



Medical Coverage Policy

Effective Date.....12/15/2021
Next Review Date.....12/15/2022
Coverage Policy Number 0156

Temporomandibular Joint (TMJ) Disorder Surgery

Table of Contents

Overview	1
Coverage Policy.....	1
General Background.....	2
Medicare Coverage Determinations	6
Coding/Billing Information.....	6
References	7

Related Coverage Resources

- [Biofeedback](#)
- [Low-Level Laser and High-Power Laser Therapy](#)
- [Manipulation Under Anesthesia](#)
- [Orthognathic Surgery](#)
- [Physical Therapy](#)

INSTRUCTIONS FOR USE

The following Coverage Policy applies to health benefit plans administered by Cigna Companies. Certain Cigna Companies and/or lines of business only provide utilization review services to clients and do not make coverage determinations. References to standard benefit plan language and coverage determinations do not apply to those clients. Coverage Policies are intended to provide guidance in interpreting certain standard benefit plans administered by Cigna Companies. Please note, the terms of a customer's particular benefit plan document [Group Service Agreement, Evidence of Coverage, Certificate of Coverage, Summary Plan Description (SPD) or similar plan document] may differ significantly from the standard benefit plans upon which these Coverage Policies are based. For example, a customer's benefit plan document may contain a specific exclusion related to a topic addressed in a Coverage Policy. In the event of a conflict, a customer's benefit plan document always supersedes the information in the Coverage Policies. In the absence of a controlling federal or state coverage mandate, benefits are ultimately determined by the terms of the applicable benefit plan document. Coverage determinations in each specific instance require consideration of 1) the terms of the applicable benefit plan document in effect on the date of service; 2) any applicable laws/regulations; 3) any relevant collateral source materials including Coverage Policies and; 4) the specific facts of the particular situation. Each coverage request should be reviewed on its own merits. Medical directors are expected to exercise clinical judgment and have discretion in making individual coverage determinations. Coverage Policies relate exclusively to the administration of health benefit plans. Coverage Policies are not recommendations for treatment and should never be used as treatment guidelines. In certain markets, delegated vendor guidelines may be used to support medical necessity and other coverage determinations.

Overview

This Coverage Policy addresses surgical procedures for temporomandibular joint (TMJ) disorder. This Coverage Policy is not intended to address procedures performed on the temporomandibular joint for indications other than TMJ disorder.

Coverage Policy

Coverage for the treatment of temporomandibular joint (TMJ) disorder varies across plans. Refer to the customer's benefit plan document for coverage details.

Many medical plans do not cover orthodontic treatment provided as an adjunct to temporomandibular joint (TMJ) disorder surgery, because such treatment is considered dental in nature and, therefore, not covered under the medical benefit.

A letter of medical necessity is required for all requests for TMJ surgery and should include a detailed history of the condition, diagnostic imaging results and documentation of prior medical and surgical treatment.

Arthrocentesis

Arthrocentesis for temporomandibular joint (TMJ) disorder is considered medically necessary when EITHER of the following criteria is met:

- Pain persists despite at least six months of noninvasive therapies such as pharmacologic pain control, physical therapy and the use of intra-oral appliances.
- Clinical examination and/or diagnostic imaging indicate the presence of hypomobility of the temporomandibular joint and symptoms persist despite at least six months of noninvasive therapy such as physical therapy and the use of intra-oral appliances.

Arthroscopy

Arthroscopy for TMJ disorder is considered medically necessary when BOTH of the following criteria are met:

- Pain or significant hypomobility persists despite at least six months of scientifically recognized noninvasive therapies such as pharmacologic pain control, physical therapy and the use of intra-oral appliances.
- Clinical examination and diagnostic imaging indicate the presence of joint pathology that requires internal structural modification.

Arthrotomy

Arthrotomy for TMJ disorder is considered medically necessary when the criteria for arthroscopy listed above are met but arthroscopy is not technically feasible, appropriate, or has previously failed to resolve the problem being treated.

