Medical Coverage Policy

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Peripheral Nerve Destruction for Pain Conditions

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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 where appropriate and have discretion in making individual coverage determinations. Where coverage for care or services does not depend on specific circumstances, reimbursement will only be provided if a requested service(s) is submitted in accordance with the relevant criteria outlined in the applicable Coverage Policy, including covered diagnosis and/or procedure code(s). Reimbursement is not allowed for services when billed for conditions or diagnoses that are not covered under this Coverage Policy (see "Coding Information" below). When billing, providers

must use the most appropriate codes as of the effective date of the submission. Claims submitted for services that are not accompanied by covered code(s) under the applicable Coverage Policy will be denied as not covered. 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 destruction of a peripheral nerve using cryoablation, or electrical, laser, chemical or radiofrequency ablation, alone or in combination, for treatment of trigeminal neuralgia, chronic sacroiliac joint, knee, and/or foot pain, headache and/or occipital neuralgia, and pain resulting from conditions such as complex regional pain syndrome, peripheral nerve entrapment/compression, or peripheral neuropathies.

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Peripheral nerve destruction using radiofrequency ablation or glycerol rhizotomy is considered medically necessary for treatment of trigeminal neuralgia refractory to other alternative treatments (e.g., medication, microdecompression).

Percutaneous cryoablation of distal/peripheral nerves in the lower extremities is considered experimental, investigational, or unproven.

Peripheral nerve destruction using cryoablation or laser, electrical, chemical or radiofrequency ablation is not covered or reimbursable for treatment of ANY of the following conditions:

- sacroiliac joint pain
- knee pain
- hip pain
- shoulder pain
- foot/heel pain
- headache
- occipital neuralgia
- intercostal neuralgia
- lower extremity pain resulting from any of the following:
  - complex regional pain syndrome
  - peripheral nerve entrapment/compression (e.g., tarsal tunnel syndrome, sciatica)
  - peripheral neuropathy

Coding Information

Notes:

1. This list of codes may not be all-inclusive since the American Medical Association (AMA) and Centers for Medicare & Medicaid Services (CMS) code updates may occur more frequently than policy updates.
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
61790	Creation of lesion by stereotactic method, percutaneous, by neurolytic agent (eg, alcohol, thermal, electrical, radiofrequency); gasserian ganglion
61791	Creation of lesion by stereotactic method, percutaneous, by neurolytic agent (eg, alcohol, thermal, electrical, radiofrequency); trigeminal medullary tract
64600	Destruction by neurolytic agent, trigeminal nerve; supraorbital, infraorbital, mental, or inferior alveolar branch
64605	Destruction by neurolytic agent, trigeminal nerve; second and third division branches at foramen ovale
64610	Destruction by neurolytic agent, trigeminal nerve; second and third division branches at foramen ovale under radiologic monitoring

Considered Experimental/Investigational/Unproven when used for the treatment of pain conditions as outlined in the above coverage policy statement:

CPT®* Codes	Description
0441T	Ablation, percutaneous, cryoablation, includes imaging guidance; lower extremity distal/peripheral nerve

HCPCS Codes	Description
C9808	Nerve cryoablation probe (e.g., cryoICE, cryoSPHERE, cryoSPHERE MAX, cryo2), including probe and all disposable system components, nonopioid medical device (must be a qualifying Medicare nonopioid medical device for postsurgical pain relief in accordance with Section 4135 of the CAA, 2023)
C9809	Cryoablation needle (e.g., iovera system), including needle/tip and all disposable system components, nonopioid medical device (must be a qualifying Medicare nonopioid medical device for postsurgical pain relief in accordance with Section 4135 of the CAA, 2023)

Not Covered or Reimbursable when used for the treatment of pain conditions as outlined in the above coverage policy statement:

CPT®* Codes	Description
64624	Destruction by neurolytic agent, genicular nerve branches including imaging guidance, when performed
64632	Destruction by neurolytic agent, plantar common digital nerve
64640	Destruction by neurolytic agent; other peripheral nerve or branch

ICD-10-CM Diagnosis Codes	Description
G43.001	Migraine without aura, not intractable, with status migrainosus
G43.009	Migraine without aura, not intractable, without status migrainosus
G43.011	Migraine without aura, intractable, with status migrainosus
G43.019	Migraine without aura, intractable, without status migrainosus

ICD-10-CM Diagnosis Codes	Description
G43.101	Migraine with aura, not intractable, with status migrainosus
G43.109	Migraine with aura, not intractable, without status migrainosus
G43.111	Migraine with aura, intractable, with status migrainosus
G43.119	Migraine with aura, intractable, without status migrainosus
G43.401	Hemiplegic migraine, not intractable, with status migrainosus
G43.409	Hemiplegic migraine, not intractable, without status migrainosus
G43.411	Hemiplegic migraine, intractable, with status migrainosus
G43.419	Hemiplegic migraine, intractable, without status migrainosus
G43.501	Persistent migraine aura without cerebral infarction, not intractable, with status migrainosus
G43.509	Persistent migraine aura without cerebral infarction, not intractable, without status migrainosus
G43.511	Persistent migraine aura without cerebral infarction, intractable, with status migrainosus
G43.519	Persistent migraine aura without cerebral infarction, intractable, without status migrainosus
G43.601	Persistent migraine aura with cerebral infarction, not intractable, with status migrainosus
G43.609	Persistent migraine aura with cerebral infarction, not intractable, without status migrainosus
G43.611	Persistent migraine aura with cerebral infarction, intractable, with status migrainosus
G43.619	Persistent migraine aura with cerebral infarction, intractable, without status migrainosus
G43.701	Chronic migraine without aura, not intractable, with status migrainosus
G43.709	Chronic migraine without aura, not intractable, without status migrainosus
G43.711	Chronic migraine without aura, intractable, with status migrainosus
G43.719	Chronic migraine without aura, intractable, without status migrainosus
G43.801	Other migraine, not intractable, with status migrainosus
G43.809	Other migraine, not intractable, without status migrainosus
G43.811	Other migraine, intractable, with status migrainosus
G43.819	Other migraine, intractable, without status migrainosus
G43.821	Menstrual migraine, not intractable, with status migrainosus
G43.829	Menstrual migraine, not intractable, without status migrainosus
G43.831	Menstrual migraine, intractable, with status migrainosus
G43.839	Menstrual migraine, intractable, without status migrainosus
G43.901	Migraine, unspecified, not intractable, with status migrainosus
G43.909	Migraine, unspecified, not intractable, without status migrainosus
G43.911	Migraine, unspecified, intractable, with status migrainosus
G43.919	Migraine, unspecified, intractable, without status migrainosus
G43.E01	Chronic migraine with aura, not intractable, with status migrainosus
G43.E09	Chronic migraine with aura, not intractable, without status migrainosus
G43.E11	Chronic migraine with aura, intractable, with status migrainosus
G43.E19	Chronic migraine with aura, intractable, without status migrainosus
G44.001-G44.89	Other headache syndromes
G54.1	Lumbosacral plexus disorders
G54.4	Lumbosacral root disorders, not elsewhere classified

ICD-10-CM Diagnosis Codes	Description
G57.00	Lesion of sciatic nerve, unspecified lower limb
G57.01	Lesion of sciatic nerve, right lower limb
G57.02	Lesion of sciatic nerve, left lower limb
G57.03	Lesion of sciatic nerve, bilateral lower limbs
G57.10	Meralgia paresthetica, unspecified lower limb
G57.11	Meralgia paresthetica, right lower limb
G57.12	Meralgia paresthetica, left lower limb
G57.13	Meralgia paresthetica, bilateral lower limbs
G57.30	Lesion of lateral popliteal nerve, unspecified lower limb
G57.31	Lesion of lateral popliteal nerve, right lower limb
G57.32	Lesion of lateral popliteal nerve, left lower limb
G57.33	Lesion of lateral popliteal nerve, bilateral lower limbs
G57.40	Lesion of medial popliteal nerve, unspecified lower limb
G57.41	Lesion of medial popliteal nerve, right lower limb
G57.42	Lesion of medial popliteal nerve, left lower limb
G57.43	Lesion of medial popliteal nerve, bilateral lower limbs
G57.50	Tarsal tunnel syndrome, unspecified lower limb
G57.51	Tarsal tunnel syndrome, right lower limb
G57.52	Tarsal tunnel syndrome, left lower limb
G57.53	Tarsal tunnel syndrome, bilateral lower limbs
G57.60	Lesion of plantar nerve, unspecified lower limb
G57.61	Lesion of plantar nerve, right lower limb
G57.62	Lesion of plantar nerve, left lower limb
G57.63	Lesion of plantar nerve, bilateral lower limbs
G57.70	Causalgia of unspecified lower limb
G57.71	Causalgia of right lower limb
G57.72	Causalgia of left lower limb
G57.73	Causalgia of bilateral lower limbs
G57.80	Other specified mononeuropathies of unspecified lower limb
G57.81	Other specified mononeuropathies of right lower limb
G57.82	Other specified mononeuropathies of left lower limb
G57.83	Other specified mononeuropathies of bilateral lower limbs
G57.90	Unspecified mononeuropathy of unspecified lower limb
G57.91	Unspecified mononeuropathy of right lower limb
G57.92	Unspecified mononeuropathy of left lower limb
G57.93	Unspecified mononeuropathy of bilateral lower limbs
G58.0	Intercostal neuropathy
G89.29	Other chronic pain
G89.4	Chronic pain syndrome
G90.521	Complex regional pain syndrome I of right lower limb
G90.522	Complex regional pain syndrome I of left lower limb
G90.523	Complex regional pain syndrome I of lower limb, bilateral
G90.529	Complex regional pain syndrome I of unspecified lower limb
M00.011	Staphylococcal arthritis, right shoulder
M00.012	Staphylococcal arthritis, left shoulder
M00.019	Staphylococcal arthritis, unspecified shoulder
M00.111	Pneumococcal arthritis, right shoulder
M00.112	Pneumococcal arthritis, left shoulder

ICD-10-CM Diagnosis Codes	Description
M00.119	Pneumococcal arthritis, unspecified shoulder
M02.811	Other reactive arthropathies, right shoulder
M02.812	Other reactive arthropathies, left shoulder
M02.819	Other reactive arthropathies, unspecified shoulder
M05.111	Rheumatoid lung disease with rheumatoid arthritis of right shoulder
M05.112	Rheumatoid lung disease with rheumatoid arthritis of left shoulder
M05.119	Rheumatoid lung disease with rheumatoid arthritis of unspecified shoulder
M05.151	Rheumatoid lung disease with rheumatoid arthritis of right hip
M05.152	Rheumatoid lung disease with rheumatoid arthritis of left hip
M05.159	Rheumatoid lung disease with rheumatoid arthritis of unspecified hip
M05.161	Rheumatoid lung disease with rheumatoid arthritis of right knee
M05.162	Rheumatoid lung disease with rheumatoid arthritis of left knee
M05.169	Rheumatoid lung disease with rheumatoid arthritis of unspecified knee
M05.171	Rheumatoid lung disease with rheumatoid arthritis of right ankle and foot
M05.172	Rheumatoid lung disease with rheumatoid arthritis of left ankle and foot
M05.179	Rheumatoid lung disease with rheumatoid arthritis of unspecified ankle and foot
M05.211	Rheumatoid vasculitis with rheumatoid arthritis of right shoulder
M05.212	Rheumatoid vasculitis with rheumatoid arthritis of left shoulder
M05.219	Rheumatoid vasculitis with rheumatoid arthritis of unspecified shoulder
M05.251	Rheumatoid vasculitis with rheumatoid arthritis of right hip
M05.252	Rheumatoid vasculitis with rheumatoid arthritis of left hip
M05.259	Rheumatoid vasculitis with rheumatoid arthritis of unspecified hip
M05.261	Rheumatoid vasculitis with rheumatoid arthritis of right knee
M05.262	Rheumatoid vasculitis with rheumatoid arthritis of left knee
M05.269	Rheumatoid vasculitis with rheumatoid arthritis of unspecified knee
M05.271	Rheumatoid vasculitis with rheumatoid arthritis of right ankle and foot
M05.272	Rheumatoid vasculitis with rheumatoid arthritis of left ankle and foot
M05.279	Rheumatoid vasculitis with rheumatoid arthritis of unspecified ankle and foot
M05.311	Rheumatoid heart disease with rheumatoid arthritis of right shoulder
M05.312	Rheumatoid heart disease with rheumatoid arthritis of left shoulder
M05.319	Rheumatoid heart disease with rheumatoid arthritis of unspecified shoulder
M05.351	Rheumatoid heart disease with rheumatoid arthritis of right hip
M05.352	Rheumatoid heart disease with rheumatoid arthritis of left hip
M05.359	Rheumatoid heart disease with rheumatoid arthritis of unspecified hip
M05.361	Rheumatoid heart disease with rheumatoid arthritis of right knee
M05.362	Rheumatoid heart disease with rheumatoid arthritis of left knee
M05.369	Rheumatoid heart disease with rheumatoid arthritis of unspecified knee
M05.371	Rheumatoid heart disease with rheumatoid arthritis of right ankle and foot
M05.372	Rheumatoid heart disease with rheumatoid arthritis of left ankle and foot
M05.379	Rheumatoid heart disease with rheumatoid arthritis of unspecified ankle and foot
M05.411	Rheumatoid myopathy with rheumatoid arthritis of right shoulder
M05.412	Rheumatoid myopathy with rheumatoid arthritis of left shoulder
M05.419	Rheumatoid myopathy with rheumatoid arthritis of unspecified shoulder
M05.451	Rheumatoid myopathy with rheumatoid arthritis of right hip
M05.452	Rheumatoid myopathy with rheumatoid arthritis of left hip
M05.459	Rheumatoid myopathy with rheumatoid arthritis of unspecified hip
M05.461	Rheumatoid myopathy with rheumatoid arthritis of right knee
M05.462	Rheumatoid myopathy with rheumatoid arthritis of left knee

