

## A Case Series of Cervical Disc Disease Pain Relieved by New Five Injection Spots of Lignocaine (The Anatomical Gates of Sodium Channels Blockers of the Upper Limbs)

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### Abstract

**Background:** This case series describes for the first time five injection spots of lignocaine only without steroids which relieve pain related to cervical spine disc disease. The injection spots are called gates and they are part of the anatomical gates of sodium channels blockers discovered by the author. These gates are M, A, H, O and B. Lignocaine is a sodium channel blocker and when it is used in these special gates it resets the disturbance in sodium channels of nerves which is the cause of pain as documented in many published studies and thus lignocaine acts as a therapeutic drug and will give long duration pain relief for months.

These gates injections are given distal to the cervical spine and the author hypothesized that the lignocaine which is a lipid soluble drug will diffuse through the myelin sheath of nerves which is mainly formed of lipids itself and that diffusion could reach, up to a limit, different nerves if they share continuous non interrupted myelin sheath and throughout that diffusion it will cause resetting of sodium channels and the relief of pain.

Gates A and B are already published and this case series will describe the other three gates for the first time.

**Case Presentation:** Five patients with variable presenting symptoms of cervical disc disease, different duration of symptoms and of different age groups were injected each in one of the gates injection M, A, H, O and B and all patients described pain relief which lasted more than three months post the injections.

**Conclusion:** These gates injections of lignocaine only which is a sodium channel blocker will give durable pain relief for months in patients with severe pain related to the cervical spine disc disease and will be very effective in reducing operations on the cervical spine knowing that the surgery of the cervical spine is done in 90% of cases to control pain not controllable by conservative management. Also, these injections use no steroids and are free of the serious risks related to cervical epidural steroids injections which are not FDA approved. Also, these injections require less training and are easier to perform and they require no theatre setting, no ultrasound and no x-ray guidance.

**Keywords:** *Cervical Disc Disease; Cervicobrachial Pain; Upper Limb Radiculopathy; Neck Pain; The Anatomical Gates of Sodium Channels Blockers*

### Introduction

Cervical disc disease can present itself as one or a combination of the following symptoms:

1. Neck pain

2. Occipital headache
3. Vertigo
4. Shoulder pain (unilateral or bilateral)

This shoulder pain if not treated with these gates injections could progress to frozen shoulder.

The author believes that the cause of frozen shoulder is not the shoulder capsule per se but it is a sequel of cervical disc disease which can present itself as pain in one shoulder without pain in the neck and that pain will cause less movement of the shoulder joint and then fibrosis ensues.

It is well known in orthopaedics that restriction in movements of joints leads fibrosis in these joints.

The author believes that the most common cause of shoulder joint pain is pain related to cervical disc disease followed by subacromial bursitis and the way to differentiate between both conditions is to palpate deep for the subacromial bursa posteriorly with the shoulder in maximum external rotation and that palpation will reveal no maximum point of tenderness in the subacromial bursa and wide spread pain and tenderness in case of pain related to cervical disc disease related shoulder joint pain, whilst in subacromial bursitis there is a point of maximum tenderness over the bursa.

Using the gates injections in a case of painful frozen shoulder will produce a dramatic response even if some degree of fibrosis with limited external rotation has happened, whilst in painless frozen shoulder, when pain disappears completely and fibrosis builds up, using the gates injections will only improve external rotation movement with non-improvement in forward flexion, abduction or internal rotation.

Should the gates injections are used early in shoulder joint pain related to cervical disc disease, we will see a dramatic decrease in frozen shoulder cases requiring surgery.

5. Chest pain over unilateral or bilateral pectoralis major muscles.
6. Pain over one or both trapezii muscles and in many instances it lies just medial to the medial border of the scapula and that pain is often misdiagnosed as (fibromyalgia).

The validity of the dermatome maps and their background needs to be revisited and questioned and the author after having treated hundreds of cervical spine disc related pain confirms that cervical spine disc disease can give pain down to T6 dermatome [1].

7. Pain in one or both arms.
8. Pain over one or both elbows and it can present itself as tennis elbow pain or golfers elbow pain.
9. Pain over one or both forearms.
10. Pain over unilateral or bilateral wrists joints and hands and it can present itself as a carpal tunnel syndrome.

The most important aspect in diagnosis is careful history and acquaintance with the variable ways this condition presents itself with.

Physical examination is usually normal apart from tender spots in the aforementioned areas, but sometimes patients do present themselves as difficulties in moving their unilateral or bilateral upper limbs. Examination of the sensory and motor nerves of the upper limbs is rarely abnormal.

