.05$
KSS function post	77.3 ± 12.2	78.5 ± 9.7	79.3 ± 10.0	70.9 ± 18.5	0.395
Δ KSS function	16.3 ± 9.1	14.5 ± 9.5	19.0 ± 7.3	15.9 ± 10.5	$p < 0.05$
Recurrence rate	17/74 (22.9%)	4/35(11.4%)	7/25 (28%)	6/14(42.9%)	$p < 0.05$
Revision rate	11/74 (14.9%)	3/35(8.6%)	3/25 (12%)	5/14 (35.7%)	$p < 0.05$

Abbreviations: PI = peripatellar impingement; AF = arthrofibrosis; GS = generalized synovitis; ROM = range of motion; KSS = Knee Society Score;

Preoperative work up & diagnosis

Extensive efforts had been made to establish the etiology preoperatively. Characteristics of pain, range of motion(ROM) limitation and joint stability were evaluated thoroughly. Erythrocyte sedimentation rate(ESR) and C-reactive protein(CRP) level were used to screen for PJI. Radiographs including X-rays and Computed Tomography(CT) were used to assess possible component loosening, fracture, malposition, obvious malalignment and PE wear when revision is needed. A preoperative diagnosis was made whenever possible mainly according to the diagnosis key points summarized in Table 2.

Table 2
Diagnostic efficacy of arthroscopic assessment according to indications.

Indications	PI	AF	GS
Pre-op. diagnosis key points	1.Crepitus & AKP; 2.A locking noted with increasing extension at about 40° of flexion; 3. Resolved with a popping concussion with further extension.	1. Pain & a limited ROM < 90° flexion.	1.Recurrent painful effusion and/or occasional catching. 2.A slightly limited ROM & scattered peripatellar tenderness 3. Joint effusion signs in Xray and CT.
Intra-op. diagnosis key points & procedures	1. Dense, well-defined, fibrous bands on the backside of quadriceps tendon, which is caught in the femoral box with increasing extension. 2. The impinging soft tissue debrided.	1. Dense adhesions and fibrous bands throughout the joint. 2. Adhesions & bands debrided, controlled arthrolysis and hemostasis.	1. Hypertrophic GS. 2. Occasional synovium entrapment and bleeding. 3. Occasional signs of polyethylene delamination. 4. Synovectomy and hemostasis.

Abbreviations: PI = peripatellar impingement; AF = arthrofibrosis; GS = generalized synovitis; ROM = range of motion; AKP = Anterior knee pain; Pre-op. = Preoperative; Intra-op. = intraoperative;

Surgical techniques & postoperative rehabilitation

Arthroscopy was performed by one surgeon. Routinely, the anterolateral portal was used as the viewing portal and the anteromedial arthroscope as the instrumentation portal. Additional superolateral and/or superomedial portal were created when necessary. The suprapatellar pouch, extensor mechanisms, medial and lateral gutters, intercondylar notch and all components were visualised systematically to check for the existence of adhesions, hypertrophied synovium, loose body, PE abrasions and etc.

Preoperative diagnosis was confirmed intraoperatively unless no major pathologic findings identified. We used motorized and mechanical instruments (CrossBlade Series Cutters, Stryker, Greenwood, CO) to remove intra-articular fibrous bands, cyclops, hypertrophied and/or entrapped synovium. Intraoperative findings and arthroscopic procedures are demonstrated in Table 2. When performing extensive synovectomy, we elaborately coagulate the hemorrhage utilizing radiofrequency ablator (SERFAS Energy System, Stryker, Kalamazoo, MI). Attention was paid not to scratch the prosthesis. After the procedure, all portals were sutured. We placed a suction drain and removed it at 24 hours in most cases. A continuous passive motion(CPM) machine was started soon after surgery in patients with AF, and at first postoperative day in other indications. Thromboembolism prophylaxis was given soon postoperatively. Prophylactic intravenous antibiotics were routinely used for 24 h, with the first dose given a minimum of 5 min before tourniquet inflation. We adhered to strict aseptic technique during the procedure.