ICD-10-CM Diagnosis Codes	Description
M05.469	Rheumatoid myopathy with rheumatoid arthritis of unspecified knee
M05.471	Rheumatoid myopathy with rheumatoid arthritis of right ankle and foot
M05.472	Rheumatoid myopathy with rheumatoid arthritis of left ankle and foot
M05.479	Rheumatoid myopathy with rheumatoid arthritis of unspecified ankle and foot
M05.511	Rheumatoid polyneuropathy with rheumatoid arthritis of right shoulder
M05.512	Rheumatoid polyneuropathy with rheumatoid arthritis of left shoulder
M05.519	Rheumatoid polyneuropathy with rheumatoid arthritis of unspecified shoulder
M05.551	Rheumatoid polyneuropathy with rheumatoid arthritis of right hip
M05.552	Rheumatoid polyneuropathy with rheumatoid arthritis of left hip
M05.559	Rheumatoid polyneuropathy with rheumatoid arthritis of unspecified hip
M05.561	Rheumatoid polyneuropathy with rheumatoid arthritis of right knee
M05.562	Rheumatoid polyneuropathy with rheumatoid arthritis of left knee
M05.569	Rheumatoid polyneuropathy with rheumatoid arthritis of unspecified knee
M05.571	Rheumatoid polyneuropathy with rheumatoid arthritis of right ankle and foot
M05.572	Rheumatoid polyneuropathy with rheumatoid arthritis of left ankle and foot
M05.579	Rheumatoid polyneuropathy with rheumatoid arthritis of unspecified ankle and foot
M05.611	Rheumatoid arthritis of right shoulder with involvement of other organs and systems
M05.612	Rheumatoid arthritis of left shoulder with involvement of other organs and systems
M05.619	Rheumatoid arthritis of unspecified shoulder with involvement of other organs and systems
M05.651	Rheumatoid arthritis of right hip with involvement of other organs and systems
M05.652	Rheumatoid arthritis of left hip with involvement of other organs and systems
M05.659	Rheumatoid arthritis of unspecified hip with involvement of other organs and systems
M05.661	Rheumatoid arthritis of right knee with involvement of other organs and systems
M05.662	Rheumatoid arthritis of left knee with involvement of other organs and systems
M05.669	Rheumatoid arthritis of unspecified knee with involvement of other organs and systems
M05.671	Rheumatoid arthritis of right ankle and foot with involvement of other organs and systems
M05.672	Rheumatoid arthritis of left ankle and foot with involvement of other organs and systems
M05.679	Rheumatoid arthritis of unspecified ankle and foot with involvement of other organs and systems
M05.711	Rheumatoid arthritis with rheumatoid factor of right shoulder without organ or systems involvement
M05.712	Rheumatoid arthritis with rheumatoid factor of left shoulder without organ or systems involvement
M05.719	Rheumatoid arthritis with rheumatoid factor of unspecified shoulder without organ or systems involvement
M05.751	Rheumatoid arthritis with rheumatoid factor of right hip without organ or systems involvement
M05.752	Rheumatoid arthritis with rheumatoid factor of left hip without organ or systems involvement

ICD-10-CM Diagnosis Codes	Description
M05.759	Rheumatoid arthritis with rheumatoid factor of unspecified hip without organ or systems involvement
M05.761	Rheumatoid arthritis with rheumatoid factor of right knee without organ or systems involvement
M05.762	Rheumatoid arthritis with rheumatoid factor of left knee without organ or systems involvement
M05.769	Rheumatoid arthritis with rheumatoid factor of unspecified knee without organ or systems involvement
M05.771	Rheumatoid arthritis with rheumatoid factor of right ankle and foot without organ or systems involvement
M05.772	Rheumatoid arthritis with rheumatoid factor of left ankle and foot without organ or systems involvement
M05.779	Rheumatoid arthritis with rheumatoid factor of unspecified ankle and foot without organ or systems involvement
M05.811	Other rheumatoid arthritis with rheumatoid factor of right shoulder
M05.812	Other rheumatoid arthritis with rheumatoid factor of left shoulder
M05.819	Other rheumatoid arthritis with rheumatoid factor of unspecified shoulder
M05.851	Other rheumatoid arthritis with rheumatoid factor of right hip
M05.852	Other rheumatoid arthritis with rheumatoid factor of left hip
M05.859	Other rheumatoid arthritis with rheumatoid factor of unspecified hip
M05.861	Other rheumatoid arthritis with rheumatoid factor of right knee
M05.862	Other rheumatoid arthritis with rheumatoid factor of left knee
M05.869	Other rheumatoid arthritis with rheumatoid factor of unspecified knee
M05.871	Other rheumatoid arthritis with rheumatoid factor of right ankle and foot
M05.872	Other rheumatoid arthritis with rheumatoid factor of left ankle and foot
M05.879	Other rheumatoid arthritis with rheumatoid factor of unspecified ankle and foot
M05.A	Abnormal rheumatoid factor and anti-citrullinated protein antibody with rheumatoid arthritis
M06.011	Rheumatoid arthritis without rheumatoid factor, right shoulder
M06.012	Rheumatoid arthritis without rheumatoid factor, left shoulder
M06.019	Rheumatoid arthritis without rheumatoid factor, unspecified shoulder
M06.051	Rheumatoid arthritis without rheumatoid factor, right hip
M06.052	Rheumatoid arthritis without rheumatoid factor, left hip
M06.059	Rheumatoid arthritis without rheumatoid factor, unspecified hip
M06.061	Rheumatoid arthritis without rheumatoid factor, right knee
M06.062	Rheumatoid arthritis without rheumatoid factor, left knee
M06.069	Rheumatoid arthritis without rheumatoid factor, unspecified knee
M06.071	Rheumatoid arthritis without rheumatoid factor, right ankle and foot
M06.072	Rheumatoid arthritis without rheumatoid factor, left ankle and foot
M06.079	Rheumatoid arthritis without rheumatoid factor, unspecified ankle and foot
M07.611	Enteropathic arthropathies, right shoulder
M07.612	Enteropathic arthropathies, left shoulder
M07.619	Enteropathic arthropathies, unspecified shoulder
M07.651	Enteropathic arthropathies, right hip
M07.652	Enteropathic arthropathies, left hip
M07.659	Enteropathic arthropathies, unspecified hip
M07.661	Enteropathic arthropathies, right knee
M07.662	Enteropathic arthropathies, left knee

ICD-10-CM Diagnosis Codes	Description
M07.669	Enteropathic arthropathies, unspecified knee
M07.671	Enteropathic arthropathies, right ankle and foot
M07.672	Enteropathic arthropathies, left ankle and foot
M07.679	Enteropathic arthropathies, unspecified ankle and foot
M08.011	Unspecified juvenile rheumatoid arthritis, right shoulder
M08.012	Unspecified juvenile rheumatoid arthritis, left shoulder
M08.019	Unspecified juvenile rheumatoid arthritis, unspecified shoulder
M08.211	Juvenile rheumatoid arthritis with systemic onset, right shoulder
M08.212	Juvenile rheumatoid arthritis with systemic onset, left shoulder
M08.219	Juvenile rheumatoid arthritis with systemic onset, unspecified shoulder
M08.411	Pauciarticular juvenile rheumatoid arthritis, right shoulder
M08.412	Pauciarticular juvenile rheumatoid arthritis, left shoulder
M08.419	Pauciarticular juvenile rheumatoid arthritis, unspecified shoulder
M08.811	Other juvenile arthritis, right shoulder
M08.812	Other juvenile arthritis, left shoulder
M08.819	Other juvenile arthritis, unspecified shoulder
M08.911	Juvenile arthritis, unspecified, right shoulder
M08.912	Juvenile arthritis, unspecified, left shoulder
M08.919	Juvenile arthritis, unspecified, unspecified shoulder
M12.511	Traumatic arthropathy, right shoulder
M12.512	Traumatic arthropathy, left shoulder
M12.519	Traumatic arthropathy, unspecified shoulder
M12.551	Traumatic arthropathy, right hip
M12.552	Traumatic arthropathy, left hip
M12.559	Traumatic arthropathy, unspecified hip
M12.561	Traumatic arthropathy, right knee
M12.562	Traumatic arthropathy, left knee
M12.569	Traumatic arthropathy, unspecified knee
M12.571	Traumatic arthropathy, right ankle and foot
M12.572	Traumatic arthropathy, left ankle and foot
M12.579	Traumatic arthropathy, unspecified ankle and foot
M12.811	Other specific arthropathies, not elsewhere classified, right shoulder
M12.812	Other specific arthropathies, not elsewhere classified, left shoulder
M12.819	Other specific arthropathies, not elsewhere classified, unspecified shoulder
M12.851	Other specific arthropathies, not elsewhere classified, right hip
M12.852	Other specific arthropathies, not elsewhere classified, left hip
M12.859	Other specific arthropathies, not elsewhere classified, unspecified hip
M12.861	Other specific arthropathies, not elsewhere classified, right knee
M12.862	Other specific arthropathies, not elsewhere classified, left knee
M12.869	Other specific arthropathies, not elsewhere classified, unspecified knee
M12.871	Other specific arthropathies, not elsewhere classified, right ankle and foot
M12.872	Other specific arthropathies, not elsewhere classified, left ankle and foot
M12.879	Other specific arthropathies, not elsewhere classified, unspecified ankle and foot
M13.111	Monoarthritis, not elsewhere classified, right shoulder
M13.112	Monoarthritis, not elsewhere classified, left shoulder
M13.119	Monoarthritis, not elsewhere classified, unspecified shoulder
M13.151	Monoarthritis, not elsewhere classified, right hip
M13.152	Monoarthritis, not elsewhere classified, left hip

ICD-10-CM Diagnosis Codes	Description
M13.159	Monoarthritis, not elsewhere classified, unspecified hip
M13.161	Monoarthritis, not elsewhere classified, right knee
M13.162	Monoarthritis, not elsewhere classified, left knee
M13.169	Monoarthritis, not elsewhere classified, unspecified knee
M13.171	Monoarthritis, not elsewhere classified, right ankle and foot
M13.172	Monoarthritis, not elsewhere classified, left ankle and foot
M13.179	Monoarthritis, not elsewhere classified, unspecified ankle and foot
M13.811	Other specified arthritis, right shoulder
M13.812	Other specified arthritis, left shoulder
M13.819	Other specified arthritis, unspecified shoulder
M13.851	Other specified arthritis, right hip
M13.852	Other specified arthritis, left hip
M13.859	Other specified arthritis, unspecified hip
M13.861	Other specified arthritis, right knee
M13.862	Other specified arthritis, left knee
M13.869	Other specified arthritis, unspecified knee
M13.871	Other specified arthritis, right ankle and foot
M13.872	Other specified arthritis, left ankle and foot
M13.879	Other specified arthritis, unspecified ankle and foot
M14.611	Charcot's joint, right shoulder
M14.612	Charcot's joint, left shoulder
M14.619	Charcot's joint, unspecified shoulder
M14.651	Charcot's joint, right hip
M14.652	Charcot's joint, left hip
M14.659	Charcot's joint, unspecified hip
M14.661	Charcot's joint, right knee
M14.662	Charcot's joint, left knee
M14.669	Charcot's joint, unspecified knee
M14.671	Charcot's joint, right ankle and foot
M14.672	Charcot's joint, left ankle and foot
M14.679	Charcot's joint, unspecified ankle and foot
M14.811	Arthropathies in other specified diseases classified elsewhere, right shoulder
M14.812	Arthropathies in other specified diseases classified elsewhere, left shoulder
M14.819	Arthropathies in other specified diseases classified elsewhere, unspecified shoulder
M14.851	Arthropathies in other specified diseases classified elsewhere, right hip
M14.852	Arthropathies in other specified diseases classified elsewhere, left hip
M14.859	Arthropathies in other specified diseases classified elsewhere, unspecified hip
M14.861	Arthropathies in other specified diseases classified elsewhere, right knee
M14.862	Arthropathies in other specified diseases classified elsewhere, left knee
M14.869	Arthropathies in other specified diseases classified elsewhere, unspecified knee
M14.871	Arthropathies in other specified diseases classified elsewhere, right ankle and foot
M14.872	Arthropathies in other specified diseases classified elsewhere, left ankle and foot
M14.879	Arthropathies in other specified diseases classified elsewhere, unspecified ankle and foot
M16.0	Bilateral primary osteoarthritis of hip
M16.10	Unilateral primary osteoarthritis, unspecified hip
M16.11	Unilateral primary osteoarthritis, right hip