Arthrotomy with a FDA-approved total or partial prosthetic joint replacement is considered medically necessary when ANY of the following criteria are met, and the indication for surgery is confirmed by magnetic resonance imaging (MRI), computed tomography (CT) or corrected tomogram:

- inflammatory arthritis involving the TMJ not responsive to other modalities of treatment
- recurrent fibrosis and/or bony ankylosis not responsive to other modalities of treatment
- failed tissue graft
- failed alloplastic joint reconstruction
- loss of vertical mandibular condylar height due to bone resorption, trauma, developmental abnormality or pathologic lesion

General Background

The temporomandibular joint (TMJ) consists of two bilateral synovial joints formed by the mandibular condyles that fit into the glenoid fossa of the temporal bones. The function of the TMJ is unique in that two joints act as a single unit. An articular disc, or meniscus, composed of dense fibrous tissue, separates the condyle from the fossa and is connected by collateral ligaments to the condyle. The collateral ligaments allow rotational movement of the disc on the condyle during opening and closing of the jaw. Six principal skeletal masticatory muscles control TMJ movement and stabilization.

Temporomandibular Disease (TMD) is a collective term, which describes clinical problems that involve the function of the masticatory muscles and the jaw joint. TMD has been used to refer to a group of conditions that are often called "TMJ syndrome" by physicians and dentists to describe the pain associated with the head, neck, and jaw. This has resulted in confusion regarding diagnostic and treatment options.

Approximately 15-25% of the population exhibit symptoms of TMJ disorders during their lifetime, with onset typically occurring between 10-40 years of age. Women are affected more often than men (4:1 ratio). Symptoms generally affect only one side, occurring in either side with similar frequency (Insalaco, 2021).

There are two distinct categories: masticatory muscle disorders and temporomandibular joint disorders.

- Masticatory muscle problems may result from abnormal parafunctional habits such as bruxism and clenching of teeth in response to stress, referred pain patterns of the cervical spine, and systemic muscle disorders (e.g., dyskinesia, fibromyalgia, myositis). If the abnormal habits exceed the functional capacity of the jaw joint, temporomandibular joint pathology may occur.
- Temporomandibular joint disorders, which may also occur from varied etiologies (e.g., internal derangement, degenerative joint disease, rheumatoid arthritis, mandibular dislocation, neoplasia, ankylosis, condylar hyper- or hypoplasia, condylar osteolysis, fractures).

Typically, the initial presentation can be confusing as both a masticatory element and a joint disorder can coexist (American Association of Oral and Maxillofacial Surgeons [AAOMS], 2017b)

Diagnosis

There is no widely accepted standard test to diagnose TMD. In the majority of cases, the patient's history, signs and symptoms, combined with a physical examination of the face and jaw, provide sufficient information to diagnose these disorders. Routine x-rays may be used to identify underlying osteoarthritis or other bony abnormalities of the TMJ. Arthrography, magnetic resonance imaging (MRI) and computed tomography (CT) are generally not indicated, although selected studies may be appropriate for persistent TMD when clinical examination indicates the presence of internal derangement and surgery is being considered.

Treatment

Noninvasive, reversible therapies are used in the initial treatment of symptomatic TMD. In many cases, TMD is self-limiting and often responds to simple measures such as eating soft foods, applying heat or ice, and avoiding extreme jaw movements (e.g., wide yawning, gum chewing). Other conservative treatments may include:

- Pharmacological pain control: Nonsteroidal anti-inflammatory drugs (NSAIDs), opiates, muscle relaxants and low-dose antidepressants may be useful for symptom management.
- Physical therapy: A variety of modalities may be employed, including active or passive jaw movement, application of heat/ice and vapocoolant spray followed by gentle stretching.
- Intra-oral appliances: The two most common intra-oral appliances are stabilization splints and anterior positioning appliances. Stabilization splints may be used to provide joint stabilization, reduction of pressure within the joint and relaxation of elevator muscles. These appliances should not create major alteration in occlusion, since these changes may be irreversible and lead to other problems. Anterior positioning appliances, also called orthopedic repositioning appliances, are used for acute joint pain, painful crepitus and symptoms associated with acute limitation of motion caused by an anteriorly displaced disc without reduction (closed lock).

Surgery is only considered if there is persistent pain and functional limitations in patients with structural anatomic pathology or TMJ intraarticular disorders that do not respond to a reasonable course of nonsurgical interventions.

