MEDICAL POLICY – 8.01.55

Stem Cell Therapy for Peripheral Arterial Disease

BCBSA Ref. Policy: 8.01.55

Effective Date: May 1, 2019
Last Revised: April 2, 2019
Replaces: N/A

RELATED MEDICAL POLICIES:
2.01.16 Recombinant and Autologous Platelet-Derived Growth Factors for Wound Healing and Other Non-Orthopedic Conditions
2.02.18 Progenitor Cell Therapy for the Treatment of Damaged Myocardium Due to Ischemia
8.01.52 Orthopedic Applications of Stem Cell Therapy (Including Allografts and Bone Substitutes Used with Autologous Bone Marrow)

Select a hyperlink below to be directed to that section.

POLICY CRITERIA | CODING | RELATED INFORMATION
EVIDENCE REVIEW | REFERENCES | HISTORY

∞ Clicking this icon returns you to the hyperlinks menu above.

Introduction

Peripheral arterial disease (PAD) is a condition in which plaque builds up in the arteries. Fat, cholesterol, and other substances in the blood make up the plaque. Over time the plaque becomes so thick and hard that the blood has trouble flowing through the artery. While PAD can affect the arms, organs, or the legs, it most often affects the legs. Pain and numbness are symptoms of PAD in the legs. PAD also increases the risk of infection and tissue death. If enough tissue dies, the leg may need to be removed. Using stem cells as a way to treat PAD is being studied. The idea is to use stem cells to stimulate the body to create new blood vessels. Using stem cells to treat PAD is unproven. Larger and longer studies are needed to find out if this treatment is safe and how long it might last.

Note: The Introduction section is for your general knowledge and is not to be taken as policy coverage criteria. The rest of the policy uses specific words and concepts familiar to medical professionals. It is intended for providers. A provider can be a person, such as a doctor, nurse, psychologist, or dentist. A provider also can be a place where medical care is given, like a hospital, clinic, or lab. This policy informs them about when a service may be covered.
Policy Coverage Criteria

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Investigational</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment of peripheral arterial disease</td>
<td>Treatment of peripheral arterial disease, including critical limb ischemia, with injection or infusion of cells from concentrated bone marrow, expanded in vitro, stimulated from peripheral blood, or from an allogeneic source, is considered investigational.</td>
</tr>
</tbody>
</table>

Coding

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0263T</td>
<td>Intramuscular autologous bone marrow cell therapy, with preparation of harvested cells, multiple injections, one leg, including ultrasound guidance, if performed; complete procedure including unilateral or bilateral bone marrow harvest</td>
</tr>
<tr>
<td>0264T</td>
<td>Intramuscular autologous bone marrow cell therapy, with preparation of harvested cells, multiple injections, one leg, including ultrasound guidance, if performed; complete procedure excluding bone marrow harvest</td>
</tr>
<tr>
<td>0265T</td>
<td>Intramuscular autologous bone marrow cell therapy, with preparation of harvested cells, multiple injections, one leg, including ultrasound guidance, if performed; unilateral or bilateral bone marrow harvest only for intramuscular autologous bone marrow cell therapy</td>
</tr>
</tbody>
</table>

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Related Information

N/A
Description

Critical limb ischemia due to peripheral arterial disease results in pain at rest, ulcers, and creates a significant risk for limb loss. Injection or infusion of stem cells, either concentrated from bone marrow, expanded in vitro, stimulated from peripheral blood, or from an allogeneic source, is being evaluated for the treatment of critical limb ischemia.

Background

*Peripheral Arterial Disease (PAD)*

PAD is a common atherosclerotic syndrome associated with significant morbidity and mortality. A less common cause of PAD is Buerger disease (also called thromboangiitis obliterans), which is a nonatherosclerotic segmental inflammatory disease that occurs in younger patients and is associated with tobacco use. Development of PAD is characterized by narrowing and occlusion of arterial vessels and eventual reduction in distal perfusion. Critical limb ischemia is the end stage of lower-extremity PAD in which severe obstruction of blood flow results in ischemic pain at rest, ulcers, and a significant risk for limb loss.

Physiology

Two endogenous compensating mechanisms may occur with occlusion of arterial vessels: capillary growth (angiogenesis) and development of collateral arterial vessels (arteriogenesis). Capillary growth is mediated by hypoxia-induced release of chemokines and cytokines such as vascular endothelial growth factor and occurs by sprouting of small endothelial tubes from preexisting capillary beds. The resulting capillaries are small and cannot sufficiently compensate for a large occluded artery. Arteriogenesis with collateral growth is, in contrast, initiated by increasing shear forces against vessel walls when blood flow is redirected from the occluded transport artery to the small collateral branches, leading to an increase in the diameter of preexisting collateral arterioles.

The mechanism underlying arteriogenesis includes the migration of bone marrow-derived monocytes to the perivascular space. The bone marrow-derived monocytes adhere to and
invade the collateral vessel wall. It is not known if the expansion of the collateral arteriole is due to the incorporation of stem cells into the wall of the vessel or to cytokines released by monocytic bone marrow cells that induce the proliferation of resident endothelial cells. It has been proposed that bone marrow-derived monocytic cells may be the putative circulating endothelial progenitor cells. Notably, the same risk factors for advanced ischemia (diabetes, smoking, hyperlipidemia, advanced age) are also risk factors for a lower number of circulating progenitor cells.

