National Imaging Associates, Inc.*	
Clinical guidelines: **KNEE ARTHROSCOPY**	**Original Date: November 2015**
CPT Codes:** - **Knee Manipulation Under Anesthesia (MUA): 27570, 29884** - **Knee Ligament Reconstruction/Repair: 27405, 27407, 27409, 27427, 27428, 27429, , 29888, 29889** - **Knee Meniscectomy/Meniscal Repair/Meniscal Transplant: 27332, 27333, 27403, 29868, 29880, , 29881, 29882, 29883** - **Knee Surgery – Other: 27412, 27415, 27416, 27418, 27420, 27422, 27424, 27425, 29866, 29867, 29870, 29873, 29874, 29875, 29876, 29877, 29879, G0289** ***See UM Matrix for allowable billed groupings and additional covered codes*	**Last Revised Date: May ~~June~~ 2021**
Guideline Number: NIA_CG_316	**Implementation Date: January 2023**

General Requirements

Elective arthroscopic surgery of the knee may be considered if the following general criteria are met:

- There is clinical correlation of the individual~~patient~~'s subjective complaints with objective exam findings and/or imaging (when applicable)
- Knee pain with documented loss of function: Deviation from normal knee function which may include painful weight bearing and/or inadequate range of motion (> 10 degrees flexion contracture or < 110 degrees flexion or both) to accomplish age-appropriate activities of daily living (ADLs), occupational or athletic requirements)
- ~~Patient~~Individual is medically stable with no uncontrolled comorbidities
- ~~Patient~~Individual does not have an active local or systemic infection

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- ~~Patient~~Individual does not have active, untreated drug dependency (including but not limited to narcotics, opioids, or muscle relaxants) unless engaged in a treatment program
- No intra-articular cortisone injections within 4 weeks of surgery[1-3]

Clinical notes should address:

- Symptom onset, duration, and severity
- Loss of function and/or limitations
- Type and duration of non-operative management modalities (where applicable)

Unless otherwise stated in the subsections below, non-operative management must include **at least two** or more of the following, unless otherwise specified:

- Rest or activity modifications/limitations
- Ice/heat
- Protected weight bearing
- Pharmacologic treatment: oral/topical NSAIDS, acetaminophen, analgesics, tramadol
- Brace/orthosis
- Physical therapy modalities
- Supervised home exercise
- Weight optimization
- Injections: corticosteroid or viscosupplementation

INDICATIONS

DIAGNOSTIC KNEE ARTHROSCOPY

Diagnostic knee arthroscopy may be medically necessary when **ALL** of the following criteria are met:

- At least 12 weeks ~~3 months~~ of knee pain with documented loss of function
- Failure of at least 12 weeks of non-operative treatment, including **at least two** of the following:
    - Rest or activity modifications/limitations
    - Ice/heat
    - Protected weight bearing
    - Pharmacologic treatment: oral/topical NSAIDS, acetaminophen, analgesics, tramadol
    - Brace/orthosis
    - Physical therapy modalities
    - Supervised home exercise
    - Weight optimization

- Corticosteroid injection

- Clinical documentation of painful weight bearing, joint line tenderness, effusion and/or limited motion compared to pre-symptomatic joint range
- Indeterminate radiographs **AND** MRI findings. Radiographs and/or MRI should not demonstrate any of the following: Kellgren-Lawrence Grade 3-4 changes (based on weight-bearing radiographs), meniscus tears, loose bodies, stress fractures (including insufficiency fractures) or patellofemoral instability (lateral patellar tilt or patellar subluxation)
- No intra-articular cortisone injections within 4 weeks of surgery[1-3]

NOTE: The following are not managed by Magellan:

- Subchondroplasty
- In-office diagnostic arthroscopy (e.g., Mi-Eye, VisionScope)[4-6] ~~(Cooper, 2018; McIntyre, 2019; Zhang, 2019)~~

DEBRIDEMENT CHONDROPLASTY

NOTE: Arthroscopic debridement with or without chondroplasty for the treatment of osteoarthritis of the knee is considered **NOT MEDICALLY NECESSARY** ~~(Katz, 2014; Mayr, 2013)~~.[7-12]

Debridement for **non-patellofemoral (femoral condyle and tibial plateau) articular cartilage** may be medically necessary when **ALL** of the following criteria are met[13-15]: ~~(Anderson, 2017; Montgomery, 2013; Scillia, 2015)~~

- Knee pain with documented loss of function
- Failure of **at least 12 weeks** of non-operative treatment, including **at least two** of the following:
  - Rest or activity modifications/limitations
  - Ice/heat
  - Protected weight bearing
  - Pharmacologic treatment: oral/topical NSAIDS, acetaminophen, analgesics, tramadol
  - Brace/orthosis
  - Physical therapy modalities
  - Supervised home exercise
  - Weight optimization

- Corticosteroid injection

- MRI results demonstrate evidence of an area of localized articular cartilage damage or an unstable chondral flap
- Two or more or persistent effusion(s)
- No intra-articular cortisone injections within 4 weeks of surgery[1-3]

Debridement chondroplasty may be medically necessary for **patellofemoral chondrosis** when **ALL** of the following criteria are met:

- Anterior knee pain with documented loss of function, exacerbated by activities that load the joint such as ascending > descending stairs or being in seated position for extended periods of time with knee flexed~~)~~
- Other extra-articular or intra-articular sources of pain or dysfunction have been excluded (referred pain, radicular pain, tendinitis, bursitis, neuroma)
- Physical exam localizes tenderness to the patellofemoral joint
- Failure of **at least 12 weeks** of non-operative treatment, including **at least two** of the following:
  - Rest or activity modifications/limitations
  - Ice/heat
  - Protected weight bearing
  - Pharmacologic treatment: oral/topical NSAIDS, acetaminophen, analgesics, tramadol
  - Brace/orthosis
  - Physical therapy modalities
  - Supervised home exercise
  - Weight optimization
  - Corticosteroid injection
- No evidence of moderate to severe osteoarthritis (Kellgren-Lawrence Grade 3-4 based on weight-bearing radiographs and patellofemoral views [see grading appendix])
- No intra-articular cortisone injections within 4 weeks of surgery[1-3]

Debridement for **arthrofibrosis** may be medically necessary when the following criteria are met:

- Arthrofibrosis as evidenced by physical exam findings of painful stiffness and loss of motion due to proliferation of scar tissue in and around the joint. Failure of at least 6 weeks of supervised or self-directed physical therapy~~;~~

NOTE: Imaging is not necessary, however historically has been used to help determine the cause of loss of motion.

MENISCECTOMY / MENISCAL REPAIR / MENISCAL TRANSPLANT

MENISCECTOMY / MENISCAL REPAIR

NOTE: There is a high incidence of incidental meniscal findings on knee MRI in middle-aged and elderly ~~patient~~individuals[16,17] ~~(Englund, 2008, 2012)~~ and several studies have indicated that there is no difference in outcome between operative and non-operative treatment of ~~patient~~individuals with degenerative meniscus tears, especially when associated with an arthritic knee~~: (Englund, 2012; Herrlin, 2013; Hohmann, 2018; Jevsevar, 2013, 2015; Katz, 2013; Kise, 2016; Leopold, 2017; Liebs, 2018; MacDonald, 2013; Sihvonen, 2013; Yim, 2013)~~.[17-28] Arthroscopic debridement of degenerative meniscus tears in those with visible arthritis is generally not recommended and in some case, may worsen the symptoms and progression of the arthritis.[29-31] Studies have also demonstrated an~~t~~ increased incidence of revision arthroplasty, infection, loosening and stiffness in individuals~~those patients~~ who underwent a knee arthroscopy prior to an arthroplasty.[32-36]

Meniscectomy and/or meniscal repair may be medically necessary when **ALL** of the following criteria in any of the following subsections are met:

- Symptomatic meniscal tear confirmed by MRI results that demonstrate a peripheral tear in the vascular zone, root tear or other tear that the requesting physician considers repairable and is associated with pain localized to the corresponding compartment upon physical examination~~;~~

OR

- MRI results demonstrate a meniscus tear in a pediatric or adolescent ~~patient~~individual who complains of either pain or mechanical symptoms and has ANY positive meniscal findings on physical examination

OR

- History of acute injury/onset of symptoms with a locked knee and/or mechanical symptoms of locking
- Physical examination demonstrates ANY positive meniscal findings on examination or demonstrates evidence of a locked knee (loss of terminal extension)

- MRI demonstrates a bucket-handle tear of the meniscus. (Does not include an extruded meniscus or flap tears)

OR

- When **at least two** of the following 5 criteria are met:
  - History of "catching" or "locking" as reported by the ~~patient~~individual
  - Knee joint line pain with forced hyperextension upon physical exam
  - Knee joint line pain with maximum flexion upon physical exam
  - Knee pain, crepitus, or an audible or palpable click with the McMurray's test or Apley grind test
  - Joint line tenderness to palpation upon physical exam

AND

- Failure of at least 6 weeks of non-operative treatment, including **at least two** of the following:
  - Rest or activity modifications/limitations
  - Ice/heat
  - Protected weight bearing
  - Pharmacologic treatment: oral/topical NSAIDS, acetaminophen, analgesics, tramadol
  - Brace/orthosis
  - Physical therapy modalities
  - Supervised home exercise
  - Weight optimization
  - Corticosteroid injection

AND

No intra-articular cortisone injections within 4 weeks of surgery[1-3]

~~o~~

AND

- **ONE** of the following:
  - Weight-bearing X-rays (standing X-rays, Rosenberg view, 45-degree flexed PA view, etc.) that demonstrate no moderate or severe osteoarthritic changes (Kellgren-Lawrence Grade 3-4 [see grading appendix]); X-rays should be described as showing either no arthritis or mild/minimal arthritis only~~;~~

    ~~o~~

    OR

- MRI results confirm a frank meniscal tear (not simply degenerative changes, i.e., fraying) and the MRI **does not** demonstrate any of the following: moderate or severe articular cartilage thinning, full-thickness articular cartilage loss or defects, extrusion of the meniscus, subchondral edema, more than mild osteophytes, subchondral cysts, or an impression of "moderate" or "advanced/severe" arthritis (see absolute and relative contraindications). If the MRI demonstrates any of the above-described findings of more than mild arthritis, **weight-bearing X-rays are required** to confirm no moderate or severe articular cartilage loss*.

***NOTE: Arthroscopic meniscus requests and MRI/X-rays of the knee: The imaging evaluation of the knee for ~~patient~~individuals with meniscus tears should be individualized, the goal of which is to recommend treatment for only those with no or minimal associated arthritis.**

Although most ~~patient~~individuals that have a request for arthroscopic meniscectomy will have had both an MRI *and* X-rays of the knee, only one of these tests is required for approval, provided all other criteria for meniscectomy have been met. For example, if there has been a failure to improve with 6 weeks of non-operative treatment and there are physical examination findings of a meniscus tear, an MRI is not required, only weight-bearing X-rays that demonstrate no more than mild arthritis. Likewise, if an MRI describes a frank meniscus tear and does not describe any significant associated arthritis, weight-bearing X-rays are not required. However, as noted above, if an MRI demonstrates findings of more than mild arthritis, **weight-bearing X-rays are required** to confirm no moderate or severe articular cartilage loss.

Absolute Contraindications: Meniscectomy-/-Meniscal Repair

- Arthroscopic meniscectomy or meniscal repair is never medically necessary in the presence of Kellgren-Lawrence Grade 4 osteoarthritis [see grading appendix].

No intra-articular cortisone injections within 4 weeks of surgery[1-3]

Relative Contraindications: Meniscectomy / Meniscal Repair

- Meniscectomy or repair is considered NOT MEDICALLY NECESSARY in the presence of Kellgren-Lawrence Grade 3 osteoarthritis [see grading appendix], **Unless**:
  - There has been an acute onset locking (does not include catching, popping, cracking, etc.); **AND**
  - There is MRI evidence of a bucket-handle **or** displaced meniscal fragment that correlates with the correct compartment (i.e., medial tenderness and locking for a medial tear).
- If grade 3 changes are present, only a meniscectomy may be indicated, not a repair. If there is evidence of meniscal extrusion on coronal MRI, with/without subchondral edema, arthroscopy is relatively contraindicated, even if a tear is present.