ICD-10-CM Diagnosis Codes	Description
M16.12	Unilateral primary osteoarthritis, left hip
M16.2	Bilateral osteoarthritis resulting from hip dysplasia
M16.30	Unilateral osteoarthritis resulting from hip dysplasia, unspecified hip
M16.31	Unilateral osteoarthritis resulting from hip dysplasia, right hip
M16.32	Unilateral osteoarthritis resulting from hip dysplasia, left hip
M16.4	Bilateral post-traumatic osteoarthritis of hip
M16.50	Unilateral post-traumatic osteoarthritis, unspecified hip
M16.51	Unilateral post-traumatic osteoarthritis, right hip
M16.52	Unilateral post-traumatic osteoarthritis, left hip
M16.6	Other bilateral secondary osteoarthritis of hip
M16.7	Other unilateral secondary osteoarthritis of hip
M16.9	Osteoarthritis of hip, unspecified
M17.0	Bilateral primary osteoarthritis of knee
M17.10	Unilateral primary osteoarthritis, unspecified knee
M17.11	Unilateral primary osteoarthritis, right knee
M17.12	Unilateral primary osteoarthritis, left knee
M17.2	Bilateral post-traumatic osteoarthritis of knee
M17.30	Unilateral post-traumatic osteoarthritis, unspecified knee
M17.31	Unilateral post-traumatic osteoarthritis, right knee
M17.32	Unilateral post-traumatic osteoarthritis, left knee
M17.4	Other bilateral secondary osteoarthritis of knee
M17.5	Other unilateral secondary osteoarthritis of knee
M17.9	Osteoarthritis of knee, unspecified
M19.011	Primary osteoarthritis, right shoulder
M19.012	Primary osteoarthritis, left shoulder
M19.019	Primary osteoarthritis, unspecified shoulder
M19.071	Primary osteoarthritis, right ankle and foot
M19.072	Primary osteoarthritis, left ankle and foot
M19.079	Primary osteoarthritis, unspecified ankle and foot
M19.111	Post-traumatic osteoarthritis, right shoulder
M19.112	Post-traumatic osteoarthritis, left shoulder
M19.119	Post-traumatic osteoarthritis, unspecified shoulder
M19.211	Secondary osteoarthritis, right shoulder
M19.212	Secondary osteoarthritis, left shoulder
M19.219	Secondary osteoarthritis, unspecified shoulder
M19.271	Secondary osteoarthritis, right ankle and foot
M19.272	Secondary osteoarthritis, left ankle and foot
M19.279	Secondary osteoarthritis, unspecified ankle and foot
M23.321	Other meniscus derangements, posterior horn of medial meniscus, right knee
M23.322	Other meniscus derangements, posterior horn of medial meniscus, left knee
M23.329	Other meniscus derangements, posterior horn of medial meniscus, unspecified knee
M23.90	Unspecified internal derangement of unspecified knee
M23.91	Unspecified internal derangement of right knee
M23.92	Unspecified internal derangement of left knee
M24.011	Loose body in right shoulder
M24.012	Loose body in left shoulder
M24.019	Loose body in unspecified shoulder

ICD-10-CM Diagnosis Codes	Description
M24.111	Other articular cartilage disorders, right shoulder
M24.112	Other articular cartilage disorders, left shoulder
M24.119	Other articular cartilage disorders, unspecified shoulder
M24.211	Disorder of ligament, right shoulder
M24.212	Disorder of ligament, left shoulder
M24.219	Disorder of ligament, unspecified shoulder
M24.311	Pathological dislocation of right shoulder, not elsewhere classified
M24.312	Pathological dislocation of left shoulder, not elsewhere classified
M24.319	Pathological dislocation of unspecified shoulder, not elsewhere classified
M24.411	Recurrent dislocation, right shoulder
M24.412	Recurrent dislocation, left shoulder
M24.419	Recurrent dislocation, unspecified shoulder
M24.511	Contracture, right shoulder
M24.512	Contracture, left shoulder
M24.519	Contracture, unspecified shoulder
M24.611	Ankylosis, right shoulder
M24.612	Ankylosis, left shoulder
M24.619	Ankylosis, unspecified shoulder
M24.811	Other specific joint derangements of right shoulder, not elsewhere classified
M24.812	Other specific joint derangements of left shoulder, not elsewhere classified
M24.819	Other specific joint derangements of unspecified shoulder, not elsewhere classified
M24.871	Other specific joint derangements of right ankle, not elsewhere classified
M24.872	Other specific joint derangements of left ankle, not elsewhere classified
M24.873	Other specific joint derangements of unspecified ankle, not elsewhere classified
M24.874	Other specific joint derangements of right foot, not elsewhere classified
M24.875	Other specific joint derangements left foot, not elsewhere classified
M24.876	Other specific joint derangements of unspecified foot, not elsewhere classified
M25.311	Other instability, right shoulder
M25.312	Other instability, left shoulder
M25.319	Other instability, unspecified shoulder
M25.511	Pain in right shoulder
M25.512	Pain in left shoulder
M25.519	Pain in unspecified shoulder
M25.551	Pain in right hip
M25.552	Pain in left hip
M25.559	Pain in unspecified hip
M25.561	Pain in right knee
M25.562	Pain in left knee
M25.569	Pain in unspecified knee
M25.571	Pain in right ankle and joints of right foot
M25.572	Pain in left ankle and joints of left foot
M25.579	Pain in unspecified ankle and joints of unspecified foot
M25.611	Stiffness of right shoulder, not elsewhere classified
M25.612	Stiffness of left shoulder, not elsewhere classified
M25.619	Stiffness of unspecified shoulder, not elsewhere classified
M43.07	Spondylolysis, lumbosacral region
M43.08	Spondylolysis, sacral and sacrococcygeal region

ICD-10-CM Diagnosis Codes	Description
M43.17	Spondylolisthesis, lumbosacral region
M43.18	Spondylolisthesis, sacral and sacrococcygeal region
M43.27	Fusion of spine, lumbosacral region
M43.28	Fusion of spine, sacral and sacrococcygeal region
M45.7	Ankylosing spondylitis of lumbosacral region
M45.8	Ankylosing spondylitis sacral and sacrococcygeal region
M46.07	Spinal enthesopathy, lumbosacral region
M46.08	Spinal enthesopathy, sacral and sacrococcygeal region
M46.1	Sacroiliitis, not elsewhere classified
M46.47	Discitis, unspecified, lumbosacral region
M46.48	Discitis, unspecified, sacral and sacrococcygeal region
M46.57	Other infective spondylopathies, lumbosacral region
M46.58	Other infective spondylopathies, sacral and sacrococcygeal region
M46.87	Other specified inflammatory spondylopathies, lumbosacral region
M46.88	Other specified inflammatory spondylopathies, sacral and sacrococcygeal region
M46.97	Unspecified inflammatory spondylopathy, lumbosacral region
M46.98	Unspecified inflammatory spondylopathy, sacral and sacrococcygeal region
M47.27	Other spondylosis with radiculopathy, lumbosacral region
M47.28	Other spondylosis with radiculopathy, sacral and sacrococcygeal region
M47.817	Spondylosis without myelopathy or radiculopathy, lumbosacral region
M47.818	Spondylosis without myelopathy or radiculopathy, sacral and sacrococcygeal region
M47.897	Other spondylosis, lumbosacral region
M47.898	Other spondylosis, sacral and sacrococcygeal region
M48.07	Spinal stenosis, lumbosacral region
M48.08	Spinal stenosis, sacral and sacrococcygeal region
M48.17	Ankylosing hyperostosis [Forestier], lumbosacral region
M48.18	Ankylosing hyperostosis [Forestier], sacral and sacrococcygeal region
M48.27	Kissing spine, lumbosacral region
M48.37	Traumatic spondylopathy, lumbosacral region
M48.38	Traumatic spondylopathy, sacral and sacrococcygeal region
M48.8X7	Other specified spondylopathies, lumbosacral region
M48.8X8	Other specified spondylopathies, sacral and sacrococcygeal region
M49.87	Spondylopathy in diseases classified elsewhere, lumbosacral region
M49.88	Spondylopathy in diseases classified elsewhere, sacral and sacrococcygeal region
M50.20	Other cervical disc displacement, unspecified cervical region
M51.17	Intervertebral disc disorders with radiculopathy, lumbosacral region
M51.27	Other intervertebral disc displacement, lumbosacral region
M51.37	Other intervertebral disc degeneration, lumbosacral region (Code invalid 01/01/2025)
M51.370	Other intervertebral disc degeneration, lumbosacral region with discogenic back pain only
M51.371	Other intervertebral disc degeneration, lumbosacral region with lower extremity pain only
M51.372	Other intervertebral disc degeneration, lumbosacral region with discogenic back pain and lower extremity pain
M51.379	Other intervertebral disc degeneration, lumbosacral region without mention of lumbar back pain or lower extremity pain

ICD-10-CM Diagnosis Codes	Description
M51.47	Schmorl's nodes, lumbosacral region
M51.87	Other intervertebral disc disorders, lumbosacral region
M51.9	Unspecified thoracic, thoracolumbar and lumbosacral intervertebral disc disorder
M51.A3	Intervertebral annulus fibrosus defect, lumbosacral region, unspecified size
M51.A4	Intervertebral annulus fibrosus defect, small, lumbosacral region
M51.A5	Intervertebral annulus fibrosus defect, large, lumbosacral region
M53.2X7	Spinal instabilities, lumbosacral region
M53.2X8	Spinal instabilities, sacral and sacrococcygeal region
M53.3	Sacrococcygeal disorders, not elsewhere classified
M53.87	Other specified dorsopathies, lumbosacral region
M53.88	Other specified dorsopathies, sacral and sacrococcygeal region
M54.17	Radiculopathy, lumbosacral region
M54.18	Radiculopathy, sacral and sacrococcygeal region
M54.30	Sciatica, unspecified side
M54.31	Sciatica, right side
M54.32	Sciatica, left side
M54.50	Low back pain, unspecified
M54.51	Vertebrogenic low back pain
M54.59	Other low back pain
M54.81	Occipital neuralgia
M54.89	Other dorsalgia
M54.9	Dorsalgia, unspecified
M62.411	Contracture of muscle, right shoulder
M62.412	Contracture of muscle, left shoulder
M62.419	Contracture of muscle, unspecified shoulder
M67.811	Other specified disorders of synovium, right shoulder
M67.812	Other specified disorders of synovium, left shoulder
M67.813	Other specified disorders of tendon, right shoulder
M67.814	Other specified disorders of tendon, left shoulder
M67.819	Other specified disorders of synovium and tendon, unspecified shoulder
M67.911	Unspecified disorder of synovium and tendon, right shoulder
M67.912	Unspecified disorder of synovium and tendon, left shoulder
M67.919	Unspecified disorder of synovium and tendon, unspecified shoulder
M70.60	Trochanteric bursitis, unspecified hip
M70.61	Trochanteric bursitis, right hip
M70.62	Trochanteric bursitis, left hip
M70.70	Other bursitis of hip, unspecified hip
M70.71	Other bursitis of hip, right hip
M70.72	Other bursitis of hip, left hip
M70.811	Other soft tissue disorders related to use, overuse and pressure, right shoulder
M70.812	Other soft tissue disorders related to use, overuse and pressure, left shoulder
M70.819	Other soft tissue disorders related to use, overuse and pressure, unspecified shoulder
M71.011	Abscess of bursa, right shoulder
M71.012	Abscess of bursa, left shoulder
M71.019	Abscess of bursa, unspecified shoulder
M71.111	Other infective bursitis, right shoulder
M71.112	Other infective bursitis, left shoulder

ICD-10-CM Diagnosis Codes	Description
M71.119	Other infective bursitis, unspecified shoulder
M71.20	Synovial cyst of popliteal space [Baker], unspecified knee
M71.21	Synovial cyst of popliteal space [Baker], right knee
M71.22	Synovial cyst of popliteal space [Baker], left knee
M71.311	Other bursal cyst, right shoulder
M71.312	Other bursal cyst, left shoulder
M71.319	Other bursal cyst, unspecified shoulder
M71.351	Other bursal cyst, right hip
M71.352	Other bursal cyst, left hip
M71.359	Other bursal cyst, unspecified hip
M71.371	Other bursal cyst, right ankle and foot
M71.372	Other bursal cyst, left ankle and foot
M71.379	Other bursal cyst, unspecified ankle and foot
M71.551	Other bursitis, not elsewhere classified, right hip
M71.552	Other bursitis, not elsewhere classified, left hip
M71.559	Other bursitis, not elsewhere classified, unspecified hip
M71.561	Other bursitis, not elsewhere classified, right knee
M71.562	Other bursitis, not elsewhere classified, left knee
M71.569	Other bursitis, not elsewhere classified, unspecified knee
M71.571	Other bursitis, not elsewhere classified, right ankle and foot
M71.572	Other bursitis, not elsewhere classified, left ankle and foot
M71.579	Other bursitis, not elsewhere classified, unspecified ankle and foot
M71.811	Other specified bursopathies, right shoulder
M71.812	Other specified bursopathies, left shoulder
M71.819	Other specified bursopathies, unspecified shoulder
M71.851	Other specified bursopathies, right hip
M71.852	Other specified bursopathies, left hip
M71.859	Other specified bursopathies, unspecified hip
M71.861	Other specified bursopathies, right knee
M71.862	Other specified bursopathies, left knee
M71.869	Other specified bursopathies, unspecified knee
M71.871	Other specified bursopathies, right ankle and foot
M71.872	Other specified bursopathies, left ankle and foot
M71.879	Other specified bursopathies, unspecified ankle and foot
M72.2	Plantar fascial fibromatosis
M75.00	Adhesive capsulitis of unspecified shoulder
M75.01	Adhesive capsulitis of right shoulder
M75.02	Adhesive capsulitis of left shoulder
M75.100	Unspecified rotator cuff tear or rupture of unspecified shoulder, not specified as traumatic
M75.101	Unspecified rotator cuff tear or rupture of right shoulder, not specified as traumatic
M75.102	Unspecified rotator cuff tear or rupture of left shoulder, not specified as traumatic
M75.110	Incomplete rotator cuff tear or rupture of unspecified shoulder, not specified as traumatic
M75.111	Incomplete rotator cuff tear or rupture of right shoulder, not specified as traumatic
M75.112	Incomplete rotator cuff tear or rupture of left shoulder, not specified as traumatic

