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Research Article

Efficacy of T2-T3 Thoracic Sympathetic Block for Management of Complex Regional Pain Syndrome 1

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Abstract

Background: This study is performed to evaluate the efficacy of radiofrequency ablation of T2-T3 Thoracic Sympathetic block for pain management of Complex Regional Pain Syndrome 1.

Materials and Methodology: We performed first stellate ganglion block for all patients in CRPS1. Those patients who have reduce pain score less than 50% was considered for diagnostic T2-T3 Thoracic Sympathetic Block. We had done Radiofrequency Ablation in patients who have pain relief more than 50% pain relief in diagnostic T2-T3 block. We have recorded to VAS pain score and requirement of analgesic dose of drugs among patients before and after Radiofrequency Ablation.

Results: Treatment produced a significant reduction in pain score, VAS value and significant reduce in dose of analgesic drugs.

Conclusion: The study of 18 patients shows that T2-T3 thoracic sympathetic block is effective in CRPS 1 who has inadequate pain relief in stellate ganglion block. Radiofrequency Ablation gives long term pain relief and decrease dosages of analgesic drugs.

Keywords: *T2-T3 Thoracic Sympathetic; Complex Regional Pain Syndrome; Management*

Abbreviations

T2-T3: Thoracic 2 and Thoracic 3; CRPS: Complex Regional Pain Syndrome; RSD: Reflex Sympathetic Dystrophy; IASP: International Association for the Study of Pain; SMP: Sympathetically Mediated Pain; SIP: Sympathetically Independent Pain; CNS: Central Nervous System; PNS: Peripheral Nervous System; NSAIDS: Non Steroidal Anti Inflammatory Drugs; SNBs: Sympathetic Nerve Blocks; SGB: Stellate Ganglion Block; TSB: Thoracic Sympathetic Block; RF: Radio Frequency; RFTC: Radio Frequency Thermo Coagulation; NMDA: N-Methyl D-Aspartate; GABA: Gamma Amino Butaric Acid; C/I: Complain of; IVRA: Intra Venous Regional Anesthesia; SCS: Spinal Cord Stimulation; G: Gauze; VAS: Visual Analogues Score; DM: Diabetes Mellitus; #: Fracture; Inj: Injection; CBC: Complete Blood Count

Introduction

Complex regional pain syndrome [CRPS] was once known as reflex sympathetic dystrophy [RSD] and causalgia [1]. The International Association for the Study of Pain (IASP) suggested a new nomenclature, CRPS, with two subtypes, which deliberately avoid suggesting etiology or site [2]. CRPS 1 (RSD) is defined as a syndrome that usually starts after a noxious events, is not limited to the distribution of a single peripheral nerve and is disproportionate to the inciting event [3]. CRPS 2 (caussalgia) is defined as a syndrome that starts after a nerve injury and is not necessarily limited to the distribution of the injured nerve [3]. Despite these changes, CRPS has generated significant research interest [4]. One issue that continues to evolve is the role of interventional therapy in managing CRPS 1 [5]. The sympathetic nervous system has been implicated in the path physiology of CRPS 1 and consequently, sympathetic nervous system blockage is widely used to treat CRPS 1 [6]. The current view is that, when necessary, interventional administered in a timely manner may help relieve pain and facilitate the primary goal-functional rehabilitation of the affected limb [7].

A review published by Cepeda., *et al*. [6] reveled that scarcity of published evidence to support the use of local anesthetic sympathetic blockade as the gold standard treatment for CRPS.

According to Sandroni incidence of CRPS I 5.46 new cases/100000 annually [8]. According to IASP incidence is 25.2 new cases/100000 annually [8]. Period prevalence is 20.57/100000 5. Female: male was 4:1, mostly 50 - 70 year age with median age of 46 years at onset [9]. Upper limb was affected twice as commonly as lower limb [9].

Even though the pathophysiology is not clearly defined [10]. The syndrome may be mainly a systemic disease involving the central and peripheral nervous system, yet the specific interaction between the central and peripheral mechanisms is unclear [10]. The postulated mechanisms includes: Inflammation, Afferent dysfunction, Central dysfunction and Sympathetic dysfunction.

CRPS mainly diagnosed by IASP Diagnostic criteria for CRPS & "Budapest" Diagnostic criteria [8].