Clinical assessment & statistical analysis

The Knee Society Score (KSS) was utilized to evaluate the knee and functional status[9] of the patients before arthroscopy and at the latest FU or just before revision (if existed). The intraobserver reliability for assessing the knee ROM using a long-arm goniometer and KSS with its specific questionnaire were 1°, and 1 score as measured by 10 consecutive measurements at the start of the study and repeated 15 days later. The intraclass correlation coefficient of 0.88 ($P < 0.001$) and 0.86 ($P < 0.001$) was obtained, respectively.

Patients were categorized according to preoperative clinical characteristics and intraoperative findings as different indication groups. Considering alpha (type 1) error of 0.05, beta (type 2) error of 0.2, mean incidence of GI, AF and GS of to be 3.5%[10], 1.3%[11] and 1%[12], respectively, and $d = 0.05$, the final estimated sample size for each group was determined to be 52 (PI), 20 (AF) and 16 (GS). Descriptive statistics were summarized as means and standard deviations (SD) for quantitative variables and as counts and frequencies for categorical variables. We used Shapiro-Wilk test to examine the distribution of the data and Levene's test to examine the equality for variances. Demographic data and preoperative radiographic measures were compared using the Kruskal–Wallis test for ordinal data and Fisher's exact test for proportions among groups. Postoperative measures were compared to baselines using paired t tests. The statistical significance was set to $p < .05$. In post hoc analysis to account for multiple comparisons, a Bonferroni corrected p value of $p < 0.017$ was used[13]. Data were statistically analyzed using the SPSS Statistics 26.0 software program (IBM Corp., Armonk NY, USA).

Results

Patient outcomes measures are presented in Table 1. Patients in all 3 groups had improvements on ROM($p < 0.05$), KSS knee ($p < 0.05$) and function score($p < 0.05$). Postoperatively among three groups, the ROM, ROM improvement, and KSS knee score varied($p < 0.05$), however there were no statistical difference in postoperative KSS function, knee improvement and function improvement. Games Howell post hoc analysis showed that the PI group had the greatest postoperative ROM and KSS knee score postoperatively($p < 0.003$). Though patients with AF acquired the greatest improvement on ROM postoperatively ($p < 0.003$). Specifically, all patients with AF experienced a preliminary improvement in motion immediately after surgery. 19 of them remained asymptomatic without obvious ROM limitation. The other 7 individuals experienced deterioration of ROM and continued pain with time. 3 had a revision TKA.

Overall, the symptom recurrence rate was 23.0%, and the revision arthroplasty rate was 14.9%. There were statistical differences on these 2 measures among groups ($p < 0.05$, Fisher Exact Test). Post hoc analysis showed that the PI group had the lowest symptom recurrence rate (11.4%) and revision rate (8.6%), while GS group had the highest recurrence rate and revision rate of 42.9% and 35.7% respectively. No patient underwent a repeat arthroscopy. One patient had a subsequent open arthrolysis but failed and she had a revision afterwards.

There were perioperative complications associated with the arthroscopic procedures. One patient with AF suffered from acute myocardial infarction(AMI) and pulmonary infection, treated with percutaneous coronary intervention and anti-bacterial treatment and finally recovered. Three patients (one in each group) developed PJI respectively in 12, 35 and 62 months after knee arthroscopy. There were no other surgical complications. The infection rate was 4.1% (3/74) and the overall complication rate was 5.4% (4/74) in this patient cohort.

Discussion

There is a great variability in reasons of failure after TKA, cases with PJI, instability, component loosening and etc. requires prosthesis revision, while those with soft tissue proliferation, scar formation and impingement may benefit from arthroscopic surgeries. In the present study, we utilized arthroscopy in managing PI, GS, and AF after TKA. Most patients acquired remarkable improvement in ROM, KSS knee and function score, with a symptom recurrence rate of 23.0%, prosthesis revision rate of 14.9%, overall complication rate of 5.4% and PJI rate of 4.1%. With longer FU and larger sample size, we achieved equivalent results compared to similar studies[5, 6, 10, 12, 14–17]. And we provided more detailed data on recurrence as well as revision rate in various indication groups.