ICD-10-CM Diagnosis Codes	Description
M75.120	Complete rotator cuff tear or rupture of unspecified shoulder, not specified as traumatic
M75.121	Complete rotator cuff tear or rupture of right shoulder, not specified as traumatic
M75.122	Complete rotator cuff tear or rupture of left shoulder, not specified as traumatic
M75.20	Bicipital tendinitis, unspecified shoulder
M75.21	Bicipital tendinitis, right shoulder
M75.22	Bicipital tendinitis, left shoulder
M75.30	Calcific tendinitis of unspecified shoulder
M75.31	Calcific tendinitis of right shoulder
M75.32	Calcific tendinitis of left shoulder
M75.40	Impingement syndrome of unspecified shoulder
M75.41	Impingement syndrome of right shoulder
M75.42	Impingement syndrome of left shoulder
M75.50	Bursitis of unspecified shoulder
M75.51	Bursitis of right shoulder
M75.52	Bursitis of left shoulder
M75.80	Other shoulder lesions, unspecified shoulder
M75.81	Other shoulder lesions, right shoulder
M75.82	Other shoulder lesions, left shoulder
M75.90	Shoulder lesion, unspecified, unspecified shoulder
M75.91	Shoulder lesion, unspecified, right shoulder
M75.92	Shoulder lesion, unspecified, right shoulder
M76.20	Iliac crest spur, unspecified hip
M76.21	Iliac crest spur, right hip
M76.22	Iliac crest spur, left hip
M77.30	Calcaneal spur, unspecified foot
M77.31	Calcaneal spur, right foot
M77.32	Calcaneal spur, left foot
M79.671	Pain in right foot
M79.672	Pain in left foot
M79.673	Pain in unspecified foot
M79.674	Pain in right toe(s)
M79.675	Pain in left toe(s)
M79.676	Pain in unspecified toe(s)
M99.04	Segmental and somatic dysfunction of sacral region
R07.82	Intercostal pain
R51.0	Headache with orthostatic component, not elsewhere classified
R51.9	Headache, unspecified
S34.22XA	Injury of nerve root of sacral spine, initial encounter
S34.22XD	Injury of nerve root of sacral spine, subsequent encounter
S34.22XS	Injury of nerve root of sacral spine, sequela
S43.431A	Superior glenoid labrum lesion of right shoulder, initial encounter
S43.432A	Superior glenoid labrum lesion of left shoulder, initial encounter
S43.439A	Superior glenoid labrum lesion of unspecified shoulder, initial encounter
S43.491A	Other sprain of right shoulder joint, initial encounter
S43.492A	Other sprain of left shoulder joint, initial encounter
S43.499A	Other sprain of unspecified shoulder joint, initial encounter

ICD-10-CM Diagnosis Codes	Description
S46.011A	Strain of muscle(s) and tendon(s) of the rotator cuff of right shoulder, initial encounter
S46.012A	Strain of muscle(s) and tendon(s) of the rotator cuff of left shoulder, initial encounter
S46.019A	Strain of muscle(s) and tendon(s) of the rotator cuff of unspecified shoulder, initial encounter
Z96.651	Presence of right artificial knee joint
Z96.652	Presence of left artificial knee joint
Z96.653	Presence of artificial knee joint, bilateral
Z96.659	Presence of unspecified artificial knee joint

General Background

Nerves transmit electrochemical impulses between the central nervous system and muscles and organs within the body. When nerves transmit pain signals in the presence of injury or disease, various methods to interrupt the pain signals may be utilized to alleviate the pain. Peripheral nerve blocks, which involve the injection of anesthetics and/or chemicals such as glycerol into the tissue surrounding the nerve, are used to temporarily disrupt the transmission of pain, as either a diagnostic or therapeutic modality. As a diagnostic modality it is used to isolate the cause of pain; as a therapeutic modality it is used to temporarily relieve pain. If the block is successful in providing pain relief, ablation of the peripheral nerve may be recommended.

Peripheral nerve destruction is an ablative modality employed for treatment of acute or chronic pain conditions. With this method of treatment, peripheral nerve fibers are ablated (i.e., destroyed) using chemical, thermal, radiofrequency or other modalities in order to block the transmission of pain signals. The intended goal is to produce a limited but precise lesion to disrupt the nerves' ability to send pain signals without resultant damage to the other structures.

Various techniques may be employed to destroy the nerve. Chemical ablative agents generally include the application of alcohol, phenol or glycerol to destroy nerve tissue involved in the perception of pain. These agents are typically used for nerve blocks but may also be used as a local neurolytic injection. These substances have been shown to inhibit nerve function, damages the cells via dehydration and necrosis leading to neuritis and a pattern of Wallerian degeneration. Cryoablative/cryodenervation techniques involve the use of a cryoprobe and administration of a freezing agent into the nerve causing the formation of a lesion and thereby interrupting the transmission of pain impulses. Thermal/laser ablation involves the use of a laser beam to induce a targeted lesion. Radiofrequency (RF) ablation (RFA), also referred to as radiofrequency lesioning, radiofrequency neurotomy, denervation, or rhizotomy, is a method of treatment more frequently employed and performed under imaging guidance that involves the use of various types of probes or needles to transmit energy and produce heat to burn tissue. During continuous RF ablation the tissue temperatures typically range from 60°C - 90°C and are maintained for 90-120 secs (Choi, et al., 2016). The high frequency electrical current is produced by a radio wave and creates a spherical shaped thermal lesion when the energy is applied through the probe. One challenge to the use of RFA reported in the medical literature includes the need to place the probe parallel to the targeted nerve resulting in lesions on a single side, although it is suggested the thermal temperature reaches the entire nerve (Choi, et al, 2016). In contrast, pulsed RF energy involves

the application of heat applied in short bursts, allowing the tissue to cool between applications and a resulting tissue temperature of approximately 42°C. Lower tissue temperatures and short bursts of application are thought to reduce the risk of destruction to nearby tissue; however, it is purported pulsed RF does not destroy the targeted nerve. Another RF modality, cooled RF, is a technology similar to thermal RF that utilizes a cooled RF probe. With this technology, circulating water is used to cool the probe tip at the probe/tissue interface. It is purported this method allows continuous thermal energy to be delivered, creating tissue temperatures exceeding 80° C adjacent to the probe, and thereby creating a larger lesion (to interrupt pain signals) distal to the probe tip.

Complications that may be associated with peripheral nerve ablation are dependent on the type of modality used; however, complications may include necrosis of the skin and other non-target tissues and neuritis. Additionally, methods such as alcohol and phenol injections which destroy the nerve may be associated with formation of a neuroma (Trescot, 2003). Nerve regeneration occurs following treatment although how long it takes to regenerate and whether or not pain recurs varies with each type of treatment and each individual.

The Association of Extremity Nerve Surgeons published updated clinical practice guidelines in 2020. Within these guidelines the panel notes denervation procedures include cryoablation, radiofrequency ablation, alcohol injections and surgical resection (Barrett, et al, 2020). With the exception of surgical resection, the authors note these methods destroy tissue in a blind manner without complete control and may not result in permanent resolution of symptoms. Procedures such as cryoablation and radiofrequency ablation should be used with caution. Within the guidelines the authors note based on their clinical experience there is some efficacy for RF ablation of the lower extremity however further research of the technique is needed. Ablation as a primary treatment of Morton’s neuroma is not recommended nor is the use of alcohol injections for any indication.

Evidence in the peer-reviewed published scientific literature evaluating peripheral nerve destruction for treatment of pain conditions is primarily in the form of case reports and prospective and retrospective case series with few randomized controlled clinical trials. Although evidence is limited for peripheral nerve destruction targeting the trigeminal ganglion, chemically or by percutaneous radiofrequency, there is some support that it is clinically effective for treatment of trigeminal neuralgia when medical therapy and/or invasive treatment has failed to relieve symptoms. For other conditions such as headache, occipital neuralgia, sacroiliac joint pain, knee pain, and foot pain evidence supporting safety and efficacy is lacking. Much of the evidence for these indications is limited by small sample populations, lack of control groups, and lack of long-term clinical outcomes and therefore strong evidence-based conclusions regarding safety and efficacy cannot be made.

U.S. Food and Drug Administration (FDA)
Peripheral nerve ablation is a procedure and as such is not regulated by the FDA. Injectable medications require FDA approval, and a number of radiofrequency (RF) generators and probes have been cleared for marketing by the U.S. Food and Drug Administration (FDA) through the 510(k) process. According to the FDA there are two product codes dedicated to these devices, one is for radiofrequency lesion generators (GXD) and the second one is for radiofrequency lesion probes (GXI) (FDA, 2023).

Trigeminal Neuralgia
Trigeminal neuralgia is a facial pain syndrome characterized by sharp stabbing pain that involves the sensory division of the fifth cranial (trigeminal) nerve. Pain is generally confined to the distribution of one or more of the three branches of the trigeminal nerve: the ophthalmic (V1), maxillary (V2), and mandibular (V3) divisions. The sensory root of the trigeminal nerve supplies the face, teeth, mouth and nasal cavity. Following stimulation of trigger zones by movement or

touch sudden and excruciating, unilateral (one-sided) facial pain arises. In addition to paroxysmal pain some individuals have continuous pain (Maarbjerg, et al., 2017). The goal of treatment is relief of pain and prevention of recurrences. First line therapy includes medication and if there is no relief, either invasive procedures such as microdecompression or percutaneous procedures, such as radiofrequency nerve destruction or glycerol rhizotomy may be recommended.

Literature Review: There are a number of studies in the published peer reviewed scientific literature evaluating the safety and efficacy of peripheral nerve destruction for trigeminal neuralgia refractory to medical and/or invasive therapies. A majority of the evidence focuses on using percutaneous radiofrequency or glycerol rhizotomy techniques, is retrospective or prospective in design, and lacks controls. Few trials have been published comparing radiofrequency methods to other treatment alternatives such as microdecompression, glycerol rhizotomy, neurectomy or alcohol blocks. Placebo controlled trials are lacking. Although evidence is limited there is some evidence to support high initial rates of pain relief, prolonged time to recurrence for some individuals, and lack of high-risk complications (Ho, et al., 2024).
The 2008 American Academy of Neurology/European Federation of Neurological Societies (AAN/EFNS) practice parameter (Gronseth, et al., 2008, reaffirmed 2024) identified four uncontrolled case series that used independent outcome assessment of Gasserian ganglion percutaneous techniques, including two reports of radiofrequency thermocoagulation, one report of glycerol rhizolysis, and one of balloon compression. The AAN/EFNS found that initial pain relief was achieved in 90 percent of patients, but that pain-free rates declined by one year to 68 to 85%, by three years to 54 to 64% and by five years to approximately 50%. According to the evidence-based review, for patients with trigeminal neuralgia refractory to medical therapy Gasserian ganglion percutaneous techniques may be considered (Level C recommendation).

Sacroiliac (SI) Joint Pain
The SI joint lies between the sacrum and the ileum, and functions more for stability than for movement. The joint's stability is maintained in part by several large ligaments and muscle groups. Pain may arise in this highly innervated joint or in the related muscles and ligaments. Pain may be felt in the lower back or may radiate to one or both hips and/or one or both legs. RF ablation of the SI joint theoretically destroys the sensory nerves to the SI joint thereby alleviating pain. The sensory innervation of the SI joint has not been defined as definitively as that of the lumbar facet joints, however. Most of the posterior sensory innervation is thought to be transmitted from the S1, S2, and S3 dorsal rami via the lateral branches, as well as through medial branches from the L4 and L5 dorsal rami (Aydin, 2010).

Literature Review: Thermal RFA as well as cooled RF have been explored for the treatment of SI joint pain. Several pilot studies, retrospective case series and prospective case series have been published evaluating RF ablation as treatment of SI joint pain (Bellini and Barbieri, 2016; Romero, et al., 2015; Ho, et al., 2013; Karaman, et al, 2011; Buijs, et al., 2004; Cohen et al., 2003; Gevargez, et al., 2002). In addition, two comparative trials have been published comparing cooled RF to conventional RF (Cheng, et al., 2013) and cooled RF to a new bipolar RF technique (Cheng, et al., 2016) for treatment of SI joint pain. Within these trials however sample populations are small, follow-up ranged from 12 weeks to two years, patient selection criteria varied, technique varied, and controls are lacking.

