Policy Number	**SUR701.035**
Policy Effective Date	**02/15/2025**
Policy End Date	**12/31/2025**

Percutaneous Image-Guided Nerve Cryoablation for Phantom Limb Pain (PLP)

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Related Policies (if applicable)
None

Disclaimer

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Each benefit plan, summary plan description or contract defines which services are covered, which services are excluded, and which services are subject to dollar caps or other limitations, conditions or exclusions. Members and their providers have the responsibility for consulting the member's benefit plan, summary plan description or contract to determine if there are any exclusions or other benefit limitations applicable to this service or supply. **If there is a discrepancy between a Medical Policy and a member's benefit plan, summary plan description or contract, the benefit plan, summary plan description or contract will govern.**

Coverage

This medical policy has become inactive as of the end date above. There is no current active version and this policy is not to be used for current claims adjudication or business purposes.

Percutaneous image-guided nerve cryoablation for the treatment of phantom limb pain **is considered experimental, investigational and/or unproven.**

Policy Guidelines

None.

Description

Background

Approximately 356 million limb amputations are performed globally every year. Sometimes, when a limb is removed during an amputation, an individual will continue to have an internal sense of the lost limb. This phenomenon is known as phantom limb pain (PLP) and is experienced by approximately 85% of some the 185,000 U.S. individuals who have an arm, leg or portions thereof surgically amputated each year. (1) Their pain is real and is often accompanied by other health problems, such as depression, anxiety, sleep disorders, and a general decrease in quality of life. Scientists believe that following amputation, nerve cells "rewire" themselves and continue to receive messages, resulting in a remapping of the brain's circuitry. Investigators predict that by 2050, an estimated 3.6 million U.S. amputees may be living with the chronic burning, stabbing, or aching sensations of phantom limb pain. (1)

The understanding of PLP has improved tremendously in recent years. Investigators previously believed that brain cells affected by amputation simply died off. They attributed sensations of pain at the site of the amputation to irritation of nerves located near the limb stamnos, using imaging techniques such as positron emission tomography (PET) and magnetic resonance imaging (MRI), scientists can actually visualize increased activity in the brain's cortex when an individual feels phantom pain. When study participants move the stump of an amputated limb, neurons in the brain remain dynamic and excitable. Surprisingly, the brain's cells can be stimulated by other body parts, often those located closest to the missing limb. Current treatments for PLP may include analgesics, anticonvulsants, and other types of drugs; nerve blocks; electrical stimulation; psychological counseling, biofeedback, hypnosis, and acupuncture; and, in rare instances, surgery. (2)

Percutaneous Cryoablation

Cryoablation or cryoneurolysis has been used for years to treat the pain of metastatic disease. Recently, investigators have been using image guidance to target nerves, enabling treatments for a variety of historically difficult to manage pain syndromes. Percutaneous cryoablation is one treatment being investigated to treat PLP. Under imaging guidance, corresponding nerves are targeted with a cryoablation needle. Two freeze-thaw cycles are undertaken, dropping the temperature to a negative 70 degrees centigrade for 25 minutes. The tip of the probe forms an ice ball that is noted to surround and destroy the targeted tissue. (3) Recent studies suggest that cryoneurolysis can provide an effective, safe, and nonpharmacological therapeutic option to treat an array of chronic pain conditions, but that further research is still required.

Rationale

Percutaneous image-guided nerve cryoablation was assessed in treating phantom limb pain in a small pilot study conducted by Prologo et al. from Emory University School of Medicine (4) in Atlanta. The Emory team in this proof-of-concept study treated 20 patients with refractory phantom pain following amputation with computed tomography - and ultrasound-guided cryoablation of the nerve and scar tissue in the residual limb. During the procedure, a cryoablation probe was guided through the skin and the temperature dropped to negative 40 degrees for 25 minutes, creating a targeted ablation zone, shutting down nerve signals. The

patients were asked to rate their pain on a Visual Analog Scale (VAS) that ranged from 1 (not painful) to 10 (extremely painful) before the procedure and seven and 45 days afterward. The technical success rate was 100% and there were no procedure-related complications. Trends in VAS and Modified Roland Morris Disability Questionnaire (MRMDQ) scores compared to baseline values were observed as mild decreases at 7 days and statistically significant decreases at 45 days post-procedure ($p=0.002$ and $p<0.001$, respectively). Before cryoablation, patients' average pain score was 6.4 points. By day 45, it had dropped to 2.4 points. The author's note that this preliminary data suggests that image-guided nerve cryoablation may be a new therapeutic option for patients with phantom limb pain, a condition that has historically been very difficult to treat. The investigators are continuing to follow the patients to gauge effectiveness at 6 months after treatment and beyond and have applied for a Department of Defense grant to continue their research.

In another prospective study conducted by Prologo et al., the feasibility, safety, and short-term efficacy of percutaneous image-guided target nerve cryoablation for the treatment of phantom limb pain was conducted in a ten patient, proof of concept, pilot cohort. (3) Ten patients (2 males, 8 females, age range 33-65 years) with refractory phantom pain following amputation were consecutively enrolled from January 2015-June 2015. Each subject underwent percutaneous image-guided (CT and ultrasound) cryoablation of the nerve and/or neuroma in their symptomatic residual limb that corresponded to the distribution of their symptoms. VAS scores and responses to a MRMDQ were documented at baseline, 7 days post-procedure, and on day 45. Analysis of covariance (ANCOVA), with baseline scores included as covariates, was used to evaluate differences in scores over time. The technical success rate of the procedures was 100%. There were no procedure-related complications. Trends in VAS and MRMDQ scores compared to baseline values were observed as mild decreases at 7 days and statistically significant decreases at 45 days post-procedure, respectively). The investigators concluded that image-guided percutaneous nerve cryoablation is feasible and safe and may represent a new efficacious therapy for patients with phantom pains related to limb loss.