Literature Review

Arthrocentesis: This is a minimally invasive procedure that involves insertion of one or two needles into the joint (no skin incisions are made). The joint is washed to remove debris and inflammatory byproducts. Some surgeons will also manipulate the joint under anesthesia and/or inject a therapeutic medication in the joint. The procedure is intended to increase range of motion and function and reduce pain. Arthrocentesis is performed on an outpatient basis under local anesthesia and is an established treatment option for persistent symptoms (e.g., pain) following failed conservative treatment (Al-Moraissi, et al., 2020; Laskin, 2018; AAOMS, 2017b; Vos, et al., 2014).

Arthroscopy: Arthroscopy of the TMJ is a surgical procedure that provides direct visualization of joint function and allows confirmation of intra-articular pathology that cannot be confirmed by other means of evaluation. It is intended to reduce pain and increase mandibular range of motion. It may be indicated when joint pathology is refractory to medical treatment and requires internal structural modifications. Arthroscopy may be used to treat internal derangement, hypomobility secondary to intra-joint adhesions, synovitis, degenerative joint disease and hypermobility causing painful subluxation or dislocation. Arthroscopy is performed under general anesthesia and in many cases can be performed on an outpatient basis. Arthroscopy is an established treatment option for

persistent symptoms (e.g., pain) following failed conservative treatment (Al-Moraissi, et al., 2020; Hossameldin and McCain, 2018; AAOMS, 2017b; Al-Moraissi, 2015).

Arthrotomy: Arthrotomy is the most invasive surgical technique used to treat TMD. Arthrotomy is performed under general anesthesia on an outpatient or inpatient basis. The following surgical procedures are carried out through arthrotomy:

- **Disc Surgery:** In cases where the joint problem is in the disc itself, the surgeon may recommend a procedure to reposition (disc plication), remove (discectomy), or replace (disk replacement) the diseased cartilage.
- **Arthroplasty:** A procedure aimed at removing adhesions, bone spurs, and other growths in the jaw that are causing joint dysfunction and pain.
- **Joint Replacement:** The TMJ can be replaced partially or completely. Individuals with end-stage pathology and severe physiologic dysfunction benefit most from partial or total joint replacement.

There is inadequate guidance in the published medical literature regarding patient-selection criteria for these procedures. Invasive surgical treatment to treat TMD should only be considered when all appropriate conservative treatment has failed and minimally invasive surgery such as arthrocentesis or arthroscopy is not indicated.

Prosthetic Joint Replacement

U.S. Food and Drug Administration (FDA): In 1993, TMJ implants were reclassified by the Dental Products Advisory Panel as Class III Devices. Manufacturers were required at that time to submit a Premarket Approval Application (PMA) for any TMJ prosthetic implants currently on the market (product codes LZD and MPI). There are three prosthetic temporomandibular joint replacement (TJR) systems approved by the FDA:

TMJ Concepts Patient-Fitted TMJ Reconstruction Prosthesis <ul style="list-style-type: none">➤ TMJ CONCEPTS, Ventura, CA; P980052 July 1999➤ Patient-specific custom prosthesis with computer-aided design.
TMJ Fossa-Eminence/Condylar Prostheses (formerly TMJ Implants, Inc., known as the Christensen device) <ul style="list-style-type: none">➤ NEXUS CMF, LLC., Golden CO; P000023 Jan 2001, P000035 Feb 2001➤ Includes stock and custom devices, and partial devices.
Walter Lorenz Total Temporomandibular Joint Replacement System (known as BIOMET) <ul style="list-style-type: none">➤ Zimmer Biomet, Jacksonville, Florida; P020016 Sept 2005➤ Includes stock and custom devices.

Prosthesis is contraindicated in patients with active or suspected infections in or about the implantation site, known allergy to any of the component materials, patients with infection or malignancy in the head or neck region, and in patients with the ability to exert significant postoperative masticatory muscle hyperfunction (clenching or grinding) which may lead to overload and fracture of the device or loosening of the screws.

