INTEGRATIVE DRY NEEDLING

The 3 I's describe the "problem" with musculoskeletal pain and dysfunction, **Inflammation, Irritation, and Inhibition**. The 3 I's do not occur in isolation; they are coupled with one another in an injury situation. Each of the I's occur locally **(Symptomatic), Segmentally, and Systemically**. If pain and dysfunction are treated solely at the site of the symptoms, "you may get to the point but will miss the system," as we like to say. The human body works as an integrated organism and must be viewed and treated in this way. The human body shares neurology and circulation, and to believe that an injury remains local to the site, absent an effect on the rest of the body, is limiting your treatment effect. This reminds me of the "guru" based treatment models of the 1980s and 90s. Clinicians would utilize a specific manual therapy paradigm and would become cult-like in their treatment approach, and if it failed, the patient was labeled "not-fixable." Since that time, the PT profession has become more eclectic in viewing the body as greater than the sum of its parts (Gestalt). This eclectic view is in perfect alignment with the IDN system of dry needling. The days of focusing on a point as the source of pain and dysfunction are numbered, and it is time that we begin to move toward a more reliable and global assessment and comprehensive treatment. The global thinking of the 3 I's and the 3 S's is the model that sums up both the injury of the system and comprehensive treatment. The dilemma lies in the fact that we do not fully understand the experience of pain, dysfunction, or the physiological mechanisms of dry needling. This is today's reality, and if we can embrace it, we can continue to move our thinking forward.

The more you read about **Inflammation** the more it becomes apparent it is centered at the root of pain and dysfunction in the human body. This creates **Irritation** of peripheral nerves that can create the sensory experience of pain and the motor effects that drive neuromuscular **Inhibition**. If inflammation could be managed more effectively, we may be better able to mitigate its effect on both pain and motor dysfunction. This is not a revelation but a basic fact of treating most musculoskeletal conditions. Following injury, the inflammation may reside in local tissue acutely, however as time goes on and the body is unable to clear the inflammation, it can become more widespread and involve more of the nervous system such as in chronic conditions. Neurogenic inflammation results from bioactive chemicals activating sensory neurons, which in turn activates the release of sensitizing chemicals from peripheral nerve terminals. (Irritation) This bidirectional process from local peripheral

tissue to the CNS causes a more widespread inflammatory process. The Inflammation that produces pain and dysfunction can be local, segmental and or systemic, which is what creates the challenge. This may explain why the modern continuing education seminars now focus on assessing and treating the body as a whole and less focused on identifying the specific tissue that is at fault. The tissue-specific diagnoses that aim to identify the "involved" structure are faulty reasoning and should be reconsidered. Sound clinical reasoning is dependent on a multifactorial construct, which encourages innovative practice. Acknowledging the lack of diagnostic accuracy in clinical testing, palpation, and even patient report makes treatment design challenging to say the least. That may have led some to attempt to create a cookbook style of treatment where it is assumed that a common grouping of signs and symptoms will all respond to a specific treatment regimen. We all know how that worked out and essentially lead back to the "not fixable" conclusions for patients that did not fit or respond favorably to the treatment mold they were placed in.

IDN's 3 S's concept of treatment provides no preconceived notions of the source of the 3 I's instead provides a foundation upon which to build a treatment plan.

Symptomatic (local)- This is undoubtedly the most obvious type of pain and dysfunction to treat as the patient tells you it hurts "here." Symptomatic pain is usually the result of an acute to sub-acute injury, and the area may have edema with a loss of motion.

Segmental- Manual therapy clinicians understand that when treating musculoskeletal pain and dysfunction, the spinal component cannot be ignored. They have been trained to first "clear" the spine to reduce the likelihood of missing a segmental problem based on a peripheral complaint. The segmental effects of needling help to reduce the symptoms of the Local (symptomatic) points.