For indications, a recent systematic review(SR) with the largest sample size of relevant studies reported that the most prevalent indications were Peripatellar fibrosis (207), Arthrofibrosis(117), Polyethylene wear and Hypertrophied synovial impingement(52), if not including those with pain undiagnosed (168)[5], which was in line with the patient distribution in the current study, indicating that these 3 major patient groups are relatively more common to other conditions and deserve enough attention. Some earlier studies involved patients with other indications and it could be depicted that the number of arthroscopically managing PJI, apparent patellar malalignment, PE wear and peg fracture cases have decreased when comparing publications in the 21st century[6] and those in the 20th century[18, 19], as severe PE wear are occurring less frequently[20] and consensus had been made regarding the standard management of PJI and apparent patella malalignment.

For efficacy, a case series study reported similar improvements that the average KSS knee score increased from 71 before arthroscopy to 85 with a FU of 34 months, while the function score increased from 69 to 83 patients[6]. In the current cohort, patients gained comparable improvements in KSS knee and function score. For symptom recurrence, a SR reported that with approximately 2 years FU on average, of the 488 patients who underwent arthroscopy for therapeutic (not diagnostic) purposes, 85 (17.4%) patients experienced symptom recurrence post-surgery[5]. In the current study, we presented slightly inferior results of 23.0% with longer FU. In the SR, more detailed statistical analysis of the pooled data was not possible because of different outcome measures described used in different patient subgroups. In the current study, we found that patients with PI had the best results, in terms of lower recurrence and revision rate, while patients with GS suffer from the highest risks of failure and prosthesis revision. For revision rate, in the current study it was 14.9%, compared to 19.7% as reported in the SR. The possible reason for the gap is that we did not include cases in which arthroscopy was applied for diagnostic purposes, i.e. those with tibial loosening, femoral prosthesis debonding, suspected PJI and no known etiology identified intraoperatively whose outcome may be inferior. As for safety, Lovro et al studied 192 TKA patients who underwent a subsequent knee arthroscopy using the information from Medicare database with a FU of 5.45 years[21]. The incidence of revision for infection was 6.3% and we reported a lower incidence of 4.1%. These numbers were higher than those published earlier in the 21st century, ranging from 0%-3.7%, with similar patient indication but smaller sample size and shorter duration of FU[6, 20, 22], as late infection might occur during the longer duration of FU[21]. And additionally, we warn that aggravation of comorbidities and life-threatening complications might occur even after this minimally invasive arthroscopic procedures.

Specific consideration on various patient groups

PI

The most common type of PI was the PF impingement, in which cases the hypertrophied cyclops and synovium at the backside of the quadriceps tendon would contact with the distal edge of the trochlea creating mechanical irritation during knee extension. The fibrotic tissue were in discord with the femoral notch, which is substantially deeper in early PS design[23], thus this problem tend to occur more often in PS prosthesis. Other proposed technical risk factors consist of patella baja, smaller patellar components, increased posterior femoral offset, and flexed femoral components etc. [24]. The conservative treatment often was unsatisfactory[23], while most individuals with isolated PF impingement could expect an excellent result of arthroscopic resection[10] with low rate of recurrence[14]. These results were consistent with the present study. Another type was tethered patella syndrome. Adhesion and fibrous bands could be found from the inferior pole of the patellar component to the intercondylar notch, tethering the patella inferiorly[19]. Also the anterior border of tibial component or the insert post comes into conflict with hypertrophic soft tissue inside the intercondylar notch. It arises more in PS design as well[25]. Generally, the treatment was surgical removal of the irritating tissue. This often lead to good results too, which was consistent with the present study.

Anterior knee pain (AKP) was usually not specific, in such cases, crepitus could be found in history taking and/or physical exams, which could facilitate diagnosis. CT should be done to rule out obvious component malrotations which could lead to AKP as well. Intraoperatively, surgeons need to routinely check the existence of hypertrophic fibrous bands, synovium and potential impingement around the patella. Mild patellar maltracking might occur simultaneously due to block of the cyclops or tethering effect from the fibrous bands, normal patellar motion has to be checked in the end.

