

MEDICAL POLICY

MEDICAL POLICY DETAILS	
Medical Policy Title	Osteochondral Grafting of the Knee
Policy Number	7.01.59
Category	Technology Assessment
Original Effective Date	12/19/02
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Product Disclaimer	<ul style="list-style-type: none"> Services are contract dependent; if a product excludes coverage for a service, it is not covered, and medical policy criteria do not apply. If a commercial product (including an Essential Plan or Child Health Plus product), medical policy criteria apply to the benefit. If a Medicaid product covers a specific service, and there are no New York State Medicaid guidelines (eMedNY) criteria, medical policy criteria apply to the benefit. If a Medicare product (including Medicare HMO-Dual Special Needs Program (DSNP) product) covers a specific service, and there is no national or local Medicare coverage decision for the service, medical policy criteria apply to the benefit. If a Medicare HMO-Dual Special Needs Program (DSNP) product DOES NOT cover a specific service, please refer to the Medicaid Product coverage line.

POLICY STATEMENT

- I. Based upon our criteria and assessment of the peer-reviewed literature, osteochondral autografting, and allografting using one or more cores of osteochondral tissue, are considered **medically appropriate** for treatment of cartilaginous defects caused by acute or repetitive trauma in the knee, when **ALL** of the following criteria are met:
- Body Mass Index (BMI) of less than 35;
 - Age 49 years or younger;
 - Absence of inflammatory arthritis or other systemic disease affecting the joints;
 - Presence of **ALL** of the following imaging or arthroscopic findings:
 - Kellgren-Lawrence Grade II or less on radiograph; **and**
 - Normal articular cartilage at the lesion border (contained lesion);
 - A full-thickness distal femoral articular surface (i.e., medial condyle, lateral condyle, or trochlea) or patellar chondral defect that has been identified with **ANY** of the following:
 - CT arthrogram;
 - MRI and the Modified Outerbridge Classification is Grade III (3) or IV (4); **or**
 - Arthroscopy and the Outerbridge Classification is Grade III (3) or IV (4);
 - Additional imaging findings required based on procedure type:
 - Osteochondral autograft transplants and mosaicplasty also require: Small (i.e., ≤ 2.5 cm² total) chondral defects with sharp, definite borders surrounded by normal-appearing hyaline cartilage; **or**
 - Osteochondral allograft transplants also require: Larger (i.e., ≤ 10.0 cm² total) chondral defects with sharp definite borders surrounded by normal appearing hyaline cartilage;
 - Absence of a Modified Outerbridge Classification grade III or IV corresponding 'kissing lesion' defect of the distal femur (trochlea, condyles), patella, or tibia is required when performed for femoral and patellar chondral lesions;

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- H. Physical exam demonstrates **BOTH** of the following findings:
 - 1. A stable knee with intact or reconstructed ligaments (ACL or PCL) and menisci; *

*Note: A concurrent ligament stabilization or meniscal procedure at the time of OATS would be acceptable;

 - 2. Normal tibial-femoral and/or patella-femoral alignment;
- I. Symptoms include:
 - 1. Function-limiting knee pain or loss of knee function which interferes with the ability to carry out age - appropriate activities of daily living;
 - 2. Failure of provider-directed non-surgical management for at least three (3) months in duration.
- II. Based upon our criteria and assessment of the peer-reviewed literature, osteochondral grafting of the distal femoral articular or patellar surface **has not been medically proven** to be effective and, therefore, is considered **investigational** for any other indication or condition, including when autologous chondrocyte implantation is performed in combination with osteochondral autograft transfer system (Hybrid Autologous Chondrocyte Implantation/ Osteochondral Autograft Transfer System (ACI/OATS)) for the treatment of osteochondral defects.