Systemic- This is where the most confusion and even misunderstanding of the pain mechanisms are experienced. In the human body, there is shared neurology, circulation, and physiology that we cannot separate into pieces or parts. We base our systemic treatment on homeostatic points that are key neurological areas in the body that have stronger therapeutic signaling to the CNS and are present in reproducible locations and patterns. The innervation zones of homeostatic points are extensions of major peripheral nerves that are present in consistent locations around the body based on the predictable anatomy of the peripheral nervous system. This is in stark contrast to locating the highly variable myofascial trigger points.

In patients with acute symptom presentations, treating just symptomatic points (local) may be all that is needed to get the desired effect. As you move from the acute patient to the sub-acute and into the chronic, the need to expand the treatment methods becomes empirically evident by the reduced clinical results. Assessment tools, such as quantitative sensory testing, may be used to identify the possible central mechanism driving the symptoms. We believe it is relevant to address the 3 S's together because clinically, this approach has a better chance to address the 3 I's of pain and dysfunction.

INTEGRATIVE DRY NEEDLING

Evidence for Increased Magnetic Resonance Imaging Signal Intensity and Morphological Changes in the Brachial Plexus and Median Nerves of Patients with Chronic Arm and Neck Pain Following Whiplash Injury.

This is an excellent research report by Greening et al. discussing the morphological changes in the median nerve after trauma. This research report is very relevant to the Integrative Dry Needling (IDN) treatment concept of Neurological Dry Needling (NDN), and I wanted to comment on the key points and provide my clinical perspective.

- It is estimated 50% of patients that sustain a cervical whiplash injury develop chronic symptoms. This, of course, leads to the question, if healing is expected to occur over time, where is the persistent pain generated from? They point out that patients frequently present with signs of cutaneous hypersensitivity in the cervical spine and upper limb, such as allodynia and hyperalgesia and hypoesthesia, may indicate neuropathic pain causation.
- They suggest that nerve inflammation (neurogenic inflammation) occurs without overt damage (axonal degeneration or demyelination) and can be a cause of the neuropathic symptoms experienced by patients post whiplash. Neurogenic inflammation can be diagnosed using a T2-weighted MRI. An increase in the T2 signal intensity is an indicator of nerve edema that is a direct result of inflammation and vascular changes within the nerve structure. The key point here is the peripheral nerve inflammation can exist in the absence of demyelination i.e., structural damage. Consequently, nerve conduction studies may be read as negative, and clinical neurological testing may only show a minor sensory loss because only small-diameter axons are affected. This opens the opportunity to have a therapeutic effect when providing treatment, specifically dry needling, near the nerve structure.

The study demonstrated a greater T2 signal intensity occurred not only in the roots of the brachial plexus but also in the median nerve of patients with chronic pain post whiplash. This is in line with empirical findings that when a nerve has irritation in one area, assessment (and treatment) is necessary down the entire length of the nerve.

- We understand from Shah's work 2,3 that inflammation is not a local phenomenon, especially in the context of neurogenic inflammation.
- When the axonal transport system of a nerve is disrupted at a proximal site, it may increase the susceptibility of distal nerve segments to further injury (i.e., Double crush Theory). Another way to say that is neurogenic inflammation in one area of a peripheral nerve may lead to inflammatory processes along the entire nerve. Clinically, pain responses, as a result of the neurogenic inflammation, are commonly reproduced when performing nerve assessments, either with digital pressure or with stretch to the involved nerves.

- All of the study participants demonstrated signs of diffuse sensory changes (paresthesia and dysesthesia) of the upper limb, not localized to specific dermatomes or myotomes. They state a likely explanation for the diffuse symptoms is a central mechanism like central sensitization. Development and maintenance of sensitization in the dorsal horn require ongoing peripheral input from nociceptive axons that eventually results in the reported cutaneous hypersensitivities. Since the patients did not demonstrate signs of frank nerve injury, neurogenic inflammation could be a driver to this ongoing central barrage.