MENISCAL TRANSPLANT

Meniscal Transplants may be medically necessary when **ALL** of the following criteria are met[37-41] ~~(Hannon, 2015; Noyes, 2015; Samitier, 2015)~~

- ~~Patient~~Individual is < 40 years ~~old;~~ of age
- ~~Patient~~Individual has no evidence of arthritic changes
- Symptomatic meniscal deficiency confirmed by MRI results that show a meniscal deficient compartment, OR previous arthroscopy photographs or video showing subtotal or total meniscectomy
- Failure of at least 6 weeks of non-operative treatment, including **at least two** of the following:
  - Rest or activity modifications/limitations
  - Ice/heat
  - Protected weight bearing
  - Pharmacologic treatment: oral/topical NSAIDS, acetaminophen, analgesics, tramadol
  - Brace/orthosis
  - Physical therapy modalities
  - Supervised home exercise
  - Weight optimization

- Corticosteroid injection

Absolute Contraindications: Meniscal Transplant

- Uncorrected (staged or simultaneous) ligamentous insufficiency (ACL, PCL, MCL, LCL, PMC, PLC)
- Uncorrected (staged or simultaneous) malalignment greater than 5 degrees varus or 5 degrees valgus
- Uncorrected (staged or simultaneous) full-thickness articular cartilage isolated defects (International Cartilage Research Society Grade 3 or 4; Outerbridge Grade IV [see grading appendix])
- ~~Kellgren-Lawrence Grade 3 or 4 osteoarthritis [see grading appendix]~~
-
- No intra-articular cortisone injections within 4 weeks of surgery[1-3]

LIGAMENT RECONSTRUCTION ~~/~~ OR ~~/~~ REPAIR

ANTERIOR CRUCIATE LIGAMENT (ACL) RECONSTRUCTION WITH ALLOGRAFT OR AUTOGRAFT

ACL reconstruction or repair may be medically necessary when **ALL** of the following criteria in any of the following subsections are met[41-44]:
~~(Dejour, 2013; Hoher, 2014; Pujol, 2012)~~

- Patient history of instability at the time of an acute injury OR history of recurrent knee instability (as defined subjectively as "giving way", "giving out", "buckling", two-fist sign) with clinical findings of instability: Lachman's 1A, 1B, 2A, 2B, 3A, 3B, a~~A~~nterior d~~D~~rawer, p~~P~~ivot s~~S~~hift test, or instrumented (KT-1000 or KT-2000) laxity of greater than 3 mm side-side difference
- MRI results confirm complete ACL tear
- **~~Patient~~Individual has no evidence of severe arthritis (Kellgren-Lawrence** Grade 3 or 4 [see grading appendix])

OR

- **At least ONE** of the following criteria are met:
  - MRI results confirm ACL tear associated with other ligamentous instability or repairable meniscus
  - MRI results confirm partial or complete ACL tear AND ~~patient~~individual has persistent symptoms despite at least 12 weeks of non-operative treatment~~;~~
  - Acute ACL tear confirmed by MRI in high demand occupation or competitive athlete (as quantified by Marx activity score for athletics (any score greater than 4) and Tegner activity score for athletics and/or occupation (score greater than 2)) [see grading appendix])

- **~~Patient~~Individual has no evidence of severe arthritis (Kellgren-Lawrence** Grade 3 or 4 [see grading appendix])

** If MRI results demonstrate an ACL tear, especially in the younger ~~-~~individual~~patient~~, and there is no mention of significant arthritis, X-rays are not required.

NOTE: ACL tears in ~~patient~~individuals less than age 13 will be reviewed on a case-by-case basis.

POSTERIOR CRUCIATE LIGAMENT (PCL) RECONSTRUCTION

PCL reconstruction or repair may be medically necessary **when the following criteria are met**[45,46]:

~~(Bedi, 2016; Laprade, 2015)~~

- Knee instability (as defined subjectively as "giving way", "giving out" or "buckling") with clinical findings of any of the following signs/tests: positive posterior drawer, posterior sag, quadriceps active, dial test at 90 degrees knee flexion or reverse pivot shift test
- MRI results confirm complete PCL tear
- Failure of at least 12 weeks of non-operative treatment, including physical therapy emphasizing quadriceps strengthening)
- Absence of medial and patellofemoral K-L grade 3-4 changes in chronic tears [see grading appendix]

The following clinical scenarios will be considered and decided on a case-by-case basis:

- Pediatric and adolescent tears in ~~patient~~individuals with open physes or open growth plates
- Symptomatic partial tears with persistent instability despite non-operative treatment
- Incidental Kellgren-Lawrence grade 2-3 osteoarthritis [see grading appendix] in acute/subacute tears with unstable joint
- Acute PCL repair or reconstruction when surgery is also required for the ACL, MCL or LCL~~.~~
- Tears in ~~patient~~individuals less than age 13

COLLATERAL LIGAMENT REPAIR OR RECONSTRUCTION

Collateral ligament repair or reconstruction should rarely occur independent of additional ligament repair or reconstruction surgery (ACL, MCL, LCL).

All non-traumatic collateral ligament repair/reconstruction requests will be reviewed on a case-by-case basis.

ARTICULAR CARTILAGE RESTORATION / REPAIR

SKELETALLY IMMATURE INDICATIONS

Articular cartilage restoration-/-repair may be medically necessary when **ALL** of the following criteria in any of the following subsections are met[47-52] ~~(Chawla, 2015; Macmull, 2010; Murphy, 2014; Salzmann, 2012, 2018; Steadman, 2015)~~:

- Skeletally immature patient
- ~~Patient~~Individual is symptomatic (pain, swelling, mechanical symptoms of popping, locking, catching, or limited range of motion)
- Radiographic findings (X-ray or MRI) of a displaced lesion

OR

- Skeletally immature patient
- ~~Patient~~Individual is symptomatic (pain, swelling, mechanical symptoms of popping, locking, catching, or limited range of motion)
- Failure of **at least 12 weeks** of non-operative treatment, including **at least two** of the following:
  - Rest or activity modifications/limitations
  - Ice/heat
  - Protected weight bearing
  - Pharmacologic treatment: oral/topical NSAIDS, acetaminophen, analgesics, tramadol
  - Brace/orthosis
  - Physical therapy modalities
  - Supervised home exercise
  - Weight optimization
  - Corticosteroid injection
- Radiographic findings (X-ray or MRI) findings of a stable osteochondral lesion~~;~~

OR

- When **ALL** of the following criteria are met:
  - Skeletally immature
  - Asymptomatic
  - Failure of at least 12 weeks of non-operative treatment, including **at least two** of the following, to improve lesion stability or size
    - Rest or activity modifications/limitations
    - Ice/heat
    - Protected weight bearing
    - Pharmacologic treatment: oral/topical NSAIDS, acetaminophen, analgesics, tramadol

- Brace/orthosis
- Physical therapy modalities
- Supervised home exercise
- Weight optimization
- Corticosteroid injection

- Radiographic findings (X-ray or MRI) findings of an unstable osteochondral lesion

Exclusion (applies to all criteria above)

Exclude ~~patient~~individuals with evidence of meniscal deficiency and/or malalignment if these are not being addressed (meniscal transplant and/or lateral release/patellar realignment procedure) at the same time as the cartilage restoration procedure.

SKELETALLY MATURE INDICATIONS

Reparative Marrow Stimulation

Reparative marrow stimulation techniques such as microfracture & drilling may be medically necessary when **ALL** of the following criteria are met[53-61]:

~~(Bae, 2013; Bark, 2014; Gobbi 2014; Goyal, 2013; Mall, 2015; Medina, 2020; Oussedik, 2015; Sommerfeldt, 2016)~~

- Skeletally mature adult
- MRI confirms a full-thickness weight-bearing lesion that is < 2.5 cm^2
- ~~Patient~~Individual is symptomatic (pain, swelling, mechanical symptoms of popping, locking, catching, or limited range of motion)
- ~~Patient~~Individual is < 50 years of age
- BMI < 35 (optimal outcomes if patient BMI < 30)
- Physical exam findings and/or (imaging) results confirm knee has stable ligaments
- No evidence of prior meniscectomy in same compartment (medial femoral condyle full thickness lesion and prior medial meniscectomy) unless concurrent meniscal transplant performed.
- No intra-articular cortisone injections within 4 weeks of surgery[1-3]
-

*__NOTE__: Abrasion arthroplasty is included in coding but is not indicated.

Restorative Marrow Techniques

Restorative techniques such as, osteoarticular transfer system or osteochondral autograft transfer system (OATS), mosaicplasty, matrix autologous chondrocyte implantation (MACI), osteochondral allograft implantation, minced articular cartilage allograft transplantation (DeNovo natural tissue NT) may be medically necessary when **ALL** of the following criteria are met[58,62-73]:

~~(Brittberg, 2018; Fu, 2016; Gou, 2020; Knutsen, 2016; Mall, 2015; Minas, 2014; Niemeyer, 2019; Sherman, 2014; Zouzias, 2016)~~

- Skeletally mature adult
- MRI results confirm a full thickness chondral or osteochondral lesion of the femoral condyles or trochlea > 2.5 cm^2
- ~~Patient~~Individual is < 50 years of age
- BMI < 35 (optimal outcomes if patient BMI < 30)
- ~~Patient~~Individual has been symptomatic (pain, swelling, mechanical symptoms of popping, locking, catching, or limited range of motion) for at least 6 months
- Failure of **at least 6 months** of non-operative treatment, including **at least two** of the following:
    - Rest or activity modifications/limitations
    - Ice/heat
    - Protected weight bearing
    - Pharmacologic treatment: oral/topical NSAIDS, acetaminophen, analgesics, tramadol
    - Brace/orthosis
    - Physical therapy modalities
    - Supervised home exercise
    - Weight optimization
    - Corticosteroid injection
- MRI and/or physical findings confirm knee has normal alignment as defined as +/- 3 degrees from neutral on full-length mechanical axis long-leg x-ray (unless concurrent or staged tibial or femoral osteotomy performed) and stability (unless concurrent ligamentous repair or reconstruction performed)
- MRI and/or X-rays shows no evidence of osteoarthritis (No greater than Kellgren-Lawrence Grade 2 changes on weight-bearing X-rays [see grading appendix])
- No prior meniscectomy in same compartment (unless concurrent or staged meniscal transplant performed)

No intra-articular cortisone injections within 4 weeks of surgery[1-3]

Patellofemoral Chondrosis

Surgical intervention for the treatment of patellofemoral chondrosis (osteochondral autograft transfer or transplantation (OATS), microfracture, matrix autologous chondrocyte implantation (MACI), osteochondral allograft implantation, minced articular cartilage allograft transplantation (DeNovo NT), tibial tubercle osteotomy) may be medically necessary when **ALL** of the following criteria are met[74-79]:

~~(Biant, 2014; Gomoll, 2014; Von Keudell, 2017, Hinckel, 2018; Olivos, 2019; Schuette, 2017)~~

- Anterior knee pain and loss of function
- Other extra-articular or intra-articular sources of pain or dysfunction have been excluded (referred pain, radicular pain, tendinitis, bursitis, neuroma)
- Physical exam localizes tenderness to the patellofemoral joint with pain aggravated by activities that load the joint (single leg squat, descending > ascending stairs or stair climbing, and being in seated position for extended periods of time with knee flexed)
- Radiologic imaging shows grade 3 or 4 patellofemoral chondrosis (International Cartilage Research Society classification*) or grade III or IV articular cartilage changes, documented by prior arthroscopic evaluation (Outerbridge Classification*)~~-~~ (*see grading appendix)
- Failure of **at least 6 months** of non-operative treatment, including **at least two** of the following:
    - Rest or activity modifications/limitations
    - Ice/heat
    - Protected weight bearing
    - Pharmacologic treatment: oral/topical NSAIDS, acetaminophen, analgesics, tramadol
    - Brace/orthosis
    - Physical therapy modalities
    - Supervised home exercise
    - Weight optimization
    - Corticosteroid injection
- No evidence of osteoarthritis (No greater than Kellgren-Lawrence Grade 2 changes on weight-bearing X-rays in the medial/lateral compartments) [see grading appendix]~~.~~
- No intra-articular cortisone injections within 4 weeks of surgery[1-3]
-

Synovectomy (major [2+ compartments], minor [1 compartment])

Synovectomy may be medically necessary when **ALL** of the following criteria in any of the following subsections are met[80-82] ~~(Auregan, 2014; Lipina, 2018; Willimon, 2018)~~:

- Proliferative rheumatoid synovium (in ~~patient~~individuals with established rheumatoid arthritis according to the American College of Rheumatology Guidelines [see grading appendix])
- Not responsive to disease modifying drug (DMARD) therapy for at least 6 months and failure of at least 6 weeks of non-operative treatment
- At least one instance of aspiration of joint effusion and corticosteroid injection (if no evidence of infection)

OR

- Hemarthrosis from injury, coagulopathy or bleeding disorder confirmed by physical exam, joint aspiration, and/or MRI

OR

- Proliferative pigmented villonodular synovitis, synovial chondromatosis, sarcoid synovitis, or similar proliferative synovial disease, traumatic hypertrophic synovitis confirmed by history, MRI or biopsy
- Failure of **at least 6 weeks** of non-operative treatment, including **at least two** of the following:
    - Rest or activity modifications/limitations
    - Ice/heat
    - Protected weight bearing
    - Pharmacologic treatment: oral/topical NSAIDS, acetaminophen, analgesics, tramadol
    - Brace/orthosis
    - Physical therapy modalities
    - Supervised home exercise
    - Weight optimization
    - Corticosteroid injection
- At least one instance of aspiration of joint effusion and injection of corticosteroid (if no evidence of infection)

OR

- Detection of painful plica confirmed by physical exam and MRI findings
- Failure of at least 12 weeks of non-operative treatment (see above for criteria)
- At least one instance of aspiration of joint effusion OR single injection of corticosteroid (effusion may not be present with symptomatic plica)

No intra-articular cortisone injections within 4 weeks of surgery[1-3]

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Loose Body Removal

Loose body removal may be medically necessary when the following criteria are met:

- Documentation of mechanical symptoms the cause limitation or loss of function
- X-ray or MRI documentation of a loose body
- No intra-articular cortisone injections within 4 weeks of surgery[1-3]
-

Lateral Release/Patellar Realignment

This guideline describes indications for surgical procedures to address patellofemoral pain disorders and abnormal alignment of the extensor mechanism of the knee by arthroscopic and/or open surgical techniques.