Nerve conduction studies of the upper limbs nerves are helpful in diagnosis [2].

X-ray and MRI of the cervical spine might be reported as normal in some cases and the diagnosis should not rely only on them.

It is worthwhile mentioning here that some nerve conduction studies might show abnormalities of carpal tunnel syndrome with or without abnormalities in the cervical roots and the author would like to mention here that he believes that carpal tunnel syndrome pain is just a variant of cervical spine disc disease and that this pain can be relieved by an injection of lignocaine only in one of the gates M, A, H, O or B (Figure 1).

This paper describes five injection spots of lignocaine called gates and they are part of the anatomical gates of sodium channels blockers discovered by the author [3].

Around 90% of the operations done on the cervical spine are for pain control following failure of conservative management and the remaining 10% are done for other indications like tumors, infections or patients with neurological findings.

Cervical epidural steroids injections are linked to serious risks and complications and are not FDA approved [4].

Also, cervical epidural steroids injections require theatre setting, the guidance of x-ray and ultrasound and are costly to any health system and their success rate in bringing about pain relief is only 63% [5].

The gates injections, on the other hand, have the following advantages:

1. Minimal training is required
2. No steroids are used.
3. No theatre setting is necessary
4. No x-ray or ultrasound are needed
5. Safe injections with no serious risks
6. The author claims that the success rate of these gates injections is 99% and he is happy for a large scale study to be done to confirm that.

The gates injections which can relieve cervical disc disease pain are M, A, H, O and B (Figure 1).

### **Gate M**

It is 2.5 Cm. above the ear.

An insulin syringe containing 1 Ml. of 2% lignocaine hcl is introduced throughout the soft tissue of the head and then injected (Figure 1).

This gate injection will work for neck pain and also for unilateral side radiculopathy pain and it does relieve contra lateral radiculopathy pain to some extent, but the author advises injecting both sides of the head in bilateral radiculopathy pain.

After injection in Gate M, the patient will feel some heaviness and numbness in unilateral side of his face especially around temporomandibular joint which will subside in around one hour time.

Thirty minutes post gate M injection, the patient will confirm the subsidence of his unilateral radiculopathy pain and also of his neck pain.

It is worthwhile mentioning here that Gate M injection was published by the author and his colleagues before as a treatment for temporomandibular disorders [6].

Although Gate M was discovered by the author to be effective in treating temporomandibular disorders, occipital headache and some cases of migraine and trigeminal neuralgia, it was Doctor Dayanidhi Jaiswara who noticed first that this injection works for cervical disc disease pain and also he discovered Dayanidhi sign of cervical spine radiculopathy pain.

Dayanidhi's sign: Pressing with the finger on gate M area for two minutes will make unilateral upper limb radiculopathy pain diminishes in severity by 50% and that pain can disappear if the pressing over gate M is continued for 10 minutes.

### **Gate A**

10 Ml. syringe containing (3 Ml. Of lignocaine hcl plus 7Ml. distilled water and not normal saline).

Patient is lying supine with external rotation of his shoulder and 90 degrees flexion of his elbow.

Palpate for the axillary artery pulsation and the bicipital groove of the humerus and then introduce needle above the pulsation of the axillary artery aiming at the bicipital groove and when you touch it with the needle, retract just enough to push up the volume of the syringe (Figure 1).

Patient will sense pain relief within three minutes after this injection and it is very rarely for this injection to cause heaviness and weakness in the upper limb (1%) and that heaviness and weakness, if happens, will take around one hour to disappear.

Gate A can relieve to some extent contra lateral radiculopathy pain as well, but the author recommends injecting both sides in patients with bilateral upper limbs symptoms.

### **Gate H**

10 Ml. syringe containing (3 Ml. Of lignocaine hcl plus 7Ml. distilled water and not normal saline).

Patient is sitting up (Figure 1).

The needle is introduced vertical to the midline lateral cortex of upper humerus 3 Cm. distal to acromion process tip above the axillary nerve position [6].

When the needle touches the lateral cortex of the humerus retract just enough to push up the volume of the syringe.

The patient will report pain relief fifteen minutes post the injection and this injection will not give any sensory or motor deficits of the axillary nerve.

The author did not notice contra lateral pain relief with this injection and advises bilateral injections in patients with bilateral symptoms.

### **Gate O**

10 Ml. syringe containing (3 Ml. Of lignocaine hcl plus 7Ml. distilled water and not normal saline).

The patient is either lying down on contra lateral side or sitting up with elbow flexed to 90 degrees.