This study demonstrates objective evidence for the presence of neurogenic inflammation using T2 weighted Magnetic Resonance Imaging. This provides validation, within the limitations of the study, that the nerve itself can be the perpetuator of soft tissue dysfunction/pain. Within the current construct of dry needling treatment, the emphasis is on structures that are perceived to be the pain source, i.e., muscles. In situations like chronic whiplash, persistent symptoms may not be attributable to damage to musculoskeletal tissue. The neuropathic component of ongoing pain needs to be better elucidated with improved clinical application. This will require new thoughts and techniques on how to assess and treat neurogenic inflammation within the peripheral nervous system.

Clinical Relevance: If the inflammation/edema is within the nerve itself, at peripheral nerve terminals and around the nerve, this may contribute to decreased modulation of pain locally and at the spinal cord level. Neurogenic inflammation causes nerve irritation and resultant endogenous muscle guarding that is seen clinically in the form of a myofascial trigger point. According to this study, neurogenic inflammation can exist anywhere along the length of nerves, so it would seem inefficient to arbitrarily "hunt down" local trigger points searching for the source of a patient's symptoms. A simpler global assessment of patient condition is needed, and the peripheral nervous system may be the key. Conceivably, a therapeutic intervention that focuses on decreasing the mechanical, physical, or chemical irritation of a nerve by normalizing blood flow and releasing endogenous muscle contraction would be of greater clinical and functional benefit. With proper knowledge of neuroanatomy, clinicians could locate the sensitized areas of the peripheral nervous system and provide more efficient and effective dry needling treatment.

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1. Greening J, Anantharaman K, Young R, Dilley A. Evidence for Increased Magnetic Resonance Imaging Signal Intensity and Morphological Changes in the Brachial Plexus and Median Nerves of Patients with Chronic Arm and Neck Pain Following Whiplash Injury. JOSPT 2018;48(7):523-32
2. Shah J, Phillips T, Danoff J, Gerber L. An in vivo microanalytical technique for measuring the local biochemical milieu of human skeletal muscle. J Appl. Physiol 2005;99:1977-84
3. Shah J, Danoff J, Desai M, et al. Biochemicals associated with pain and inflammation are elevated in sites near to and remote from active myofascial trigger points. Arch Phys Med Rehabil 2008;89(January):16-23

24 Homeostatic Neuro-Trigger Points (HNTrP)

KEY: * In the extremities, the length and depth of the needle penetration is variable based on patient size and the intended therapeutic result. In the extremities, different needling techniques can be safely utilized from superficial to deep (including to the depth of bone). This decision is based solely on the specific need of the patient and your therapeutic goal for the treatment.

1. Deep Radial	2 finger widths distal to the lateral epicondyle of the elbow in the extensor groove between the brachioradialis and extensor carpi radialis brevis
Needle direction	Perpendicular to skin
Needle depth	*Depth is variable dependent on patient size and clinical intent.
Special notes	Upper extremity Quantitative Analysis point.
2. Greater Auricular	Clinical point is posterior and inferior to the anatomical point directly over the SCM. Inferior and posterior to the anterior portion of the mastoid process (behind the ear lobe) directly over the SCM.
Needle length	15mm / ½ inch
Needle direction	Perpendicular to skin
Needle depth	Up to ½ inch
Special notes	Set needle between 2 fingers bracketing the anterior and posterior margins of SCM.
3. Spinal Accessory	Mid-point between the acromion and 7th cervical vertebra on the anterior aspect of the upper trap
Needle length	25-50mm / 1-2 inch
Needle direction	Posterior to anterior, or anterior to posterior, slightly cephalic and always directed toward the clinician's palpating finger
Needle depth	Insert needle into muscle bulk until detected by palpating finger on opposite side
Special notes	LUNG FIELD SAFETY. Must hold muscle between thumb and fingers while needling. Needle IN/OUT +/- pistoning. Release muscle AFTER needle removed.
4. Saphenous	Located in a 'box' below the tibial plateau and on the medial side of the tibial shaft. Palpate for the most tender spot within the box.
Needle direction	Perpendicular to skin
Needle depth	*Depth is variable dependent on patient size and clinical intent.
Special notes	Lower Extremity Quantitative Analysis point.
5. Deep Fibular	Between the 1st and 2nd metatarsals approximately one finger width proximal to the web space
Needle length	25-50mm / 1-2 inch
Needle direction	Perpendicular to skin
Needle depth	As deep as necessary, until detected by palpating finger on plantar aspect of foot.
Special notes	Use clinician's fingers to palpate plantar aspect of foot between 1st and 2nd MT while inserting.