Lateral Patellar Compression Syndrome

Surgical intervention for the treatment of lateral patellar compression syndrome is indicated when **ALL** the following criteria are met[83-87]:

~~(Clifton, 2010; Fonseca, 2017; Pagenstert, 2012; Petersen, 2014; Saper, 2014)~~

- Evidence of lateral patellar tilt from radiologic images (patellofemoral view: Merchant (45 degrees flexion; and/or skyline (60-90 degrees flexion); and/or sunrise (60-90 degrees flexion)
- Associated lateral patella facet Kellgren-Lawrence changes grade 1, 2, or 3 [see grading appendix]
- Reproducible isolated lateral patellofemoral pain with patellar tilt test
- Failure of **at least 6 months** of non-operative treatment, including quadriceps strengthening and appropriate hamstring/IT band stretching and patellar mobilization techniques, and **at least one** of the following:
    - Rest or activity modifications/limitations
    - Ice/heat
    - Protected weight bearing
    - Pharmacologic treatment: oral/topical NSAIDS, acetaminophen, analgesics, tramadol
    - Brace/orthosis
    - Physical therapy modalities
    - Supervised home exercise
    - Weight optimization
    - Corticosteroid injection
- No evidence of patellar dislocation.
- No evidence of medial patellofemoral changes (Kellgren-Lawrence Grade 2 osteoarthritis or higher [see grading appendix])

~~-~~No intra-articular cortisone injections within 4 weeks of surgery[1-3]

-

Patellar Malalignment and/or Patellar Instability

Surgical intervention for the treatment of patellar malalignment and/or patellar instability is indicated when **ALL** of the following criteria in any of the following subsections are met[88-95] ~~(Allen, 2018; Arshi, 2016; Koh, 2015; Steensen, 2015, Vairo, 2019)~~:

- Acute traumatic patellar dislocation is associated with an osteochondral fracture, loose body, vastus medialus obliquus/medial patellofemoral ligament muscle avulsion, or other intra-articular injury that requires urgent operative management~~;~~

OR

- Repeat (2 or more) patellar dislocations or subluxations have occurred despite 6 months of non-operative treatment with radiologic confirmation of MPFL (medial patellofemoral ligament) deficiency (including evidence of acute or remote injury, scarring, incomplete healing, etc.) **OR** physical examination demonstrates evidence of patellar instability (positive apprehension test).

OR

- When all the following criteria have been met:
  - Physical exam has patellofemoral tenderness and abnormal articulation of the patella in the femoral trochlear groove (patellar apprehension or positive J sign)
  - Radiologic and/or advanced images (CT or MRI) rule out fracture or loose body, and show abnormal articulation, trochlear dysplasia, abnormal TT-TG distance (tibial tubercle-trochlear groove)* or other abnormality related to malalignment[92,96-99]; ~~(Cooney, 2012; Imhoff, 2019, 2020; Tanaka, 2019; Vairo, 2019)~~
  - Failure of at least 6 months of non-operative treatment, including at least 3 months of physical therapy, and **ONE** of the following:
    - Rest or activity modifications/limitations
    - Ice/heat
    - Protected weight bearing
    - Pharmacologic treatment: oral/topical NSAIDS, acetaminophen, analgesics, tramadol
    - Brace/orthosis
    - Supervised home exercise
    - Weight optimization
    - Corticosteroid injection
- No intra-articular cortisone injections within 4 weeks of surgery

~~1 3~~

*The tibial tubercle-trochlear groove (TT-TG) distance is normally @5-10mm. Some authors use 13mm as a cut-off and most agree that a TT-TG of 15 or over is abnormal ~~(Imhoff, 2019; Tanaka, 2019; Vairo, 2019)~~.[92,97,99] TT-TG values over 17 indicate other possible bony abnormalities such as increased femoral anteversion that may cause patellar instability.[100-102] ~~(Franciozi, 2017)~~

Manipulation under Anesthesia (MUA)

Manipulation under anesthesia (MUA) may be indicated when **ALL** of the following criteria are met[103-108]~~: (Baydoun, 2013; Colacchio, 2019; Evans, 2012; Gu, 2018; Issa, 2014; Kumar, 2021; Mamarelis, 2015):~~

- Physical exam findings demonstrate inadequate range of motion of the knee defined as less than 110 degrees of flexion or lack of full extension
- Failure to improve range of motion of the knee despite 6 weeks (12 visits) of documented physical therapy
- ~~Patient~~Individual is less than ~~20 weeks~~20 weeks after ligamentous or joint reconstruction

Lysis of Adhesions for Arthrofibrosis of the knee

Surgical indications are based on relevant clinical symptoms, physical exam, radiologic findings, time from primary surgery, and response to conservative management when medically appropriate. Improved range of motion may be accomplished through arthroscopically assisted or open lysis of adhesions with general anesthesia, regional anesthesia, or sedation ~~(Chen, 2011; Schwarzkopf, 2013; Volchenko, 2019)~~.[109-111]

Lysis of a~~A~~dhesions for a~~A~~rthrofibrosis of the knee may be indicated when **ALL** of the following criteria in any of the following subsections are met:

- Physical exam findings demonstrate inadequate range of motion of the knee, defined as less than 110 degrees of flexion or lack of full extension
- Failure to improve range of motion of the knee despite 6 weeks (12 visits) of documented physical therapy
- ~~Patient~~Individual is more than 12 weeks after ligamentous or joint reconstruction, or resolved infection
- No intra-articular cortisone injections within 4 weeks of surgery[1-3]

OR

- ~~Patient~~Individual is more than 12 weeks after trauma, or resolved infection
- ~~Patient~~Individual has native knee
- Manipulation under anesthesia is also performed
- No intra-articular cortisone injections within 4 weeks of surgery[1-3]

GRADING APPENDIX

- Kellgren-Lawrence Grading System
- Outerbridge Arthroscopic Grading System
- Marx Scale
- Tegner Activity Score
- The International Cartilage Research Society (ICRS)
- American College of Rheumatology Guidelines

Kellgren-Lawrence Grading System (Standing/weight-bearing X-rays)

MRI should not be the primary tool used to determine the presence or severity of arthritic changes in the joint.

Grade	Description
0	No radiographic features of osteoarthritis
1	Possible joint space narrowing and osteophyte formation
2	Definite osteophyte formation with possible joint space narrowing
3	Moderate multiple osteophytes, definite narrowing of joint space, some sclerosis and possible deformity of bone contour
4	Large osteophytes, marked narrowing of joint space, severe sclerosis and definite deformity of bone contour

Outerbridge Arthroscopic Grading System

Grade	Description
0	Normal cartilage
I	Softening and swelling/blistering
II	Partial thickness defect, fissures < 1.5cm diameter/wide
III	Fissures /defects down to subchondral bone with intact calcified cartilage layer, diameter > 1.5cm
IV	Exposed subchondral bone

MARX SCALE (For determination of activity level in acute ACL tears)

Indicate how often you performed each activity in your healthiest and most active state, in the past year.

Activity/Movement	Less than one time in a month	One time in a month	One time in a week	2 or 3 times in a week	4 or more times in a week
Running: running while playing a sport or jogging	0	1	2	3	4
Cutting: changing directions while running	0	1	2	3	4
Deceleration: coming to a quick stop while running	0	1	2	3	4
Pivoting: turning your body with your foot planted while playing sport; For example: skiing, skating, kicking, throwing, hitting a ball (golf, tennis, squash), etc.	0	1	2	3	4

TEGNER SCORES (For determination of activity level in acute ACL tears)

Indicate in the spaces below the HIGHEST level of activity that you participated in BEFORE YOUR INJURY and the highest level you are able to participate in **CURRENTLY**

Level	Activity Description
Level -10	Competitive sports- soccer, football, rugby (national elite)
Level 9	Competitive sports- soccer, football, rugby (lower divisions), ice hockey, wrestling, gymnastics, basketball
Level 8	Competitive sports- racquetball or bandy, squash or badminton, track and field athletics (jumping, etc.), down-hill skiing
Level 7	Competitive sports- tennis, running, motorcars speedway, handball Recreational sports- soccer, football, rugby, bandy, ice hockey, basketball, squash, racquetball, running
Level 6	Recreational sports- tennis and badminton, handball, racquetball, down-hill skiing, jogging at least 5 times per week
Level 5	Work- heavy labor (construction, etc.) Competitive sports- cycling, cross-country skiing; Recreational sports- jogging on uneven ground at least twice weekly
Level 4	Work- moderately heavy labor (e.g., truck driving, etc.)
Level 3	Work- light labor (nursing, etc.)
Level 2	Work- light labor

	Walking on uneven ground possible, but impossible to ~~back pack~~backpack or hike
Level 1	Work- sedentary (secretarial, etc.)
Level 0	Sick leave or disability pension because of knee problems

The International Cartilage Research Society (ICRS)

Grade	Description
0	Normal cartilage
1	Nearly normal cartilage *Superficial lesions. Soft indentation and/or superficial fissures and cracks.*
2	Abnormal cartilage *Lesions extending down to <50% of cartilage depth.*
3	Severely abnormal cartilage *Cartilage defects extending down >50% of cartilage depth as well as down to calcified layer and down to but not through the subchondral bone. Blisters are included in this Grade.*
4	Severely abnormal cartilage (through the subchondral bone) *Penetration of subchondral bone that may or may not be across the full diameter of defect*

American College of Rheumatology Guidelines

2010 ACR/EULAR: Classification Criteria for RA	
JOINT DISTRIBUTION (0-5)	
1 large joint	0
2-10 large joints	1
1-3 small joints (large joints not counted)	2
4-10 small joints (large joints not counted)	3
>10 joints (at least one small joint)	5
SEROLOGY (0-3)	

Negative RF AND negative ACPA	0
Low positive RF OR low positive ACPA	2
High positive RF OR high positive ACPA	3
SYMPTOM DURATION (0-1)	
<6 weeks	0
≥6 weeks 1	1
ACUTE PHASE REACTANTS (0-1)	
Normal CRP AND normal ESR	0
Abnormal CRP OR abnormal ESR	1
	≥6 = definite RA

BACKGROUND

KNEE ARTHROSCOPY - Knee Arthroscopy & Open, Non-Arthroplasty

This guideline addresses the following elective, non-emergent, arthroscopic knee repair procedures:

- Diagnostic knee arthroscopy
- Debridement with or without chondroplasty
- Meniscectomy/meniscal repair/meniscal transplant
- Ligament reconstruction/repair
- Articular cartilage restoration/repair (marrow stimulating and restorative techniques)
- Synovectomy (major [2+ compartments], minor [1 compartment])
- Loose body removal
- Lateral release/patellar realignment
- Manipulation under anesthesia (MUA)
- Lysis of adhesions for arthrofibrosis of the knee

Arthroscopy introduces a fiber-optic camera into the knee joint through a small incision for diagnostic visualization purposes. Other instruments may then be introduced to remove, repair, or reconstruct intra- and extra-articular joint pathology. Surgical indications are based on relevant subjective clinical symptoms, objective physical exam and radiologic findings, and response to previous non-operative treatments when medically appropriate.

Open, non-arthroplasty knee surgeries are performed instead of an arthroscopy as dictated by the type and severity of injury and/or disease.

POLICY HISTORY SUMMARIES

Date	Summary
May ~~June~~ 2022	• Updated references • Added cortisone injection within 4 weeks of arthroscopy as a contraindication. • Expanded references pertaining to recommendations against the use of arthroscopy for arthritis, with or without associated meniscus tears. • Included references pertaining to total knee arthroplasty complications in those with prior arthroscopic surgery of the knee • ~~-~~Replaced “patient” with “individual” where appropriate
June 2021	• New definition of loss of motion to include lack of full extension for both MUA and lysis of adhesions • Extended time from MUA from 12 weeks to 20 weeks postop.