Bhatia et al. (2018) completed an evidence-based narrative review regarding radiofrequency procedures to relieve chronic hip pain. Fourteen publications (case reports, case series) involving 90 subjects who underwent ablative RF treatments of innervation of the hip joint were included in the review. A high success rate of these procedures in relieving chronic pain of the hip joint was reported at 8 days to 36 months after the procedures, however none of the publications were randomized controlled trials. There was evidence for improvement in function and a lack of serious adverse events of RF treatments. The authors concluded radiofrequency treatments for the

sensory innervation of the hip joint have the potential to reduce pain secondary to degenerative conditions although concerns remain regarding the anatomic targets, as well as quality, procedural aspects, and monitoring outcomes in publications on this topic. Randomized controlled trials of high methodological quality are required to further elaborate the role of these interventions in this population.

Sun and colleagues (2018) published a meta-analysis evaluating the efficacy and safety of cooled RF for treatment of SI joint pain. A total of seven studies (4 retrospective observational, 2 RCTs, and one prospective observational study) involving 240 subjects met inclusion criteria consisting of subjects with chronic SI joint pain, cooled RF as the intervention, and outcomes measured to three months. Overall pooled results demonstrated a decrease in pain intensity when compared with pain measured prior to treatment using VAS and Numerical Rating Scale (3.78, 3.81 respectively), improved disability scores using Oswestry Disability Index (ODI), and that 72% of subjects presented positive results as measured using Global Perceived Effect. No severe complications were reported in the studies (Sun, et al, 2018). Limitations noted by the authors include small number of subjects within studies, potential for placebo effect due to inclusion of observational studies, differences in cutoff value for diagnostic block (50% vs 75%), and difference in overall patient selection. The authors concluded although variations exist in the studies the analysis supports safety and efficacy of cooled RF for treatment of SI joint pain.

Juch et al. (2017) reported the results of three multicenter, nonblinded, randomized trials (Mint Study) evaluating the effectiveness of RF denervation added to a standardized exercise program for subjects with chronic low back pain (n=681). Included subjects had chronic low back pain, a positive prior diagnostic block of the facet (n=251), sacroiliac (n=228), or a combination of joints (n=202) and were unresponsive to conservative care. All subjects received a three-month standard exercise program and psychological support if needed, the experimental group also underwent RF denervation (1-3 treatments were allowed). The primary outcome was pain intensity three months following treatment with final follow-up one year post treatment. A total of 599 subjects (88%) completed the three-month follow-up and 521 subjects (77%) completed 12 months follow-up. The mean difference in pain intensity scores at three months for the facet, SI joint and combination group were -.18, -.71, and -.99, respectively. The authors concluded RF denervation combined with a standard exercise program resulted in either no improvement or no clinically important improvement in low back pain when compared with a standard exercise program alone.

Two randomized controlled trials evaluating cooled RF as a treatment of SI pain were found in the literature (Patel, et al., 2012; Cohen, et al., 2008). Patel et al. (2012) reported on their results of 51 subjects randomized to receive either cooled RF denervation at S1-3 lateral branch and L5 dorsal rami or sham. Follow-up was conducted at one, three, six- and nine-months post procedure. Both subjects and coordinators were blinded to randomization until three months. Subjects were allowed to crossover to the treatment group after three months. Using outcome measures that included SF-36BP (pain), SF-36PF (function), Oswestry Disability Index (ODI), quality of life and treatment success, the authors reported statistically significant changes in pain, physical function, disability, and quality of life were found at three-month follow-up. Treatment success was documented for 47% of the experimental group compared to 12% in the sham group at three months, at six and nine months 38% and 59% of treated subjects achieved treatment success. The study is limited by small sample population and short-term outcomes. Cohen and colleagues (2008) reported on 28 subjects with SI joint pain confirmed by injection block resulting in 75% or greater pain relief. Subjects were randomized to receive either RF using a cooled probe after a local anesthetic block (n=14) or local anesthetic block followed by placebo denervation (n=14) of L4-5 primary dorsal rami and S1-3 lateral branch. Subjects who did not respond were allowed to crossover to the treatment group using conventional RF. At one, three- and six-months following treatment 11 (79%), 9 (64%), and 8 (57%) RF treated subjects experienced pain relief

of 50% or greater and significant functional improvement. Only two subjects in the placebo group experienced relief at one month following treatment; and none experienced pain relief at the three-month follow-up. Eleven subjects crossed over and experienced pain relief at one, three- and six-months following treatment respectively: 7(64%), 6(55%), and 4(36%). Only two subjects (14%) at one year follow-up continued to experience pain relief. In the author's opinion, RF denervation for treatment of SI joint pain was effective in the intermediate term although studies with larger populations are needed to confirm results. The study is limited by small sample population and short-term outcomes.

Systematic reviews evaluating RF ablation as treatment of SI pain have been published (King, et al., 2015; Leggett, et al., 2014; Hansen, et al., 2012). Hansen et al (2012) evaluated radiofrequency neurotomy in a systematic review of the therapeutic effectiveness of SI joint interventions. The authors concluded that the evidence was fair for cooled radiofrequency neurotomy. Leggett et al. (2014) published a systematic review evaluating RF ablation as treatment of chronic back pain associated with lumbar facet joints, SI joints, discogenic back pain and the coccyx. The review consisted of 11 sham controlled RCTs; three involved discogenic pain, six involved lumbar facet, two involved SI joint and none were found evaluating coccyx pain. The authors concluded RF ablation is effective for lumbar facet joint pain and SI pain, the efficacy of RF ablation for discogenic pain remains unclear. In 2015 King and associates published their results of a systematic review (King, et al., 2015). This group of authors evaluated sacral branch block and sacral branch thermal RF neurotomy for SI pain. The review included two RCTs evaluating sacral branch blocks graded as moderate quality, and 15 publications evaluating RF ablation (13 observation studies, two RCTs). The authors concluded there is moderate evidence on RF ablation although it is insufficient to determine indications and effectiveness, more research is needed. Overall, limitations of these reviews include a paucity of literature on therapeutic interventions, variations in technique, and variable diagnostic standards and patient selection criteria for SI joint pain.

Aydin et al. (2010) conducted a meta-analysis to assess the effectiveness of RFA of the SI joint for pain relief at three and six months. Ten articles were included in the analysis. Different techniques and combinations of different nerve lesions were used in the included studies. The authors noted that no standards have been established for the specific nerves to ablate, the type of technique, or the type of RFA. The primary outcome measure was a reduction in pain by ≥ 50%. Analysis was conducted on seven groups from six studies. At three- and six-month follow-up, half or greater of the patients treated with RFA of the SI joint met the outcome measure of ≥ 50% reduction in pain. The authors concluded that RFA of the SI joint appears to have a role in the treatment of patients with SI joint pain refractory to more conservative measures. The analysis is limited, however, by the available literature and lack of randomized controlled trials.

A Cochrane review (Maas, et al., 2015) assessed the evidence for RF denervation as a treatment of chronic low back pain and concluded the results were conflicting for disc pain, low quality evidence revealed no differences from placebo in effects on pain and function for SI joint pain over the short-term. One study showed a small effect on both pain and function over the intermediate term for SI joint pain, no high-quality evidence indicates RF denervation provides pain relief in patients with back pain.

The Institute of Clinical Systems Improvement (ICSI) published a guideline title "Pain: Assessment, Non-Opioid Treatment Approaches and Opioid Management" (Hooten, 2017). Within the report the authors acknowledge there is mixed evidence regarding the efficacy of percutaneous RF neurotomy for both medial and lateral branch nerves supplying the target joints.

The American Society of Interventional Pain Physicians (ASIPP) "Interventional Pain Management" guidelines for the diagnosis and treatment of chronic spinal pain were updated in 2013

(Manchikanti, et al., 2013). Within these guidelines for lumbar spine the authors report for sacroiliac joint interventions the evidence for cooled RF neurotomy is fair (based on two RCTS, 2 observational trials and one case report]) and limited for conventional RF or pulsed radiofrequency neurotomy (based on two observational studies). An update to the report has not been found.

American Society of Anesthesiologists (ASA)/American Society of Regional Anesthesia and Pain Medicine (ASRA) published a statement in 2010 by the ASA Task Force on Chronic Pain Management and the ASRA on the management of chronic pain. Within this publication it is noted the medical literature is insufficient to evaluate the efficacy of RFA for SIJ pain although the guideline states that water-cooled RFA may be used for chronic SIJ pain. The task force recommended that neuroablative procedures be used as part of a comprehensive pain management regimen, performed only as a last resort when pain is refractory to other therapies. An update to the report has not been found.

The clinical effectiveness and duration of effect of SI RF ablation has not been consistently demonstrated in well-designed studies. Evidence in the form of RCTs is limited, involves small sample populations, and evaluates short-term outcomes following treatment with RF ablation. In addition, there is an overlap of studies reviewed within the published systematic reviews, Cochrane review, and technology assessment. The evidence in the medical literature is insufficient to demonstrate safety and efficacy of SI joint radiofrequency (RF) ablation or ablation of lumbar or sacral dorsal rami for the treatment of SI joint and other lumbar-related pain. In addition, there is insufficient evidence in the peer-reviewed scientific literature to determine safety and efficacy for other ablative modalities (e.g., laser, chemical, electrical) when employed for treatment of sacroiliac joint and other similar type pain.

Foot Pain (e.g., Plantar fasciitis)
Pain can occur in any number of areas of the foot but most commonly occurs in the heel or near the toes. Symptoms involving the nerves of the foot/ankle typically involve burning, tingling, numbness, and/or pain that radiates along a nerve.

Plantar fasciitis is a common cause of heel pain. Symptoms usually start gradually with mild pain located at the heel which occurs following exercise and/or with standing first thing in the morning. First-line nonsurgical treatment includes a program of stretching exercises, ice, activity modification, weight loss in overweight patients, adaptive footwear, arch taping, nonsteroidal anti-inflammatory medications, shock-absorbing shoe inserts or orthoses, and iontophoresis. When first-line treatment fails to relieve symptoms, second line therapy may be recommended and includes night splints, steroidal anti-inflammatory injections, and/or a walking cast. Surgical intervention (plantar fasciotomy) and ablative methods may be recommended for intractable pain following 6-12 months of first- and second-line therapies.

Literature Review: There is a paucity of evidence evaluating the safety and efficacy of neuro-ablative procedures for treatment of plantar fasciitis in the peer-reviewed medical literature. One group of authors, Cavazos et al. (2009), evaluated cryoablation for plantar fasciitis. Within this retrospective case series (n=137) the authors reported success and failure rates of 77.4% and 22.6% (respectively). The mean pain score decreased from 7.6 before cryosurgery to 1.1 ($p < 0.0005$) at 24 months of follow-up. The study is limited by the retrospective and uncontrolled design. Allen and colleagues (2007) utilized cryosurgery for 59 consecutive patients (61 heels) who had failed prior conservative therapy and were considered surgical candidates. These study results suggested that pain decreased significantly after the procedure ($p<.0001$). However, the nonrandomized design and small sample size of this study decrease its generalizability.

Radiofrequency lesioning has been investigated as a treatment of plantar fasciitis. The results of mainly retrospective case series (Arslan, et al., 2016; Erken, et al., 2014; Cozzarelli, et al., 2010;

Cione, et al., 2009; Liden, et al., 2009; Solitto, et al., 1997) suggests RF reduces pain resulting from plantar fasciitis. A majority of these studies are flawed by retrospective design, lack of controls, short-term outcomes, and use of various outcome measures making comparisons across studies difficult.

Authors of two comparative trials (Ozan, et al., 2017; Osman, et al., 2016) evaluated RF ablation for treatment of plantar fasciitis. Ozan et al. (2017) compared RF (n=16) to extracorporeal shockwave therapy (n=40). Subjects were followed for six months using VAS and modified Roles-Maudsley (RM) scores at one, three- and six-months following treatment. There was no significant difference in baseline and post-treatment scores between groups. Both VAS and RM scores were significantly decreased in both groups ($p<.05$) at all follow-up periods, although the RM at one month was significantly different in the RF group compared to the ESWT group. In a second trial, Osman et al (2016) compared continuous RF to pulsed RF ablation for treatment of refractory plantar fasciitis (n=20). This group of authors used a numeric verbal rating scale and satisfaction score for assessment of outcomes up to 24 weeks following treatment. All subjects demonstrated significant improvement in pain scales following treatment; the pulsed RF group achieved pain relief more rapidly. The authors concluded randomized trials are necessary to confirm the therapeutic effects and optimal dose of RF. Both studies are limited by small sample population, short term outcomes and a variety of outcome measures precluding generalization of results.