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6. Tibial	4 finger widths proximal from the top of the medial malleolus and posterior to the tibia
Needle direction	Perpendicular to skin, aiming behind tibia
Needle depth	*Depth is variable dependent on patient size and clinical intent.
Special notes	Tibial nerve is immobile in this area, insert the needle slowly
7. Greater Occipital	Locate the C2 spinous process and move laterally over the paraspinal muscle bulk and move slightly superior to be located over the inferior oblique muscle. Halfway between C2 spinous process and C1 transverse process.
Needle length	25-50mm / 1-2 inch
Needle direction	Perpendicular to skin
Needle depth	Depending on the tolerance of the patient you can go as deep as necessary, may go to the C2 lamina
8.Suprascapular (Infraspinatus)	Bracket the medial border and lateral border of the scapula with your thumb and middle finger; center your index finger between them. (Center of the scapular fossa)
Needle length	25-50mm / 1-2 inch
Needle direction	Perpendicular to skin
Needle depth	As deep as necessary, may go to the bone
Special notes	Care must be taken to verify that you are over the scapula and not medial to it!
9. Lateral Antebrachial Cutaneous	With the elbow bent and forearm supinated, the HNTrP is at the lateral margin of the cubital crease.
Needle direction	Perpendicular to skin in a posterior to medial direction towards the radial head.
Needle depth	*Depth is variable dependent on patient size and clinical intent.
Special notes	
10. Sural	The HNTrP is between the two heads of the gastrocnemius muscle
Needle direction	Perpendicular to skin.
Needle depth	*Depth is variable dependent on patient size and clinical intent.
Special notes	
11. Lateral Popliteal	Flex the knee, the HNTrP is on the crease just medial to the biceps femoris tendon.
Needle direction	Perpendicular to skin.
Needle depth	*Depth is variable dependent on patient size and clinical intent.
Special notes	Avoid neurovascular bundle in midline. Avoid visible blood vessels, or baker's cyst.
12. Superficial Radial	Located between the 1st and 2nd metacarpals at the midpoint of the interosseous muscle bulk
Needle length	25mm / 1inch
Needle direction	Perpendicular to skin.
Needle depth	As deep as necessary, until detected by palpating finger on palmar aspect of hand.
Special notes	Use clinician's fingers to palpate palmar aspect of hand between 1st and 2nd MC while inserting.