**Treatment**

Use of autologous stem cells freshly harvested and allogeneic stem cells are purported to have a role in the treatment of peripheral arterial disease. The primary outcome in stem cell therapy trials regulated by the U.S. Food and Drug Administration (FDA) is amputation-free survival. Other outcomes for CLI include the Rutherford criteria for limb status, healing of ulcers, the Ankle-Brachial Index (ABI), transcutaneous oxygen pressure (TcO2), and pain-free walking. The Rutherford criteria include ankle and toe pressure, the level of claudication, ischemic rest pain, tissue loss, nonhealing ulcer, and gangrene. The ABI measures arterial segmental pressures on the ankle and brachium, and indexes ankle systolic pressure against brachial systolic pressure (normative range, 0.95–1.2 mm Hg). An increase greater than 0.1 mmHg is considered to be clinically significant. TcO2 is measured with an oxymonitor; the normal value is 70 to 90 mm Hg. Pain-free walking may be measured by time on a treadmill, or more frequently, by distance in a 400-meter walk.

**Summary of Evidence**

For individuals who have peripheral arterial disease who receive stem cell therapy, the evidence includes small randomized trials, systematic reviews, retrospective reviews, and case series. The relevant outcomes are overall survival, symptoms, change in disease status, morbid events, functional outcomes, quality of life, and treatment-related morbidity. The current literature on stem cells as a treatment for critical limb ischemia due to peripheral arterial disease consists primarily of phase 2 studies using various cell preparation methods and methods of administration. A meta-analysis of the trials with the lowest risk of bias has shown no significant benefit of stem cell therapy for overall survival, amputation-free survival, or amputation rates. Two randomized controlled trials have been published that used granulocyte colony-stimulating factor mobilized peripheral mononuclear cells. The route of administration of the cell therapy and the primary outcomes differed between studies. In the trial that added cell therapy to
guideline-based care, there were no significant differences in progression-free survival and frequency of limb amputation at one year of follow-up. There was a substantial rate of subsequent surgical intervention in both arms. Well-designed randomized controlled trials with a larger number of subjects and low-risk of bias are needed to evaluate the health outcomes of these various procedures. Several are in progress, including multicenter randomized, double-blind, placebo-controlled trials. More data on the safety and durability of these treatments are also needed. The evidence is insufficient to determine the effects of the technology on health outcomes.

Ongoing and Unpublished Clinical Trials

Some currently unpublished trials that might influence this review are listed in Table 1. A search of ClinicalTrials.gov in January 2018 and reviews by Powell (2012) and Bartel et al in (2013) identified a number of ongoing trials with concentrated, expanded, or stimulated stem cells for PAD (see Table 1).

The review by Powell (2012) evaluated the effects of biologic therapy in patients with CLI and described several products in phase 2 or 3 trials. The U.S. Food and Drug Administration recommended that the primary efficacy end point in a phase 3 CLI trial should be amputation-free survival. When the probability of this outcome is combined with the comorbid burden of CLI patients and variable natural history, a large numbers of patients (≈500) may be needed to evaluate clinical outcomes.

Table 1. Summary of Key Trials

<table>
<thead>
<tr>
<th>NCT No.</th>
<th>Trial Name</th>
<th>Planned Enrollment</th>
<th>Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ongoing</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NCT01049919a</td>
<td>MarrowStim PAD Kit for the Treatment of Critical Limb Ischemia (CLI) in Subjects With Severe Peripheral Arterial Disease (PAD) (MOBILE)</td>
<td>152</td>
<td>May 2020</td>
</tr>
<tr>
<td>NCT03304821</td>
<td>Granulocyte-Macrophage Stimulating Factor (GM-CSF) in Peripheral Artery Disease: the GPAD-3 Study</td>
<td>176</td>
<td>Jun 2022</td>
</tr>
<tr>
<td><strong>Unpublished</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NCT01483898a</td>
<td>An Efficacy and Safety Study of Ixmyelocel-T in Patients With Critical Limb Ischemia (CLI) (REVIVE)</td>
<td>594</td>
<td>Apr 2014 (last update)</td>
</tr>
<tr>
<td>NCT No.</td>
<td>Trial Name</td>
<td>Planned Enrollment</td>
<td>Completion Date</td>
</tr>
<tr>
<td>-----------------</td>
<td>----------------------------------------------------------------------------</td>
<td>--------------------</td>
<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>NCT01245335[^a^]</td>
<td>Pivotal Study of the Safety and Effectiveness of Autologous Bone Marrow Aspirate Concentrate (BMAC) for the Treatment of Critical Limb Ischemia Due to Peripheral Arterial Disease</td>
<td>97</td>
</tr>
<tr>
<td></td>
<td>NCT02538978[^a^]</td>
<td>Safety and Effectiveness of the SurgWerksTM-CLI Kit and VXPTM System for the Rapid Intra-operative Aspiration, Preparation and Intramuscular Injection of Concentrated Autologous Bone Marrow Cells Into the Ischemic Index Limb of Rutherford Category 5 Non-Reconstructable Critical Limb Ischemia Patients</td>
<td>224</td>
</tr>
<tr>
<td></td>
<td>NCT01679990[^a^]</td>
<td>A Phase II, Randomized, Double-Blind, Multicenter, Multinational, Placebo-Controlled, Parallel-Groups Study to Evaluate the Safety and Efficacy of Intramuscular Injections of Allogeneic PLX-PAD Cells for the Treatment of Subjects With Intermittent Claudication (IC)</td>
<td>172</td>
</tr>
</tbody>
</table>