Literature Review: There are no randomized trials comparing the three prosthetic temporomandibular joint replacement (TJR) systems approved by the FDA. Recent meta-analyses have been completed (Zou, et al., 2018a; Johnson, et al., 2017). The meta-analysis by Zou et al. (2018a) included 20 studies with 1,262 patients. Case reports and cases series of fewer than 10 cases or a follow-up time shorter than one year were excluded. Outcome measurements were changes in maximal incisal opening (MIO), pain, dietary limitations, and functional deficiencies from before to after TJR. Comparison of the TJR systems showed no real difference for pre- versus postoperative MIO, pain, diet, and function. MIO and functional efficiency decreased gradually over time, but effective pain relief and improvements in dietary limitations were stable with no relevant differences during follow-up. Comparison of the custom and stock devices showed similar results for pre- and postoperative MIO, pain, function, and diet.

Professional Societies/Organizations

American Association of Oral and Maxillofacial Surgeons (AAOMS): The AAOMS Clinical Condition Statements on Temporomandibular Disorders was updated in 2017. The statement lists the following potential therapeutic options for temporomandibular joint disorders, and desired treatment outcomes:

- Non-surgical management:
 - medication (e.g., NSAIDs)
 - orthotic appliance
 - physical therapy

- Surgical treatment:
 - manipulation under anesthesia (e.g., brisement)
 - arthrocentesis
 - non-arthroscopic lysis and lavage and manipulation
 - arthroscopic surgery
 - diagnostic
 - operative
 - open arthroplasty with or without autograft
 - open arthroplasty with alloplast
 - disc repair or removal, with or without replacement
 - coronoidectomy
 - condylectomy
 - mandibular condylotomy
 - myotomy
 - orthognathic surgery
 - partial or total joint reconstruction (e.g., autogenous graft, allogeneic graft and alloplastic implant)

- Favorable therapeutic outcomes:
 - level of pain that is of little or no concern to the patient
 - improved jaw function
 - improved ability to masticate food
 - functional and stable occlusion
 - in a growing child, continued symmetrical growth of the mandible in proper relationship to the midface
 - limited period of disability
 - acceptable clinical appearance
 - absence of recurrent jaw locking or dislocation
 - limited progression of the disease

The AAOMS 2017 Parameters of Care: Clinical Practice Guidelines for Oral and Maxillofacial Surgery (Temporomandibular Joint Surgery) state that temporomandibular joint (TMJ) surgery is indicated for the treatment of a wide range of pathologic conditions. The guideline details indications for therapy, therapeutic goals, and specific factors affecting risk, therapeutic parameters, and outcome assessment indices for multiple conditions. The authors' state that surgical intervention for internal derangement arthritic conditions, degenerative joint disease, infectious arthritis, and ankylosis/restricted jaw motion is indicated only when nonsurgical therapy has been ineffective and pain and/or dysfunction are moderate to severe.

American Association for Dental, Oral, and Craniofacial Research (AADOCR): In a policy statement on TMD, the AADOCR recommends that, unless there are specific indications otherwise, initial treatment of TMD should be focused on the use of conservative, reversible and evidence-based therapeutic interventions. Conservative modalities present a lower risk of harm, and may be at least as effective in providing symptomatic relief as more invasive treatments (AADOCR, 2015).

American Academy of Pediatric Dentistry (AAPD): The AAPD recommendations for the diagnosis and treatment of TMJ disorders in infants, children, and adolescents were updated in 2020. The AAPD advised that every dental history and exam should address TMJ history and assessment. Imaging and specialist referral may be appropriate if signs and symptoms of TMJ disorder are present. Reversible therapies should be considered for children and adolescents with TMJ disorder, and irreversible treatments should be avoided (AAPD, 2020).

The American Board of Internal Medicine’s (ABIM) Foundation Choosing Wisely® Initiative
The American Dental Association states to “Avoid routinely using irreversible surgical procedures such as braces, occlusal equilibration and restorations as the first treatment of choice in the management of temporomandibular joint disorders” (released June 27, 2016).

Use Outside the U.S.

National Institute for Health and Care Excellence (NICE) (United Kingdom): Interventional procedure guidance issued by NICE in August 2014 states that “Current evidence on the efficacy and safety of total prosthetic replacement of the temporomandibular joint is adequate to support the use of this procedure provided that normal arrangements are in place for clinical governance, consent and audit”.