In a randomized controlled trial (Landsman, et al., 2013) the authors evaluated RF ablation as a treatment of plantar fasciitis (n=8) compared with sham (n=9). The study was a multicenter, randomized, prospective trial using a crossover design if no improvement was observed four weeks following treatment. Outcome measures included a weekly Visual Analogue Scale (VAS) score, average pain level, and peak pain level. The study demonstrated a statistically significant improvement in symptoms for the RF group and lack of significant improvement in the sham group. Following crossover to the treatment group the sham group also demonstrated statistically significant improvement of symptoms. This study is limited by a small sample population and short-term outcomes.

In 2010, the American College of Foot and Ankle Surgeons (ACFAS) issued a guideline on the treatment of heel pain. Bipolar radiofrequency is listed as a third-tier option for patients who have failed other treatments. It was given a grade C recommendation, meaning that this treatment option is supported by either conflicting or level IV expert opinion evidence (Thomas, et al., 2010). In an updated clinical consensus statement published by ACFAS for the diagnosis and treatment of adult acquired infracalcaneal heel pain (Schneider, et al., 2018), a recommendation is not made on bipolar RF treatment. The authors concluded the evidence is uncertain, neither appropriate or inappropriate.

Foot Pain (e.g., peripheral neuroma, Morton's Neuroma)
In the toe area, interdigital spaces of the foot are common sites for the development of neuromas. These occur most often between the third and fourth digits of the foot where the medial and lateral plantar nerves combine, usually from repetitive trauma or stress, with resultant pain in the ball of the foot often described as a lump on the bottom of the foot. It may also develop in the first, second, or fourth interdigital space (Fields and Atkinson, 2024). Morton's neuroma is a compression neuropathy of the common digital nerve (Thomas, et al., 2009). Initial treatment includes adaptive footwear, orthotics, and injections of anesthetics, corticosteroids, alcohol or phenol (Thomas, et al., 2009). When conservative therapy fails, surgical treatment may be recommended and involves resection of a portion of the nerve or release of the tissue surrounding the nerve (American Orthopaedic Foot and Ankle Society [AOFAS], 2024). Ablative approaches, such as alcohol injections and RF ablation using imaging guidance have also been employed as treatment of refractory Morton's neuroma.

Literature Review: Evidence in the peer reviewed literature evaluating ablative techniques for peripheral neuromas focus primarily on Morton's neuroma using alcohol injections, radiofrequency ablation and cryoablation. Several case series have been published evaluating ultrasound guided alcohol ablation as treatment of Morton's neuroma with some evidence supporting relief of pain and patient satisfaction (Perini, et al, 2016; Pasquali, et al., 2015; Musson, et al., 2012; Hughes, et al., 2007; Mozena, et al., 2007; Fanucci, et al., 2004). A majority of these studies involve small sample populations and evaluate short term outcomes. Long-term outcomes of US guided alcohol injection (n=45) reported by Gurdezi et al. (2013) illustrated alcohol injection did not result in permanent resolution of symptoms. At an average follow-up of five years 13/45 subjects had return of symptoms, 16/45 subjects underwent surgical excision at an average of 24 months follow-up, and 13/45 subjects maintained complete resolution of symptoms. In general, the body of evidence evaluating alcohol ablation is insufficient and lacks well-designed controlled trials comparing outcomes with well-established alternative treatments, such as surgical decompression. A recently published systematic review continues to support short term outcomes and low-level evidence open to methodological bias and interpretation (Santos, et al., 2018).

Evidence evaluating cryoablation for Morton's neuroma is limited. One group of authors reported on the technical aspects of magnetic resonance guided cryoablation and included retrospective results of their preliminary clinical experience (Cazzato, et al., 2016). Measured procedural outcomes included technical success, procedural time, and complications; clinical outcomes included patient satisfaction, residual pain using the VAS scale, and instances of stump neuroma. A total of 20 subjects (24 neuromas) were included in the trial. Follow-up (mean 19.7 months) was available for 18/24 neuromas. Regarding clinical outcomes the authors reported 77.7% of subjects were completely satisfied, 16.6% were satisfied with mild reservations, and 5.7% were satisfied with major reservations. Mean pain score was 3.0 post procedure and there were no instances of stump neuroma. A second group of authors evaluated clinical outcomes associated with ultrasound guided cryoneurolysis (n=20) as treatment of Morton's neuroma (Friedman, et al., 2012). Five subjects had a painful neuroma, 12 had a stump neuroma secondary to surgery or trauma, and three had peripheral neuritis without a visible anatomic lesion. Outcomes were measured four to eight months following treatment with cryoablation. At follow-up, a total of 15 subjects had pain relief (11 subjects had marked or total relief, three had moderate relief, one had mild relief), five subjects had no relief, three of which went on to have surgical treatment. The study is limited by sample size, short-term follow-up and lack of controls.

Evidence evaluating radiofrequency ablation as a treatment of Morton's neuroma in the medical literature is limited to primarily retrospective reviews (Masala, et al 2018; Chuter, et al., 2013; Moore, et al., 2012).

Within clinical practice guidelines published by the Association of Extremity Nerve Surgeons (Barrett, et al., 2014) the authors note ablation as a primary treatment of Morton's neuroma is not recommended nor is the use of alcohol injections.

Within practice guidelines developed by the Clinical Practice Guideline Forefoot Disorders Panel of the American College of Foot and Ankle Surgeons (ACFAS) for Morton's Neuroma the panel reported cryogenic neuroablation may be performed as a treatment although it was further noted cryoablation is limited by lack of permanent results and decreased efficacy when employed for treatment of large neuromas or in the presence of thick fibrosis. In addition, the consensus statement reports that 3 to 7 dilute alcohol injections of 4% alcohol injected at 5-to-10-day intervals has been associated with an 89% success rate with 82% of individuals achieving complete relief of symptoms. However, overuse of corticosteroid injections was cautioned as it may result in atrophy of the plantar fat pad as well as joint subluxation (Thomas, et al., 2009).

A Cochrane review evaluating the effectiveness of surgical and non-surgical interventions for Morton's neuroma was published by Thompson and colleagues in 2004. Insoles, corticosteroid injections, excision of nerve, transposition of nerve, and neurolysis are commonly used treatments although their effectiveness is poorly understood. According to the authors the review included one randomized controlled trial that evaluated surgical treatment, little evidence from randomized trials supporting the use of insoles, and no randomized trials evaluating corticosteroid injections. Cochrane concluded there was insufficient evidence to evaluate the effectiveness of surgical and non-surgical interventions for Morton's neuroma and well-designed trials are needed to guide clinical practice.

The American Podiatric Sports Medicine (APSM) (2003) provides information about Morton's Neuroma, although it is not a formal position statement or clinical recommendation the information available supports orthotics, steroid injection, and surgical removal as treatment of Morton's neuroma, occasionally injection of other substances to ablate the neuroma are effective.

There is insufficient evidence to support the safety and efficacy of neuroablative treatment for a peripheral neuroma (e.g., Morton's neuroma). Treatments such as alcohol injections and radiofrequency ablation of the neuroma have shown promise in observational case series; these treatments should however be considered research treatments until further study clarifies their efficacy (Fields and Atkinson, 2024).

Knee Pain (e.g., osteoarthritis, degenerative)
Chronic osteoarthritis of the knee occurs commonly with advanced age and is the most common form of arthritis. Rheumatoid and posttraumatic arthritis are less common forms of arthritis affecting the knee joint however all forms result in inflammation and pain. Treatment generally includes lifestyle modifications, exercise, weight loss, physical therapy, assistive devices, and pharmacologic agents (e.g., corticosteroids, NSAIDs, intra-articular viscosupplements). Surgical methods are recommended when conservative measures fail to relieve symptoms and include arthroscopy and knee replacement procedures. Recently, neuroablative destruction of the genicular (and other nerves) have been investigated as a method of treatment for knee pain and disability caused by osteoarthritis of the knee. Anatomically genicular nerves are in close proximity to the genicular arteries and vascular injury is a potential complication of RF of the genicular nerve (Kim, et al., 2016). Additional complications include septic arthritis, pes anserine tendon injury, third-degree skin burn, and clinically significant hematoma and/or hemarthrosis (McCormick, et al., 2021).

Literature Review: Evidence evaluating neuroablative methods as treatment of chronic knee pain focuses primarily on RF techniques and consists mainly of case reports, observational case series (Iannaccone, et al., 2017; Santana Pineda, et al., 2017; Bellini, et al., 2015), systematic reviews (Orhurhu, et al., 2019; Gupta, et al., 2017), narrative review (Bhatia, et al., 2016), and few controlled trials (McCormick, et al., 2018; El-Hakeim, et al., 2018; Davis, et al., 2018; Qudsi, et al., 2017; Sari et al., 2016; Choi, et al., 2011; Ikeuchi, et al., 2011). Few studies in the published peer reviewed literature lend support to improvement in pain after ablative treatment however, these studies are limited by variability in RF technique, small patient populations, heterogeneity in patient selection criteria and conflicting outcomes. Chemical ablation of the genicular nerve with phenol for knee pain has also been studied (Risso, et al., 2020). There is insufficient evidence in the peer-reviewed scientific literature evaluating RF ablative treatment or chemical ablation for chronic knee pain and strong evidenced based conclusions regarding the effects of the technology on health outcomes cannot be made. Additional well-designed, homogeneous studies involving larger populations and long-term outcomes are needed to support the safety and efficacy of TF for knee pain.

Li et al. (2021) conducted a meta-analysis of eight randomized control trials evaluating the safety and efficacy of radiofrequency ablation (RFA) for the treatment of pain and improved function in patients with knee osteoarthritis (OA). Patient populations' ages ranged from 57–70 years old with 17–49 patients in the treatment groups, 18-75 in control groups with follow ups of 3–6 months. The majority of patients were female. The intervention was RFA of the knee. Control groups received varying treatments including same procedure without effective neurotomy, intra-articular injection of 0.5% ropivacaine with dextrose 25%; intra-articular injection of bupivacaine, morphine, and betamethasone; injection of platelet-rich plasma and sodium hyaluronate; injection of 2% lidocaine and betamethasone; oral paracetamol and diclofenac; intra-articular injection of sodium hyaluronate; and intra-articular steroid injection. Primary outcomes included pain score at different time points, Western Ontario and McMaster Universities Arthritis (WOMAC) index, Lequesne index and adverse effects. Meta-analysis reported improved pain relief in RFA group at four weeks (five RCT) with a weighted mean difference (WMD) of -0.504 ($p<0.001$), at 12 weeks (seven RCT) with a WMD of -0.280 ($p=0.005$), and at 24 weeks (five RCT) with a WMD of -0.359 ($p=0.001$). Meta-analysis of mean change from baseline in WOMAC index was superior in RFA group at four weeks (four RCT) with WMD of -3.189 ($p=0.026$), at 12 weeks (four RCT) with WMD of -3.706 ($p=0.012$), and at 24 weeks (four RCT) with WMD of -2.437 ($p=0.038$). The Lequesne index (three RCT) was improved with a WMD of -2.135 ($p<0.001$). Four studies reported on adverse events. There was no significant difference between treatment group and control group. Author noted limitations include small patient populations, heterogeneity of the studies, short term follow ups and low quality of evidence. Larger, well-designed studies with large patient populations and long-term follow-up are needed to determine the safety and efficacy of RFA for the treatment of pain in patients with OA.

Chen et al. (2020) conducted a systematic review to evaluate the effectiveness and safety of nerve radiofrequency ablation (RFA) compared to other non-surgical treatments for symptomatic osteoarthritis (OA) of the knee. Seven randomized controlled trials (RCTs) met the inclusion criteria of symptomatic knee OA, comparative design, and quantitative patient-reported outcome data. Patient population sizes were not reported. Comparators included intra-articular (IA) corticosteroids, IA hyaluronic acid, NSAIDs, acetaminophen (paracetamol), and control/sham procedures. Pain, function, and composite patient-reported outcomes varied in measurement tools used and included the following: visual analog scale, numeric rating scale, Western Ontario, and McMaster Universities Arthritis Index (WOMAC), Short Form-36, Lysholm knee score, Oxford Knee Score, and Global Perceived Effect (GPE). Length of follow up varied between the studies from three months to one year. Outcome measures were varied, however all RCTs showed favorable results for geniculate nerve thermal RFA. Two RCT reported that geniculate nerve RFA provided statistically significant improvements compared with control or sham procedures regarding pain, function, quality of life, and composite scores. Compared with IA corticosteroids ($n=1$ study), heated RFA reported improved WOMAC function ($p=0.003$ at one month) and stiffness ($p=0.007$ at three months) and visual analog scale pain ($p=0.001$ at one month), although no significant difference was noted on the WOMAC pain subscale ($p=0.639$). In one study comparing IA corticosteroids to cooled RFA, cooled RFA reported greater pain relief and improved function at six months. In a study comparing RFA to acetaminophen and diclofenac, RFA reported improvement in overall WOMAC, function and pain at six months; however, a combination of acetaminophen and diclofenac was favored for stiffness at three months ($p=0.004$) and six months ($p<0.001$). When compared with IA corticosteroids and hyaluronic acid ($n=2$ studies). The RFA group was reported to have notable improvement in pain, function, and composite scores. Four RCTs showed that RFA had favorable outcomes for overall WOMAC and GPE scores when compared with IA HA, IA corticosteroids, conventional oral nonopioid analgesics, and sham procedures. RFA was reported to be markedly favored over IA corticosteroids ($n=1$ study) at one month for WOMAC total but not at three months. Three RCTs reported greater than a four-point improvement in pain relief at all time points (score >2 was considered a clinically important difference). Clinically effective pain relief was noted at six months in two RCTs and at 12 months in one RCT. No serious

adverse events were reported. This review is limited by lack of detail of patient population sizes, heterogeneity of comparators and inclusion of studies utilizing comparators that are not recommended (injection of hyaluronic acid) which reduces the clinical relevancy of those studies. Prospective randomized controlled trials with matched patient populations homogenous comparators and long-term follow-ups are needed to validate the efficacy of nerve radiofrequency ablation (RFA) for knee pain.