July 2021	• New definition of loss of motion to include lack of full extension for both MUA and lysis of adhesions • Extended time from MUA from 12 weeks to 20 weeks postop. • Updated references •
October 2020	• Added statement pertaining to subchondroplasty and in-office arthroscopy: these procedures are not managed by Magellan. • Further clarification was added pertaining to the imaging requirements for meniscus tears and associated arthritis • Clarification on the use of the TT-TG distance when determining the criteria for patellar realignment • Updated references • Added CPT 29877 (chondroplasty) to Meniscectomy in guideline header •
October 2019	• Updated in-text references and bibliography • Platelet rich plasma (PRP) deleted from non-operative treatment options • Added section for root tear or other possible repairable meniscus: "Symptomatic meniscal tear confirmed by MRI results that demonstrate a peripheral tear in the vascular zone, root tear or other tear that the requesting physician considers repairable and is associated with pain localized to the corresponding compartment upon physical exam" • Revised radiographic indications for arthroscopic meniscectomy: "Weight-bearing X-ray(s) that demonstrate no moderate or severe osteoarthritic changes (Kellgren-Lawrence Grade 3-4 [see grading appendix]); X-rays should be described as showing minimal or mild arthritis only; OR • MRI results confirm a frank meniscal tear (not simply degenerative changes, i.e., fraying) and the MRI does not demonstrate any of the following: moderate or severe articular cartilage thinning, full-thickness articular cartilage loss or defects, extrusion of the meniscus, subchondral edema, more than mild osteophytes, subchondral cysts or an impression of "moderate" or "advanced/severe" arthritis (see absolute and relative contraindications). If the MRI demonstrates any of the above-described findings of more than mild arthritis, weight-bearing X-rays are required to confirm no moderate or severe articular cartilage loss • Added: Additional note for radiographic criteria for meniscectomy:" Although most patients that have a request for

	arthroscopic meniscectomy will have had both an MRI and X-rays of the knee, not every patient with an MRI requires a standing X-ray. Only one of these tests is required for approval, provided all other criteria for meniscectomy have been met. For example, if there has been a failure to improve with 6 weeks of non-operative treatment and there are physical examination findings of a meniscus tear, an MRI is not required, only weight-bearing X-rays that demonstrate no more than mild arthritis. Likewise, if an MRI describes a meniscus tear and does not describe any associated arthritis, weight-bearing X-rays are not required. • Patellar instability change:" Repeat (two or more) patellar dislocations or subluxations have occurred despite 6 months of non-operative treatment with radiologic confirmation of MPFL (medial patellofemoral ligament) deficiency;(including evidence of acute or remote injury, scarring, incomplete healing, etc.); OR physical examination demonstrates patellar instability (positive apprehension test)
November 2018	• General Requirements for Elective Arthroscopic Surgery: Removed comorbidity example of diabetes • Diagnostic Knee Arthroscopy: Added section 'Note' to clarify the indications for a diagnostic arthroscopy to be approved: "**Note**: Radiographs and/or MRI should not demonstrate any of the following: Kellgren-Lawrence Grade 3-4 changes (based on standing or weight-bearing radiographs), meniscus tears, loose bodies, stress fractures (including insufficiency fractures) or patellofemoral instability (lateral patellar tilt)" • Meniscectomy/Meniscal Repair: Added indication for locked knee with an MRI that shows a bucket-handle tear of the meniscus: "History of acute injury/onset of symptoms with a locked knee and/or mechanical symptoms of locking; Physical examination demonstrates 2 of the following: joint line TTP, positive McMurray's test localized to the correct compartment, pain with full flexion or pain with full extension; MRI demonstrates a bucket-handle tear of the meniscus (Does not include an extruded meniscus or flap tears)" • Added a statement pertaining to arthroscopic meniscectomy in association with degenerative arthritis of the knee" Note: There is a high incidence of incidental meniscal findings on knee MRI in middle aged and elderly patients and several studies indicating that there is no difference in outcome between operative and

	non-operative treatment of patients with degenerative meniscus tears, especially when associated with an arthritic knee" • Added and updated references

REFERENCES

~~Abrams GD, Frank RM, Gupta AK, et al. Trends in meniscus repair and meniscectomy in the United States, 2005-2011. *Am J Sports Med*. 2013; 41(10):2333-9.~~

~~Aletaha DN, Silman AJ, Funovits J, et al. Rheumatoid arthritis classification criteria: An American College of Rheumatology/European League against Rheumatism Collaborative Initiative. *Arthritis Rheumatism*. 2010; 62(9):2569–2581.~~

~~Anderson DE, Rose MB, Wille AJ, et al. Arthroscopic mechanical chondroplasty of the knee is beneficial for treatment of focal cartilage lesions in the absence of concurrent pathology. *Orthop J Sports Med*. 2017 May 24; 5(5):2325967117707213.~~

~~Alizai H, Roemer FW, Hayashi D, et al. An update on risk factors for cartilage loss in knee osteoarthritis assessed using MRI-based semiquantitative grading methods. *Eur Radiol*. 2015; 25(3):883-93.~~

~~Allen MM, Krych AJ, Johnson NR, et al. Combined tibial tubercle osteotomy and medial patellofemoral ligament reconstruction for recurrent lateral patellar instability in patients with multiple anatomic risk factors. *Arthroscopy*. 2018 Aug; 34(8):2420-26. Epub 2018 May 19.~~

~~Arshi A, Cohen JR, Wang JC, et al. Operative management of patellar instability in the United States: An evaluation of national practice patterns, surgical trends, and complications. *Orthop J Sports Med*. 2016 Aug; 4(8):2325967116662873.~~

~~Auregan JC, Klouche S, Bohu Y, et al. Treatment of pigmented villonodular synovitis of the knee. *Arthroscopy*. 2014 Oct; 30(10):1327-41. Epub 2014 Jul 4.~~

~~Bae DK, Song SJ, Yoon KH, et al. Survival analysis of microfracture in the osteoarthritic knee—Minimum 10-year follow-up. *Arthroscopy*. 2013; 29(2):244-250.~~

Bark S, Piontek T, Behrens P, et al. Enhanced microfracture techniques in cartilage knee surgery: Fact or fiction? *World J Orthop*. 2014; 5(4):444.

Baydoun HE, Yang A, Dalal A, et al. Arthroscopic lysis of adhesions improves range of motion in patients with arthrofibrosis after primary total knee arthroplasty. *Bone & Joint Journal Orthopaedic Proceedings Supplement*. 2013; 15:131.

Bedi A, Musahl V, Cowan JB. Management of posterior cruciate ligament injuries: An evidence-based review. J Am Acad Orthop Surg. 2016; 24(5):277-89. Epub 2016 April 21.

Bhatia S, LaPrade CM, Ellman MB, et al. Meniscal root tears significance, diagnosis, and treatment. *Am J Sports Med*. 2014; 42:12:3016-30.

Biant LC, Bentley G, Vijayan S, et al. Long-term results of autologous chondrocyte implantation in the knee for chronic chondral and osteochondral defects. *Am J Sports Med*. 2014; 42(9):2178-83.

Btittberg M, Recker D, Llgenfritz J, et al. Matrix-applied characterized autologous cultured chondrocytes versus microfracture: five-year follow-up of a prospective randomized trial. *Am J Sports Med*. 2018; 46(6):1343-1351.

Chawla A, Twycross-Lewis R, Maffulli N. Microfracture produces inferior outcomes to other cartilage repair techniques in chondral injuries in the paediatric knee. *Br Med Bull*. 2015; 116:93-103.

Chen MR and Dragoo JL. Arthroscopic releases for arthrofibrosis of the knee. *J Am Acad Orthop Surg*. 2011; 709-716.

Ciccotti MC, Kraeutler MJ, Austin LS, et al. The prevalence of articular cartilage changes in the knee joint in patients undergoing arthroscopy for meniscal pathology. *Arthroscopy*. 2012; 28(10):1437-1444.

Clifton R, Ng CY, Nutton RW. What is the role of lateral retinacular release? *J Bone Jt Surg Br*. 2010; 92(1):1-6.

Colacchio ND, Abela D, Bono JV. Efficacy of manipulation under anesthesia beyond three months following total knee arthroplasty. *Arthroplast Today*. 2019;5:515

Cooney AD, Kazi Z, Caplan N, et al. The relationship between quadriceps angle and tibial tuberosity-trochlear groove distance in patients with patellar instability. *Knee Surg Sports Traumatol Arthrosc*. 2012 Dec; 20(12):2399-404. Epub 2012 Jan 26.

Cooper DE. Editorial commentary: The desire to take a look: Surgeons and patients must weigh the benefits and costs of in-office needle arthroscopy versus magnetic resonance imaging. *Arthroscopy*. 2018 Aug; 34(8):2436-2437. doi: 10.1016/j.arthro.2018.06.002.

Dejour D, Ntagiopoulos PG, Saggin PR, et al. The diagnostic value of clinical tests, magnetic resonance imaging, and instrumented laxity in the differentiation of complete versus partial anterior cruciate ligament tears. *Arthroscopy*. 2013; 29(3):491-499.

Englund M, Guermazi A, Gale D, et al. Incidental meniscal findings on knee MRI in middle-aged and elderly persons. *NEJM*. 2008; 359(11):1108-1115.

Englund M, Roemer FW, Hayashi D, et al. Meniscus pathology, osteoarthritis and the treatment controversy. *Nat Rev Rheumatol*. 2012; 8(7):412-19.

Evans KN, Lewandowski L, Pickett A, et al. Outcomes of manipulation under anesthesia versus surgical management of combat-related arthrofibrosis of the knee. *J Surg Orthop Adv*. 2012; 22(1):36-41.

Fitzsimmons SE, Vazquez EA, Bronson MJ. How to treat the stiff total knee arthroplasty: A systematic review. *Clin Orthop Relat Res*. 2010; 468(4):1096-1106.

Fonseca LPR, Kawatake EH, Pochini AC. Lateral patellar retinacular release: Changes over the last ten years. *Rev Bras Ortop*. 2017 Jun 15; 52(4):442-49. Ecollection 2017 Jun-Jul.

Franciozi CE, Ambra LF, Albertoni LJ, et al. Increased femoral anteversion influence over surgically treated recurrent patellar instability patients. *Arthroscopy*. (2017) 33:633–640

Fu FH, Soni A. ACI versus microfracture: The debate continues. *J Bone Joint Surg Am*. 2016; 98(16):e69.

Gobbi A, Karnatzikos G, Kumar A. Long-term results after microfracture treatment for full-thickness knee chondral lesions in athletes. *Knee Surg Sports Traumtol Arthrosc*. 2014; 22(9): 1986-1996.

Gomoll AH, Gillogly SD, Cole BJ, et al. Autologous chondrocyte implantation in the patella: a multicenter experience. *Am J Sports Med*. 2014; 42(5):1074-81.

Gou, GH, Tseng, FJ, Wang, SH, et al. Autologous chondrocyte implantation versus microfracture in the knee: a meta-analysis and systematic review. *Arthroscopy*. 2020; 36(1):289-303.

Goyal D, Keyhani S, Lee EH, et al. Evidence-based status of microfracture technique: A systematic review of level I and II studies. *Arthroscopy*. 2013; 29(9):1579-88.

Gu A, Michalak AJ, Cohen JS, et al. Efficacy of manipulation under anesthesia for stiffness following total knee arthroplasty: A systematic review. J Arthroplasty. 2018 May; 33(5):1598-1605. Epub 2017 Dec 5.

Hannon MG, Ryan MK, Strauss EJ. Meniscal allograft transplantation: A comprehensive historical and current review. *Bull Hosp Jt Dis*. 2015; 73(2):100-8.

Herrlin SV, Wange PO, Lapidus G, et al. Is arthroscopic surgery beneficial in treating non-traumatic, degenerative medial meniscal tears? A five-year follow-up. *Knee Surg Sports Traumatol Arthrosc*. 2013; 21(2):358-364.

Hinckel BB, Gomoll AH.Hinckel BB, et al. Patellofemoral cartilage restoration: indications, techniques, and outcomes of autologous chondrocytes implantation, matrix-induced chondrocyte implantation, and particulated juvenile allograft cartilage. *J Knee Surg*. 2018 Mar; 31(3):212-226.

Höher J, Offerhaus C. Conservative versus operative treatment. *Anterior Cruciate Ligament Reconstruction*. 2014 Mar 20; 77-84.

Hohmann E, Glatt V, Tetsworth K, et al. Arthroscopic partial meniscectomy versus physical therapy for degenerative meniscus lesions: how robust is the current evidence? A critical systematic review and qualitative synthesis. *Arthroscopy*. 2018; 34:2699-708.

Imhoff FB, Cotic M, Liska F, et al. Derotational osteotomy at the distal femur is effective to treat patients with patellar instability. *Knee Surg Sports Traumatol Arthroscopy*. 2019; 27:652–658.

Imhoff FB, Funke V, Muench LN, et al. The complexity of bony malalignment in patellofemoral disorders: femoral and tibial torsion, trochlear dysplasia, TT–TG distance, and frontal mechanical axis correlate with each other. *Knee Surg Sports Traumatol Arthroscopy*. 2020; 28:897–904.

Issa K, Banerjee S, Kester MA, et al. The effect of timing of manipulation under anesthesia to improve range of motion and functional outcomes following total knee arthroplasty. *J Bone Joint Surg*. 2014; 96(16):1349-1357.

Järvinen, TLN, Sihvonen R, Englund M. Arthroscopy for degenerative knee-a difficult habit to break? *Acta Orthopaedica*. 2014; 85(3):215-217.

Jazrawi L, Gold HT, Zuckerman JD. Physical therapy or arthroscopic surgery for treatment of meniscal tears is noninferiority enough? *JAMA*. 2018 Oct 2; 320(13).

Jevsevar D, Brown GA, Jones DL, et al. Treatment of osteoarthritis of the knee. Evidence-based guideline. Ed 2. American Academy of Orthopaedic Surgeons, Rosemont, IL; 2013.

Joseph GB, McCulloch CE, Nevitt MC, et al. A reference database of cartilage 3 T MRI T2 values in knees without diagnostic evidence of cartilage degeneration: Data from the osteoarthritis initiative. *Osteoarthritis Cartilage*. 2015; 23(6):897-905.

Katz JN, Brownlee SA, Jones MH. The role of arthroscopy in the management of knee osteoarthritis. *Best Pract Res Clin Rheumatol*. 2014; 28(1):143-156.

Katz JN, Losina E. Surgery versus physical therapy for a meniscal tear and osteoarthritis. *NEJM*. 2013; 368(18):1675-1684.