Medicare Coverage Determinations

	Contractor	Determination Name/Number	Revision Effective Date
NCD		No National Coverage Determination found	
LCD		No Local Coverage Determination found	

Note: Please review the current Medicare Policy for the most up-to-date information.

Coding/Billing Information

- Note:** 1) This list of codes may not be all-inclusive.
2) Deleted codes and codes which are not effective at the time the service is rendered may not be eligible for reimbursement.

Considered Medically Necessary when criteria in the applicable policy statements listed above are met:

CPT®* Codes	Description
20605	Arthrocentesis, aspiration and/or injection, intermediate joint or bursa (eg, temporomandibular, acromioclavicular, wrist, elbow, or ankle, olecranon bursa); without ultrasound guidance
20606	Arthrocentesis, aspiration and/or injection, intermediate joint or bursa (eg, temporomandibular, acromioclavicular, wrist, elbow, or ankle, olecranon bursa); with ultrasound guidance, with permanent recording and reporting
21010	Arthrotomy, temporomandibular joint
21050	Condylectomy, temporomandibular joint (separate procedure)
21060	Menisectomy, partial or complete, temporomandibular joint (separate procedure)
21240	Arthroplasty, temporomandibular joint, with or without autograft (includes obtaining graft)
21242	Arthroplasty, temporomandibular joint, with allograft
21243	Arthroplasty, temporomandibular joint, with prosthetic joint replacement
21247	Reconstruction of mandibular condyle with bone and cartilage autografts (includes obtaining grafts) (eg, for hemifacial microsomia)
29800	Arthroscopy, temporomandibular joint, diagnostic, with or without synovial biopsy (separate procedure)
29804	Arthroscopy, temporomandibular joint, surgical

*Current Procedural Terminology (CPT®) ©2020 American Medical Association: Chicago, IL.

References

1. Aagaard E, Thygesen T. A prospective, single-centre study on patient outcomes following temporomandibular joint replacement using a custom-made Biomet TMJ prosthesis. *Int J Oral Maxillofac Surg.* 2014 Oct;43(10):1229-35.
2. Al-Moraissi EA. Arthroscopy versus arthrocentesis in the management of internal derangement of the temporomandibular joint: a systematic review and meta-analysis. *Int J Oral Maxillofac Surg.* 2015 Jan;44(1):104-12.
3. Al-Moraissi EA, Wolford LM, Ellis E 3rd, Neff A. The hierarchy of different treatments for arthrogenous temporomandibular disorders: A network meta-analysis of randomized clinical trials. *J Craniomaxillofac Surg.* 2020 Jan;48(1):9-23.
4. American Academy of Pediatric Dentistry (AAPD). Acquired temporomandibular disorders in infants, children, and adolescents. *The Reference Manual of Pediatric Dentistry.* Chicago, Ill.: American Academy of Pediatric Dentistry; 2020:410-7.
5. American Association for Dental, Oral, and Craniofacial Research (AADOCR). Policy Statement: Temporomandibular Disorders (TMD). Reaffirmed 2015. Accessed October 12, 2021. Available at URL address: <https://www.iadr.org/aadocr>
6. American Association of Oral and Maxillofacial Surgeons (AAOMS). Parameters of Care: AAOMS Clinical Practice Guidelines for Oral and Maxillofacial Surgery. Temporomandibular Joint Surgery. (AAOMS ParCare) Sixth Edition. 2017a. Accessed October 12, 2021. Available at URL address: <https://www.aaoms.org>
7. American Association of Oral and Maxillofacial Surgeons (AAOMS). Clinical Condition Statements. Temporomandibular Disorders. 2017b. Accessed October 12, 2021. Available at URL address: <https://www.aaoms.org/practice-resources/aaoms-advocacy-and-position-statements/clinical-resources>
8. American Society of Temporomandibular Joint Surgeons. Surgical Management of TMJ Disorders. Not dated. Accessed October 12, 2021. Available at URL address: <https://astmjs.org/education/surgical-management-of-tmj-disorders>
9. Baltali E, Keller EE. Surgical management of advanced osteoarthritis of the temporomandibular joint with metal fossa-eminence hemijoint replacement: 10-year retrospective study. *J Oral Maxillofac Surg.* 2008 Sep;66(9):1847-55.
10. Boyo A, McKay J, Lebovic G, Psutka DJ. Temporomandibular joint total replacement using the Zimmer Biomet Microfixation patient-matched prosthesis results in reduced pain and improved function. *Oral Surg Oral Med Oral Pathol Oral Radiol.* 2019 Apr 26. pii: S2212-4403(19)30477-8.
11. Centers for Medicare and Medicaid Services (CMS). Local Coverage Determinations (LCDs) alphabetical index. Accessed October 13, 2021. Available at URL address: <https://www.cms.gov/medicare-coverage-database/indexes/lcd-alphabetical-index.aspx>
12. Centers for Medicare and Medicaid Services (CMS). National Coverage Determinations (NCDs) alphabetical index. Accessed October 13, 2021. Available at URL address: <https://www.cms.gov/medicare-coverage-database/indexes/ncd-alphabetical-index.aspx>
13. Choosing Wisely®. ABIM Foundation. Accessed October 5, 2021. Available at URL address: <https://www.choosingwisely.org/clinician-lists/>

