

Medical Policy

Autologous Chondrocyte Implantation in the Knee

Policy Number: 07

	Commercial and Qualified Health Plans	MassHealth	Medicare Advantage
Authorization required	X	X	X
Notification within 24 hours of service or next business day			

Overview

The purpose of this document is to describe the guidelines Mass General Brigham Health Plan utilizes to determine the medical appropriateness for autologous chondrocyte implantation (ACI) for repairing cartilage defects of the knee. Mass General Brigham Health Plan will consider FDA-approved matrix-induced chondrocyte implantation (MACI) under the conditions listed in the coverage guidelines below. The treating specialist must request prior authorization for this procedure.

Coverage Guidelines

Mass General Brigham Health Plan medical necessity criteria for autologous chondrocyte implantation in the knee is determined through a custom subset accessible through InterQual®. To access the criteria, log into Mass General Brigham Health Plan's provider website at MassGeneralBrighamHealthPlan.org and click the InterQual® Criteria Lookup link under the Resources Menu, or see below:

- Member is age 15–55 years of age; (If an adolescent member is evaluated, the member should be 15 years of age or older on the date of service and skeletally mature with documented closure of growth plates.); and
- A BMI of $< 35\text{kg/m}^2$; and
- When symptoms of knee pain interfere with activities of daily living and have persisted for at least six months; and
- Single or multiple full-thickness cartilage defects each measuring greater than or equal to 2.0 cm^2 ; and
- Cartilage defect involves the weight bearing areas of the femoral condyle (medial, lateral, or trochlear) or the patella based on documentation from prior arthroscopic procedures; and
- Femoral condyle defects are the result of acute or repetitive trauma; and
- Prior conservative treatment including physical therapy, nonsteroidal medications, and steroid injections have failed to offer relief; and
- Member must be willing to comply with a vigorous rehabilitation program post ACI procedure.

Instability of the knee may adversely affect the success of the procedure and should be corrected. The anterior and posterior cruciate ligaments should be free of laxity as well as stable and intact. It is recommended that cruciate deficiencies be corrected. Abnormal weight-distribution within the joint may adversely affect the success of the procedure and should be corrected. The tibial/femoral joint should be properly aligned.

Exclusions

Mass General Brigham Health Plan does not provide coverage for:

1. Joints other than the knee
2. Active infection of the knee
3. Presence of osteoarthritis

MassHealth Variation

Mass General Brigham Health Plan uses guidance from MassHealth for coverage determinations for its MassHealth ACO members. **At the time of Mass General Brigham Health Plan's most recent policy review, MassHealth did not have medical necessity guidelines for autologous chondrocyte implantation in the knee.**

Medicare Variation

Mass General Brigham Health Plan uses guidance from the Centers for Medicare and Medicaid Services (CMS) for coverage determinations for its Medicare Advantage plan members. National Coverage Determinations (NCDs), Local Coverage Determinations (LCDs), Local Coverage Articles (LCAs) and documentation included in the Medicare manuals are the basis for coverage determinations. When there is no guidance from CMS for the requested service, Mass General Brigham Health Plan's medical policies are used for coverage determinations. At the time of Mass General Brigham Health Plan's most recent policy review, Medicare has **no NCD or LCD for autologous chondrocyte implantation in the knee.**

Definitions

Autologous chondrocyte implantation: a two-step procedure in which new cartilage cells are grown and then implanted in the cartilage defect. Healthy cartilage tissue is first removed from a non-weight bearing area of the bone and sent to a laboratory. The cells are cultured and increase in number over a 3- to 5-week period and are then transplanted back via a second procedure.

Full thickness chondral defects are those that extend through to the subchondral bone.

Matrix-induced Autologous Chondrocyte Implantation (MACI): MACI is autologous cultured chondrocytes on porcine collagen membrane. It is an autologous cellularized scaffold product that is indicated for the repair of single or multiple symptomatic, full-thickness cartilage defects of the adult knee, with or without bone involvement.

Codes

The following codes are included below for informational purposes only; inclusion of a code does not constitute or imply coverage.

This list of codes applies to commercial and MassHealth plans only.

Authorized CPT/HCPCS Codes	Code Description
27412	Autologous chondrocyte implantation, knee
27416	Osteochondral autograft(s), knee, open (e.g., mosaicplasty) (includes harvesting of autograft[s])
29866	Arthroscopy, knee, surgical; osteochondral autograft(s) (e.g., mosaicplasty) (includes harvesting of the autograft[s])
J7330	Autologous cultured chondrocytes, implant

Summary of Evidence

Randomized by Brittberg et al. (2018), Knutsen et al. (2016), and others demonstrate generally favorable long-term outcomes for ACI compared with standard care, with follow-up periods ranging from 2 to 15 years. Multiple systematic reviews, including that by Grossman et al. (2022), show improvement that ACI improves patient-reported outcomes in patients with large ($\geq 2\text{cm}^2$), full-thickness cartilage defects in the knee. A systematic review by Dhillon et al. (2022) suggests that third-generation ACI techniques are superior to microfracture for focal chondral defects. Another systematic review of RCTs by Gou et al. (2020) finds that scores on standardized measures of knee symptoms were no better for ACI than for microfracture at 1-5 years of follow-up, though ACI may offer improved pain relief and quality of life. Niethammer et al. (2021) shows that the improvement in patient-reported outcomes was larger for ACI treatment of femoral cartilage defects than



for ACI treatment of patellar cartilage defects. Dibartola et al. (2016) and Hoburg et al. (2019) demonstrate safety and efficacy in adolescents and young adults.