The syringe is introduced vertically to the midline posterior cortex of the humerus 3 Cm. proximal to the olecranon tip into the olecranon fossa and when the cortex of the bone is touched, retract just enough to push up the volume (Figure 1).

This injection spot is safe and is similar to posterior portal used in elbow arthroscopy [7].

The patient will report pain relief fifteen minutes post the injection and this injection will not give any sensory or motor deficits.

The author did not notice contra lateral pain relief with this injection and advises bilateral injections in patients with bilateral symptoms.

**Gate B**

It is just a carpal tunnel injection with 1 or 2 ml of lignocaine 2% (Figure 1).

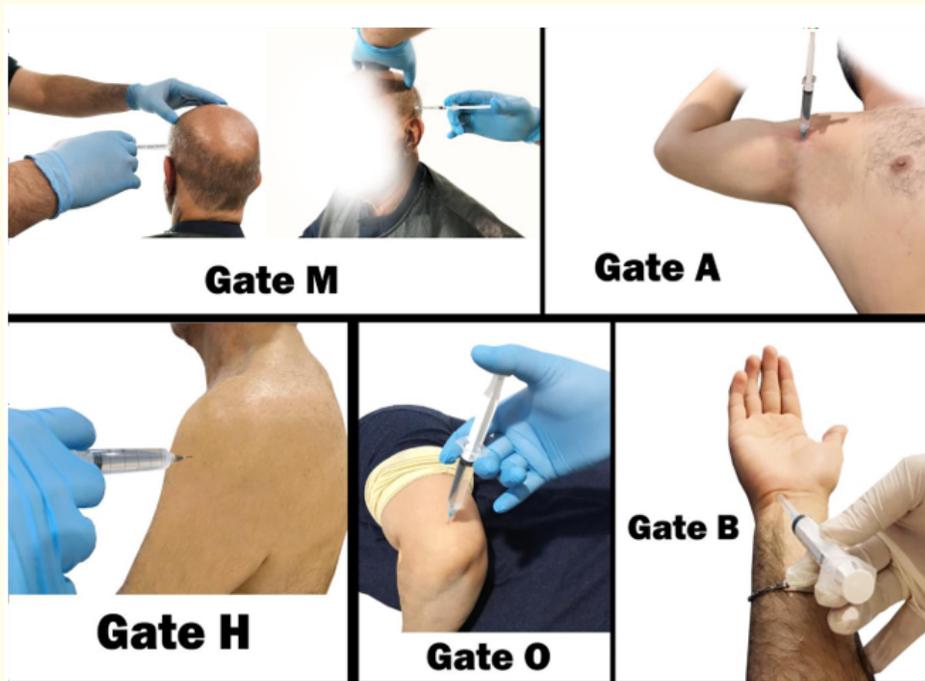
The injection is deemed successful only if medial nerve dermatomes of the hand are anaesthetized fifteen minutes post the injection, otherwise it was outside the carpal tunnel.

Thirty minutes post the injection the patient will describe around 75% pain relief of his cervical spine related pain.

The author did not notice contra lateral pain relief with this injection and advises bilateral injections in patients with bilateral symptoms.

The author confirms that gate B injection, unlike expectations, is the most difficult one and when doctors start practicing giving lignocaine only they will realize that many injections were outside the carpal tunnel as no median nerve dermatomes of the hand go numb in fifteen minutes post the injection.

Please note that the naming of the gates is not perfect because the discovery of these gates injections came over one after another over a period of two years, but that remains a small price to pay for their benefits.



*Figure 1: The anatomical gates of sodium channels blockers (upper limbs).*

## **Case Series**

### **Case 1 presentation**

A 45-year-old Arab lady with no significant past medical, family or psychosocial history, presented with pain in her neck and right wrist joint and hand for one year.

Patient described chronic mild pain in her neck over years which gradually got worse during the last year.

Physical examination revealed moderate tenderness over her cervical spine and right wrist joint and hand and patient had a normal gait.

Patient had normal sensory and motor nerve examination of both her upper limbs and she had normal movements of both upper limbs.

Spurling's and Romberg's tests were negative, phalen's and tinel's signs of her right wrist were positives.

Dayanidhi's sign was positive on the right side.

Blood tests including complete blood picture, kidney function tests, liver function tests, ESR, rheumatoid factor, ANA, ACCP, alkaline phosphatase, blood sugar, Vitamin D, serum uric acid and thyroid function tests were all normal.