Ilfeld et al. (2023) conducted a multicenter, randomized, observer- and participant-masked, sham-controlled, parallel-arm, partial crossover clinical trial to determine if a single treatment of ultrasound-guided percutaneous cryoneurolysis would provide effective and lasting analgesia for established lower extremity phantom limb pain. (5) Specifically, researchers tested the primary hypothesis that the change in average phantom limb pain intensity between baseline and 4 months would be greater after cryoneurolysis versus sham treatment. The authors enrolled a total of 144 patients with a lower-limb amputation and established phantom pain. Each received a single-injection femoral and sciatic nerve block with lidocaine and was subsequently randomized to receive either ultrasound-guided percutaneous cryoneurolysis or sham treatment at these same locations. The primary outcome was the change in average phantom pain intensity between baseline and 4 months as measured with a numeric rating scale (0 to 10), after which an optional crossover treatment was offered. Investigators, participants, and clinical staff were masked to treatment group assignment with the exception of the treating physician performing the cryoneurolysis, who had no subsequent participant interaction. Pretreatment phantom pain scores were similar in both groups, with a median

[quartiles] of 5.0 [4.0, 6.0] for active treatment and 5.0 [4.0, 7.0] for sham. After 4 months, pain intensity decreased by 0.5 [–0.5, 3.0] in patients given cryoneurolysis (n=71) versus 0 [0, 3] in patients given sham (n=73), with an estimated difference (95% CI) of –0.1 (–1.0 to 0.7), *P* = 0.759. Following their statistical gatekeeping protocol, the authors did not make inferences or draw conclusions on secondary endpoints. One serious adverse event occurred after a protocol deviation in which a femoral nerve cryolesion was induced just below the inguinal ligament—instead of the sensory-only saphenous nerve—which resulted in quadriceps weakness, and possibly a fall and clavicle fracture. Researchers concluded that percutaneous cryoneurolysis did not decrease chronic lower extremity phantom limb pain 4 months after treatment. However, these results were based upon the authors' specific study protocol, and since the optimal cryoneurolysis treatment parameters such as freeze duration and anatomic treatment location remain unknown, further research is warranted. (5)

Finneran et al. (2024) conducted a randomized, controlled pilot study to evaluate the use of percutaneous cryoneurolysis for the treatment of pain following amputation to 1) determine the feasibility of and optimize the study protocol for a subsequent definitive clinical trial; and 2) estimate analgesia and opioid reduction within the first postoperative weeks. (6) A convenience sample of seven patients undergoing lower extremity amputation were randomized to receive either active cryoneurolysis or a sham procedure targeting the sciatic and femoral nerves in a participant-masked fashion. Compared to the participants who received sham treatment (n=3), those who underwent active cryoneurolysis (n=4) reported lower pain scores and decreased opioid consumption at nearly all time points between days one and 21 following amputation. Given the small sample size, data was not analyzed statistically. These results should be interpreted with caution based on the small number of participants and relatively unsuccessful follow-up after three postoperative weeks. The authors concluded that further investigation in the form of larger randomized controlled trials appears warranted, and that these data may serve to help power such investigations.

Summary of Evidence

At this time, percutaneous image-guided nerve cryoablation for the treatment of phantom limb pain (PLP) continues to be investigated and caution remains about the current preliminary findings until further research is completed. Percutaneous image-guided nerve cryoablation for PLP is considered experimental, investigational and/or unproven.

Coding

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The presence or absence of procedure, service, supply, or device codes in a Medical Policy document has no relevance for determination of benefit coverage for members or reimbursement for providers. **Only the written coverage position in a Medical Policy should be used for such determinations.**

Benefit coverage determinations based on written Medical Policy coverage positions must include review of the member's benefit contract or Summary Plan Description (SPD) for defined coverage vs. non-coverage, benefit exclusions, and benefit limitations such as dollar or duration caps.

CPT Codes	0440T, 0441T, 0442T
HCPCS Codes	None

*Current Procedural Terminology (CPT®) ©2024 American Medical Association: Chicago, IL.

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Centers for Medicare and Medicaid Services (CMS)

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The Centers for Medicare and Medicaid Services (CMS) does not have a national Medicare coverage position. Coverage may be subject to local carrier discretion.

A national coverage position for Medicare may have been developed since this medical policy document was written. See Medicare's National Coverage at <https://www.cms.hhs.gov>.

Policy History/Revision

Date	Description of Change
12/31/2025	Document became inactive.
02/15/2025	Document updated with literature review. Coverage unchanged. References 1 and 5 added.

03/15/2024	Document updated with literature review. Coverage unchanged. Reference 3 and 4 added/some revised.
06/01/2023	Reviewed. No changes.
01/01/2023	Document updated with literature review. Coverage unchanged. No new references added.
11/01/2021	Reviewed. No changes.
01/15/2021	Document updated with literature review. Coverage unchanged. No new references added.
09/15/2019	Reviewed. No changes.
05/15/2018	Document updated with literature review. Coverage unchanged. No references added.
07/15/2017	Reviewed. No changes.
07/01/2016	New medical policy. Percutaneous image-guided nerve cryoablation for the treatment of phantom limb pain (PLP) is considered experimental, investigational and/or unproven.