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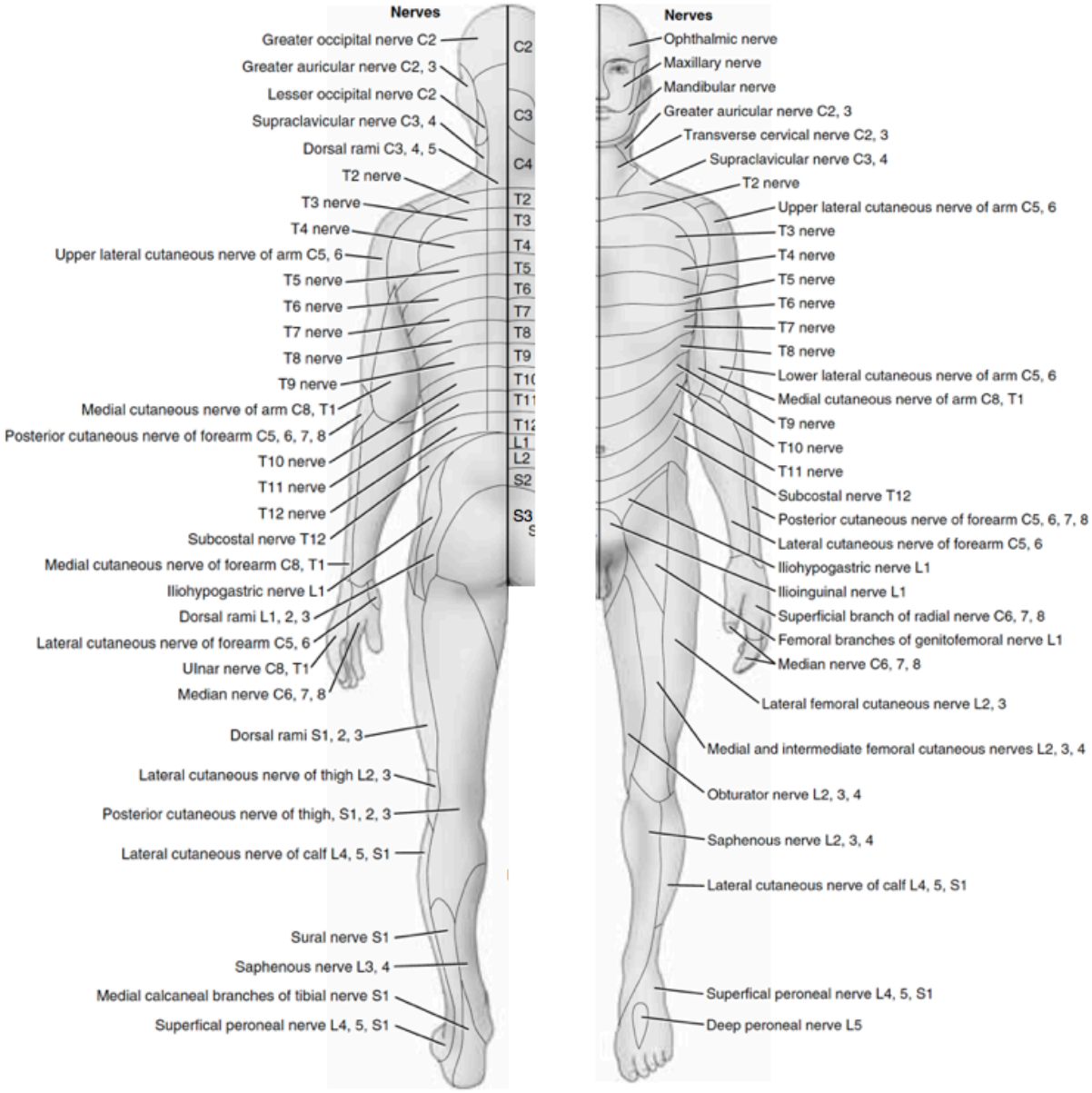
13. Dorsal Scapular	Locate the superior angle of the scapula, the HNTrP is in the levator scapulae insertion.
Needle length	Up to 25mm / 1inch
Needle direction	The needle should be directed from the medial aspect of the superior angle of the scapula moving laterally away from the thorax, assuring the needle point is over the bony backdrop of superior angle of the scapula.
Needle depth	Assure the needle point is directed toward the bony backdrop of the superior angle of the scapula. It is also acceptable to grasp the soft tissue and lift away from the thorax and needle as described above.
Special notes	LUNG FIELD SAFETY. Needle IN/OUT and verify that you are needling from medial to lateral toward the superior angle of the scapula.
14. Superior Cluneal (L1-L3)	There are 3 branches of the nerve traveling over the iliac crest inferiorly toward the gluteus medius region. There is variability in their location so draw a small box beginning 4 fingers widths from the spinous process
Needle length	75mm / 3inch
Needle direction	superior to inferior ensuring you are inferior to the iliac crest. Can vary the needle angle to obtain more depth into the gluteal muscles
Needle depth	Variable depending on therapeutic goal-can be superficial to affect the cutaneous distribution or deep to affect the gluteals.
Special notes	Care must be taken to verify the iliac crest is properly identified and the needle is inserted below it to avoid penetrating the abdominal cavity
15. Posterior Cutaneous of L2	At the inferior aspect of the 12th rib make a horizontal line back toward the spine, which approximates the L2 vertebra. The clinical HNTrP is 2 finger widths lateral to L2 spinous process
Needle length	Up to 50mm / 2 inch
Needle direction	Perpendicular to skin, can adjust angle the needle more medially toward lamina.
Needle depth	Up to 50mm / 2 inch
Special notes	KIDNEY FIELD SAFETY use 2:2 rule in upper lumbar region. 2:2 rule = 2 finger widths lateral to the spinous process and up to a 2" needle. In cases of the presence of a LAMINECTOMY use a shorter needle or move a segment up or down as there may be no bony backdrop.
16. Inferior Gluteal	Find the "crown" or center of the buttock.
Needle length	75mm / 3inch or more depending on patient size
Needle direction	Perpendicular to skin at center of buttock.
Needle depth	As deep as necessary, may go to the bone.
Special notes	Sciatic nerve is in close proximity, advance the needle slowly in final 25mm / 1inch.
17. Lateral Pectoral	HNTrP is located 2 finger widths inferior and perpendicular to the center of the clavicle.
Needle length	50mm / 2inch
Needle direction	Medial to lateral direction aiming the needle tip toward the clinician's palpating fingers
Needle depth	As deep as necessary until detected by palpating fingers under pectoralis major.
Special notes	LUNG FIELD SAFETY. Must hold pectoralis muscle between thumb and fingers while needling, always identify the rib cage and needle parallel, never perpendicular, to it. Needle IN/OUT +/- pistoning. Release muscle hold AFTER needle is removed. Care must be taken when IMPLANTED DEVICES (tissue or other device) are present and may be prudent not to perform dry needling.