Refer to Corporate Medical Policy #7.01.38 Autologous Chondrocyte Implantation

Refer to Corporate Medical Policy #11.01.03 Experimental and Investigational Services

DESCRIPTION

Osteochondral autografting and allografting have been investigated for full-thickness cartilage defects of weight-bearing surfaces due either to trauma or conditions such as osteochondritis dissecans. Overall, the goal of osteochondral grafting procedures is to re-establish the cartilage matrix with chondrocytes and supporting bone, to improve joint function and decrease pain. The procedure entails the harvesting of one or more small grafts of bone and cartilage from either the patient's non-weight-bearing or less-weight-bearing surfaces (autograft) or from a cadaver joint (fresh or cryopreserved allograft). The base of the defect is then abraded or curetted down to subchondral bone, and the grafts are implanted in the defect. Use of autografting is associated with repairing smaller defects, whereas allografts are utilized for larger defects. The advantages of using autograft material include graft availability, the absence of possible disease transmission risk, and the ability to perform the procedure in a single stage. Disadvantages include donor site morbidity and limit available graft volume. In addition, tissue may have to be harvested from two different donor sites, to provide enough material for a large defect without compromising the donor site. The use of allograft cartilage has the advantages of providing osteochondral segments that are able to survive transplant, the ability to heal to recipient-site tissue, and no associated donor site morbidity. Application of osteochondral allografting is limited, because cryopreserved allografts do not contain an acceptable level of cartilage viability, and cryopreservation may decrease the viability of the cartilage cells. Fresh, osteochondral allografts must be implanted within 72 hours of donor death, may be difficult to obtain (due to scarcity), and may transmit disease. A well-organized transplant program is required, and the surgery cannot be done on an elective basis.

Several systems are available for performing this procedure: the Mosaicplasty System (Smith and Nephew), the OATS, (Arthrex, Inc.), and the COR and COR2 systems (DePuy-Mitek), Lopez-Vidriero and Johnson, 2016). The OATS procedure involves use of larger plugs, usually filling the entire defect with a single plug, while mosaicplasty uses multiple, small, cylindrical plugs. It is suggested that mosaicplasty reduces the possibility of donor site morbidity and produces a more congruent surface. In both of these techniques, harvesting and transplantation is performed during the same surgical procedure. The COR and COR2 systems can be utilized for autograft or allograft transplantation.

Filling defects with minced articular cartilage (autologous or allogeneic) is another single-stage procedure that is being investigated for cartilage repair. The Cartilage Autograft Implantation System (CAIS; Johnson and Johnson; phase 3 trial) harvests cartilage and disperses chondrocytes on a scaffold in a single-stage treatment. BioCartilage (Arthrex) consists of a micronized allogeneic cartilage matrix that is intended to provide a scaffold for microfracture. DeNovo NT Graft (Natural Tissue Graft) is produced by ISTO Technologies, with exclusive distribution rights by Zimmer. DeNovo NT consists of manually minced cartilage tissue pieces obtained from juvenile allograft donor joints. The tissue fragments are mixed intra-operatively with fibrin glue before implantation in the prepared lesion. It is thought that mincing the tissue helps both with cell migration from the extracellular matrix and with fixation.

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Manipulated (decellularized) human tissue graft products (e.g., Chondrofix osteochondral allograft) are made of bone and cartilage tissue that has been harvested from a cadaveric donor and processed, to remove blood, cells, and fat from the tissue. It is sterilized to kill bacteria and other microorganisms, and purportedly promotes bone integration and remodeling, while reducing the risk of inflammation, in repair of Grade III and Grade IV osteochondral lesions. While this product does not require U.S. Food and Drug Administration (FDA) approval, it does require handling and processing from an FDA-accredited tissue bank (LifeNet Health). It also comes in a variety of sizes to treat different defect sizes.

