Interventional Spine Injections for Chronic Pain

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Intervertebral Disc

Cushions between vertebrae serve as the spine's shock absorbent system and allows spine to bend, rotate and twist

No disc between CO-C1 and C1-C2 and below L5-S1

2 components:

- Annulus fibrosus: Strong radial tire-like structure which encloses the nucleus pulposus
- Nucleus pulposus: water rich, gel-like center of the disc which is under most pressure when the body is upright



Disc Displacement

Occurs most frequently in the lower lumbar spine, especially at the L4-L5 and L5-S1 level SPINE CONDITIONS





Spinal Cord

An extension of the brain that runs down the back

Enclosed by the bony vertebral column (70 cm)

Major functions: Main pathway for information connecting the brain and peripheral nervous system





Radiculitis/Neuritis

Radiculitis: Inflammation of a spinal nerve root

- Includes symptoms such as pain, numbness, tingling, and/or weakness in the arms or legs
- Often caused by direct pressure on a nerve root from a herniated disc or degenerative changes in the spine

Radiculopathy: Any disease or spinal nerve root(s); often used interchangeably with radiculitis

Neuritis/neuropathy: Inflammation of one or more nerves/any disease of the nerves



Anatomy

Superficial tissues

Supraspinous ligament

Ligamentum flavum

Interspinous ligament

Epidural space



Vertebral body

Intervertebral disc

Anterior longitudinal ligament

Posterior longitudinal ligament



Indications

- Spinal nerve root inflammation traumatic
- Spinal nerve root compression
- Spinal stenosis
- Spinal nerve root inflammationinfectious

(e.g., acute or subacute herpes zoster, postherpetic neuralgia)

Disc degeneration or herniation



Contraindications

- True allergy to the local anesthetic, corticosteroid, or contrast agent
- Infection at the site of injection
- Coagulopathy
- Pregnancy
- Patient unwilling to consent to the procedure

Complications (minimal)

- Pain at the injection site
- Nerve root injury
- Spinal cord injury
- Epidural hematoma
- Epidural abscess
- Meningitis
- Osteomyelitis
- Postdural puncture headache



Mechanism of action

- Inhibit the activity of phospholipase A2 thereby inhibit the inflammatory process/fibrosis and scarring
- Possibly dilute inflammatory mediators by the volume of injection material around the affected nerve root
- May modulate nociceptive input from peripheral nociceptors by direct action on the spinal cord (there are glucocorticoid receptor sites located within the dorsal horn substantia gelatinosa which are known pathways for pain transmission)



Procedure





Procedure











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Thoracic facet referral pattern



Lumbar facet referral pattern





Damage and irritation of the lumbar joints will often cause pain to be felt into the hips and legs as well as the back itslef. Which joints are affected will determine where the referred pain is felt.

Background

- A person can suffer from facet-related pain even though x-rays, CT and MRI may not demonstrate abnormality of the facet joint
- Neck and back pain can originate from more than one facet joint therefore multiple facet joint injections may be needed
- The facet joints are innervated by the medial branch of the dorsal ramus, one from the level above the target point and one from the level below the target point



Facet joint is a true synovium-lined joint allowing the spine to flex, extend and rotate.

Facet joint pain can be contributed by osteoarthritis and trauma.

The sensory nerve endings innervating the facets become irritated by the inflammatory process resulting in sensation of pain.

Repeated or excessive hyperflexion, hyperextension or twisting movements may eventually results in facet disease.

Degenerative disc narrowing may also predispose to facet disease. When the disc becomes narrowed, up to 70% of the compressive force usually applied to the disc is transferred to the facet joints.

A variety of neurochemical constituents have been identified within the facet joint capsule and probably mediate the pain response.









Cervical facet syndrome

- Unilateral or bilateral paravertebral neck pain
- Decreased range of motion of the neck
- Focal tenderness over the affected facet joints
- Upper cervical facet joints causing not only neck pain but also headaches and cutaneous pain
- Pain frequently referred into the shoulder girdle
- Pain can extend to the elbow but fairly distal to the elbow. The pain should follow a non-dermatomal (non-radicular) pattern



Lumbar facet syndrome

- Unilateral or bilateral paravertebral low back pain which is often aggravated by rest in any posture.
- Deep, dull pain that is often limited to the low back, buttock, and hip; the pain can radiate into the thigh and down to the knee in a non-dermatomal (nonradicular) distribution. Facet pain usually does not extend below the knee.