24 Homeostatic Neuro-Trigger Points (HNTrP)

18. Iliotibial	Midway between the greater trochanter and lateral femoral condyle. (Center of the femur)
Needle length	50-75mm / 2-3 inch
Needle direction	Perpendicular to skin, towards femur.
Needle depth	As deep as necessary, may go to the bone.
19. Infraorbital	Located directly below the pupil, level with the nasal flare
Needle length	15mm / ½ inch
Needle direction	Angled inferior to superior so needle handle is angled away from the eye.
Needle depth	Superficial, set the needle with minimal advancement just to ensure needle is well set
Special notes	To reduce the likelihood of bruising on the face apply direct pressure to the needle site simultaneously while removing the needle, hold pressure for 5-10 seconds after removing needle.
20. Spinous Process of T7	Draw a horizontal line from the inferior angles of the scapula, which approximates T7, palpate for tenderness in the interspinous space. Select the most symptomatic interspinous space T6-7 or T7-8.
Needle length	Up to 50mm / 2 inch
Needle direction	Inferior to superior in the interspinous space (i.e. between the spinous processes) adjusting the angle of the needle as necessary.
Needle depth	Up to 2 inches
Special notes	Use 2 palpating fingers to bracket the lateral borders of the intended interspinous space while needling.
21. Posterior Cutaneous of T6	Locate the T7 HNTrP, move up 1 segment and laterally 1 finger width
Needle length	Up to 25mm / 1 inch
Needle direction	Perpendicular to skin, or lateral to medial towards vertebra.
Needle depth	Up to 25mm / 1 inch
Special notes	LUNG FIELD SAFETY. Use the 1:1 rule when needling the thoracic paravertebral area T1-T12. 1:1 rule = 1 finger width lateral to the spinous process and up to a 1” needle. Reduce needle depth in cases of lung disease, fragility, small stature and severe scoliosis if unsure of rib orientation.
22. Posterior Cutaneous of L5	HNTrP located within the paravertebral muscle above the sacrum at the level of L5, the 2:2 rule applies but can increase needle length on larger patients
Needle length	50-75mm / 2-3inch as needed.
Needle direction	Perpendicular to skin, can adjust angle the needle more medially toward lamina.
Needle depth	As deep as necessary, may to go the bone.
Special notes	In case of LAMINECTOMY use a shorter needle or move a segment superior as there may be no bony backdrop.
23. Supraorbital	Medial aspect of the eyebrow is the clinical point.
Needle length	15mm / ½ inch
Needle direction	Slightly superior to inferior, ensuring the handle of needle is directed AWAY from the eye.
Needle depth	Superficial
Special notes	To reduce the likelihood of bruising on the face apply direct pressure to the needle site simultaneously while removing the needle, hold pressure for 5-10 seconds after removing needle.
24. Common fibular	Located 4 finger widths below the patella between the anterior aspect of the fibular head and tibial shaft.
Needle direction	Perpendicular to the skin, towards the tibia.
Needle depth	*Depth is variable dependent on patient size and clinical intent.
Special notes	Fibular nerve is superficial as it passes the fibular head so insert the needle slowly