AF

In the present study, AF was the second largest subgroup. We defined a stiff TKA as a flexion under 90° and a flexion contracture over 10°. Treatment initiated with physical therapy. Manipulation under anaesthesia(MUA) could be feasible and applied in the later phase (at 6–12 weeks postoperatively), but may be related with risks of extensor mechanism rupture. Arthrolysis (open/arthroscopic) and revision surgery were options in refractory cases. In the current study, arthroscopic arthrolysis was always supplemented by MUA and CPM. Arthroscopy allows surgeon to release adhesions in a controlled manner. Previous investigations reported an average improvement in ROM of approximately 30° after arthroscopic release[15, 16]. Our results was similar. And it should be noted that the improvements in the current study, generated from both arthroscopic arthrolysis, MUA and intensive postoperative rehabilitation.

Even though detectable clinical or radiographic abnormalities had been already ruled out, six of twenty five patients encountered ROM limitation recurrence, five of them underwent a prosthesis revision. Frustratingly, we were unable to figure out risk factors for treatment failure due to a relatively small sample size, thus therapeutic efficacy for a specific patient with AF is less predictable. We suggest a delicate analysis of potential etiology. If apparent surgical errors are present, arthroscopy should be avoided. Arthroscopy might be helpful when the stiffness is caused by a tight posterior cruciate ligament(PCL)[15] or adhesions formation in the superior pouch or the medial and lateral retinaculum due to poor rehabilitation. Release of these tissue including the quadriceps and the PCL[15, 26] would enhance mobility. In contrast, extension deficit caused by a tight posterior capsule is not an ideal indication. Postoperatively, an intensive rehabilitation process with optimized pain control should be conducted to improve the outcome.

Synovitis

The etiology of synovitis after TKA is also multifactorial, which can be categorized into systemic, local and iatrogenic factors. Systemic factors include anticoagulant use or presence of a bleeding disorder. Local ones include trauma, inflamed synovium (eg, pigmented villonodular synovitis[27], crystalline and inflammatory arthropathies[28], and metal hypersensitivities[29]), or vascular anomaly (eg, arteriovenous malformation). Iatrogenic factors include an unrecognized vascular injury, implant malposition, loosening or knee instability[30]. Cases caused by vascular injury usually presents swelling within 6 months postoperatively[30]. There were no such cases in this study. Another more common mechanism and pathologic entity originates from hypertrophic synovium entrapment. Varied conditions could cause synovium hypertrophy, i.e. malaligned implants could lead to asymmetric PE wear and particle generation, causing synovial proliferation, subsequent impingement and bleeding. This is a more chronic process, usually occurring later than one year after TKA[30]. Four patients had wear induced synovitis in the current study.

Despite extensive case series, no consensus was made on how to provide best treatment. Conservative management consists of immobilization, cryotherapy, cessation of the anticoagulants, rest (and/or aspiration). But only thirty percents of the patients could had resolution[17]. Angiography and selective embolization offers another choice, with the advantages of low infection risk, ability to be performed under local anesthesia, and quick rehabilitation postoperatively[31]. It was reported to be effective in more than 90% of cases[32]. However repeat embolization may be necessary[33]. Also in patients with contraindications including severe renal impairment, contrast allergy, and difficult arterial access etc., arthroscopic synovectomy could be attempted. But unfortunately, the success is less predictable[17, 34, 35]. Previous research reported synovitis recurrence rate of 33%-50%[12, 17]. Additionally, the pathologic site was not always identified arthroscopically. These failure rates and intraoperative findings were in line with those in the current study. There is angiographic evidence of contrast “blush”, indicating the pathologic site, sometimes are arthroscopically inaccessible, i.e. at the posterior capsule[31]. In such circumstances, an open synovectomy is indicated which is often effective, with reported resolution of more than 90%[17, 36]. However infection risk, wound complications, and a prolonged rehabilitation would be of clinical concerns. Revision is needed when obvious clinical or radiographic abnormalities are present. According to the current patient cohort, arthroscopic synovectomy should not be the first line treatment for GS, good results were obtained in cases whose pathologic site could be identified and accessible arthroscopically and the etiology could be meanwhile dealt with.