Lumbar facet syndrome (continued):

- Pain is accentuated by twisting or rotational motion
- More pain on extension and flexion. Pain may be relieved by flexion
- Pain exacerbated by moving from sitting to standing position
- Pain relieved by standing, walking, rest or repeated activity



Lumbar facet syndrome (continued):

- Morning stiffness
- Normal neurologic examination
- Tenderness to palpation over the affected facet joint
- Radicular pain absent, straight-leg raising negative



Contraindications

- Coagulopathy
- Pregnancy
- Systemic infection or skin infection
- Allergies to medications
- Inability to obtain access to facet joint because of extensive solid lateral or posterior lateral fusion
- Patient with motor weakness, absent reflexes or long tract signs







A. Position of needle for medical branch block B. Facet joint injection at C5-6 level (right side)

Lumbar facet injections



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Radiofrequency Neurotomy (Ablation, rhizotomy) of Medial Branches Supplying the Facet Joints

The facet joints are innervated by medial branches of the dorsal ramus nerve coming from the spinal cord.

These nerves transmit pain messages from the facets to the central nervous system.

Lesioning of these nerves can result in longer-term pain relief related to facet pain.

In some cases pain relief can last for one to 2 years.



Radiofrequency Neurotomy of Medial Branches Supplying the Facets

To qualify for radiofrequency procedure the patient must first undergo diagnostic medial branch nerve blocks.

Medial branch nerve blocks are done by putting local anesthetic on the nerves supplying the joints.

If the patient has good pain relief then they are candidates for the radiofrequency procedure.



Radiofrequency Neurotomy of the Medial Branches Supplying the Facets

Medial branch nerve blocks



Radiofrequency Neurotomy of the Medial Branches Supplying the Facets

Lesioning of the medial branches



Radiofrequency Neurotomy of the Medial Branches Supplying the Facets

Complications

- Minimal
- Bleeding
- Infection
- Thecal sac puncture and headache
- Risk of pneumothorax with thoracic procedure
- Vasovagal reaction and ataxia, especially with cervical facet denervation
- Permanent damage to the spinal nerve



Anatomy

- The joint is formed by articulation between the sacrum and the ilium
- A true synovial lined cartilaginous joint and a fibrous articulation
- Innervation of the SI joint is predominantly from the dorsal rami of the S1-S4 nerve roots
- There is the presence of nerve fibers within the SI joint capsule and adjoining ligaments
- The pain is referred into the dermatomes supplied by these nerve fibers
- Capsular irritation of the SI joint is thought to be the underlying factor leading to lower extremity symptoms





Patient selection

- SI joint—related symptoms requiring pain control, including low back pain (usually unilateral, but can be bilateral); groin pain; sitting intolerance (can't sit in one place for only a short time); and possible referred numbness, burning, or tingling in the buttock and lower extremity
- No associated radiculopathy
- No underlying arthropathy



Procedure



Indications

- Chronic regional pain syndrome type I and II reflex sympathetic dystrophy (RSD)
- Treatment of acute herpes zoster in cervical and upper thoracic dermatomes
- Raynaud's syndrome of the upper extremities
- Frostbite and acute vascular insufficiency of the face and upper extremities





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Anatomy

- Stellate ganglion is located on the anterior surface of the longus coli muscle
- This muscle lies anterior to the transverse processes of the seventh cervical and first thoracic vertebral bodies
- The ganglion lies medial to the vertebral artery and is medial to the common carotid artery and jugular vein



Stellate Ganglion Injection

Procedure



Complications

- Local anesthetic toxicity
- Hematoma
- Injection into the epidural, subdural or subarachnoid space
- Pneumothorax
- Seizures
- Block of recurrent laryngeal nerve resulting in hoarseness and dysphagia



Indications

- Chronic regional pain syndrome type I and II (RSD)
- Vascular insufficiency, frostbite, atherosclerosis, arteritis and Buerger's disease
- Sympathetically mediated pain of the kidneys, ureters, genitalia and lower extremities
- Acute herpes zoster and postherpetic neuralgia



Anatomy



Procedure



Complications

- Infection, bleeding and injury to the nerve roots
- Epidural, subdural or subarachnoid injections
- Damage to the abdominal viscera
- Damage to the disc



References

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Questions?

Thank You