Kim S, Bosque J, Meehan JP, et al. Increase in outpatient knee arthroscopy in the United States: A comparison of National Surveys of Ambulatory Surgery, 1996 and 2006. *J Bone Joint Surg*. 2011; 93(11):994-1000.

Kise NJ, Risberg MA, Stensrud S, et al. Exercise therapy versus arthroscopic partial meniscectomy for degenerative meniscal tear in middle aged patients: Randomised controlled trial with two-year follow-up. *BMJ*. 2016; 354:i3740.

Knutsen G, Drogset JO, Engebretsen L, et al. A randomized multicenter trial comparing autologous chondrocyte implantation with microfracture. *J Bone Joint Surg Am*. 2016; 98(16):1332-39.

Koh JL, Stewart C. Patellar instability. *Orthop Clin North Am*. 2015; 46:147-57.

LaPrade CM, Civitarese DM, Rasmussen MT, et al. Emerging updates on the posterior cruciate ligament: A review of the current literature. *Am J Sports Med*. 2015; 43(12):3077-92. Epub 2015 Mar 18.

Leopold SS. Editorial: Appropriate use? Guidelines on arthroscopic surgery for degenerative meniscus tears need updating. *Clin Orthop Relat Res*. 2017; 475:1283-6.

Liebs TR, Ziebarth K, Berger S. Randomized controlled trials for arthroscopy in degenerative knee disease: Was conservative therapy appropriately tried prior to arthroscopy? *Arthroscopy*. 2018; 34:1680–7.

Lipina M, Makarov M, Mukanov V, et al. Arthroscopic synovectomy of the knee joint for rheumatoid arthritis. *Int Orthop*. 2018 Oct 3.

MacDonald PB. Arthroscopic partial meniscectomy was not more effective than physical therapy for meniscal tear and knee osteoarthritis. *J Bone Joint Surg*. 2013; 95(22):2058.

Macmull S, Skinner JA, Bentley G, et al. Treating articular cartilage injuries of the knee in young people. *BMJ*. 2010; 340:c998.

Mall NA, Harris JD, Cole BJ. Clinical evaluation and preoperative planning of articular cartilage lesions of the knee. *J Am Acad Orthop Surg*. 2015; 23(10):633-640.

Mamarelis G, etal; Timing of Manipulation Under Anaesthesia for Stoffness After Total Knee *Arthroplasty*. 2015 Nov; 3(20) 316.

Marx Scale (English Version) https://www.aaos.org/uploadedFiles/PreProduction/Quality/Measures/pdf-MARX%20SCALE-%20english.pdf.

Mather 3rd RC, Garrett WE, Cole BJ, et al. Cost-effectiveness analysis of the diagnosis of meniscus tears. *Am J Sports Med*. 2015; 43(1):128-37.

Mayr HO, Rueschenschmidt M, Seil R, et al. Indications for and results of arthroscopy in the arthritic knee: A European survey. *Int Orthop*. 2013; 37(7):1263-1271.

McAlindon TE, Bannuru RR, Sullivan MC, et al. OARSI guidelines for the non-surgical management of knee osteoarthritis. *Osteoarthritis Cartilage*. 2014; 22(3):363-388.

McIntyre LF. Editorial commentary: What you see is what you get-is in-office needle arthroscopy ready for prime time? *Arthroscopy*. 2019 Sep; 35(9):2722-2723.

Medina J, Garcia-Mansilla I, Fabricant PD, et al. Microfracture for the treatment of symptomatic cartilage lesions of the knee: A survey of the International Cartilage Regeneration and Joint Preservation Society. *Cartilage*. Published online September 10, 2020

Milewski MD, Sanders TG, Miller MD. MRI-arthroscopy correlation: The knee. *J Bone Joint Surg*. 2011; 93(18):1735-1745.

Minas T, Von Keudell A, Bryand T, et al. The John Insall Award: A minimum 10-year outcome study of autologous chondrocyte implantation. *Clin Orthop Relat Res*. 2014; 472(1):41-51.

Montgomery SR, Foster BD, Ngo SS, et al. Trends in the surgical treatment of articular cartilage defects of the knee in the United States. *Knee Surg Sports Traumatol Arthrosc*. 2013; 22:2070-2075.

Mosier BA, Arendt EA, Dahm DL, et al. Management of patellofemoral arthritis: From cartilage restoration to arthroplasty. *J Am Acad Orthop Surg*. 2016; 24(11): e163-e173.

Murphy RT, Pennock AT, Bugbee WD. Osteochondral allograft transplantation of the knee in the pediatric and adolescent population. *Am J Sports Med*. 2014; 42(3):635-640.

Nepple JJ, Dunn WR, Wright RW. Meniscal repair outcomes at greater than five years: A systematic literature review and meta-analysis. *J Bone Joint Surg*. 2012; 94(24):2222-27.

Niemeyer, P, Laute, V, Zinser, W, et al. A prospective, randomized, open-label, multicenter, phase III noninferiority trial to compare the clinical efficacy of matrix-associated autologous chondrocyte implantation with spheroid technology versus arthroscopic microfracture for cartilage defects of the knee. *Orthop J Sports Med*. 2019; 7(7):

Noyes FR, Barber-Westin SD. Meniscal transplantation in symptomatic patients under fifty years of age. *J Bone Joint Surg Am*. 2015; 97(15):1209-1219.

Olivos Meza A, Cortés González S, Ferniza Garza JJ, et al. Arthroscopic treatment of patellar and trochlear cartilage lesions with matrix encapsulated chondrocyte implantation versus microfracture: quantitative assessment with MRI T2 mapping and MOCART at 4 year follow up. *Cartilage*. Published online April 3, 2019.

Oussedik, S, Tsitskaris, K, Parker, D. Treatment of articular cartilage lesions of the knee by microfracture or autologous chondrocyte implantation: A systematic review. *Arthroscopy*. 2015; 31(4):732-744.

Pagenstert G, Wolf N, Bachmann M, et al. Open lateral patellar retinacular lengthening versus open retinacular release in lateral patellar hypercompression syndrome: A prospective double-blinded comparative study of complications and outcome. *Arthroscopy*. 2012; 28(6):788-797.

Petersen W, Ellermann A, Gosele-Koppenburg A, et al. Patellofemoral pain syndrome. *Knee Surg Sports Traumatol Arthrosc*. 2014 Oct; 22(10):2264-74. Epub 2013 Nov 13.

Potter HG, Jain SK, Ma Y, et al. Cartilage injury after acute, isolated anterior cruciate ligament tear immediate and longitudinal effect with clinical/MRI follow-up. *Am J Sports Med*. 2012; 40(2):276-285.

Pujol N, Colombet P, Cucurulo T, et al. Natural history of partial anterior cruciate ligament tears: A systematic literature review. *Orthop Traumatol Surg Res*. 2012; 98(8):S160-S164.

Rodríguez-Merchán EC. The treatment of cartilage defects in the knee joint: Microfracture, mosaicplasty, and autologous chondrocyte implantation. *Am J Orthop*. 2012; 21(5):236-9.

Samitier G, Alentorn-Geli E, Taylor DC, et al. Meniscal allograft transplantation. Part 2: Systematic review of transplant timing, outcomes, return to competition, associated procedures, and prevention of osteoarthritis. *Knee Surg Sports Traumatol Arthroscopy*. 2015; 23(1):323-33.

Saper MG, Shneider DA. Diagnosis and treatment of lateral patellar compression syndrome. *Arthrosc Tech*. 2014 Oct 20; 3(5):e633-8.

Salzmann GM, Niemeyer P, Hochrein A, et al. Articular cartilage repair of the knee in children and adolescents. *Orthop J Sports Med*. 2018 Mar; 6(3):2325967118760190. Epub 2018 Mar 13.

Salzmann GM, Sah BR, Schmal H, et al. Microfracture for treatment of knee cartilage defects in children and adolescents. *Pediatr Rep*. 2012; 4(2):e21.

Schuette, HB, Kraeutler, MJ, McCarty, EC. Matrix-assisted autologous chondrocyte transplantation in the knee: A systematic review of mid- to long-term clinical outcomes. *Orthop J Sports Med*. 2017; 5(6).

Schwarzkopf R, William A, Deering RM, et al. Arthroscopic lysis of adhesions for stiff total knee arthroplasty. *Orthopedics*. 2013; 36(12):e1544-e1548.

Scillia AJ, Aune KT, Andrachuk JS, et al. Return to play after chondroplasty of the knee in National Football League athletes. *Am J Sport Med*. 2015; 43:663-68.

Seo, HS, Lee SC, Jung KA. Second-look arthroscopic findings after repairs of posterior root tears of the medial meniscus. *Am J Sports Med*. 2011; 39(1):99-107.

Sherman SL, Garrity J, Bauer K, et al. Fresh osteochondral allograft transplantation for the knee: Current concepts. *J Am Acad Orthop Surg*. 2014; 22(2):121-33.

Siclari A, Mascaro G, Gentili C, et al. Cartilage repair in the knee with subchondral drilling augmented with a platelet-rich plasma-immersed polymer-based implant. *Knee Surg Sports Traumatol Arthroscopy*. 2014; 22(6):1225-1234.

Sihvonen R, Paavola M, Malmivaara A, et al. Arthroscopic partial meniscectomy versus sham surgery for a degenerative meniscal tear. *NEJM*. 2013; 369(26):2515-2524.

Sommerfeldt MF, Magnussen RA, Hewett TE., et al. Microfracture of articular cartilage. *JBJS Reviews*. 2016; 4(6):e6.

Steadman JR, Briggs KK, Matheny LM, et al. Outcomes following microfracture of full-thickness articular cartilage lesions of the knee in adolescent patients. *J Knee Surg*. 2015; 28(2):145-150.

Steadman JR, Briggs KK, Matheny LM, et al. Ten-year survivorship after knee arthroscopy in patients with Kellgren-Lawrence grade 3 and grade 4 osteoarthritis of the knee. *Arthroscopy*. 2013; 29(2):220-225.

Steensen RN, Bentley JC, Trinh TQ, Backes JR, Wiltfong RE. The prevalence and combined prevalences of anatomic factors associated with recurrent patellar dislocation: A magnetic resonance imaging study. *Am J Sports Med*. 2015; 43:921-27.

Stensrud S, Risberg MA, Roos EM. Effect of exercise therapy compared with arthroscopic surgery on knee muscle strength and functional performance in middleaged patients with degenerative meniscus tears: A 3-mo follow-up of a randomized controlled trial. *Am J Phys Med Rehabil*. 2015; 94:460–73.

Tanaka MJ, D'Amore T, Elias JJ, et al. Anteroposterior distance between the tibial tuberosity and trochlear groove in patients with patellar instability. *Knee*. 2019 Dec; 26(6):1278-1285.

Tjoumakaris FP, Tucker BC, Post Z, et al. Arthroscopic lysis of adhesions for the stiff total knee: Results after failed manipulation. *Orthopedics*. 2014; 37(5):e482-e487.

Vairo GL, Moya-Angeler J, Siorta MA, et al. Tibial tubercle-trochlear groove distance is a reliable and accurate indicator of patellofemoral instability. *Clin Orthop Relat Res*. 2019 Jun; 477(6):1450-58.

Van de Graaf VA, Noorduyn JCA, Willigenburg NW. Effect of early surgery vs physical therapy on knee function among patients with nonobstructive meniscal tears: The ESCAPE randomized clinical trial. *JAMA*. 2018; 320(13):1328-1337.

Volchenko E, et al; Arthroscopic Lysis of Adhesions with Manipulation Under Anesthesia Versus Manipulation Alone in the Treatment of Arthrofibrosis After TKA: A Matched Cohort Study; *Orthopedics*. 2019; 42(3):163-167.

Von Keudell A, Han R, Bryant T, et al. Autologous chondrocyte implantation to isolated patella cartilage defects. *Cartilage*. 2017 Apr; 8(2):146-54.

Willimon SC, Busch MT, Perkins CA. Pigmented villonodular synovitis of the knee: An underappreciated source of pain in children and adolescents. *J Pediatr Orthop*. 2018 Sep; 38(8):e482-e485.

Yim JH, Seon JK, Song EK, et al. A comparative study of meniscectomy and non-operative treatment for degenerative horizontal tears of the medial meniscus. *Am J Sports Med*. 2013; 41(7):1565-1570.

Zhang K, Crum RJ, Samuelsson K, et al. In-office needle arthroscopy: A systematic review of indications and clinical utility. *Arthroscopy*. 2019 Sep; 35(9):2709-2721.

Zouzias IC, Bugbee WD. Osteochondral allograft transplantation in the knee. *Sports Med Arthrosc Rev*. 2016 Jun; 24(2):79-84.