X-ray of the cervical spine showed no significant findings.

MRI of the cervical spine showed mild disc prolapse at C5/C6 level.

Nerve conduction studies reported cervical root problems with moderate degree right carpal tunnel syndrome.

Patient was due to have right carpal tunnel release surgery and that to be followed by a cervical spine operation.

Patient was injected in gate M on the right side and thirty minutes post the injection patient reported complete pain relief of her symptoms in the neck, right wrist joint and hand and she continues to be symptoms free for six months post the injection.

### **Case 2 presentation**

A 43-year-old Arab lady with no significant past medical, family or psychosocial history, presented with pain over her upper back, just medial to the medial borders of both scapulae, for the last five years.

Patient denies any pain in her neck or in her upper limbs.

Patient was diagnosed by two doctors as having (fibromyalgia syndrome) and was taking Duloxetine for the last one year which failed to control her symptoms.

X-ray of her cervical spine showed no abnormality and her blood tests were normal apart from low vitamin D.

Physical examination revealed tender spots just medial to the medial borders of both scapulae with no tenderness over the cervical spine or upper limbs.

Patient was injected in gate A bilaterally with lignocaine only (10 Ml. of lignocaine 0.6% in each side, by adding 3 Ml. of lignocaine hcl 2% to 7 Ml. of distilled water) and reported complete disappearance of her upper back pain for one month duration and she was injected again in gate A bilaterally again and she continues to be pain free for the last one year.

### **Case 3 presentation**

A 30-year-old Arab man with no significant past medical, family or psychosocial history, presented with severe pain in his neck and right upper limb with mild vertigo for the last 3 months.

Physical examination revealed tenderness over her cervical spine and tender spots over the right upper limb.

Patient had normal sensory and motor nerve examination of both her upper limbs and he had normal movements of both upper limbs.

Spurling's and Romberg's tests were negative, whilst Dayanidhi's sign was positive on the right side.

Blood tests including complete blood picture, kidney function tests, liver function tests, ESR, rheumatoid factor, ANA, ACCP, alkaline phosphatase, blood sugar, Vitamin D, serum uric acid and thyroid function tests were all normal.

X-ray and MRI of the cervical spine showed no significant findings.

Patient was injected in gate H on the right side with lignocaine only (10 Ml. of lignocaine 0.6%, by adding 3 Ml. of lignocaine hcl 2% to 7 Ml. of distilled water) and was reviewed thirty minutes post the injection and he reported complete pain relief of his pain and he continues to be pain free for three months.

### **Case 4 presentation**

A 52-year-old Arab man with no significant past medical, family or psychosocial history, presented with severe pain in his left upper chest for the last one year.

Patient was suspected of having a cardiac problem and was seen by a cardiologist who requested an ECG, stress ECG test, chest x-ray, echocardiography and eventually a cardiac catheterization which were all normal.

On examination, patient had tender spots over left pectoralis major muscle with no tenderness elsewhere over his cervical spine, upper back or upper limbs.

Patient had normal sensory and motor nerve examination of both her upper limbs and he had normal movements of both upper limbs.

Spurling's, Romberg's and Dayanidhi's signs were all negative. X-ray of the cervical spine showed no significant findings.

MRI of the cervical spine showed mild disc prolapse at C5/C6 level.

Patient was injected in gate O on the left side with lignocaine only (10 Ml. of lignocaine 0.6%, by adding 3 Ml. of lignocaine hcl 2% to 7 Ml. of distilled water) and reported complete relief of his chest pain fifteen minutes post the injection and he continues to be pain free for the last three months.

### **Case 5 presentation**

A 70-year-old Arab woman who is hypertensive and has type 2 diabetes with no family or psychosocial history, presented with severe pain in her neck that is radiating to both shoulders and upper arms for the last six months.

Physical examination revealed tenderness over her cervical spine and both shoulders. Patient could not raise her hands above her head because of pain.

Patient had normal sensory nerve examination of both her upper limbs, however motor nerve examination revealed mild decrease in muscle power in her right and left upper limbs muscles (grade 4 in C5-T1 myotomes).

Spurling's and Romberg's signs were negative, whilst Dayanidhi's sign was positive on both sides.

X-ray showed generalized cervical spine degeneration.

MRI of the cervical spine showed generalized degeneration and mild disc prolapse at multiple levels.

Patient was injected in gate B bilaterally (carpal tunnels), each with 2 ML. of lignocaine hcl and the injections were deemed successful when patient confirmed anesthesia in the medial nerve dermatomes bilaterally fifteen minutes post the injections and that anesthesia lasted for around one hour.