The literature collectively supports ACI as an effective treatment option for large, full-thickness knee cartilage defects. Mass General Brigham Health Plan criteria reflect the inclusion/exclusion criteria of trials mentioned above. Evidence of safety and efficacy in other populations is still lacking.

Effective

March 2025: Ad hoc update. Summary of evidence added.

November 2024: Ad hoc update. Medicare Variation language clarified. Added language to coverage guidelines pointing to custom subset in InterQual™. MassHealth Variation language added. Codes updated.

August 2024: Annual update. Added BMI restriction.

August 2023: Annual update. Medicare Advantage added to table. Minor editorial refinement to coverage guidelines; intent unchanged. Medicare Variation language added.

August 2022: Annual update. References updated.

August 2021: Annual update. Revised language under Coverage Guidelines to state “Single or multiple full-thickness cartilage each measuring greater than or equal to 2.0 cm²”. References updated.

August 2020: Annual update. References updated.

July 2019: Annual update. Revised language under Overview section to reflect policy only allows for MACI. Removed Carticel. Revised Coverage guidelines. Allow for up to age 55. Removed requirement that member have inadequate response to prior surgical treatment. Under Exclusion section; removed defects of the patella. Updated Code and References.

June 2018: Annual update.

December 2017: Effective date. Codes added.

References

130 CMR 433.000: Physician Manual

130 CMR 450.000: Administrative and Billing

Abraamyan T, Johnson AJ, Wiedrick J, et al. Marrow Stimulation Has Relatively Inferior Patient-Reported Outcomes in Cartilage Restoration Surgery of the Knee: A Systematic Review and Metaanalysis of Randomized Controlled Trials. *Am J Sports Med*. Apr 23 2021: 3635465211003595.

Alvarez-Lozano E, Luna-Pizarro D, Meraz-Lares G, et al. Two-stage bone and meniscus allograft and autologous chondrocytes implant for unicompartamental osteoarthritis: Midterm results. *Musculoskelet Surg*. 2022;106(2):133-143.

American Academy of Orthopedic Surgeons (AAOS) Articular Cartilage Restoration

Basad E, Ishaque B, Bachmann G, et al. Matrix-induced autologous chondrocyte implantation versus microfracture in the treatment of cartilage defects of the knee: a 2-year randomised study. *Knee Surg Sports Traumatol Arthrosc* 2010 Apr;18(4):519-27.

Brittberg M, Recker D, Ilgenfritz J, Saris DB. Matrix-Applied Characterized Autologous Cultured Chondrocytes Versus Microfracture: Five-Year Follow-up of a Prospective Randomized Trial. *The American Journal of Sports Medicine* 2018;46(6):1343–51. DOI: 10.1177/0363546518756976

Clavé A, Potel J-F, Servien E, Neyret P, Dubrana F, Stindel E. Third-generation autologous chondrocyte implantation versus mosaicplasty for knee cartilage injury: 2-year randomized trial. *Journal of Orthopaedic Research* 2016;34(4):658–65.



Cochrane Collaboration. Autologous chondrocyte implantation for full thickness articular cartilage defects of the knee (review). 2011. Accessed 8/31/2015, 7/18/2017.

Dai X, Fang J, Wang S, Luo J, Xiong Y, Zhang M, Zhu S, Yu X. Short- to Midterm Clinical and Radiological Outcomes After Matrix-Associated Autologous Chondrocyte Implantation for Chondral Defects in Knees. *Orthop J Sports Med*. 2021 Feb 24;9(2):2325967120982139.

Dibartola AC, Wright BM, et al. Clinical Outcomes After Autologous Chondrocyte Implantation in Adolescents' Knees: A Systematic Review. *Arthroscopy: The Journal of Arthroscopic & Related Surgery* 2016;32(9):1905–16.

Dhillon J, Decilveo AP, Kraeutler MJ., et. al. Third-Generation Autologous Chondrocyte Implantation (Cells Cultured Within Collagen Membrane) Is Superior to Microfracture for Focal Chondral Defects of the Knee Joint: Systematic Review and Meta-analysis. *Arthroscopy*. 2022 Aug;38(8):2579-2586. doi: 10.1016/j.arthro.2022.02.011. Epub 2022 Mar 10. PMID: 35283221.

Ebert JR, Fallon M, Wood DJ, Janes GC. An accelerated 6-week return to full weight bearing after matrix-induced autologous chondrocyte implantation results in good clinical outcomes to 5 years post-surgery. *Knee Surg Sports Traumatol Arthrosc*. 2021 Jan 18.