Reviewed / Approved by NIA Clinical Guideline Committee

~~**GENERAL INFORMATION**~~

~~It is an expectation that all patients receive care/services from a licensed clinician. All appropriate supporting documentation, including recent pertinent office visit notes, laboratory data, and results of any special testing must be provided. If applicable: All prior relevant imaging results and the reason that alternative imaging cannot be performed must be included in the documentation submitted.~~

1. Belk JW, Keeling LE, Kraeutler MJ, et al. Risk of Infection in Knee Arthroscopy Patients Undergoing Corticosteroid Injections in the Perioperative Period. *Orthop J Sports Med*. Aug 2021;9(8):23259671211032941. doi:10.1177/23259671211032941

2. Forsythe B, Forlenza EM, Agarwalla A, et al. Corticosteroid Injections 1 Month Before Arthroscopic Meniscectomy Increase the Risk of Surgical-Site Infection. *Arthroscopy*. Sep 2021;37(9):2885-2890.e2. doi:10.1016/j.arthro.2021.02.047

3. Lee W, Bhattacharjee S, Lee MJ, Ho SW, Athiviraham A, Shi LL. A Safe Interval between Preoperative Intra-articular Corticosteroid Injections and Subsequent Knee Arthroscopy. *J Knee Surg*. Jan 2022;35(1):47-53. doi:10.1055/s-0040-1712949

4. Cooper DE. Editorial Commentary: The Desire to Take a Look: Surgeons and Patients Must Weigh the Benefits and Costs of In-Office Needle Arthroscopy Versus Magnetic Resonance Imaging. *Arthroscopy*. Aug 2018;34(8):2436-2437. doi:10.1016/j.arthro.2018.06.002

5. McIntyre LF. Editorial Commentary: What You See Is What You Get-Is In-Office Needle Arthroscopy Ready for Prime Time? *Arthroscopy*. Sep 2019;35(9):2722-2723. doi:10.1016/j.arthro.2019.06.032

6. Zhang K, Crum RJ, Samuelsson K, Cadet E, Ayeni OR, de Sa D. In-Office Needle Arthroscopy: A Systematic Review of Indications and Clinical Utility. *Arthroscopy*. Sep 2019;35(9):2709-2721. doi:10.1016/j.arthro.2019.03.045

7. O'Connor D, Johnston RV, Brignardello-Petersen R, et al. Arthroscopic surgery for degenerative knee disease (osteoarthritis including degenerative meniscal tears). *Cochrane Database Syst Rev*. Mar 3 2022;3(3):Cd014328. doi:10.1002/14651858.Cd014328

8. Katz JN, Brownlee SA, Jones MH. The role of arthroscopy in the management of knee osteoarthritis. *Best Pract Res Clin Rheumatol*. Feb 2014;28(1):143-56. doi:10.1016/j.berh.2014.01.008

9. Mayr HO, Rueschenschmidt M, Seil R, et al. Indications for and results of arthroscopy in the arthritic knee: a European survey. *Int Orthop*. Jul 2013;37(7):1263-71. doi:10.1007/s00264-013-1896-3

10. Totlis T, Marín Fermín T, Kalifis G, Terzidis I, Maffulli N, Papakostas E. Arthroscopic debridement for focal articular cartilage lesions of the knee: A systematic review. *Surgeon*. Dec 2021;19(6):356-364. doi:10.1016/j.surge.2020.11.011

11. American Academy of Orthopaedic Surgeons Management of Osteoarthritis of the Knee (NonArthroplasty) Evidence-Based Clinical Practice Guideline. https://www.aaos.org/oak3cpg

Published 08/31/2021.

12. Avoid routinely performing arthroscopy with lavage and/or debridement in patients with a primary diagnosis of symptomatic osteoarthritis of the knee. *Choosing Wisely: American Academy of Orthopaedic Surgeons https://wwwchoosingwiselyorg/clinician-lists/aaos-avoid-routinely-performing-arthroscopy-with-lavage-and-or-debridement-in-patients-with-a-primary-diagnosis-of-symptomatic-osteoarthritis-of-the-knee/ Released May 15, 2020*.

13. Montgomery SR, Foster BD, Ngo SS, et al. Trends in the surgical treatment of articular cartilage defects of the knee in the United States. *Knee Surg Sports Traumatol Arthrosc*. Sep 2014;22(9):2070-5. doi:10.1007/s00167-013-2614-9

14. Anderson DE, Rose MB, Wille AJ, Wiedrick J, Crawford DC. Arthroscopic Mechanical Chondroplasty of the Knee Is Beneficial for Treatment of Focal Cartilage Lesions in the Absence of Concurrent Pathology. *Orthop J Sports Med*. May 2017;5(5):2325967117707213. doi:10.1177/2325967117707213

15. Scillia AJ, Aune KT, Andrachuk JS, et al. Return to play after chondroplasty of the knee in National Football League athletes. *Am J Sports Med*. Mar 2015;43(3):663-8. doi:10.1177/0363546514562752

16. Englund M, Guermazi A, Gale D, et al. Incidental meniscal findings on knee MRI in middle-aged and elderly persons. *N Engl J Med*. Sep 11 2008;359(11):1108-15. doi:10.1056/NEJMoa0800777

17. Englund M, Roemer FW, Hayashi D, Crema MD, Guermazi A. Meniscus pathology, osteoarthritis and the treatment controversy. *Nat Rev Rheumatol*. May 22 2012;8(7):412-9. doi:10.1038/nrrheum.2012.69

18. Sihvonen R, Paavola M, Malmivaara A, et al. Arthroscopic partial meniscectomy for a degenerative meniscus tear: a 5 year follow-up of the placebo-surgery controlled FIDELITY (Finnish Degenerative Meniscus Lesion Study) trial. *Br J Sports Med*. Nov 2020;54(22):1332-1339. doi:10.1136/bjsports-2020-102813

19. Herrlin SV, Wange PO, Lapidus G, Hållander M, Werner S, Weidenhielm L. Is arthroscopic surgery beneficial in treating non-traumatic, degenerative medial meniscal tears? A five year follow-up. *Knee Surg Sports Traumatol Arthrosc*. Feb 2013;21(2):358-64. doi:10.1007/s00167-012-1960-3

20. Hohmann E, Glatt V, Tetsworth K, Cote M. Arthroscopic Partial Meniscectomy Versus Physical Therapy for Degenerative Meniscus Lesions: How Robust Is the Current Evidence? A Critical Systematic Review and Qualitative Synthesis. *Arthroscopy*. Sep 2018;34(9):2699-2708. doi:10.1016/j.arthro.2018.04.018

21. Jevsevar DS. Treatment of osteoarthritis of the knee: evidence-based guideline, 2nd edition. *J Am Acad Orthop Surg*. Sep 2013;21(9):571-6. doi:10.5435/jaaos-21-09-571

22. Katz JN, Brophy RH, Chaisson CE, et al. Surgery versus physical therapy for a meniscal tear and osteoarthritis. *N Engl J Med*. May 2 2013;368(18):1675-84. doi:10.1056/NEJMoa1301408

23. Kise NJ, Risberg MA, Stensrud S, Ranstam J, Engebretsen L, Roos EM. Exercise therapy versus arthroscopic partial meniscectomy for degenerative meniscal tear in middle aged patients: randomised controlled trial with two year follow-up. *Bmj*. Jul 20 2016;354:i3740. doi:10.1136/bmj.i3740

24. Leopold SS. Editorial: Appropriate Use? Guidelines on Arthroscopic Surgery for Degenerative Meniscus Tears Need Updating. *Clin Orthop Relat Res*. May 2017;475(5):1283-1286. doi:10.1007/s11999-017-5296-7

25. Liebs TR, Ziebarth K, Berger S. Randomized Controlled Trials for Arthroscopy in Degenerative Knee Disease: Was Conservative Therapy Appropriately Tried Prior to Arthroscopy? *Arthroscopy*. May 2018;34(5):1680-1687.e6. doi:10.1016/j.arthro.2017.12.016

26. MacDonald PB. Arthroscopic partial meniscectomy was not more effective than physical therapy for meniscal tear and knee osteoarthritis. *J Bone Joint Surg Am*. Nov 20 2013;95(22):2058. doi:10.2106/JBJS.9522.ebo745

27. Sihvonen R, Paavola M, Malmivaara A, et al. Arthroscopic partial meniscectomy versus sham surgery for a degenerative meniscal tear. *N Engl J Med*. Dec 26 2013;369(26):2515-24. doi:10.1056/NEJMoa1305189

28. Yim JH, Seon JK, Song EK, et al. A comparative study of meniscectomy and nonoperative treatment for degenerative horizontal tears of the medial meniscus. *Am J Sports Med*. Jul 2013;41(7):1565-70. doi:10.1177/0363546513488518

29. Leopold SS. Editorial: The New AAOS Guidelines on Knee Arthroscopy for Degenerative Meniscus Tears are a Step in the Wrong Direction. *Clinical Orthopaedics and Related Research®*. 2022;480(1):1-3. doi:10.1097/corr.0000000000002068

30. Chen F. Letter to the Editor: Editorial: The New AAOS Guidelines on Knee Arthroscopy for Degenerative Meniscus Tears are a Step in the Wrong Direction. *Clin Orthop Relat Res*. May 1 2022;480(5):1021. doi:10.1097/corr.0000000000002173

31. van de Graaf VA, Bloembergen CM, Willigenburg NWP, et al. Can even experienced orthopaedic surgeons predict who will benefit from surgery when patients present with degenerative meniscal tears? A survey of 194 orthopaedic surgeons who made 3880 predictions. *Br J Sports Med*. Mar 2020;54(6):354-359. doi:10.1136/bjsports-2019-100567

32. Goyal T, Tripathy SK, Schuh A, Paul S. Total knee arthroplasty after a prior knee arthroscopy has higher complication rates: a systematic review. *Arch Orthop Trauma Surg*. Sep 20 2021;doi:10.1007/s00402-021-04175-6

33. Gu A, Fassihi SC, Wessel LE, et al. Comparison of Revision Risk Based on Timing of Knee Arthroscopy Prior to Total Knee Arthroplasty. *J Bone Joint Surg Am*. Apr 21 2021;103(8):660-667. doi:10.2106/jbjs.20.00218

34. Gu A, Malahias MA, Cohen JS, et al. Prior Knee Arthroscopy Is Associated With Increased Risk of Revision After Total Knee Arthroplasty. *J Arthroplasty*. Jan 2020;35(1):100-104. doi:10.1016/j.arth.2019.08.043

35. Liu Q, Tian Z, Pian K, et al. The influence of prior arthroscopy on outcomes of primary total lower extremity arthroplasty: A systematic review and meta-analysis. *Int J Surg*. Feb 2022;98:106218. doi:10.1016/j.ijsu.2021.106218

36. Werner BC, Burrus MT, Novicoff WM, Browne JA. Total Knee Arthroplasty Within Six Months After Knee Arthroscopy Is Associated With Increased Postoperative Complications. *J Arthroplasty*. Aug 2015;30(8):1313-6. doi:10.1016/j.arth.2015.02.023

37. Hannon MG, Ryan MK, Strauss EJ. Meniscal Allograft Transplantation A Comprehensive Historical and Current Review. *Bull Hosp Jt Dis (2013)*. Jun 2015;73(2):100-8.

38. Noyes FR, Barber-Westin SD. Meniscal Transplantation in Symptomatic Patients Under Fifty Years of Age: Survivorship Analysis. *J Bone Joint Surg Am*. Aug 5 2015;97(15):1209-19. doi:10.2106/jbjs.N.01340

39. Samitier G, Alentorn-Geli E, Taylor DC, et al. Meniscal allograft transplantation. Part 2: systematic review of transplant timing, outcomes, return to competition, associated procedures, and prevention of osteoarthritis. *Knee Surg Sports Traumatol Arthrosc*. Jan 2015;23(1):323-33. doi:10.1007/s00167-014-3344-3

40. Anderson AB, Gaston J, LeClere LE, Dickens JF. Meniscal Salvage: Where We Are Today. *J Am Acad Orthop Surg*. Jul 15 2021;29(14):596-603. doi:10.5435/jaaos-d-20-00915

41. Rosso F, Bisicchia S, Bonasia DE, Amendola A. Meniscal allograft transplantation: a systematic review. *Am J Sports Med*. Apr 2015;43(4):998-1007. doi:10.1177/0363546514536021

42. Dejour D, Ntagiopoulos PG, Saggin PR, Panisset JC. The diagnostic value of clinical tests, magnetic resonance imaging, and instrumented laxity in the differentiation of complete versus partial anterior cruciate ligament tears. *Arthroscopy*. Mar 2013;29(3):491-9. doi:10.1016/j.arthro.2012.10.013

43. Höher J, Offerhaus C. Conservative versus operative treatment. *Anterior cruciate ligament reconstruction*. Springer; 2014:77-84.