IASP diagnostic criteria for CRPS:

1. The presence of an initiating noxious event or a cause of immobilization.
2. Continuing pain, alloying or hyperalgesia with which the pain is disproportionate to any inciting event.
3. Evidence at some time of edema, changes in skin blood flow, or abnormal sudomotor activity in the region of pain.
4. This diagnosis is excluded by the existence of conditions that would otherwise account for the degree of pain and dysfunction.
5. Type I: Without obvious nerve damage (aka RSD).
6. Type II: With obvious nerve damage (aka Causalgia)

Budapest" Diagnostic Criteria for CRPS

General Definition of the Syndrome
CRPS describes an array of painful conditions that are characterized by a continuing (spontaneous and/or evoked) regional pain that is seemingly disproportionate in the time or degree to the usual course of any known trauma or other lesion. The pain is regional (not in a specific nerve territory or dermatome), but may spread, and usually has a distal predominance of abnormal sensory, motor, sudomotor, vasomotor, and/or trophic findings. The syndrome show variable progression over time.

To make clinical diagnosis, the following criteria must be met:
• Continuing pain, which is disproportionate to any inciting event.
• Must report at least one symptoms in 'three of the four' following categories:
  • Sensory: Reports of hyperalgesia and/or allodynia.
  • Vasomotor: Reports of temperature asymmetry and/or skin color changes and/or skin color asymmetry.
  • Sudomotor/Edema: Reports of edema and/or sweating changes and/or sweating asymmetry.
  • Motor/Trophic: Reports of decreased range of motion and/or motor dysfunction (weakness, tremor, dystonia) and/or trophic changes (hair, nail, skin).
• Must display at least one sing at time of evaluation in two or more of the following categories:
  • Sensory: Evidence of hyperalgesia (to pinprick) and/or allodynia (to light touch and/or deep somatic pressure and/or joint movement).
  • Vasomotor: Evidence of temperature asymmetry and/or skin color changes and/or skin color asymmetry.
  • Sudomotor/Edema: Evidence of edema and/or sweating changes and/or sweating asymmetry.
  • Motor/Trophic: Evidence of decreased range of motion and/or motor dysfunction (weakness, tremor, dystonia) and/or trophic changes (hair, nail, skin).
• There is no other diagnosis that better explains the signs and symptoms.

Table

Management requires Multimodal and Multidisciplinary approaches [6] that is: Effective pain control: (1) pharmacologic (2) interventional methods by IVRA, Sympathetic nerve blocks and Spinal cord stimulation; Functional restoration, Rehabilitation-Based Treatment Modalities, Psychologic Interventions and Other Therapeutic Modalities.

Price and colleagues found that sympathetic block with local anesthetic gives immediate relief on pain and mechanical allodynia and sympatholysis may be important in prolonging the duration of pain relief for CRPS I patients who respond to diagnostic sympathetic block. Radiofrequency thermo coagulation of sympathetic chain is provides long term pain relief in CRPS 1 and improves quality of life.

Methods

This study is consisted of 18 patients attending to the Advance Pain Care Clinic, Surat, Gujarat, India from January 2015 to June 2015 with diagnosis of CRPS 1 in one hand.

The diagnosis is based on IASP-BUDAPEST criteria [8] with VAS > 4/10 with failed conservative management (6 weeks).

All 18 patients were examined and diagnosis of CRPS type 1, right side 11 and 7 left were included. 10 patients were women and 8 were men. Age of patients were between 18 - 85 years were included. The conditions associated with development of CRPS 1 includes lower end radius fracture, hand trauma, metacarpal fracture, soft tissue excision, carpel tunnel release and crush injury hand.

All 18 patients are assessed and then explain about the procedure. Written informed consent was taken and all 18 patients were given diagnostic stellate ganglion block.

Pain intensity was evaluated before and after diagnostic block using a 10cm VAS in which 0 means no pain and 10 represented most severe pain. More than 50% reduction in VAS SCORE for at least 6 hours was considered as positive diagnostic block.

Among 18 patients, 10 patients having positive stellate ganglionic block, so these patients was given Radiofrequency ablation and 8 patients had negative stellate ganglion block so these 8 patients were given T2-T3 Thoracic sympathetic diagnostic block after one week.

Among 8 patients, 4 patients having positive T2-T3 diagnostic block, so these patients was given Radiofrequency Ablation T2-T3 sympathetic block after 1 week

4 patients had negative T2-T3 Sympathetic block, so these patients are considered as a sympathetic independent and these patients are exclude from the study.

All patients experienced more than 50% pain relief after RF after 2 weeks and 1 month follow up. All patients were able to decrease their oral analgesic drugs dosage more than 50% after 1 month of RF and improved range of movement of wrist joint after 1 month of RF.