Ebert JR, Fallon M, Smith A, et al. Prospective clinical and radiologic evaluation of patello-femoral matrix-induced autologous chondrocyte implantation. *Am J Sports Med* 2015;43(6):1362-1372.

Hayes Technology Assessment, Matrix-Induced Autologous Chondrocyte Implantation (MACI) Procedure for Repair of Articular Cartilage of the Knee. Hayes Directory. August 26, 2020. Annual Review September 30, 2021

Hayes Medical Technology, Inc. Autologous Chondrocyte Implantation of the Knee. Hayes Directory. July 15, 2013.

Hayes Medical Technology, Inc. Comparative Effectiveness Review of Second- and Third-Generation Autologous Chondrocyte Implantation of the Knee. Hayes Directory. July 13, 2017. Annual Review July 9, 2020.

Food and Drug Administration (FDA) Carticel (autologous cultured chondrocyte) package insert. Revised 6/2007.

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. PMID 31708355

Gracitelli GC, Moraes VY, Franciozi CE, et al. Surgical interventions (microfracture, drilling, mosaicplasty, and allograft transplantation) for treating isolated cartilage defects of the knee in adults. *Cochrane Database Syst Rev*. Sep 03 2016;9:CD010675. PMID 27590275.

Grossman AD, Den Haese JP Jr, Georger L, et al. Matrix-Induced Autologous Chondrocyte Implantation (MACI) is Largely Effective and Provides Significant Improvement in Patients With Symptomatic, Large Chondral Defects: A Systematic Review and Meta-Analysis. *Surg Technol Int*. 2022 Aug 1;41:sti41/1613. doi: 10.52198/22.STI.41.OS1613. Epub ahead of print. PMID: 35920337.

Hayden BS, Matthew J. Kraeutler, et al. 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):2325967117709250.

Hoburg A, Löer I, Körsmeier K, et al. Matrix-Associated Autologous Chondrocyte Implantation Is an Effective Treatment at Midterm Follow-up in Adolescents and Young Adults. *Orthop J Sports Med*. 2019 Apr 25;7(4):2325967119841077. doi: 10.1177/2325967119841077. eCollection 2019 Apr. PMID: 31041335

Knutsen, G., Drogset, J., et al. A Randomized Trial Comparing Autologous Chondrocytes Implantation with Microfracture. Findings at Five Years. *The Journal of Bone and Joint Surgery*, 2007 Oct; 89 (10): 2105-2112.



Knutsen, G., Engebretsen, L., et al. Autologous Chondrocyte Implantation Compared with Microfracture in the Knee. A Randomized Trial. *The Journal of Bone and Joint Surgery*. 2004 Mar; 86 (3):455-464.

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. *The Journal of Bone and Joint Surgery* 2016; 98 (16) :1332-1339. <https://doi.org/10.2106/JBJS.15.01208>. doi:10.2106/JBJS.15.01208.

McNickle, A., L'Heureux, D, et al. Outcomes of Autologous Chondrocyte Implantation in a Diverse Patient Population. *The American Journal of Sports Medicine*, 2009 Jul; 37 (7) 1344-1350.

Olivos Meza A, Cortés González S, 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*. 2021 Jul;12(3):320-332. doi: 10.1177/1947603519835909. Epub 2019 Apr 3. PMID: 30943755.

Moseley, J., Allen, F., et al. Long-Term Durability of Autologous Chondrocyte Implantation: A Multicenter, Observational Study in US Patients. *Am J Sports Med*, 2010(38):238 DOI: DOI: 10.1177/0363546509348000.

Niethammer TR, Gallik D, Chevalier Y, et al. Effect of the defect localization and size on the success of third-generation autologous chondrocyte implantation in the knee joint. *Int Orthop*. 2021 Jun;45(6):1483-1491

Smith L, Jakubiec A, Biant L, et al. The biomechanical and functional outcomes of autologous chondrocyte implantation for articular cartilage defects of the knee: A systematic review. *Knee*. 2023 Oct;44:31-42. doi: 10.1016/j.knee.2023.07.004. Epub 2023 Jul 27. PMID: 37516029.

Solheim E, Hegna J, Inderhaug E, et al. Results at 10-14 years after microfracture treatment of articular cartilage defects in the knee. *Knee Surg Sports Traumatol Arthrosc*. May 2016;24(5):1587-1593. PMID 25416965.

Yoon KH, Yoo JD, Choi CH, Lee J, Lee JY, Kim SG, Park JY. Costal Chondrocyte-Derived Pellet-Type Autologous Chondrocyte Implantation versus Microfracture for Repair of Articular Cartilage Defects: A Prospective Randomized Trial. *Cartilage*. 2021 Dec;13(1_suppl):1092S-1104S. doi: 10.1177/1947603520921448. Epub 2020 Jun 1. PMID: 32476445; PMCID: PMC8808917.

Zamborsky R, Danisovic L. Surgical Techniques for Knee Cartilage Repair: An Updated Large-Scale Systematic Review and Network Meta-analysis of Randomized Controlled Trials. *Arthroscopy*. Mar 2020; 36(3): 845-858. PMID 32139062