Hong et al. (2019) conducted a systematic review and meta-analysis of 12 randomized control trials (RCTs) (n=841) to evaluate the efficacy of invasive radiofrequency (RF) treatment for knee pain and function in patients with osteoarthritis (OA). Patient populations ranged from 33-151 subjects. Studies were included If they were RCTs reporting on the clinical efficacy of invasive radiofrequency treatment for OA. Excluded were studies on patients who had undergone knee arthroplasty and arthroscopic surgery. The intervention was radiofrequency ablation (RFA) (n=7 studies) on the genicular nerve, intra-articular pulsed radiofrequency ablation (PRF) (n=4 studies), and cooled radiofrequency ablation (CRF) (n=1 study). Comparators included the conservative treatments of weight loss, physical therapy, oral nonsteroidal anti-inflammatory drugs (NSAIDs), or intra-articular injections of hyaluronic acid or corticosteroid. Primary outcomes measured were pain improvement using the visual analogue scale/numerical rating scale (VAS/NRS) and knee function improvement using Oxford Knee Score/the Western Ontario and McMaster (OKS/WOMAC). Follow up occurred at one week, one month, three months, and six months. Pain scores were reported to be lower in the RF treatment group (one week, one month and three months ($p<0.01$). No significant improvement in knee function were reported from OKS at one week ($p=0.01$), one month ($p=0.33$), three months ($p=0.79$) or WOMAC at one week ($p=0.45$), one month ($p=0.09$), or three months ($p=0.69$). One study reported knee joint dropsy in both groups within two weeks after the treatment. No adverse events were reported in the other studies. Author noted study limitations included the heterogeneity between studies, and small patient populations with short term follow ups. Randomized control trials with larger patient populations and long-term follow-ups are needed to establish safety and efficacy of invasive radiofrequency (RF) treatment for knee pain and function.

In December of 2018, the Washington State Healthcare Authority published an evidence report evaluating peripheral nerve ablation for the treatment of limb pain. As part of the review, the authors collected and evaluated 13 RCTs which met their inclusion criteria; seven focused on osteoarthritic knee pain. A total of five studies evaluated conventional RF; most outcomes were measured at 6 months with one study reporting 12-month outcomes. One study evaluated cooled RFA (6-month outcomes) and one evaluated cryoablation for knee pain (6-month outcomes). Although there was some improvement in function and pain scores, according to the authors the studies had significant limitations and/or high risk of biased assessments. Using the GRADE system, the group reported there was low quality evidence in favor of peripheral nerve ablation to improve some short-term functional and pain measures for moderate to severe pain resulting from chronic knee OA. The evidence demonstrated some improvement that was both statistically significant and likely to be clinically meaningful, although improvements were small in magnitude and not consistent.

A number of RCTs have been published recently evaluating RF for treatment of OA knee pain. Davis and colleagues (2018) evaluated cooled RF as treatment of subjects with chronic knee pain (n=151) unresponsive to conservative modalities. The primary endpoint was the proportion of subjects with 50% or greater reduction of treatment effect, and analgesic use. Patients were randomized to receive either cooled RF (n=76) or intraarticular steroid injection (IAS) (n=75), subjects were allowed to cross over at 6 months follow-up. A total of 138 subjects underwent treatment, the remaining were either lost to follow-up (n=2), withdrew (n=9), or were protocol deviations (n=2), 126 subjects were available for six-month follow-up. Both study groups had reduction of pain from baseline at six months. The cooled RF group had a greater reduction in

numeric rating scale (NRS) from baseline at all follow-ups, with 74% meeting successful outcome criteria (greater than 50% relief) compared to the IAS group (10%). Additionally, the cooled RF group had better improvement of Oxford Knee Scores and Global Perceived Effect as well as a greater mean change in nonopioid medication use. The authors reported at six-month follow-up 22% of the cooled RF group and 4% of the IAS group reported complete reduction of pain. Limitations include varying doses of medication with duration of effect for IASs, differential loss to follow-up, and lack of blinding. Davis et al. (2019) reported on 12-month postintervention outcomes (n=52/67) and six-month outcomes of patients who crossed over to cooled radiofrequency ablation (CRFA) treatment (n=58/71). Results at 12 months showed that 65% of the original CRFA group had greater than 50% pain reduction with 75% reporting improved effects. The cross-over group (49%) reported ≥ 50% improvement in pain and functional capacity ($p<0.0001$). In 2019, the 18- (n=25) and 24-month(n=18) results were published by Hunter et al. At 18 months after cooled radiofrequency ablation (CRFA) treatment, mean numeric rating scale (NRS) score was 3.1 ± 2.7 with 12 subjects reporting ≥ 50% pain relief compared to baseline. The Oxford Knee Score overall reported a mean change from baseline of 26.0 ± 9.6 points. At 24 months, the reported mean NRS score was 3.6 ± 2.8 with 11 subjects reporting ≥ 50% pain relief compared to baseline. The reported Oxford Knee Score overall mean change from baseline was 29.9 ± 10.4.

El-Hakeim et al. (2018) published results of RCT fluoroscopic-guided RFA for treatment of chronic knee OA (n=60). Subjects were randomized to undergo RF of the genicular nerve (n=30) or receive conventional analgesics (acetaminophen, diclofenac, and physical therapy) (n=30). RF was accomplished using three 90 seconds cycles at 80° C. Outcome measures included VAS, WOMAC, and Likert scale for patient satisfaction. At six months follow-up VAS values were significantly lower in the RF group. WOMAC function values improved in both groups, however at six months there was a significant difference with lower scores in the RF group. Patient satisfaction according to Likert scales favored RF in the third and six months. Limitations noted by the author include lack of blinding and lack of diagnostic nerve block prior to RF treatment.

Qudsi et al. (2017) published the results of a double-blinded randomized controlled trial comparing traditional RF neurolysis (n=14) to local anesthetic and corticosteroid block (n=14) of the genicular nerves for treatment of persistent pain following total knee arthroplasty. Subjects were followed for one year following treatment. At three and six months both groups demonstrated a reduction in pain and significant joint function improvement, results were similar in both groups, as well as improvement in quality of life and disability and a reduced need for analgesics The study is limited by small sample population and short-term outcomes, further clinical trials are needed to establish safety and efficacy.

Sari et al. (2016) compared the efficacy of intra-articular injection (n=36) and RF neurotomy of genicular nerves (n=37) in subjects with chronic knee OA. The main outcome was pain intensity with functional status as a secondary outcome compared at baseline, one- and three-months follow-up. The authors reported for the RF group there was a significant reduction in VAS pain ($P <0.001$) at both the first months and three-month follow-up in comparison to subject who received intra-articular injections. In addition, the RF group had a significant reduction in WOMAC score sin the first month ($P<0.001$). The study is limited by small sample and short-term outcomes.

A randomized controlled trial evaluating RF of the genicular nerves for treatment of chronic knee pain was published by Choi and associates (2011). This study involved 38 subjects with chronic knee pain unresponsive to other treatments (physical therapy, oral analgesics, and intra-articular injections) who were randomized to receive percutaneous RF neurotomy (n=19) or the same procedure without neurotomy (n=19). Outcomes were measured at 1-, 4-, and 12-weeks post procedure and included VAS scores, Oxford Knee scores, and global assessment. The authors

reported VAS scores and Oxford Knee scores showed the RF group had less knee joint pain at four- and 12-weeks follow-up when compared to the control group. RF of the genicular nerves resulted in significant reduction of pain and improved function in the experimental group. Ten subjects in the RF group experienced at least 50% reduction of pain at 12 weeks versus none in the control group. Limitations of the study include small sample population and measurement of short-term outcomes. In the authors opinion further trials with larger sample size and longer follow-up are needed.

In a nonrandomized controlled study, Ikeuchi and colleagues (2011) compared RF ablation (n=18) to nerve block (n=17) for treatment of refractory knee pain. RF current or local anesthetic was applied to the medial retinacular nerve and the infrapatellar branch of the saphenous nerve. Outcome measures included Western Ontario McMaster Universities Osteoarthritis Index (WOMAC) score, pain VAS, and patient global assessment with a minimum follow-up of six months. Differences in pain VAS scores were statistically significant at four, eight and 12 weeks with the RF group scores averaging lower than the control group. Percentage of responders in the RF at four weeks, 12 weeks and six months was 50%, 30% and less than 10% (respectively); for the control group the percentage of responders were less than 12% at four and 12 weeks, and 0% at six months. There was no significant difference in patients' global assessment (p=0.126) and no serious adverse events. Limitations noted by the authors include uncertain placebo effects and differences in baseline characteristics of each group.

Hip Pain
Osteoarthritis (OA) is a disease of joint tissue destruction that affects adults later in life. As OA of the hip progresses, it affects a person's mobility and quality of life. The pathogenesis of OA includes factors such as biomechanical factors, proinflammatory mediators, and proteases (Loeser, 2023). The initial approach to treatment includes nonpharmacologic measures such as exercise, walking aids and weight management. Patients will concomitantly start pharmacologic therapy of oral nonsteroidal anti-inflammatory drugs (NSAIDs); however, these are contraindicated in patients with cardiovascular comorbidities. If there is insufficient relief with these measures, there is a lack of other nonsurgical treatment alternatives (Deveza and Eyles, 2024). It has been proposed to target radiofrequency ablation on the obturator and femoral nerves to stop the transmission of pain signals and reduce pain in the hip with osteoarthritis.

Literature Review: Evidence evaluating radiofrequency nerve ablation for the treatment of hip pain is primarily in the form of case series, observational studies and retrospective reviews (Mariconda, 2020; Kapural, 2018; Tinnirello, 2018; Chye, 2015; Rivera, 2012; Malik, 2003).

Shoulder Pain
Shoulder pain can be due to injuries and acute or chronic degeneration or inflammation of the shoulder joint, tendons, surrounding ligaments, or periarticular structures. Glenohumeral joint osteoarthritis (OA) occurs most often in patients over aged 70 years typically with a history of previous direct injury or dislocation, humeral head or neck fracture, and large rotator cuff tears (Doherty and Abhishek, 2024). Radiofrequency ablation on the suprascapular nerve as treatment to manage chronic shoulder joint pain has been proposed as a treatment option for this population. There is not sufficient evidence in the published literature to support its use at this time. Evidence is primarily in the form of case series and small randomized control trials with short term follow ups.

Orhurhu et al. (2019) conducted a systematic review to investigate the safety and effectiveness of radiofrequency ablation (RFA) in the management of chronic shoulder pain. Eighteen studies including six randomized control trials (RCTs), one prospective study, one retrospective study, seven case series and three case reports met inclusion criteria. Patient populations ranged from 6–59. Studies were included if they were original studies on adults with shoulder pain and used

pulsed radiofrequency (PRF) or continuous RFA to the axillary or suprascapular nerve, intra-articular glenohumeral joint, subacromial space, or intrabursal area. In the studies that had a comparator, either intra-articular steroid, lidocaine or sham treatment was used. Primary outcomes include pain scores using a visual analog scale (VAS), functional or physical disability scores, changes in analgesic consumption, and adverse effects. Follow ups ranged from 3–12 months with one study reporting results at 18 months. Results were not statistically significant. Improved pain, range of motion and quality of life was reported for both intra-articular steroids and lidocaine and PRF or continuous RFA. Adverse events reported included a brief hypotensive episode, small hematoma and transient mild tingling or pain at puncture site. Author noted study limitations included: heterogeneity of study structure and designs; inclusion of retrospective reviews, case series and case studies; small patient populations; short term follow ups; and varying techniques of ablation methods. Randomized control trials with large, homogeneous patient populations and long term follow up are needed to validate the safety and effectiveness of radiofrequency ablation (RFA) in the management of chronic shoulder pain.