14. de Souza RF, Lovato da Silva CH, Nasser M, Fedorowicz Z, Al-Muharraqi MA. Interventions for the management of temporomandibular joint osteoarthritis. *Cochrane Database Syst Rev.* 2012 Apr 18;4:CD007261.
15. Dimitroulis G, Austin S, Sin Lee PV, Ackland D. A new three-dimensional, print-on-demand temporomandibular prosthetic total joint replacement system: Preliminary outcomes. *J Craniomaxillofac Surg.* 2018 Aug;46(8):1192-1198.
16. Gerbino G, Zavattoni E, Bosco G, Berrone S, Ramieri G. Temporomandibular joint reconstruction with stock and custom-made devices: Indications and results of a 14-year experience. *J Craniomaxillofac Surg.* 2017 Oct;45(10):1710-1715.
17. Giannakopoulos HE, Sinn DP, Quinn PD. Biomet Microfixation Temporomandibular Joint Replacement System: a 3-year follow-up study of patients treated during 1995 to 2005. *J Oral Maxillofac Surg.* 2012 Apr;70(4):787-94; discussion 795-6.
18. Gonzalez-Perez LM, Fakh-Gomez N, Gonzalez-Perez-Somarriba B, Centeno G, Montes-Carmona JF. Two-year prospective study of outcomes following total temporomandibular joint replacement. *Int J Oral Maxillofac Surg.* 2016a Jan;45(1):78-84.
19. Gonzalez-Perez LM, Gonzalez-Perez-Somarriba B, Centeno G, Vallellano C, Montes-Carmona JF. Evaluation of total alloplastic temporo-mandibular joint replacement with two different types of prostheses: A three-year prospective study. *Med Oral Patol Oral Cir Bucal.* 2016b Nov 1;21(6):e766-e775.
20. Gruber EA, McCullough J, Sidebottom AJ. Medium-term outcomes and complications after total replacement of the temporomandibular joint. Prospective outcome analysis after 3 and 5 years. *Br J Oral Maxillofac Surg.* 2015 May;53(5):412-5.
21. Hossameldin RH, McCain JP. Outcomes of office-based temporomandibular joint arthroscopy: a 5-year retrospective study. *Int J Oral Maxillofac Surg.* 2018 Jan;47(1):90-97.
22. Insalaco LF. Temporomandibular Joint Syndrome. In *Ferri's Clinical Advisor 2022.* Elsevier; 2021:1464-1465.e1.
23. Johnson NR, Roberts MJ, Doi SA, Batstone MD. Total temporomandibular joint replacement prostheses: a systematic review and bias-adjusted meta-analysis. *Int J Oral Maxillofac Surg.* 2017 Jan;46(1):86-92.
24. Kanatas AN, Jenkins GW, Smith AB, Worrall SF. Changes in pain and mouth opening at 1 year following temporomandibular joint replacement--a prospective study. *Br J Oral Maxillofac Surg.* 2011 Sep;49(6):455-8.
25. Kanatas AN, Needs C, Smith AB, Moran A, Jenkins G, Worrall SF. Short-term outcomes using the Christensen patient-specific temporomandibular joint implant system: a prospective study. *Br J Oral Maxillofac Surg.* 2012 Mar;50(2):149-53.
26. Kanatsios S, Breik O, Dimitroulis G. Biomet stock temporomandibular joint prosthesis: Long-term outcomes of the use of titanium condyles secured with four or five condylar fixation screws. *J Craniomaxillofac Surg.* 2018 Oct;46(10):1697-1702.
27. Keller EE, Baltali E, Liang X, Zhao K, Huebner M, An KN. Temporomandibular custom hemijoint replacement prosthesis: prospective clinical and kinematic study. *J Oral Maxillofac Surg.* 2012 Feb;70(2):276-88.
28. Laskin DM. Arthroscopy Versus Arthrocentesis for Treating Internal Derangements of the Temporomandibular Joint. *Oral Maxillofac Surg Clin North Am.* 2018 Aug;30(3):325-328.