Nerves
Greater occipital nerve C2
Greater auricular nerve C2, 3
Lesser occipital nerve C2
Supraclavicular nerve C3, 4
Dorsal rami C3, 4, 5
T2 nerve
T3 nerve
T4 nerve
Upper lateral cutaneous nerve of arm C5, 6
T5 nerve
T6 nerve
T7 nerve
T8 nerve
T9 nerve
Medial cutaneous nerve of arm C8, T1
Posterior cutaneous nerve of forearm C5, 6, 7, 8
T10 nerve
T11 nerve
T12 nerve
Subcostal nerve T12
Medial cutaneous nerve of forearm C8, T1
Iliohypogastric nerve L1
Dorsal rami L1, 2, 3
Lateral cutaneous nerve of forearm C5, 6
Ulnar nerve C8, T1
Median nerve C6, 7, 8
Dorsal rami S1, 2, 3
Lateral cutaneous nerve of thigh L2, 3
Posterior cutaneous nerve of thigh, S1, 2, 3
Lateral cutaneous nerve of calf L4, 5, S1
Sural nerve S1
Saphenous nerve L3, 4
Medial calcaneal branches of tibial nerve S1
Superfical peroneal nerve L4, 5, S1
C2
C3
C4
T2
T3
T4
T5
T6
T7
T8
T9
L1
L2
S2
S3
Nerves
Ophthalmic nerve
Maxillary nerve
Mandibular nerve
Greater auricular nerve C2, 3
Transverse cervical nerve C2, 3
Supraclavicular nerve C3, 4
T2 nerve
Upper lateral cutaneous nerve of arm C5, 6
T3 nerve
T4 nerve
T5 nerve
T6 nerve
T7 nerve
T8 nerve
Lower lateral cutaneous nerve of arm C5, 6
Medial cutaneous nerve of arm C8, T1
T9 nerve
T10 nerve
T11 nerve
Subcostal nerve T12
Posterior cutaneous nerve of forearm C5, 6, 7, 8
Lateral cutaneous nerve of forearm C5, 6
Iliohypogastric nerve L1
Ilioinguinal nerve L1
Superficial branch of radial nerve C6, 7, 8
Femoral branches of genitofemoral nerve L1
Median nerve C6, 7, 8
Lateral femoral cutaneous nerve L2, 3
Medial and intermediate femoral cutaneous nerves L2, 3, 4
Obturator nerve L2, 3, 4
Saphenous nerve L2, 3, 4
Lateral cutaneous nerve of calf L4, 5, S1
Superfical peroneal nerve L4, 5, S1
Deep peroneal nerve L5