Patient reported 75% reduction in the severity of her neck and shoulders pain thirty minutes post the injections and she continues to be so for the last three months.

## **Discussion**

Voltage-gated sodium channels (VGSCs) are membrane ion channels which create action potential in nerves and excitable tissues and were discovered by Hodgkin and Huxley in 1952 [8].

The relationship between pain and Voltage-gated sodium channels (VGSCs) has been stressed up by many published papers [9-13].

Pain was found to be related to disturbances in these Voltage-gated sodium channels (VGSCs).

Lignocaine is a sodium channel blocker and when it is given in the special injection spots discovered by the author and called gates, it will cause resetting of these disturbed sodium channels causing pain relief for a period of time much beyond the half life of lignocaine which is around one hour.

Accordingly, we should think about lignocaine as a therapeutic drug when the sodium channels concept is understood and when these injections are done in these special gates which are by big peripheral nerves.

By injecting close to a particular peripheral nerve like the median nerve in the carpal tunnel (gate B) the author hypothesized that lipid soluble lignocaine will diffuse through the myelin sheath of the nerve, which has a high content of lipids itself (70 to 85%), distally and proximally towards the spinal roots and that diffusion can carry on, for a limit, to other nerves sharing continuity in their myelin sheath, i.e. a patient with ulnar nerve pain can responds to a carpal tunnel injection of lignocaine as both median and ulnar nerves have continuous non interrupted myelin sheaths [14,15].

The author hypothesizes that as that diffusion carry on throughout different nerve segments, it will cause resetting of the disturbances of sodium channels causing the relief of pain like resetting a jammed laptop.

The same idea applies to Gates M, A, H and O.

Gate M injection is deep to the soft tissues in an area supplied by the lesser occipital nerve (C2, C3) and great auricular nerve (C2, C3) and the lignocaine, being injected deep to soft tissues, will have less systemic clearance and will travel by diffusion through the myelin sheath of these two nerves to other roots and nerves of the cervical spine causing resetting of sodium channels.

In gates A, H and O the brachial plexus cords, axillary nerve and ulnar nerve respectively are responsible for diffusion of the lignocaine injection towards the cervical roots.

The gate injection idea is to inject by a peripheral nerve without the need of x-ray, ultrasound or nerve device guidance and these injections need to be in an area of least vascular supply so that maximum clearance of the lignocaine happens by diffusion through the nerve myelin sheath.

The bigger and closer the peripheral nerve to the spinal roots the better is the outcome.

Lignocaine in 0.6% concentration is as effective as in 2% concentration in these gates injections and probably concentrations as low as 0.3% can work the same as well.

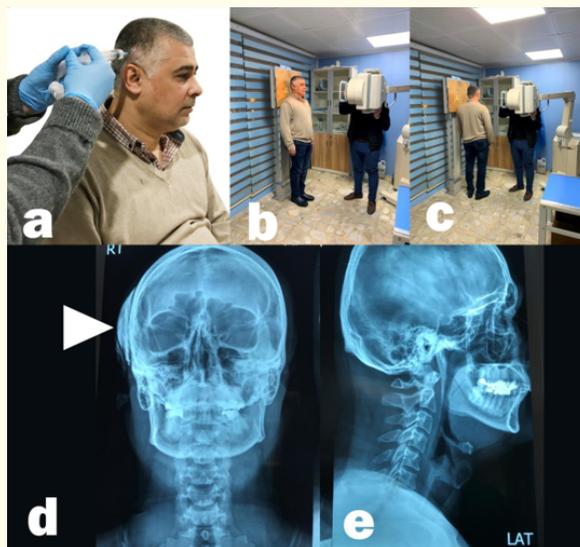
Lignocaine 0.6% can be obtained by adding 3 Ml. of lignocaine hcl 2% to 7 Ml. of distilled water and the recommendation is to use distilled water always and not normal saline for dilution as the latter was found to give bad results by other doctors practicing gates injections.

Using lignocaine in 0.6% concentration will enable us to give four to six gates injections in one session safely depending on the patient weight and symptoms.

Doctors willing to practice the gates injections should familiarize themselves with the management of anaphylaxis due to lignocaine which is very rare but could happen and the author recommends the availability of adrenaline ampoules in the practice as a minimum precaution.

Again, these gates injections are injected distal to the cause of pain, i.e. distal to spinal roots and the mechanism of myelin sheath diffusion will need some development in technology to discover a contrast chemical which is lipid soluble to prove or refute this theory.