No complications attributed to procedure were noted.

Inclusion criteria

- H/O trauma or surgery.
- Patient had taken conservative treatment e.g. medication, physical therapy, rehabilitation Programmed but failed to have pain relief.
- Any age.
- Any sex.

Exclusion criteria

- Upper limb CRPS II and lower limb CRPS.
- H/O nerve injury.
- Patient having other neuropathy like DM or other.
- Patients who has not taken conservative treatment.

- False negative block.
- Use of tobacco products or any medication that could affect sympathetic function.
- Active infection at injection site.
- Allergy to medication.
- Previous neck surgeries, Reynaud's disease or phenomenon.
- Coagulopathy.

No.	Age	Gender	Initial trauma	Side	Duration (weeks)
1	50	F	Carpel tunnel release	L	15
2	67	F	# Lower end radius	R	16
3	61	F	Hand trauma	R	17
4	75	M	#Lower end radius	R	17
5	58	F	Radial distal end #	R	18
6	60	F	Hand trauma	R	20
7	29	F	Soft tissue excision biopsy	L	21
8	34	M	Crush injury hand	L	22
9	73	M	Radial distal end #	R	26
10	18	F	Hand trauma	L	28
11	85	M	#Lower end radius	R	29
12	43	M	Metacarpal fracture	L	33
13	46	F	Crush injury hand	R	35
14	74	M	Lower end radius #	R	48
15	59	F	Radial distal end #	R	50
16	38	M	Soft tissue excision	L	51
17	70	F	Radial distal end #	R	52
18	27	M	Fifth metacarpal #	L	54

Table 1*: Patient demographic values and etiologies.*

Results

Values VAS score pretreatment and after diagnostic block are shown in table 2. Values VAS score after RF after 2 weeks and 1 month follow up are shown table 3. Values of analgesic dosages before and after RF in both groups are shown in table 4. The blockade was significantly reduced in analgesic dosages in all patients.

No.	Before block	After diagnostic SGB	After diagnostic TSB
1	6	3	-----
2	7	3	------
3	7	2	------
4	8	4	------
5	8	4	------
6	8	3	------
7	9	4	-----
8	9	3	------

9	10	4	-------
10	10	4	-------
11	10	7	2
12	9	6	3
13	9	6	3
14	10	8	4
15	10	7	5
16	10	10	7
17	10	9	8
18	9	9	6

Table 2: *Vas Score.*

Patient No.	Initial Vas	2 Weeks After RF	1 Month After RF
1	10	4	3
2	9	3	2
3	9	2	1
4	10	3	2

Table 3: *Shows patient's VAS score RF T2-T3 sympathetic block.*

Patient no.	Tramadol Pre RF	Tramadol Post RF	Gabapine Pre RF	Gabapine Post RF	Amitriptyline Pre RF	Post RF
1	100	50	300	100	25	00
2	150	50	600	200	25	10
3	150	50	400	200	25	10
4	100	50	400	200	25	00

Table 4: *Shows analgesic (Mg/Day) usages before and after T2-T3 sympathetic block.*

Limitation

1. Comparison between Stellate Ganglion Block and T2-T3 block is not taking in study but efficacy is taken in study.
2. False positive and false negative block should not take in consideration.
3. Negative diagnostic block not take study.
4. Long term follow up more than one month is not taken study.

Discussion

CRPS is an inflammatory and neuropathic pain disorder characterized by autonomic nervous system involves sensory, motor, sudomotor and vasomotor changes.

There are 3 stages of CRPS summarized by Bonica.

1. **Acute stage:** Pain or sensory abnormalities hyperalgesia, allodynia, vasomotor and sudomotor dysfunctions and prominent edema.
2. **Dystrophic stage:** It takes 3 - 6 months after onset. It is characterized by more or provoked pain or sensory dysfunction with continues evidence of vasomotor dysfunction and development of significant motor and trophic changes.

3. **Atrophic changes:** It is characterized by decreased pain or sensory disturbance, cor time vasomotor disturbances and markedly increased motor or trophic changes.

As per pathophysiology, sympathetic nervous system have important role in pain and many studies shows that sympathetic blocks help to reliving pain.

Thus interdisciplinary or multidisciplinary approaches are key for management of CRPS and that includes pain management, psychological support and rehabilitation for restoration of function.