Synthetic grafts are being investigated as alternatives to allografts and autografts. It has been proposed that synthetic grafts could provide a substrate, encouraging bony in-growth and surface repair. Synthetic resorbable polymers (e.g., PolyGraft, TruGraft, and TruFit plugs) are polymer scaffolds that are being proposed for the repair of osteochondral articular cartilage defects. The implant functions as a scaffold for chondral and osteogenic cells, with the synthetic polymer being resorbed as the cells produce their normal matrices. TruFit plugs are synthetic polymer scaffolds that are inserted into an articular surface, to provide a stable scaffold to encourage the regeneration of a full thickness of articular cartilage to repair chondral defects. The clinical value of TruFit plugs for osteochondral allografts of the knee has not been established. The bone graft substitute implant can be used to backfill harvest sites. At this time, the literature is insufficient to support their use.

ProChondrix (AlloSource) and Cartiform (Arthrex) are wafer-thin allografts in which the bony portion of the allograft has been reduced. The discs are laser-etched or porated and contain hyaline cartilage with chondrocytes, growth factors, and extracellular matrix proteins. ProChondrix is available in dimensions from 7 to 20 mm and is stored fresh for a maximum of 28 days. Cartiform is cut to the desired size and shape and is stored frozen for a maximum of two years. The osteochondral discs are typically inserted after microfracture and secured in place with fibrin glue and/or sutures.

The Outerbridge Classification is a system that has been developed for judging articular cartilage injury to the knee. This system allows delineation of varying areas of chondral pathology, based on the qualitative appearance of the cartilage surface as viewed by direct visualization intraoperatively, and can assist in identifying those injuries that are suitable for repair techniques. The characterization of cartilage in this system is as follows:

1. Grade I – softening with swelling;
2. Grade II – fragmentation and fissuring less than one square centimeter (1 cm²);
3. Grade III – fragmentation and fissuring greater than one square centimeter (1 cm²);
4. Grade IV – subchondral bone exposed.

Modified Outerbridge Classification is a system that has been developed for judging articular cartilage injury to the knee. This system allows delineation of varying areas of chondral pathology, based on the qualitative appearance of the cartilage surface as viewed on MRI, and can assist in identifying those injuries that are suitable for repair techniques. The characterization of cartilage in this system is as follows:

1. Grade I – softening with swelling;
2. Grade II – fragmentation and fissuring less than one square centimeter (1 cm²);
3. Grade III – fragmentation and fissuring greater than one square centimeter (1 cm²);
4. Grade IV – subchondral bone exposed.

The Kellgren-Lawrence Grading System is a radiographic grading system that has been developed for describing osteoarthritic changes to the knee. When used, the radiographic findings are typically reported within one of the following categories:

1. Grade 0 – No radiographic features of osteoarthritis are present;
2. Grade I – Doubtful narrowing of joint space and possible osteophytic lipping;
3. Grade II – Definite osteophytes and possible narrowing of joint space;
4. Grade III – Moderate multiple osteophytes, definite narrowing of joint space, some sclerosis, and possible deformity of bone contour;
5. Grade IV – Large osteophytes, marked narrowing of joint space, severe sclerosis, and definite deformity of bone contour.

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RATIONALE

Evidence is sufficient to consider osteochondral allografting medically appropriate as a technique to repair large (e.g., 10 cm²), full-thickness chondral defects of the knee caused by acute or repetitive trauma. Use of allografts for large defects of the talus has been reported in small case series. For osteochondral autografting, only three relatively small, randomized, controlled trials from investigators in Europe have demonstrated improved clinical outcomes with osteochondral autografting of the knee, when compared with microfracture. However, controlled studies demonstrate similar benefit to other cartilage-resurfacing procedures in appropriately selected patients, and a number of uncontrolled studies indicate that osteochondral autografts can improve symptoms in some patients with focal lesions of articular cartilage of the knee who have failed prior surgical treatment. These patients have limited options.