[^a^]: Denotes industry-sponsored or cosponsored trial.

NCT: national clinical trial.

Practice Guidelines and Position Statements

**American Heart Association and American College of Cardiology**

The guidelines from the American Heart Association and American College of Cardiology (2016) provided recommendations on the management of patients with lower-extremity peripheral arterial disease (PAD), including surgical and endovascular revascularization for critical limb ischemia (CLI).[17][18] Stem cell therapy for PAD was not addressed.

**European Society of Cardiology**

The European Society of Cardiology (2011) guidelines on the diagnosis and treatment of PAD did not recommend for or against stem cell therapy for PAD.[19] However, in 2017, updated guidelines, published in collaboration with the European Society of Vascular Surgery, stated:
“Angiogenic gene and stem cell therapy are still being investigated with insufficient evidence in favour of these treatments.” The current recommendation is that stem cell/gene therapy is not indicated in patients with chronic limb-threatening ischemia (class of recommendation: III; level of evidence: B).\textsuperscript{20}

**Medicare National Coverage**

There is no national coverage determination.

**Regulatory Status**

Two devices that provide point-of-care concentration of bone marrow aspirate have been cleared by the Food and Drug Administration through the 510(k) process and are summarized in Table 2.

Table 2. FDA Approved Point-of-Care Concentration of Bone Marrow Aspirate Devices

<table>
<thead>
<tr>
<th>Device</th>
<th>Manufacturer</th>
<th>Location</th>
<th>Date Cleared</th>
<th>510(k) No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>The SmarktPReP2® Bone Marrow Aspirate Concentrate System</td>
<td>Harvest Technologies</td>
<td>Lakewood, CO</td>
<td>12/06/2010</td>
<td>K103340</td>
</tr>
<tr>
<td>SmarktPReP Platelet Concentration System</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MarrowStim Concentration System</td>
<td>Biomet Biologics, Inc</td>
<td>Warsaw, IN</td>
<td>12/18/2009</td>
<td>BK090008</td>
</tr>
</tbody>
</table>

FDA product code: JQC.

**References**


### History

<table>
<thead>
<tr>
<th>Date</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>08/09/11</td>
<td>New policy; add to Therapy section. Policy created with literature review through March 2011; considered investigational.</td>
</tr>
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<td>07/20/12</td>
<td>Replace policy. Policy updated with literature review through February 2012, rationale section revised. References 4 and 10 added. Policy statement is unchanged.</td>
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<tr>
<td>10/09/12</td>
<td>Update Coding Section – ICD-10 codes are now effective 10/01/2014.</td>
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<tr>
<td>07/08/13</td>
<td>Replace policy. Policy updated with literature review through April 8, 2013; references 3, 4, 6, 10, 12, 13, 15 added; references reordered; policy statement unchanged.</td>
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<tr>
<td>08/20/13</td>
<td>Update Related Policies. Change title to 2.02.18.</td>
</tr>
<tr>
<td>07/31/14</td>
<td>Annual Review. Policy updated with literature review through April, 2014. References 5,14 added; others renumbered/removed. Policy statement unchanged.</td>
</tr>
<tr>
<td>07/14/15</td>
<td>Annual Review. Policy updated with literature review through April 14, 2015; references 4, 9, and 23 added; policy statement unchanged. ICD-9 and ICD-10 procedure codes removed; these were listed for informational purposes only.</td>
</tr>
<tr>
<td>04/01/16</td>
<td>Annual Review, approved March 8, 2016. Policy updated with literature review through November 17, 2015; references 4, 7, and 9 added; some references removed. Policy statement unchanged.</td>
</tr>
<tr>
<td>09/01/17</td>
<td>Annual Review, approved August 22, 2017. Policy updated with literature review through June 4, 2017; references 3 and 14 added. Policy statement updated to describe specific sources of stem cells.</td>
</tr>
<tr>
<td>Date</td>
<td>Comments</td>
</tr>
<tr>
<td>------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>05/01/19</td>
<td>Annual Review, approved April 2, 2019. Policy updated with literature review through October 2018; references 4, 8 and 16 added. Policy statement unchanged.</td>
</tr>
</tbody>
</table>

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U.S. Department of Health and Human Services
200 Independence Avenue SW, Room S09FF, HHH Building
Washington, D.C. 20201, 1-800-368-1019, 800-537-7697 (TDD)

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