In the current study, we utilized arthroscopy to manage PI, AF and GS. Keys for a good outcome incorporate precise diagnosis before surgery, systematic visualization of various compartment and careful procedure during arthroscopy, as well as rigorous and painless rehabilitation process. Avoiding unnecessary arthroscopic interventions in cases with clear technical errors is also important, as arthroscopy after TKA was associated with certain possibilities of recurrence, PJI and serious complications threatening patients' lives. Unlike other relevant studies[5], we did not include patients receiving arthroscopy for diagnostic purposes. The most important reason is that in this patient group, the sample size for different subgroups was rather low (less than ten), which would undermine statistical power[37]. From the clinical perspective, the application of arthroscopy as a diagnostic procedure could be avoided in some cases as it carries certain complication risks and in 8 patients in the current cohort, no pathology could be identified. And meanwhile recent literatures proposed new imaging tests to serve as appropriate and non-invasive diagnostic tools. In magnetic resonance(MR) imaging, frondlike hypertrophied synovitis was often found with PE wear, while in PJI cases, lamellated and hyperintense synovium could be discovered, in nonspecific synovitis, it often revealed as homogeneous effusion along with the signal intensity of fluid[38]. Also MR imaging could help distinguish qualitative differences in synovium appearance in TKA between particle-induced synovitis, infection, and nonspecific synovitis, with almost perfect interobserver and intraobserver reliability[38]. MR imaging had a 0.907–0.930

sensitivity and 0.723–0.738 specificity for a surgical diagnosis of complications related to polyethylene wear (including osteolysis and loosening); 0.652–0.783 sensitivity and 0.976–0.988 specificity for infection; and 0.643–0.667 sensitivity and 0.894–0.939 specificity for stiffness, instability, and nonspecific pain[38]. Other studies used MR angiography[39], synovial fluid cell phenotypes analysis[40], and SPECT/CT[41] etc. to help diagnose the etiology for painful TKA. These analysis had not been utilized in the present study. However they would be able to facilitate identifying the major etiology and prevent unnecessary arthroscopic examinations.

Several limitations should be acknowledged when drawing conclusions. The most important limitations include the retrospective study design, and the absence of a control group which can both lead to potential recall bias. Second, the study design would also induce selection bias. Third, the sample size in the PI and GS did not reach the number derived from the sample size calculations due to the particular patient population presenting to a single surgeon in a single center. And the lost to follow up rate was 19.6%, which poses a potential threat to the validity[42]. However the sample size in the current study was relatively large and the follow up duration was comparatively long. In the current study, we provided information and evidence on the therapeutic efficacy and safety of arthroscopic debridement to manage PI, AF and GS after TKA.

Conclusions

Overall in patients without obvious clinical and radiographic abnormalities, arthroscopy could be effective in managing a painful TKA in approximately 80 percents of the cases with improved ROM and KSS score. Patients with PI typically had an excellent outcome, while the efficacy for patients with GS or AF relied on whether etiology could be identified, accessed and corrected. In most patients with AF, simultaneous MUA, early-initiated CPM and an aggressive rehabilitation process should be combined and a profound recovery on ROM and joint function could be expected. In patients with GS, arthroscopic procedure should be limited and mainly applied when conservative treatment and selective embolization fails, and the identified pathologic site is accessible arthroscopically.

Abbreviations

TKA: total knee arthroplasty; PI: peripatellar impingement; AF: arthrofibrosis; GS: generalized synovitis; ROM: range of motion; KSS: Knee Society Score; FU: follow up; PF: patellofemoral; PJI: periprosthetic joint infection; PE: polyethylene; SR: systematic review; PS: posterior stabilized; CR: cruciate retaining; ESR: erythrocyte sedimentation rate; CRP: C-reactive protein; CT: computed tomography; AKP : Anterior knee pain; Pre-op.: preoperative; Intra-op. = intraoperative; AMI: acute myocardial infarction; CPM: continuous passive motion; MUA: manipulation under anaesthesia; PCL: posterior cruciate ligament, MR: magnetic resonance

Declarations

Ethics approval and consent to participate:

All procedures performed in this study were in accordance with the ethical standards of the institutional and national research committee and with 1964 Helsinki declarations and its later amendments. The study commenced after receiving its ethical approval from the institutional review board. Written informed consent was obtained from all of the patients before the surgery.

Consent for publication:

Not applicable.

