02-33000-19

Original Effective Date: 06/15/00

Reviewed: 01/22/26

Revised: 02/15/26

Subject: Transmyocardial Revascularization (TMR)

THIS MEDICAL COVERAGE GUIDELINE IS NOT AN AUTHORIZATION, CERTIFICATION, EXPLANATION OF BENEFITS, OR A GUARANTEE OF PAYMENT, NOR DOES IT SUBSTITUTE FOR OR CONSTITUTE MEDICAL ADVICE. ALL MEDICAL DECISIONS ARE SOLELY THE RESPONSIBILITY OF THE PATIENT AND PHYSICIAN. BENEFITS ARE DETERMINED BY THE GROUP CONTRACT, MEMBER BENEFIT BOOKLET, AND/OR INDIVIDUAL SUBSCRIBER CERTIFICATE IN EFFECT AT THE TIME SERVICES WERE RENDERED. THIS MEDICAL COVERAGE GUIDELINE APPLIES TO ALL LINES OF BUSINESS UNLESS OTHERWISE NOTED IN THE PROGRAM EXCEPTIONS SECTION.

Position Statement	Billing/Coding	Reimbursement	Program Exceptions	Definitions	Related Guidelines
Other	References	Updates			

DESCRIPTION:

Transmyocardial revascularization (TMR), also known as transmyocardial laser revascularization, is a surgical technique that attempts to improve blood flow to ischemic heart muscles by creating direct channels from the left ventricle into the myocardium. TMR may be performed via a thoracotomy or percutaneous TMR (PTMR).The patient is under general anesthesia for a TMR performed via a thoracotomy. Cardiopulmonary bypass is not required. A laser probe is placed on the surface of the myocardium, and while the heart is in diastole, the laser is discharged to create a channel through the myocardium into the left ventricle.

PTMR (also called percutaneous myocardial channeling) is a catheter-based system using holmium:YAG laser revascularization under fluoroscopic guidance. Although less invasive than TMR, PTMR has potential disadvantages. To minimize the risks of cardiac tamponade, a potentially fatal condition in which the pericardium fills with blood, the myocardial channels created by PTMR are not as deep as those made by TMR. Also, positioning the laser under fluoroscopic guidance is less precise than the direct visual control of TMR. Less invasive (eg, robotic) techniques for use of this procedure are also being studied.

POSITION STATEMENT:

Transmyocardial laser revascularization **meets the definition of medical necessity** for members with class III or IV angina, who are *not* candidates for coronary artery bypass graft (CABG) surgery or percutaneous transluminal coronary angioplasty (PTCA) surgery who meet **ALL** of the following criteria:

- Presence of class III or IV angina refractory to medical management;
- Documentation of reversible ischemia;
- Left ventricular ejection fraction greater than 30%;
- No evidence of recent myocardial infarction (MI) or unstable angina within the last 21 days; **AND**
- No severe comorbid illness such as chronic obstructive pulmonary disease (COPD).

Transmyocardial laser revascularization **meets the definition of medical necessity** as an adjunct to coronary artery bypass graft (CABG) in those members with documented areas of ischemic myocardium that are amenable to surgical revascularization.

Transmyocardial laser revascularization is considered **experimental or investigational** for all other indications not meeting the above criteria. The evidence is insufficient to determine the effects of the technology on health outcomes.

Percutaneous transmyocardial laser revascularization is considered **experimental or investigational** for all indications. The evidence is insufficient to determine the effects of the technology on health outcomes.

BILLING/CODING INFORMATION:

CPT Coding

33140	Transmyocardial laser revascularization, by thoracotomy; (separate procedure)
33141	Transmyocardial laser revascularization, by thoracotomy; performed at the time of other open cardiac procedure(s) (List separately in addition to code for primary procedure

ICD-10 Diagnosis Codes That Support Medical Necessity

I20.0 – I20.9	Angina pectoris
I25.110 – I25.119	Atherosclerotic heart disease of native coronary artery with angina pectoris
I25.89	Other forms of chronic ischemic heart disease
I25.9	Chronic ischemic heart disease, unspecified

REIMBURSEMENT INFORMATION:

Refer to sections entitled **POSITION STATEMENT**.

PROGRAM EXCEPTIONS:

Federal Employee Program (FEP): Follow FEP guidelines.

State Account Organization (SAO): Follow SAO guidelines.

Medicare Advantage products:

The following National Coverage Determination (NCD) was reviewed on the last guideline reviewed date: Transmyocardial Revascularization (TMR) (20.6) located at cms.gov.