The author made an experiment on himself trying to achieve what he called (peripheral myelography) which is the visualization of peripheral nerves by means of diffusion of contrast through the myelin sheaths of peripheral nerves to be able to see them on x-ray (Figure 2).



**Figure 2:** Peripheral myelography attempt. a: The author receiving an injection of 10 ml. of omnipaque in right gate M. b and c: The author having an x-ray of his cervical spine 30 minutes post Gate M injection. D and e: An anterior and lateral views x-ray of the author head and cervical spine showing the collection of omnipaque on the right lateral side of head beneath the soft tissues (arrow head).

The author was injected in his right gate M by a colleague with 10 ML. of omnipaque which is used in myelography and was hopeful that this could show the nerves on x-ray, but unfortunately the experiment failed because omnipaque is water soluble and not lipid soluble.

The author hopes that future technology will discover a contrast that is lipid soluble to enable us to do a new diagnostic test called peripheral myelography by which we will be able to see the nerves on x-ray films and that will help us in many clinical scenarios and enhance our knowledge of the nervous system.

These gates injections are now practiced by many doctors in different countries with very promising results and they would be the safe solution to many patients suffering from severe pain especially those being weaned off opioids due to their side effects.

The author confirms that giving an injection in one of the five gates described above will work for cervical disc disease pain, non-specific shoulder pain, painful frozen shoulder, tennis elbow, golfer elbow, ulnar nerve pain, radial tunnel syndrome, de quervain's tenosynovitis pain, carpal tunnel pain, pain over upper chest and pain over trapezii muscles often referred to as fibromyalgia trigger points.

The response to gates injections is usually very good, however that depends on the severity of the condition and its chronicity and some cases show resistance to achieve resetting of the sodium channels, however giving repeating sessions can bring about pain relief eventually in most cases and these injections use lignocaine which is quite safe to be repeated frequently as its half life is around one hour only.

In order to prolong the duration of pain relief after the gates injections, the author recommends using lignocaine gel 2% to be applied to lateral sides of head (gate M area) post the injections, and this application of the gel should be done overnight for a period of time similar or longer to the duration of symptoms before having the injections, i.e. a patient who presents with a one year history of cervical spine disc disease related pain and gets one of the gates injections should use the lignocaine gel on the sides of his head overnight for a minimum of one year.

In patients having chronic diseases like diabetes mellitus or rheumatoid diseases the author recommends using the lignocaine gel on the lateral sides of head for good.

In patients with mild to moderate pain severity, they can be treated without gates injections by applying lignocaine gel 2% to the sides of head frequently over the day and then decrease the frequency as the pain gets less.

Out of all the five gates injections described above the soft tissue thickness is the least at gate M area and that is why applying the lignocaine gel to the sides of the head will have less soft tissue thickness to diffuse through and reach the peripheral nerves.

The pain relief effect of lignocaine gel when applied to the sides of the head in patients with cervical spine disc disease pain is quite astonishing and it will beat up the strongest pain killers which usually fail to control this notorious pain.

## **Conclusion**

These gates injections of lignocaine only which is a sodium channel blocker will give durable pain relief for months in patients with severe pain related to the cervical spine disc disease and will be very effective in reducing operations on the cervical spine knowing that the surgery of the cervical spine is done in 90% of cases to control pain not controllable by conservative management.

Also, when these injections are practiced widely, there will be a dramatic decrease in operations like surgery of the cervical spine, frozen shoulder, tennis elbow, ulnar nerve decompression and carpal tunnel surgery.

## **Declaration**

Written informed consent was obtained from the patients for publication of this case series and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

## **Ethics Approval and Consent to Participate**

Approved by the governance team of Al-Dahwi hospital, Al-Harithiya, Baghdad, Iraq.

## **Consent for Publication**

Available.

## **Availability of Data and Material**

The datasets during and/or analysed during the current study available from the corresponding author on reasonable request.

## **Competing Interests**

The author declares that they have no competing interests.

## **Funding**

None.

## **Author's Contribution**

Dr. A. Hammodi discovered this phenomena of retrograde analgesia achieved with peripheral nerve injection (the anatomical gates of sodium channels blockers) approve the submission of this manuscript and agrees both to be personally accountable for the author's own contributions and to ensure that questions related to the accuracy or integrity of any part of the work, even ones in which the author was not personally involved, are appropriately investigated, resolved, and the resolution documented in the literature.

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