Availability of data and material:

All of the data will be available for secondary analysis in necessary cases from the corresponding author through email address.

Competing interests:

The authors declare that they have no conflict of interests.

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Authors' contributions:

Study design: Z.Z. and J.L. Data collection/validation: J. Guo and X.H. Data analysis: G.P. and Z.G. Result interpretation: W.R. and X.Y. Reporting and editing: Y.H. and J.Gao. Project guarantor: Z.Z. and J.L. The author(s) read and approved the final manuscript.

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Figures

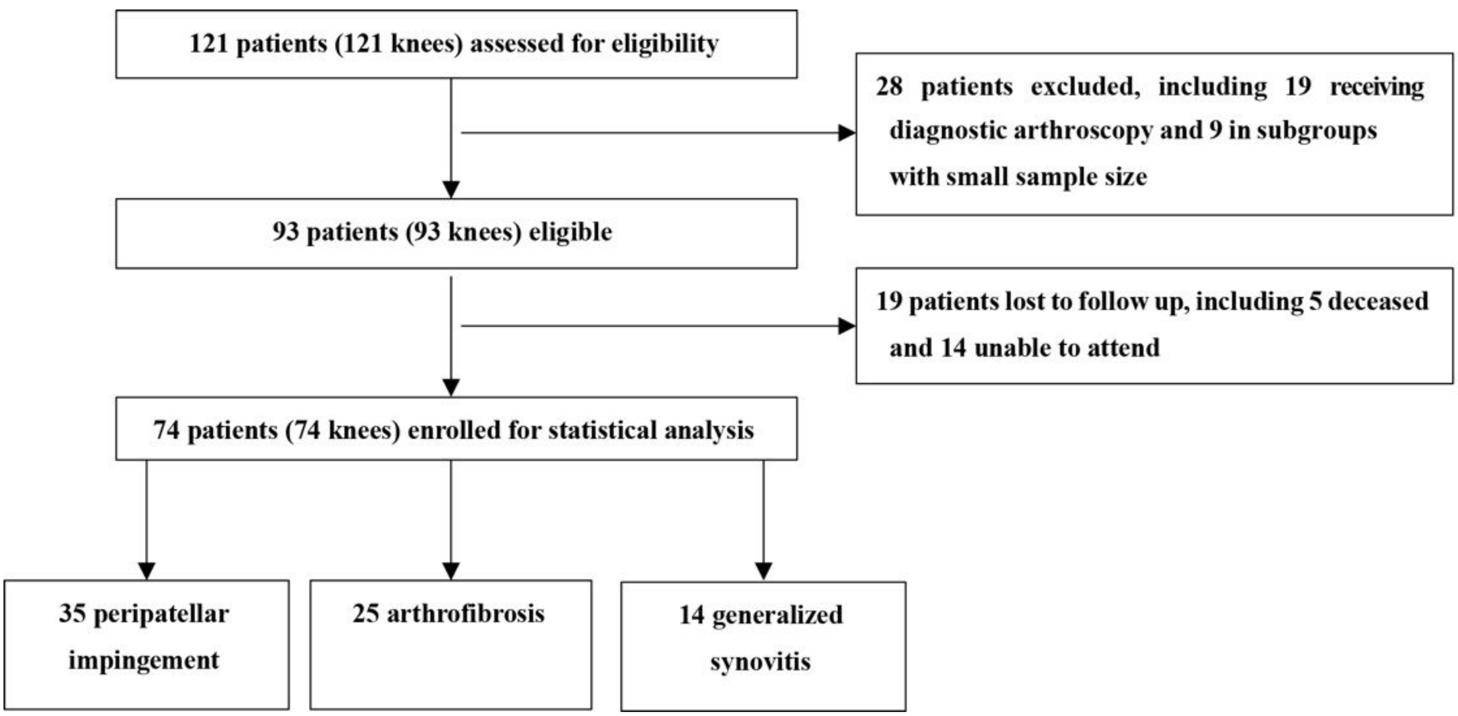

Figure 1

Flow chart of the study. 121 consecutive knee arthroscopy procedures were performed, out of which 93 patients met our inclusion criteria. 74 patients (74 knees) were enrolled for statistical analysis.