Eyigor et al. (2010) conducted a randomized control trial comparing the efficacy of intra-articular corticosteroid injection to pulse radiofrequency (PRF) when applied to the suprascapular nerve in patients with shoulder pain. Patients (n=50) were included if they had shoulder pain for at least three months or with rotator cuff lesion pathology detected by shoulder ultrasonography. Excluded were those with inflammatory arthritis (rheumatoid arthritis, ankylosing spondylitis, etc), active synovitis in the joints, a history of shoulder surgery, a history of nerve blocks to the shoulder, intraarticular injection within the last three months, trauma or physical therapy within the last six months, advanced osteoarthritis, referred pain in the shoulder, neurologic impairment (stroke, Parkinson disease, paresis), severe cardiovascular disease (acute myocardial infarction, congestive heart failure, uncontrolled hypertension), unstable chronic or terminal illness (diabetes mellitus, malignancies), bleeding problems, major depression, severe cognitive impairment, or severe musculoskeletal impairment. Primary outcomes measured included: a pain scale (visual analog scale; VAS), range of motion, Shoulder Pain and Disability Index (SPADI), the Short Form-36, Beck Depression Scale questionnaires, and paracetamol consumption. Patients were evaluated at one, four, and 12 weeks. Both groups reported statistically significant improvement in all weeks of VAS, range of motion (active-passive), and SPADI subscores ($p<0.05$) at weeks one, four, and 12 compared with the pretreatment period. When compared, intra-articular injection of corticosteroid was favored in VAS at night and VAS at rest at weeks one, four and 12; VAS during movement in week one ($p<0.05$); SPADI pain and total subscore in weeks one, four, and 12 ($p<0.05$); and paracetamol consumption was lower. No serious side effects were reported. Author noted limitations included the lack of a placebo group and short-term follow up. Additional well-designed randomized controlled trials with large patient populations with long term follow up are needed to validate the efficacy of PRF for the treatment of shoulder pain.

Headache/Occipital Neuralgia

Cervicogenic headache and occipital neuralgia refers to specific types of headaches thought to arise from impingement or entrapment of the occipital nerves and/or the upper spinal cervical vertebrae (Dinakar, 2016; Evans, 2004; Biondi, 2001; Bogduk, 2001; Vincent, et al., 1998). The clinical features of cervicogenic headache may mimic those associated with primary headache disorders (e.g., tension-type headache, migraine, or hemicrania continua), making it difficult to distinguish among headache types (Biondi, 2005; Martelletti, 2004; Peters, 2004).

Cervicogenic headache and occipital neuralgia are syndromes whose diagnosis and treatment have been reported as controversial in the medical literature due to lack of expert consensus regarding their etiology and treatment. A consensus on standard treatment does not exist because of the variability in patient selection and clinical outcomes. Numerous treatments or procedures for headaches (e.g., chronic migraine, chronic cluster or cervicogenic headache) and occipital neuralgia have been proposed, with varying levels of success. Pharmacological treatment

generally includes oral analgesics, anti-inflammatory medications, tricyclic antidepressants, and anticonvulsant medications, used alone or in combination with other treatment modalities. Other suggested treatments include the use of a cervical collar during the acute phase; physical therapy with stretching and strengthening exercises; postural training; relaxation exercises; transcutaneous nerve stimulation (TENS); and manual therapy, including spinal manipulation and spinal mobilization (Bogduk, et al., 2009; Biondi, 2005, 2001; Martelletti, et al., 2004).

In a review of medical textbooks, commonly used treatments for pain relief from cervicogenic headache and occipital neuralgia include the use of local injected anesthetics, with or without the addition of corticosteroid preparation, to block the affected nerve(s). It is noted that these injections can be used as therapeutic treatment measures for pain relief, although the duration of pain relief varies from hours to months. The scientific evidence supporting injection therapy or percutaneous nerve block for occipital neuralgia and cervicogenic headache has been limited (Goyal, et al., 2021; Dinakar, 2016; Peters, 2004; Chavin, 2003). Ablative treatments (e.g., pulsed radiofrequency ablation, radiofrequency ablation, radiofrequency neurotomy, radiofrequency denervation, neurolysis, cryodenervation, nerve root rhizotomy) have also been investigated as an attempt to denervate the occipital and/or upper cervical nerve. Nevertheless, evidence in the medical literature evaluating ablative techniques is limited and improvement in clinical outcomes has not been consistently demonstrated in well-designed clinical studies.

Literature Review: In a retrospective study, Lee et al. (2007) studied the clinical efficacy of radiofrequency cervical zygapophyseal joint neurotomy in patients with cervicogenic headache. A total of thirty patients suffering from chronic cervicogenic headaches for longer than six months and showing a pain relief by greater than 50% from diagnostic/prognostic blocks were included in the study. These patients were treated with radiofrequency neurotomy of the cervical zygapophyseal joints and were subsequently assessed at one week, one month, six months, and at 12 months following the treatment. The results of this study showed that radiofrequency neurotomy of the cervical zygapophyseal joints significantly reduced the headache severity in 22 patients (73.3%) at 12 months after the treatment. The limitations of this study include the lack of a control group and small sample size.

In a randomized controlled study, Haspeslagh et al. (2006) compared the efficacy of a radiofrequency treatment with treatment by local injection of the greater occipital nerve in patients with cervicogenic headache (n=30). Fifteen patients received a sequence of radiofrequency treatments (cervical facet joint denervation, followed by cervical dorsal root ganglion lesions when necessary), and the other 15 patients underwent local injections with steroid and anesthetic at the greater occipital nerve, followed by TENS when necessary. Visual analogue scores for pain, global perceived effects scores, quality of life scores were assessed at 8, 16, 24 and 48 weeks. Patients also kept a headache diary. There were no statistically significant differences between the two treatment groups at any time point in the trial. The authors reported that they did not find evidence that radiofrequency treatment of cervical facet joints and dorsal root ganglion is an effective treatment for patients fulfilling the clinical criteria of cervicogenic headache. The authors reported that many patients in clinical practice are treated with neurotomies despite the lack of evidence for positive outcomes.

In a randomized, double-blind, placebo-controlled study, Stovner et al. (2004) studied radiofrequency denervation of facet joints C2 through C6 in cervicogenic headache (n=12). The patients had some improvement three months after treatment, but there were no marked differences between the two groups, concluding that the procedure is probably not beneficial for cervicogenic headaches.

Govind et al. (2003) studied 49 patients with occipital headaches who underwent percutaneous radiofrequency neurotomy. Eighty-eight percent of the patients achieved a successful outcome

(complete relief of pain for at least 90 days). The median duration of relief in these patients was 297 days. While the results were promising in this study, it lacked a control group which leads to difficulties in interpretation of the findings.

Nagar et al. (2015) published the results of a systematic review to evaluate the effectiveness of RF and pulsed RF for the treatment of cervicogenic headache. A total of nine studies met inclusion criteria and consisted of four randomized controlled trials (RCTs) (two high quality) and five non-randomized controlled trials. In the selected studies there were inconsistencies between randomized trials, flaws in trial design, and gaps in the chain of evidence. The primary outcome measures were headache relief and improved quality of life. The authors reported none of the four RCTs provided strong evidence that radiofrequency ablation or pulsed radiofrequency therapy was effective for cervicogenic headache and only three of the five non RCTs suggested RF was effective. There were not enough homogenous studies to conduct a meta-analysis. The authors concluded there is limited evidence to support RF and pulsed RFA therapies for management of cervicogenic headache and there is a need for high quality randomized controlled trials (RCTs) and/or multiple consistent non-RCTs without methodological flaws to evaluate the efficacy of RF and pulsed RF ablative therapies for cervicogenic headache.

The American Association of Neurological Surgeons (AANS) website provides the following information: treatment of occipital neuralgia can be non-surgical or surgical and aims to alleviate the pain but is not a cure. Non-surgical interventions include heat, rest, physical therapy including massage, anti-inflammatory medications, muscle relaxants, and oral anticonvulsant medications. Percutaneous nerve blocks can be used to diagnose and treat occipital neuralgia. Nerve blocks involve either the occipital nerves or in some patients, the C2 and/or C3 ganglion nerves. It is important to keep in mind that repeat blocks using steroids may cause serious adverse effects. Surgical interventions including occipital nerve stimulation, spinal cord stimulation, and C2,3 ganglionectomy may be considered when the pain is chronic, severe and does not respond to conservative treatment (AANS, 2024).

There is insufficient evidence in the published medical literature to demonstrate the safety and efficacy of peripheral nerve ablation, using any method, for treatment of cervicogenic headache and/or occipital neuralgia.

Other Pain Related Conditions
There is a paucity of evidence in the peer-reviewed literature evaluating neuroablative procedures as treatment of other pain conditions including intercostal neuralgia, chronic regional pain syndrome (Straube, et al., 2013; Manjunath, et al., 2008), peripheral nerve compression/entrapment conditions (McSweeney and Cichero, 2015), peripheral neuropathic conditions , craniofacial pain syndromes, post-herpetic neuralgia, post-amputation pain, and post inguinal herniorrhaphy pain (Wray et al., 2023). Evidence is mainly in the form of published reviews and few case reports with an emphasis of lower extremity pain. Published peer-reviewed evidence for intercostal neuralgia is in the form of a case series, case report, retrospective review and review article (Abd-Elsayed, et al., 2018; Chrona, et al., 2017; Engel, 2012; Cohen, et al., 2006). At present the evidence is insufficient to support safety and efficacy of peripheral nerve destruction when performed for treatment of pain related to these conditions.

Professional Societies/Organizations
In relation to the use of radiofrequency neurotomy (RFN) to treat pain involving peripheral joints and nerves, Lee et al. (2021) participated in a work group from the American Society of Pain and Neuroscience (ASPN). The work group conducted a systematic review to provide best practice guidelines, evidence and consensus grading for each of the following anatomical targets: cervical, posterior sacroiliac joint pain, hip and knee joints, and occipital neuralgia.

- A total of nine studies met inclusion criteria for cervical medial branch and consisted of one randomized control trial (RCT), four observational studies, one case series and one retrospective review.
- A total of 18 studies met inclusion criteria for lateral sacral branch and consisted of four RCT, two observational studies, two pilot studies, four retrospective reviews and five case series.
- A total of four studies on RFN of nerves that supply the knee were identified including one literature review, one RCT, one systematic review and one meta-analysis.
- A total of five studies met inclusion criteria for hip RFN including one cadaveric study, one clinical trial, one case series and two retrospective cohort studies.
- A total of eight studies on occipital nerve RFN met inclusion criteria including one RCT, one prospective study, four retrospective studies, one case series and one case report.

Although the consensus statements concluded that RFN may be used for the cervical medial branch, lateral sacral branch, genicular nerve, hip joint targeting the obturator and femoral nerve branches, and occipital nerve, the studies were limited by variable outcomes, small patient populations, short term follow ups, inclusion of a cadaveric study, heterogeneity of types of RF, variable parameters, procedural times, RF targets, techniques, and patient selection criteria. The authors concluded that more evidence is needed to confirm the safety, efficacy and long-term effects of RFA for the proposed anatomical targets.

As noted above, several professional societies (American Society of Interventional Pain Physicians [ASIPP, Manchikanti, et al., 2013]; American College of Foot and Ankle Surgeons [ACFAS, Thomas, et al., 2010; Thomas, et al., 2009]) have published position statements or clinical recommendations for various medical conditions which include recommendations for or against peripheral nerve ablative modalities. In addition, the American Society of Anesthesiologists (ASA) Task Force on Chronic Pain Management and the American Society of Regional Anesthesia and Pain Medicine Practice (ASRA) published their guidelines for chronic pain management in 2010. The guideline was based on scientific evidence, opinion-based evidence (i.e., expert opinion, membership opinion, and informed opinion), the level of evidence for individual recommendations however is not specified. Regarding ablative methods specifically, the Task Force concluded the following:

- Other treatment modalities should be attempted before consideration of the use of ablative techniques.
- Chemical denervation (e.g., alcohol, phenol, or high-concentration local anesthetics) should *not* be used in the routine care of patients with chronic noncancer pain.
- Cryoablation may be used in the care of selected patients (e.g., post-thoracotomy pain syndrome, low back pain [medial branch], and peripheral nerve pain).
- Conventional radiofrequency ablation may be performed for neck pain, and water-cooled radiofrequency ablation may be used for chronic sacroiliac joint pain.
- Conventional or thermal radiofrequency ablation of the dorsal root ganglion should not be routinely used for the treatment of lumbar radicular pain.

Health Equity Considerations

Health equity is the highest level of health for all people; health inequity is the avoidable difference in health status or distribution of health resources due to the social conditions in which people are born, grow, live, work, and age.

Social determinants of health are the conditions in the environment that affect a wide range of health, functioning, and quality of life outcomes and risks. Examples include safe housing, transportation, and neighborhoods; racism, discrimination and violence; education, job

opportunities and income; access to nutritious foods and physical activity opportunities; access to clean air and water; and language and literacy skills.

Medicare Coverage Determinations

	Contractor	Determination Name/Number	Revision Effective Date
NCD	National	Induced Lesions of Nerve Tracts/160.1	Longstanding, no date
LCD	NGS	Sacroiliac Joint Injections and Procedures/ L39455	8/10/2023
LCD	Noridian Healthcare Solutions	Injections - Tendon, Ligament, Ganglion Cyst, Tunnel Syndromes and MORTON's Neuroma/L34076	10/01/2019
LCD	Noridian Healthcare Solutions	Injections - Tendon, Ligament, Ganglion Cyst, Tunnel Syndromes and MORTON's Neuroma/L34218	10/01/2019

Note: Please review the current Medicare Policy for the most up-to-date information.
(NCD = National Coverage Determination; LCD = Local Coverage Determination)

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Revision Details

Type of Revision	Summary of Changes	Date
Focused Review	• No policy statement changes	10/15/2025
Annual review	• No policy statement changes.	2/15/2025
Annual review	• No policy statement changes.	2/15/2024
Focused review	• Added policy statement for percutaneous cryoablation of the lower extremities	12/3/2023