29. Leandro LF, Ono HY, Loureiro CC, Marinho K, Guevara HA. A ten-year experience and follow-up of three hundred patients fitted with the Biomet/Lorenz Microfixation TMJ replacement system. *Int J Oral Maxillofac Surg*. 2013 Aug;42(8):1007-13.
30. Lindenmeyer A, Sutcliffe P, Eghtessad M, Goulden R, Speculand B, Harris M. Oral and maxillofacial surgery and chronic painful temporomandibular disorders--a systematic review. *J Oral Maxillofac Surg*. 2010 Nov;68(11):2755-64.
31. Linsen SS, Reich RH, Teschke M. Pressure pain threshold and oral health-related quality of life implications of patients with alloplastic temporomandibular joint replacement--a prospective study. *J Oral Maxillofac Surg*. 2012 Nov;70(11):2531-42.
32. McKenzie WS, Louis PJ. Temporomandibular total joint prosthesis infections: a ten-year retrospective analysis. *Int J Oral Maxillofac Surg*. 2017 May;46(5):596-602.
33. Mehta NR. Temporomandibular disorders in adults. In: UpToDate, Aronson MD, Deschler DG (Eds.). April 19, 2021. UpToDate, Waltham, MA. Accessed October 12, 2021.
34. Mercuri LG, Edibam NR, Giobbie-Hurder A. Fourteen-year follow-up of a patient-fitted total temporomandibular joint reconstruction system. *J Oral Maxillofac Surg*. 2007 Jun;65(6):1140-8.
35. National Institutes of Health. National Institute of Dental and Craniofacial Research. Health Topics. TMJ (Temporomandibular Joint and Muscle Disorders). Updated July 2018. Accessed October 12, 2021. Available at URL address: <https://www.nidcr.nih.gov/health-info/tmj/more-info>
36. National Institute of Health and Care Excellence (NICE). Interventional procedure guidance 500. Total prosthetic replacement of the temporomandibular joint. August 27, 2014. Accessed October 12, 2021. Available at URL address: <https://www.nice.org.uk/guidance/ipg500>
37. Nyberg J, Adell R, Svenson B. Temporomandibular joint discectomy for treatment of unilateral internal derangements: a 5 year follow-up evaluation. *Int J Oral Maxillofac Surg*. 2004 Jan;33(1):8-12.
38. O'Connor RC, Saleem S, Sidebottom AJ. Prospective outcome analysis of total replacement of the temporomandibular joint with the TMJ Concepts system in patients with inflammatory arthritic diseases. *Br J Oral Maxillofac Surg*. 2016 Jul;54(6):604-9.
39. Sahdev R, Wu BW, Anderson N, Khawaja SN, Kim S, Keith DA. A Retrospective Study of Patient Outcomes After Temporomandibular Joint Replacement With Alloplastic Total Joint Prosthesis at Massachusetts General Hospital. *J Oral Maxillofac Surg*. 2019 Feb;77(2):280-288.
40. Sanovich R, Mehta U, Abramowicz S, Widmer C, Dolwick MF. Total alloplastic temporomandibular joint reconstruction using Biomet stock prostheses: the University of Florida experience. *Int J Oral Maxillofac Surg*. 2014 Sep;43(9):1091-5.
41. Sidebottom AJ, Gruber E. One-year prospective outcome analysis and complications following total replacement of the temporomandibular joint with the TMJ Concepts system. *Br J Oral Maxillofac Surg*. 2013 Oct;51(7):620-4.
42. TMJ Concepts. Accessed October 12, 2021. Available at URL address: <https://tmjconcepts.com/>
43. U.S. Food and Drug Administration. Temporomandibular Joint (TMJ) Implants. July 7, 2021. Accessed October 12, 2021. Available at URL address: <https://www.fda.gov/medical-devices/temporomandibular-disorders-tmd-devices/temporomandibular-joint-tmj-implants>