Overall, there is evidence that osteochondral grafting procedures in defects of the knee demonstrated relief of symptoms and improved function in a subset of patients who had failed conservative management and arthroscopic or other surgical treatments. For knee defects, patients should be skeletally mature, with documented closure of growth plates (approximately 15 years of age or older), yet should be too young to be considered an appropriate candidate for total knee arthroplasty or other reconstructive knee surgery (55 years of age or younger). Patient samples/inclusion criteria in currently published studies support this age range.

Minced cartilage techniques are either not approved in the United States and/or are in the early stages of development and testing (e.g., particulated juvenile articular cartilage). Early results from case series appear to show similar outcomes, compared with other treatments for cartilage defects, but these case series do not permit conclusions regarding the effect of this treatment on health outcomes. Further studies with a larger number of patients and longer follow-up are needed, especially randomized, controlled trials that directly compare particulated juvenile articular cartilage with other established treatments.

Decellularized Osteochondral Allografts or Reduced Allograft Discs

For individuals with full-thickness articular cartilage lesions who receive decellularized osteochondral allograft plugs or reduced osteochondral allograft discs, the evidence includes one small case series on decellularized osteochondral allograft plugs. Relevant outcomes of the case series were symptoms, functional outcomes, quality of life, and treatment-related morbidity. The researchers reported delamination of the implants, with a high failure rate. No studies have been identified with reduced osteochondral allograft discs. The evidence is insufficient to determine the effects of the technology on health outcomes.

The first report on the use of decellularized osteochondral allograft plugs (Chondrofix) was published by Farr et al. in 2016. Review of records for 32 patients identified a high failure rate. Failure was defined as structural damage of the graft identified by MRI or arthroscopy, or any reoperation resulting in removal of the allograft, and 23 of 32 (72%) knees were considered failures.

Synthetic Products

Verhaegen and colleagues (2015) performed a systematic search in five databases for clinical trials in which patients were treated with a TruFit plug for osteochondral defects. To be included, studies had to report clinical, radiological, or histological outcome data. The included studies were assessed for quality. A total of five studies described clinical results, all indicating improvement at follow-up of 12 months, compared to pre-operative status. However, two studies reporting longer follow-up showed deterioration of early improvement. Radiological evaluation indicated favorable MRI findings regarding filling of the defect and incorporation with adjacent cartilage at 24-month follow-up, but conflicting evidence existed on the properties of the newly formed overlying cartilage surface. None of the included studies showed evidence for bone in-growth. The few histological data available confirmed these results. The authors concluded that there are no data available that support superiority or equality of TruFit, compared to conservative treatment or mosaicplasty/microfracture. They stated that further investigation is needed, to improve synthetic biphasic implants as therapy for

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osteochondral lesions; randomized, controlled trials comparing TruFit plugs with an established treatment method are needed, before further clinical use can be supported.

CODES

- Eligibility for reimbursement is based upon the benefits set forth in the member's subscriber contract.
- **CODES MAY NOT BE COVERED UNDER ALL CIRCUMSTANCES. PLEASE READ THE POLICY AND GUIDELINES STATEMENTS CAREFULLY.**
- Codes may not be all inclusive as the AMA and CMS code updates may occur more frequently than policy updates.
- Code Key: Experimental/Investigational = (E/I), Not medically necessary/appropriate = (NMN).

CPT Codes

Code	Description
27415	Osteochondral allograft, knee, open
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)
29867	Arthroscopy, knee, surgical; osteochondral allograft (e.g., mosaicplasty)

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HCPCS Codes

Code	Description
No codes	

ICD10 Codes

Code	Description
M12.561-M12.569	Traumatic arthropathy, knee (code range)
M17.0-M17.9	Osteoarthritis of knee (code range)
M22.40-M22.42	Chondromalacia patella, knee (code range)
M23.8x1-M23.92	Other and unspecified internal derangement of knee (code range)
M25.861-M25.869	Other specified joint disorders, knee (code range)
M93.261-M93.269	Osteochondritis dissecans knee (code range)
M94.261-M94.269	Chondromalacia of knee (code range)

REFERENCES

*Adams SB, et al. Midterm results of osteochondral lesions of the talar shoulder treated with fresh osteochondral allograft transplantation. J Bone Joint Surg Am 2011 Apr 6;93(7):648-54.