If this Medical Coverage Guideline contains a step therapy requirement, in compliance with Florida law 627.42393, members or providers may request a step therapy protocol exemption to this requirement if based on medical necessity. The process for requesting a protocol exemption can be found at Coverage Protocol Exemption Request

DEFINITIONS:

Angina pectoris (angina): pain radiating from the heart caused by decreased blood supply to the myocardium.

Atherosclerosis: accumulation of plaque containing cholesterol and lipid material, within the inner walls of arteries.

Class III angina: Canadian Cardiovascular Society (CCS) functional classification for angina: Marked limitation of ordinary activity. Angina when walking one or two blocks on the level, or when climbing one flight of stairs at a normal pace.

Class IV angina: Canadian Cardiovascular Society (CCS) functional classification for angina: Inability to carry on any physical activity without discomfort. Angina may be present at rest.

Coronary artery disease: atherosclerotic blockage of the arteries supplying blood to the myocardium.

Ejection fraction: a clinical cardiac measurement – end-systolic volume-end-systolic volume end diastolic volume = ejection fraction.

Myocardium: the heart muscle.

RELATED GUIDELINES:

None applicable.

OTHER:

None applicable.

REFERENCES:

1. Allen KB, Dowling RD, Schuch DR, Pfeffer TA, Marra S, Lefrak EA, Fudge TL, Mostovych M, Szentpetery S, Saha SP, Murphy D, Dennis H. Adjunctive transmyocardial revascularization: five-year follow-up of a prospective randomized trial. Ann Thorac Surg. 2004 Aug; 78(2): 458-65; discussion 458-65.
2. Blue Cross Blue Shield Association Evidence Positioning System®, 7.01.54 Transmyocardial Revascularization, 04/25.
3. Blue Cross Blue Shield Association Technology Evaluation Center (TEC). TMR as an adjunct to CABG surgery for the treatment of coronary artery disease. TEC Assessments. 2001;Volume 16:Tab 1.
4. Bridges CR, Horvath KA, Nugent WC, Shahian DM, Haan CK, Shemin RJ, Allen KB, Edwards FH. The Society of Thoracic Surgeons practice guideline series: transmyocardial laser revascularization. Ann Thorac Surg. 2004. Apr; 77:1494-1502.
5. Briones E, Lacalle JR, Marin I. Transmyocardial laser revascularization versus medical therapy for refractory angina. Cochrane Database of Systematic Reviews 2009, Issue 1. Art. No.: CD003712.
6. Centers for Medicare & Medicaid Services (CMS), National Coverage Determination (NCD) for Transmyocardial Revascularization (TMR), (20.6), located at cms.gov.
7. Dallan LA, Gowdak LH, Lisboa LA, Schettert I, Krieger JE, Cesar LA, Oliveira SA, Stolf NA. Cell therapy plus transmyocardial laser revascularization: a proposed alternative procedure for refractory angina] Rev Bras Cir Cardiovasc. 2008 Mar;23(1):46-52. Portuguese.
8. Eagle KA, Guyton RA, Davidoff R, Edwards FH, Ewy GA, Gardner TJ, Hart JC, Herrmann HC, Hillis LD, Hutter AM Jr, Lytle BW, Marlow RA, Nugent WC, Orszulak TA. ACC/AHA 2004 guideline update for coronary artery bypass graft surgery: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee to Update the 1999 Guidelines for Coronary Artery Bypass Graft Surgery). American College of Cardiology Web Site. Accessed at: acc.org 04/09/11.
9. Fihn SD, Gardin JM, et al. 2012 ACCF/AHA/ACP/AATS/PCNA/SCAI/STS Guideline for the diagnosis and management of patients with stable ischemic heart disease: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines, and the American College of Physicians, American Association for Thoracic Surgery, Preventive Cardiovascular Nurses Association, Society for Cardiovascular Angiography and Interventions, and Society of Thoracic Surgeons. J Am Coll Cardiol. Dec 18 2012;60(24):e44-e164.