44. U.S. Food and Drug Administration. Premarket Approval (PMA). TMJ Concepts Patient-Fitted TMJ Reconstruction Prosthesis. P980052. July 1999. Accessed October 12, 2021. Available at URL address: https://www.accessdata.fda.gov/cdrh_docs/pdf/P980052A.pdf
45. U.S. Food and Drug Administration. Premarket Approval (PMA). Walter Lorenz Total Temporomandibular Joint Replacement System. P020016. Approved Sep 2005. Accessed October 12, 2021. Available at URL address: https://www.accessdata.fda.gov/cdrh_docs/pdf2/P020016B.pdf
46. U.S. Food and Drug Administration. Premarket Approval (PMA). TMJ Fossa-Eminence/Condylar Prostheses. P000023. Approved Jan 2001. Accessed October 12, 2021. Available at URL address: https://www.accessdata.fda.gov/cdrh_docs/pdf/P000023B.pdf
47. U.S. Food and Drug Administration. Premarket Approval (PMA). TMJ Fossa-Eminence Prosthesis™. P000035. Approved Feb 2001. Accessed October 12, 2021. Available at URL address: https://www.accessdata.fda.gov/cdrh_docs/pdf/P000035B.pdf
48. Vos LM, Huddleston Slater JJ, Stegenga B. Arthrocentesis as initial treatment for temporomandibular joint arthropathy: a randomized controlled trial. *J Craniomaxillofac Surg.* 2014 Jul;42(5):e134-9.
49. Wolford LM, Mercuri LG, Schneiderman ED, Movahed R, Allen W. Twenty-year follow-up study on a patient-fitted temporomandibular joint prosthesis: the Techmedica/TMJ Concepts device. *J Oral Maxillofac Surg.* 2015 May;73(5):952-60.
50. Wolford LM, Pitta MC, Reiche-Fishel, O. TMJ Concepts/Techmedica custom-made TMJ total joint prosthesis: 5-year follow-up study. *Int J Oral Maxillofac Surg.* 2003 Jun;32(3):268-74.
51. Yoda T, Ogi N, Yoshitake H, Kawakami T, Takagi R, Murakami K, Yuasa H, Kondoh T, Tei K, Kurita K. Clinical guidelines for total temporomandibular joint replacement. *Jpn Dent Sci Rev.* 2020 Nov;56(1):77-83.
52. Zimmer Biomet. Healthcare Professionals. Total Mandibular Joint Replacement System. Accessed October 12, 2021. Available at URL address: <https://www.zimmerbiomet.com/en/products-and-solutions/specialties/cmfm.html>
53. Zou L, He D, Ellis E. A Comparison of Clinical Follow-Up of Different Total Temporomandibular Joint Replacement Prostheses: A Systematic Review and Meta-Analysis. *J Oral Maxillofac Surg.* 2018a Feb;76(2):294-303.
54. Zou L, Zhang L, He D, Yang C, Zhao J, et al. Clinical and Radiologic Follow-Up of Zimmer Biomet Stock Total Temporomandibular Joint Replacement After Surgical Modifications. *J Oral Maxillofac Surg.* 2018b Dec;76(12):2518-2524.

"Cigna Companies" refers to operating subsidiaries of Cigna Corporation. All products and services are provided exclusively by or through such operating subsidiaries, including Cigna Health and Life Insurance Company, Connecticut General Life Insurance Company, Cigna Behavioral Health, Inc., Cigna Health Management, Inc., QualCare, Inc., and HMO or service company subsidiaries of Cigna Health Corporation. The Cigna name, logo, and other Cigna marks are owned by Cigna Intellectual Property, Inc. © 2021 Cigna.