Altschuler N, et al. Aragonite-based scaffold versus microfracture and debridement for the treatment of knee chondral and osteochondral lesions: results of a multicenter randomized controlled trial. The American Journal of Sport Medicine 2023 Feb;51(4):957-967.

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*American Academy of Orthopedic Surgeons. Articular cartilage restoration: A review of currently available methods for repair of articular cartilage defects. Last reviewed 2009 Feb [<https://orthoinfo.aaos.org/en/treatment/articular-cartilage-restoration/>] accessed 05/23/24.

*Bentley G, et al. Minimum ten-year results of a prospective randomized study of autologous chondrocyte implantation versus mosaicplasty for symptomatic articular cartilage lesions of the knee. J Bone Joint Surg Br 2012 Apr;94(4):504-9.

*Chambers HG, et al. American Academy of orthopedic Surgeons clinical practice guideline on the diagnosis and treatment of osteochondritis dissecans. J Bone Joint Surg Am 2012 Jul 18;94(14):1322-4.

Crawford ZT, et al. Return to sport and sports-specific outcomes after osteochondral allograft transplantation in the knee: a systematic review of studies with at least 2 years' mean follow-up. Arthroscopy 2019 Jun;35(6):1880-1889.

Dhillon JS, 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.

*El-Rashidy H, et al. Fresh osteochondral allograft for the treatment of cartilage defects of the talus: a retrospective review. J Bone Joint Surg Am 2011 Sep 7;93(7):1634-40.

*Emre TY, et al. Open mosaicplasty in osteochondral lesions of the talus: a prospective study. J Foot Ankle Surg 2012 Sep-Oct;51(5):556-60.

*Farr J, et al. High failure rate of a decellularized osteochondral allograft for the treatment of cartilage lesions. Am J Sports Med 2016 Aug;44(8):2015-2022.

*Gobbi A, et al. Osteochondral lesions of the talus: randomized controlled trial comparing chondroplasty, microfracture, and osteochondral autograft transplantation. Arthroscopy 2006 Oct;22(10):1085-92.

*Gudas R, et al. A prospective, randomized clinical study of osteochondral autologous transplantation versus microfracture for the treatment of osteochondritis dissecans in the knee joint in children. J Pediatr Orthop 2009 Oct-Nov;29(7):741-8.

*Gudas R, et al. Ten-year follow-up of a prospective, randomized clinical study of mosaic osteochondral autologous transplantation versus microfracture for the treatment of osteochondral defects in the knee joint of athletes. Am J Sports Med 2012 Nov;40(1):2499-508.

*Harris JD, et al. Biological knee reconstruction: a systematic review of combined meniscal allograft transplantation and cartilage repair or restoration. Arthroscopy 2011;27(3):409-18.

*Imhoff AB, et al. Osteochondral transplantation of the talus: long-term clinical and magnetic resonance imaging evaluation. Am J Sports Med 2011 Jul;39(7):1487-93.

*Iwasaki N, et al. Autologous osteochondral mosaicplasty for osteochondritis dissecans of the elbow in teenage athletes. J Bone Joint Surg Am 2009 Oct;91(10):2359-66.

Jones KJ, et al. Comparative effectiveness of cartilage repair with respect to the minimal clinically important difference. Am J Sports Med 2019 Nov;47(13):3284-3293.

*Kircher J, et al. Osteochondral autologous transplantation for the treatment of full-thickness cartilage defects of the shoulder: results at nine years. J Bone Joint Surg Br 2009 Apr;91(4):499-503.

León SA, et al. Long-term results of fresh osteochondral allografts and realignment osteotomy for cartilage repair in the knee. Bone Joint J 2019 Jan;101-B(1_Supple_A):46-52.