44. Pujol N, Colombet P, Cucurulo T, et al. Natural history of partial anterior cruciate ligament tears: a systematic literature review. *Orthop Traumatol Surg Res*. Dec 2012;98(8 Suppl):S160-4. doi:10.1016/j.otsr.2012.09.013

45. Bedi A, Musahl V, Cowan JB. Management of Posterior Cruciate Ligament Injuries: An Evidence-Based Review. *J Am Acad Orthop Surg*. May 2016;24(5):277-89. doi:10.5435/jaaos-d-14-00326

46. LaPrade CM, Civitarese DM, Rasmussen MT, LaPrade RF. Emerging Updates on the Posterior Cruciate Ligament: A Review of the Current Literature. *Am J Sports Med*. Dec 2015;43(12):3077-92. doi:10.1177/0363546515572770

47. Chawla A, Twycross-Lewis R, Maffulli N. Microfracture produces inferior outcomes to other cartilage repair techniques in chondral injuries in the paediatric knee. *Br Med Bull*. 2015;116:93-103. doi:10.1093/bmb/ldv040

48. Macmull S, Skinner JA, Bentley G, Carrington RW, Briggs TW. Treating articular cartilage injuries of the knee in young people. *Bmj*. Mar 5 2010;340:c998. doi:10.1136/bmj.c998

49. Murphy RT, Pennock AT, Bugbee WD. Osteochondral allograft transplantation of the knee in the pediatric and adolescent population. *Am J Sports Med*. Mar 2014;42(3):635-40. doi:10.1177/0363546513516747

50. Salzmann GM, Niemeyer P, Hochrein A, Stoddart MJ, Angele P. Articular Cartilage Repair of the Knee in Children and Adolescents. *Orthop J Sports Med*. Mar 2018;6(3):2325967118760190. doi:10.1177/2325967118760190

51. Salzmann GM, Sah BR, Schmal H, Niemeyer P, Sudkamp NP. Microfracture for treatment of knee cartilage defects in children and adolescents. *Pediatr Rep*. Apr 2 2012;4(2):e21. doi:10.4081/pr.2012.e21

52. Steadman JR, Briggs KK, Matheny LM, Guillet A, Hanson CM, Willimon SC. Outcomes following microfracture of full-thickness articular cartilage lesions of the knee in adolescent patients. *J Knee Surg*. Apr 2015;28(2):145-50. doi:10.1055/s-0034-1373737

53. Sommerfeldt MF, Magnussen RA, Hewett TE, Kaeding CC, Flanigan DC. Microfracture of Articular Cartilage. *JBJS Rev*. Jun 28 2016;4(6)doi:10.2106/jbjs.Rvw.15.00005

54. Bae DK, Song SJ, Yoon KH, Heo DB, Kim TJ. Survival analysis of microfracture in the osteoarthritic knee-minimum 10-year follow-up. *Arthroscopy*. Feb 2013;29(2):244-50. doi:10.1016/j.arthro.2012.09.006

55. Bark S, Piontek T, Behrens P, Mkalaluh S, Varoga D, Gille J. Enhanced microfracture techniques in cartilage knee surgery: Fact or fiction? *World J Orthop*. Sep 18 2014;5(4):444-9. doi:10.5312/wjo.v5.i4.444

56. Gobbi A, Karnatzikos G, Kumar A. Long-term results after microfracture treatment for full-thickness knee chondral lesions in athletes. *Knee Surg Sports Traumatol Arthrosc*. Sep 2014;22(9):1986-96. doi:10.1007/s00167-013-2676-8

57. Goyal D, Keyhani S, Lee EH, Hui JH. Evidence-based status of microfracture technique: a systematic review of level I and II studies. *Arthroscopy*. Sep 2013;29(9):1579-88. doi:10.1016/j.arthro.2013.05.027

58. Mall NA, Harris JD, Cole BJ. Clinical Evaluation and Preoperative Planning of Articular Cartilage Lesions of the Knee. *J Am Acad Orthop Surg*. Oct 2015;23(10):633-40. doi:10.5435/jaaos-d-14-00241

59. Medina J, Garcia-Mansilla I, Fabricant PD, Kremen TJ, Sherman SL, Jones K. Microfracture for the Treatment of Symptomatic Cartilage Lesions of the Knee: A Survey of International Cartilage Regeneration & Joint Preservation Society. *Cartilage*. Dec 2021;13(1_suppl):1148s-1155s. doi:10.1177/1947603520954503

60. Oussedik S, Tsitskaris K, Parker D. Treatment of articular cartilage lesions of the knee by microfracture or autologous chondrocyte implantation: a systematic review. *Arthroscopy*. Apr 2015;31(4):732-44. doi:10.1016/j.arthro.2014.11.023

61. Orth P, Gao L, Madry H. Microfracture for cartilage repair in the knee: a systematic review of the contemporary literature. *Knee Surg Sports Traumatol Arthrosc*. Mar 2020;28(3):670-706. doi:10.1007/s00167-019-05359-9

62. Brittberg M, Recker D, Ilgenfritz J, Saris DBF. Matrix-Applied Characterized Autologous Cultured Chondrocytes Versus Microfracture: Five-Year Follow-up of a Prospective Randomized Trial. *Am J Sports Med*. May 2018;46(6):1343-1351. doi:10.1177/0363546518756976

63. Fu FH, Soni A. ACI Versus Microfracture: The Debate Continues: Commentary on an article by Gunnar Knutsen, MD, PhD, et al.: "A Randomized Multicenter Trial Comparing Autologous Chrondrocyte Implantation with Microfracture: Long-Term Follow-up at 14 to 15 Years". *J Bone Joint Surg Am*. Aug 17 2016;98(16):e69. doi:10.2106/jbjs.16.00565

64. Gou GH, Tseng FJ, Wang SH, et al. Autologous Chondrocyte Implantation Versus Microfracture in the Knee: A Meta-analysis and Systematic Review. *Arthroscopy*. Jan 2020;36(1):289-303. doi:10.1016/j.arthro.2019.06.033

65. Knutsen G, Drogset JO, Engebretsen L, et al. A Randomized Multicenter Trial Comparing Autologous Chondrocyte Implantation with Microfracture: Long-Term Follow-up at 14 to 15 Years. *J Bone Joint Surg Am*. Aug 17 2016;98(16):1332-9. doi:10.2106/jbjs.15.01208

66. Minas T, Von Keudell A, Bryant T, Gomoll AH. The John Insall Award: A minimum 10-year outcome study of autologous chondrocyte implantation. *Clin Orthop Relat Res*. Jan 2014;472(1):41-51. doi:10.1007/s11999-013-3146-9

67. Niemeyer P, Laute V, Zinser W, et al. A Prospective, Randomized, Open-Label, Multicenter, Phase III Noninferiority Trial to Compare the Clinical Efficacy of Matrix-Associated Autologous Chondrocyte Implantation With Spheroid Technology Versus Arthroscopic Microfracture for Cartilage Defects of the Knee. *Orthop J Sports Med*. Jul 2019;7(7):2325967119854442. doi:10.1177/2325967119854442

68. Sherman SL, Garrity J, Bauer K, Cook J, Stannard J, Bugbee W. Fresh osteochondral allograft transplantation for the knee: current concepts. *J Am Acad Orthop Surg*. Feb 2014;22(2):121-33. doi:10.5435/jaaos-22-02-121

69. Zouzias IC, Bugbee WD. Osteochondral Allograft Transplantation in the Knee. *Sports Med Arthrosc Rev*. Jun 2016;24(2):79-84. doi:10.1097/jsa.0000000000000109

70. Abraamyan T, Johnson AJ, Wiedrick J, Crawford DC. Marrow Stimulation Has Relatively Inferior Patient-Reported Outcomes in Cartilage Restoration Surgery of the Knee: A Systematic Review and Meta-analysis of Randomized Controlled Trials. *Am J Sports Med*. Mar 2022;50(3):858-866. doi:10.1177/03635465211003595

71. Ibarra C, Villalobos E, Madrazo-Ibarra A, et al. Arthroscopic Matrix-Assisted Autologous Chondrocyte Transplantation Versus Microfracture: A 6-Year Follow-up of a Prospective Randomized Trial. *Am J Sports Med*. Jul 2021;49(8):2165-2176. doi:10.1177/03635465211010487

72. Kim JH, Heo JW, Lee DH. Clinical and Radiological Outcomes After Autologous Matrix-Induced Chondrogenesis Versus Microfracture of the Knee: A Systematic Review and Meta-analysis With a Minimum 2-Year Follow-up. *Orthop J Sports Med*. Nov 2020;8(11):2325967120959280. doi:10.1177/2325967120959280

73. Schuette HB, Kraeutler MJ, Schrock JB, McCarty EC. Primary Autologous Chondrocyte Implantation of the Knee Versus Autologous Chondrocyte Implantation After Failed Marrow Stimulation: A Systematic Review. *Am J Sports Med*. Jul 2021;49(9):2536-2541. doi:10.1177/0363546520968284

74. Biant LC, Bentley G, Vijayan S, Skinner JA, Carrington RW. Long-term results of autologous chondrocyte implantation in the knee for chronic chondral and osteochondral defects. *Am J Sports Med*. Sep 2014;42(9):2178-83. doi:10.1177/0363546514539345

75. Gomoll AH, Gillogly SD, Cole BJ, et al. Autologous chondrocyte implantation in the patella: a multicenter experience. *Am J Sports Med*. May 2014;42(5):1074-81. doi:10.1177/0363546514523927

76. Hinckel BB, Gomoll AH. Patellofemoral Cartilage Restoration: Indications, Techniques, and Outcomes of Autologous Chondrocytes Implantation, Matrix-Induced Chondrocyte Implantation, and Particulated Juvenile Allograft Cartilage. *J Knee Surg*. Mar 2018;31(3):212-226. doi:10.1055/s-0037-1607294

77. Olivos Meza A, Cortés González S, Ferniza Garza JJ, Pérez Jiménez FJ, Enrique VC, Ibarra C. Arthroscopic Treatment of Patellar and Trochlear Cartilage Lesions with Matrix Encapsulated Chondrocyte Implantation versus Microfracture: Quantitative Assessment with MRI T2-Mapping and MOCART at 4-Year Follow-up. *Cartilage*. Jul 2021;12(3):320-332. doi:10.1177/1947603519835909

78. Schuette HB, Kraeutler MJ, McCarty EC. Matrix-Assisted Autologous Chondrocyte Transplantation in the Knee: A Systematic Review of Mid- to Long-Term Clinical Outcomes. *Orthop J Sports Med*. Jun 2017;5(6):2325967117709250. doi:10.1177/2325967117709250

79. von Keudell A, Han R, Bryant T, Minas T. Autologous Chondrocyte Implantation to Isolated Patella Cartilage Defects. *Cartilage*. Apr 2017;8(2):146-154. doi:10.1177/1947603516654944

80. Aurégan JC, Klouche S, Bohu Y, Lefèvre N, Herman S, Hardy P. Treatment of pigmented villonodular synovitis of the knee. *Arthroscopy*. Oct 2014;30(10):1327-41. doi:10.1016/j.arthro.2014.04.101

81. Lipina M, Makarov M, Mukhanov V, et al. Arthroscopic synovectomy of the knee joint for rheumatoid arthritis. *Int Orthop*. Aug 2019;43(8):1859-1863. doi:10.1007/s00264-018-4160-z

82. Willimon SC, Busch MT, Perkins CA. Pigmented Villonodular Synovitis of the Knee: An Underappreciated Source of Pain in Children and Adolescents. *J Pediatr Orthop*. Sep 2018;38(8):e482-e485. doi:10.1097/bpo.0000000000001213

83. Clifton R, Ng CY, Nutton RW. What is the role of lateral retinacular release? *J Bone Joint Surg Br*. Jan 2010;92(1):1-6. doi:10.1302/0301-620x.92b1.22909

84. Fonseca L, Kawatake EH, Pochini AC. Lateral patellar retinacular release: changes over the last ten years. *Rev Bras Ortop*. Jun-Jul 2017;52(4):442-449. doi:10.1016/j.rboe.2017.06.003

85. Pagenstert G, Wolf N, Bachmann M, et al. Open lateral patellar retinacular lengthening versus open retinacular release in lateral patellar hypercompression syndrome: a prospective double-blinded comparative study on complications and outcome. *Arthroscopy*. Jun 2012;28(6):788-97. doi:10.1016/j.arthro.2011.11.004

86. Petersen W, Ellermann A, Gösele-Koppenburg A, et al. Patellofemoral pain syndrome. *Knee Surg Sports Traumatol Arthrosc*. Oct 2014;22(10):2264-74. doi:10.1007/s00167-013-2759-6

87. Saper MG, Shneider DA. Diagnosis and treatment of lateral patellar compression syndrome. *Arthrosc Tech*. Oct 2014;3(5):e633-8. doi:10.1016/j.eats.2014.07.004

88. Allen MM, Krych AJ, Johnson NR, Mohan R, Stuart MJ, Dahm DL. Combined Tibial Tubercle Osteotomy and Medial Patellofemoral Ligament Reconstruction for Recurrent Lateral Patellar Instability in Patients With Multiple Anatomic Risk Factors. *Arthroscopy*. Aug 2018;34(8):2420-2426.e3. doi:10.1016/j.arthro.2018.02.049

89. Arshi A, Cohen JR, Wang JC, Hame SL, McAllister DR, Jones KJ. Operative Management of Patellar Instability in the United States: An Evaluation of National Practice Patterns, Surgical Trends, and Complications. *Orthop J Sports Med*. Aug 2016;4(8):2325967116662873. doi:10.1177/2325967116662873

90. Koh JL, Stewart C. Patellar instability. *Orthop Clin North Am*. Jan 2015;46(1):147-57. doi:10.1016/j.ocl.2014.09.011

91. Steensen RN, Bentley JC, Trinh TQ, Backes JR, Wiltfong RE. The prevalence and combined prevalences of anatomic factors associated with recurrent patellar dislocation: a magnetic resonance imaging study. *Am J Sports Med*. Apr 2015;43(4):921-7. doi:10.1177/0363546514563904

92. Vairo GL, Moya-Angeler J, Siorta MA, Anderson AH, Sherbondy PS. Tibial Tubercle-Trochlear Groove Distance Is a Reliable and Accurate Indicator of Patellofemoral Instability. *Clin Orthop Relat Res*. Jun 2019;477(6):1450-1458. doi:10.1097/corr.0000000000000711