Conservative management includes opioids, NSAIDS, anticonvulsant drugs, antidepressant drugs, NMDA antagonist drugs, steroids with rehabilitation.

Invasive procedures include nerve blocks, Spinal cord stimulator, peripheral nerve stimulator, clinical and surgical sympathectomy and deep brain stimulator have been used to manage CRPS 1 for some time.

Conclusion

Invasive procedure, including nerve block, spinal cord and peripheral stimulation, chemical and surgical sympathectomy and deep brain stimulation have been used to manage CRPS type 1 [4]. Sympathetic nervous system dysfunction is presumed to be an essential component of the syndrome [11] and sympathetic blockage has been recommended as early as possible to interrupt and reverse the process [12]. Sympathetic block treatment may be particularly helpful in cases in which, despite adequate doses of oral medication, pain limits a patient participation in physical and occupational therapy [13].

Some study suggested that stellate ganglion may not be the most suitable target for upper limb sympathetic block in CRPS 1 [14-17]. This suggestion is mainly due to fact that SGB may miss the sympathetic nerve fibers travelling to the upper limb in a significant proportion of individual [18]. Thus, by blocking T2-T3 sympathetic ganglion can cover all sympathetic fibers. In fact, Hogan [17] showed that in 100 consecutive technically well-performed SGB procedure monitored by papillary and hand temperature change, the clinically signs of upper limb sympathetic blockage were only detected after 27 of the procedure [17]. Kuntz [18] has demonstrated that in 20% of individuals the ganglion sympathetic fibers projected to upper limb directly, thus bypassing the stellate ganglion after synapsing in the upper thoracic ganglia. This is important given the major difference between TSB and SGB.

The study of these 18 patients shows that there is chance of inadequate pain relief after satisfactory stellate ganglion block because of KUNTZ'S nerve and giving T2-T3 sympathetic block among this gives good pain relief. Also, RF in stellate ganglion and T2-T3 sympathetic ganglion block gives long term pain relief and decrease analgesic dosages and thus improves quality of life.

Bibliography

1. Rowbotham MC. "Phamacologic management of complex regional pain syndrome". *The Clinical Journal of Pain* 22.5 (2006): 425-429.
2. Merskey H and Bogduk N. "Classification of chronic pain". *Seattle* (1994): 40-43.
3. Kingery WS. "A critical review of controlled clinical trials for peripheral neruropathic pain and complex regional pain syndrome". *Pain* 73.2 (1997): 123-139.
4. Wilson PR., et al. "CRPS: current diagnosis and therapy". IASP, Seattle (2005): 45-58.
5. Nelson DV and Staccy BR. "Interventional therapes in the management of complex regional pain syndrome". *The Clinical Journal of Pain* 22.5 (2006): 438-442.
6. Cepeda MS., *et al*. "Local anaesthetic sympathetic blockade for complex regional pain syndrome". *Cochrane Database of Systematic Reviews* 19 (2005): CD004598.

7. Stanton-Hicks MD., *et al*. "An updated interdisciplinary clinical pathway for CRPS: report of an expert panel". *Pain Practice* 2.1 (2002): 1-16.

8. Bonica JJ. "The Management of Pain". Philadelphia, Lea & Febiger, 1953 & 4th edition (2010).

9. Raj's Practical management of pain 4th edition (2008).

10. AA.

11. Schwartzman RJ and McLellan TL. "Reflex sympathetic dystrophy. A review". *Archives of Neurology* 44.5 (1987): 555-561.

12. Bonica JJ. "Causalgia and other reflex sympathetic dystrophies". In Bonica JJ, Loeser JD, Chapman CR, Fordyee WE (edition) The management of pain volume 1, 2nd edition. Lea and Febiger London, Philadelphia (1990): 220-243.

13. Bbb.

14. Boas RA. "Sympathetic nerve blocks: in search of a role". *Regional Anesthesia and Pain Medicine* 23.3 (1998): 292-305.

15. Day M. "Sympathetic blocks: the evidence". *Pain Practice* 8.2 (2008): 98-109.

16. Elias M. "Cervical sympathetic and stellate ganglion blocks". *Pain Physician* 3.3 (2000): 294-304.

17. Hogan QH., *et al*. "Success rates in producing sympathetic blockade by paratracheal injection". *The Clinical Journal of Pain* 10.2 (1994): 139-145.

18. Kunzt A. "Distribution of the sympathetic rami to the brachial plexus its relation to sympathectomy affecting the upper extremity". *The Archives of Surgery* 15.6 (1927): 871-877.

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