*Lim HC, et al. Current treatments of isolated articular cartilage lesions of the knee achieve similar outcomes. Clin Orthop Relat Res 2012 Aug;470(8):2261-7.

*Liu W, et al. Osteochondral autograft transplantation for acute osteochondral fractures associated with an ankle fracture. Foot Ankle Int 2011 Apr;32(4):437-42.

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Mathew JR, et al. Comparison of clinical outcomes following osteochondral allograft transplantation for osteochondral versus chondral defect in the knee. Knee Surgery & Related Research 2022 May;34(1):23.doi: 10.1186/s43019-022-00149-z.

*National Institute for Health and Clinical Excellence. Mosaicplasty for symptomatic articular cartilage defects of the knee. IPG607. 2018 Mar 14 [<https://www.nice.org.uk/guidance/ipg607>] accessed 05/23/24.

*Ollat D, et al. Mosaic osteochondral transplantations in the knee joint, midterm results of the SFA multicenter study. Orthop Traumatol Surg Res 2011 Dec;97(8 Suppl):S160-6.

*Ovesen J, et al. The clinical outcomes of mosaicplasty in the treatment of osteochondritis dissecans of the distal humeral capitellum of young athletes. J Shoulder Elbow Surg 2011 Jul;20(5):813-8.

*Pearce CJ, et al. Synthetic osteochondral grafting of ankle osteochondral lesions. Foot Ankle Surg 2012 Jun;18(2):114-8.

Shivji FS, et al. Treatment of focal chondral lesions in the knee using a synthetic scaffold plug: Long-term clinical and radiological results. J Orthop 2020 Jan 14;20:12-16.

Sochacki KR, et al. Comparison of autologous chondrocyte implantation and osteochondral allograft transplantation of the knee in a large insurance database: reoperation rate, complications, and cost analysis. Cartilage 2021 Dec;13(1):1187S-1194S.

Trofa DP, et al. Isolated osteochondral autograft versus allograft transplantation for the treatment of symptomatic cartilage lesion of the knee: a systematic review and meta-analysis. The American Journal of Sports Medicine 2022 Feb; online ahead of print.

*Ulstein S, et al. Microfracture technique versus osteochondral autologous transplantation mosaicplasty in patients with articular chondral lesions of the knee: a prospective randomized trial with long-term follow-up. Knee Surg Sports Traumatol Arthrosc 2014 Jun;22(6):1207-15.

*Verhaegen J, et al. TruFit Plug for repair of osteochondral defects- where is the evidence? Systematic review of the literature. Cartilage 2015 Jan;6(1):12-19.

Lopez-Vidriero E and Johnson DH. Topic: Master Techniques in Orthopaedic Surgery: Sport Medicine. Mosaicplasty/OATS. Orthopedic June 13, 2016. <https://musculoskeletalkey.com/mosaicplastyoats/> accessed 05/23/24.

*Vogt S, et al. Osteochondral transplantation in the elbow leads to good clinical and radiologic long-term results: An 8-to 14-year follow-up examination. Am J Sports Med 2011 Dec;39(12):2619-25.

Wang D, et al. Osteochondral allograft transplantation of the knee in patients with an elevated body mass index. Cartilage 2019 Apr;10(2):214-221.

Zamborsky R and Danisovic L. Surgical techniques for knee cartilage repair: an updated large-scale systematic review and network meta-analysis of randomized controlled trials. Arthroscopy 2020 Mar;36(3):845-858.

*Key Article

KEY WORDS

Chondral defects, Chondrofix, COR, COR2, Mosaicplasty, minced cartilage, OATS, osteochondral autograft, osteochondral allograft, osteochondral autograft transfer procedure.

CMS COVERAGE FOR MEDICARE PRODUCT MEMBERS

Based upon our review, Osteochondral Grafting is not addressed in National or Regional Medicare coverage determinations or policies.