10. Gibbons RJ, Abrams J, Chatterjee K, Daley J, Deedwania PC, Douglas JS, Ferguson TB Jr., Fihn SD, Fraker TD Jr., Gardin JM, O'Rourke RA, Pasternak RC, Williams SV. ACC/AHA 2002 guideline update for the management of patients with chronic stable angina: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee to Update the 1999 Guidelines for the Management of Patients with Chronic Stable Angina). 2002. Accessed at: acc.org 04/09/11.
11. Kloner RA, Chaitman B. Angina and Its Management. J Cardiovasc Pharmacol Ther, 22 (3), 199-209 May 2017. PMID: 28196437.
12. Konstanty-Kalandyk J, Piatek J, et al. Ten-year Follow-Up After Combined Coronary Artery Bypass Grafting and Transmyocardial Laser Revascularization in Patients With Disseminated Coronary Atherosclerosis. Lasers Med Sci, 33 (7), 1527-1535 Sep 2018. PMID: 29732521.
13. Laham RJ, Simons M. Transmyocardial laser revascularization for management of refractory angina. In: UpToDate, Aldea GS, Verrier E, Gersh BJ, Dardas TF (Eds), UpToDate, Waltham, MA 2023; accessed at uptodate.com.
14. Lawton JS, Tamis-Holland JE, et al. 2021 ACC/AHA/SCAI Guideline for Coronary Artery Revascularization: Executive Summary: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. Circulation. 2022 Jan 18;145(3):e4-e17.
15. Leon MB, Kornowski R, et al. A blinded, randomized, placebo-controlled trial of percutaneous laser myocardial revascularization to improve angina symptoms in patients with severe coronary disease. J Am Coll Cardiol. 2005 Nov 15;46(10):1812-9. PMID: 16286164.
16. Liao L, Sarria-Santamera A, Matchar DB, Huntington A, Lin S, Whellan DJ, Kong DF. Meta-analysis of survival and relief of angina pectoris after transmyocardial revascularization Am J Cardiol. 2005 May 15; 95(10): 1243-5.
17. McGillion M, Cook A, et al. Effectiveness of percutaneous laser revascularization therapy for refractory angina. Vasc Health Risk Manag. 2010 Sep 7:6:735-47.
18. National Institute for Health and Clinical Excellence (NICE), Percutaneous laser revascularisation for refractory angina pectoris; Interventional Procedure Guidance 302; 05/09 accessed at nice.org.uk.
19. National Institute for Health and Clinical Excellence (NICE), Transmyocardial Laser Revascularisation for Refractory Angina Pectoris, Interventional Procedure Guidance 301, 05/09; accessed at nice.org.uk.
20. Oesterle SN, Sanborn TA, et al. Percutaneous transmyocardial laser revascularisation for severe angina: the PACIFIC randomised trial. Potential Class Improvement From Intramyocardial Channels. Lancet. 2000 Nov 18;356(9243):1705-10. PMID:11095257.
21. Sarria-Santamera A,Liao L, Huntington A, Matchar D B. Percutaneous myocardial laser revascularization and transmyocardial laser revascularization. Rockville: Agency for Healthcare Research and Quality (AHRQ). 2004:131. Agency for Healthcare Research and Quality (AHRQ).
22. Simons M, Laham RJ. New therapies for angina pectoris. In: UpToDate, Kaski JC, Dardas TF (Eds), UpToDate, Waltham, MA 2022; accessed at uptodate.com.
23. U.S. Food & Drug Administration (FDA); accessed at fda.gov.

COMMITTEE APPROVAL:

This Medical Coverage Guideline (MCG) was approved by the Florida Blue Medical Policy and Coverage Committee on 01/22/26.

GUIDELINE UPDATE INFORMATION:

06/15/00	Medical Coverage Guideline developed.
09/15/01	Changes to Covered Services" section.
10/15/03	Review and revision of guideline; consisting of updated references and addition of investigational statement for percutaneous myocardial revascularization.
10/15/05	Review and revision of guideline; consisting of updated references.
10/15/06	Review and revision of guideline consisting of updated references.
07/15/07	Annual review, coverage statement maintained, guideline reformatted, references updated.
10/15/08	Review and revision of guideline consisting of updated references.
07/15/09	Annual review: position statements maintained and references updated.
10/15/10	Revision; related ICD-10 codes added.
06/15/11	Scheduled review; position statements maintained, coding section and references updated.
05/11/14	Revision: Program Exceptions section updated.
10/01/15	Revision; ICD9 & ICD10 coding sections updated.
11/01/15	Revision: ICD-9 Codes deleted.
05/15/17	Revision; Investigational position statement added; description, program exception and references updated.
06/15/18	Revision; Description, coding, and references updated.
05/15/20	Review; Position statements maintained and references updated.
04/15/22	Review: Position statements maintained; references updated.
05/23/23	Update to Program Exceptions section.
05/15/24	Review: Position statements maintained; description and references updated.
02/15/26	Position statements maintained.