93. Schlumberger M, Schuster P, Hofmann S, et al. Midterm Results After Isolated Medial Patellofemoral Ligament Reconstruction as First-Line Surgical Treatment in Skeletally Immature Patients Irrespective of Patellar Height and Trochlear Dysplasia. *Am J Sports Med*. Dec 2021;49(14):3859-3866. doi:10.1177/03635465211050419

94. Erickson BJ, Nguyen J, Gasik K, Gruber S, Brady J, Shubin Stein BE. Isolated Medial Patellofemoral Ligament Reconstruction for Patellar Instability Regardless of Tibial Tubercle-Trochlear Groove Distance and Patellar Height: Outcomes at 1 and 2 Years. *Am J Sports Med*. May 2019;47(6):1331-1337. doi:10.1177/0363546519835800

95. Kim JM, Sim JA, Yang H, Kim YM, Wang JH, Seon JK. Clinical Comparison of Medial Patellofemoral Ligament Reconstruction With or Without Tibial Tuberosity Transfer for Recurrent Patellar Instability. *Am J Sports Med*. Oct 2021;49(12):3335-3343. doi:10.1177/03635465211037716

96. Cooney AD, Kazi Z, Caplan N, Newby M, St Clair Gibson A, Kader DF. The relationship between quadriceps angle and tibial tuberosity-trochlear groove distance in patients with patellar instability. *Knee Surg Sports Traumatol Arthrosc*. Dec 2012;20(12):2399-404. doi:10.1007/s00167-012-1907-8

97. Imhoff FB, Cotic M, Liska F, et al. Derotational osteotomy at the distal femur is effective to treat patients with patellar instability. *Knee Surg Sports Traumatol Arthrosc*. Feb 2019;27(2):652-658. doi:10.1007/s00167-018-5212-z

98. Imhoff FB, Funke V, Muench LN, et al. The complexity of bony malalignment in patellofemoral disorders: femoral and tibial torsion, trochlear dysplasia, TT-TG distance, and frontal mechanical axis correlate with each other. *Knee Surg Sports Traumatol Arthrosc*. Mar 2020;28(3):897-904. doi:10.1007/s00167-019-05542-y

99. Tanaka MJ, D'Amore T, Elias JJ, Thawait G, Demehri S, Cosgarea AJ. Anteroposterior distance between the tibial tuberosity and trochlear groove in patients with patellar instability. *Knee*. Dec 2019;26(6):1278-1285. doi:10.1016/j.knee.2019.08.011

100. Franciozi CE, Ambra LF, Albertoni LJ, et al. Increased Femoral Anteversion Influence Over Surgically Treated Recurrent Patellar Instability Patients. *Arthroscopy*. Mar 2017;33(3):633-640. doi:10.1016/j.arthro.2016.09.015

101. Zhang Z, Zhang H, Song G, Zheng T, Ni Q, Feng H. Increased femoral anteversion is associated with inferior clinical outcomes after MPFL reconstruction and combined tibial tubercle osteotomy for the treatment of recurrent patellar instability. *Knee Surg Sports Traumatol Arthrosc*. Jul 2020;28(7):2261-2269. doi:10.1007/s00167-019-05818-3

102. Franciozi CE, Ambra LF, Albertoni LJB, et al. Anteromedial Tibial Tubercle Osteotomy Improves Results of Medial Patellofemoral Ligament Reconstruction for Recurrent Patellar Instability in Patients With Tibial Tuberosity-Trochlear Groove Distance of 17 to 20 mm. *Arthroscopy*. Feb 2019;35(2):566-574. doi:10.1016/j.arthro.2018.10.109

103. Baydoun HE, Yang A, Dalal AH, Chmel SJ. Arthroscopic Lysis of Adhesions Improves Range of Motion in Patients With Arthrofibrosis After Primary Total Knee Arthroplasty. *Orthopaedic Proceedings*. 2013;95-B(SUPP_15):131-131. doi:10.1302/1358-992x.95bsupp_15.Ista2012-131

104. Colacchio ND, Abela D, Bono JV, Shah VM, Bono OJ, Scott RD. Efficacy of manipulation under anesthesia beyond three months following total knee arthroplasty. *Arthroplast Today*. Dec 2019;5(4):515-520. doi:10.1016/j.artd.2019.08.002

105. Evans KN, Lewandowski L, Pickett A, Strauss JE, Gordon WT. Outcomes of manipulation under anesthesia versus surgical management of combat-related arthrofibrosis of the knee. *J Surg Orthop Adv*. Spring 2013;22(1):36-41. doi:10.3113/jsoa.2013.0036

106. Gu A, Michalak AJ, Cohen JS, Almeida ND, McLawhorn AS, Sculco PK. Efficacy of Manipulation Under Anesthesia for Stiffness Following Total Knee Arthroplasty: A Systematic Review. *J Arthroplasty*. May 2018;33(5):1598-1605. doi:10.1016/j.arth.2017.11.054

107. Issa K, Banerjee S, Kester MA, Khanuja HS, Delanois RE, Mont MA. The effect of timing of manipulation under anesthesia to improve range of motion and functional outcomes following total knee arthroplasty. *J Bone Joint Surg Am*. Aug 20 2014;96(16):1349-57. doi:10.2106/jbjs.M.00899

108. Mamarelis G, Sunil-Kumar KH, Khanduja V. Timing of manipulation under anaesthesia for stiffness after total knee arthroplasty. *Ann Transl Med*. Nov 2015;3(20):316. doi:10.3978/j.issn.2305-5839.2015.10.09

109. Chen MR, Dragoo JL. Arthroscopic releases for arthrofibrosis of the knee. *J Am Acad Orthop Surg*. Nov 2011;19(11):709-16. doi:10.5435/00124635-201111000-00007

110. Schwarzkopf R, William A, Deering RM, Fitz W. Arthroscopic lysis of adhesions for stiff total knee arthroplasty. *Orthopedics*. Dec 2013;36(12):e1544-8. doi:10.3928/01477447-20131120-20

111. Volchenko E, Schwarzman G, Robinson M, Chmell SJ, Gonzalez MH. Arthroscopic Lysis of Adhesions With Manipulation Under Anesthesia Versus Manipulation Alone in the Treatment of Arthrofibrosis After TKA: A Matched Cohort Study. *Orthopedics*. May 1 2019;42(3):163-167. doi:10.3928/01477447-20190424-08

ADDITIONAL RESOURCES

1. Abrams GD, Frank RM, Gupta AK, Harris JD, McCormick FM, Cole BJ. Trends in meniscus repair and meniscectomy in the United States, 2005-2011. *Am J Sports Med*. Oct 2013;41(10):2333-9. doi:10.1177/0363546513495641

2. Aletaha D, Neogi T, Silman AJ, et al. 2010 Rheumatoid arthritis classification criteria: an American College of Rheumatology/European League Against Rheumatism collaborative initiative. *Arthritis Rheum*. Sep 2010;62(9):2569-81. doi:10.1002/art.27584

3. Alizai H, Roemer FW, Hayashi D, Crema MD, Felson DT, Guermazi A. An update on risk factors for cartilage loss in knee osteoarthritis assessed using MRI-based semiquantitative grading methods. *Eur Radiol*. Mar 2015;25(3):883-93. doi:10.1007/s00330-014-3464-7

4. Bhatia S, LaPrade CM, Ellman MB, LaPrade RF. Meniscal root tears: significance, diagnosis, and treatment. *Am J Sports Med*. Dec 2014;42(12):3016-30. doi:10.1177/0363546514524162

5. Ciccotti MC, Kraeutler MJ, Austin LS, et al. The prevalence of articular cartilage changes in the knee joint in patients undergoing arthroscopy for meniscal pathology. *Arthroscopy*. Oct 2012;28(10):1437-44. doi:10.1016/j.arthro.2012.02.029

6. Fitzsimmons SE, Vazquez EA, Bronson MJ. How to treat the stiff total knee arthroplasty?: a systematic review. *Clin Orthop Relat Res*. Apr 2010;468(4):1096-106. doi:10.1007/s11999-010-1230-y

7. Järvinen TL, Sihvonen R, Englund M. Arthroscopy for degenerative knee--a difficult habit to break? *Acta Orthop*. Jun 2014;85(3):215-7. doi:10.3109/17453674.2014.922736

8. Jazrawi L, Gold HT, Zuckerman JD. Physical Therapy or Arthroscopic Surgery for Treatment of Meniscal Tears: Is Noninferiority Enough? *JAMA*. Oct 2 2018;320(13):1326-1327. doi:10.1001/jama.2018.13181

9. Joseph GB, McCulloch CE, Nevitt MC, et al. A reference database of cartilage 3 T MRI T2 values in knees without diagnostic evidence of cartilage degeneration: data from the osteoarthritis initiative. *Osteoarthritis Cartilage*. Jun 2015;23(6):897-905. doi:10.1016/j.joca.2015.02.006

10. Kim S, Bosque J, Meehan JP, Jamali A, Marder R. Increase in outpatient knee arthroscopy in the United States: a comparison of National Surveys of Ambulatory Surgery, 1996 and 2006. *J Bone Joint Surg Am*. Jun 1 2011;93(11):994-1000. doi:10.2106/jbjs.I.01618

11. Mather RC, 3rd, Garrett WE, Cole BJ, et al. Cost-effectiveness analysis of the diagnosis of meniscus tears. *Am J Sports Med*. Jan 2015;43(1):128-37. doi:10.1177/0363546514557937

12. McAlindon TE, Bannuru RR, Sullivan MC, et al. OARSI guidelines for the non-surgical management of knee osteoarthritis. *Osteoarthritis Cartilage*. Mar 2014;22(3):363-88. doi:10.1016/j.joca.2014.01.003

13. Milewski MD, Sanders TG, Miller MD. MRI-arthroscopy correlation: the knee. *J Bone Joint Surg Am*. Sep 21 2011;93(18):1735-45. doi:10.2106/JBJS.9318icl

14. Mosier BA, Arendt EA, Dahm DL, Dejour D, Gomoll AH. Management of Patellofemoral Arthritis: From Cartilage Restoration to Arthroplasty. *J Am Acad Orthop Surg*. Nov 2016;24(11):e163-e173. doi:10.5435/jaaos-d-16-00009

15. Nepple JJ, Dunn WR, Wright RW. Meniscal repair outcomes at greater than five years: a systematic literature review and meta-analysis. *J Bone Joint Surg Am*. Dec 19 2012;94(24):2222-7. doi:10.2106/jbjs.K.01584

16. Potter HG, Jain SK, Ma Y, Black BR, Fung S, Lyman S. Cartilage injury after acute, isolated anterior cruciate ligament tear: immediate and longitudinal effect with clinical/MRI follow-up. *Am J Sports Med*. Feb 2012;40(2):276-85. doi:10.1177/0363546511423380

17. Rodríguez-Merchán EC. The treatment of cartilage defects in the knee joint: microfracture, mosaicplasty, and autologous chondrocyte implantation. *Am J Orthop (Belle Mead NJ).* May 2012;41(5):236-9.

18. Seo HS, Lee SC, Jung KA. Second-look arthroscopic findings after repairs of posterior root tears of the medial meniscus. *Am J Sports Med*. Jan 2011;39(1):99-107. doi:10.1177/0363546510382225

19. Siclari A, Mascaro G, Gentili C, Kaps C, Cancedda R, Boux E. Cartilage repair in the knee with subchondral drilling augmented with a platelet-rich plasma-immersed polymer-based implant. *Knee Surg Sports Traumatol Arthrosc*. Jun 2014;22(6):1225-34. doi:10.1007/s00167-013-2484-1

20. Steadman JR, Briggs KK, Matheny LM, Ellis HB. Ten-year survivorship after knee arthroscopy in patients with Kellgren-Lawrence grade 3 and grade 4 osteoarthritis of the knee. *Arthroscopy*. Feb 2013;29(2):220-5. doi:10.1016/j.arthro.2012.08.018

21. Stensrud S, Risberg MA, Roos EM. Effect of exercise therapy compared with arthroscopic surgery on knee muscle strength and functional performance in middle-aged patients with degenerative meniscus tears: a 3-mo follow-up of a randomized controlled trial. *Am J Phys Med Rehabil*. Jun 2015;94(6):460-73. doi:10.1097/phm.0000000000000209

22. Tjoumakaris FP, Tucker BC, Post Z, Pepe MD, Orozco F, Ong AC. Arthroscopic lysis of adhesions for the stiff total knee: results after failed manipulation. *Orthopedics*. May 2014;37(5):e482-7. doi:10.3928/01477447-20140430-60

23. van de Graaf VA, Noorduyn JCA, Willigenburg NW, et al. Effect of Early Surgery vs Physical Therapy on Knee Function Among Patients With Nonobstructive Meniscal Tears: The ESCAPE Randomized Clinical Trial. *JAMA*. Oct 2 2018;320(13):1328-1337. doi:10.1001/jama.2018.13308

Reviewed / Approved by NIA Clinical Guideline Committee

GENERAL INFORMATION

It is an expectation that all patients receive care/services from a licensed clinician. All appropriate supporting documentation, including recent pertinent office visit notes, laboratory data, and results of any special testing must be provided. If applicable: All prior relevant imaging results and the reason that alternative imaging cannot be performed must be included in the documentation submitted.