

# MANAGEMENT OF CHRONIC REFRACTORY PAIN IN A CASE OF BRACHIAL PLEXUS AVULSION INJURY - A CASE REPORT

<sup>1</sup>Dr. Priti Patel, <sup>2</sup>Dr. Amita Jansari, <sup>3</sup>Dr. Chetna Katariya, <sup>4</sup>Dr. Jayshree Thakkar,  
<sup>5</sup>Dr. Dipak Patel, <sup>6</sup>Dr. B M Patel

<sup>1</sup>Asst Professor, <sup>2</sup>Jr Lecturer, <sup>3</sup>2<sup>nd</sup> Year Resident, <sup>4</sup>Professor, <sup>5</sup>HOD (Neurosurgery), <sup>6</sup>Professor & HOD  
Department of Anaesthesia, Gujarat Cancer & Research Institute, Asarwa, Ahmedabad – 380016, Gujarat, India

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**Abstract:** Avulsion of one or more cervical roots of the brachial plexus causes severe, disabling pain. Various medical and surgical treatment modalities have been used to relieve such pain. Most of them offer only limited benefits. Radiofrequency thermo coagulation ( RFTC ) of the dorsal root entry zone (DREZ) of spinal cord is one of the most effective surgical treatments for these patients. A case of chronic refractory neuropathic pain following brachial plexus injury is described here. Cervical ( C<sub>5</sub>-T<sub>1</sub> ) DREZ radiofrequency ablation was carried out with good pain relief.

**Keywords:** Brachial plexus avulsion, Dorsal root entry zone (DREZ), Neuropathic Pain, Deafferentation pain.

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## I. INTRODUCTION

Brachial plexus injury is frequently associated with avulsion of the dorsal or ventral root, or both, from their associated entry zones into the spinal cord. This leads to the production of deafferentation pain in up to 20% to 30% of patients.<sup>1</sup> This pain is resistant to several pain control procedures including analgesic drugs like narcotics, antidepressants and anticonvulsants, cervical sympathetic ganglion blockade, TENS, amputation, sympathectomy, cordotomy etc. DREZ RFTC of the avulsed roots was first described by Nashold et al in 1976 as a treatment for this type of pain.<sup>2</sup>

## II. CASE REPORT

A 42 years old male patient with H/O fall from motor cycle resulting in right brachial plexus injury, for which he had undergone plexus repair, six months back came to our hospital. Since that time, patient had paralysis with loss of sensation and severe crushing and burning type pain in the right arm. On examination right upper limb power grade was 0/5, sensory loss from C<sub>5</sub>-T<sub>1</sub> and reflexes were absent. MRI was suggestive of contusion in the right supraclavicular area. Pain persisted in right arm and was referred for pain management. He was treated with oral analgesic drugs like NSAID<sub>s</sub>, Tramadol HCL, anticonvulsants like Pregabalin, Gabapentin, antidepressants like Amitriptylin with partial pain relief. Intravenous 2% Lignocaine hydrochloride infusion at the rate of 5 mg/kg and epidural Ketamine hydrochloride with Bupivacaine hydrochloride were effective for short term pain relief. Pulsed Radiofrequency lesioning of stellate ganglion done under IITV guidance. Pain relief was only 10-15% followed by pulling sensation of muscles which was treated by Tablet Baclofen 10mg OD and Diclofenac gel local application. None of this treatment gave satisfactory pain relief. Then he was subjected to temporary spinal cord stimulation (SCS) implantation at private hospital. Pain relief was 30% only. Ultimately radiofrequency lesioning of dorsal root entry zone (DREZ) was planned for this refractory pain. After C<sub>5</sub>-T<sub>1</sub>

laminectomy DREZ lesions were spaced at interval of 2 mm for 15 seconds and temperature 80<sup>0</sup> C, about 50 in numbers using thermo coagulation radio frequency generator. (RFG-3CF graphics RF lesion generator system, Radionics, INC, Burlington, MA) Operative findings showed atrophic nerve roots on right side.

Post operatively immediate pain relief was 100%. After surgery patient developed pad like feeling and heaviness in right lower limb within 48 hours however he was able to walk for which he was treated with drugs Pregabalin and Vitamin B<sub>12</sub>. At 6 months and 2 years follow up patient had complete pain relief and right lower limb problems gradually abated.

### III. DISCUSSION

Significant numbers of patients experience intractable pain after brachial plexus root avulsion. Medications and surgical procedures are often not successful. Central deafferentation pain that persists and becomes intractable among patients with traumatic cervical avulsion root has been difficult to treat.<sup>3</sup>

In acute phase NSAID<sub>s</sub> are useful however gabapentin and pregabalin may be considered the first line of drugs for the treatment of central pain due to their consistent efficacy, safety and minimal potential for drug-drug interactions and tricyclic antidepressants a second line of treatment and third line of treatment include opioids and tramadol. In many cases treatment is insufficient, associated with range of side effects and often combination therapy is used.<sup>4</sup>

In neuropathic pain intravenous lignocaine produces dose dependent suppression of allodynia without blocking nerve conduction, reduces neuropathic pain behavior by increasing the threshold for mechanical allodynia and reduces the discharge rate of injured nociceptive fibers. One retrospective study provides evidence that intravenous lidocaine administered in an escalating dose to 5 mg/L under carefully monitored conditions is safe and may decrease many signs and symptoms of severe CRPS.<sup>5</sup>

Ketamine has an analgesic action both centrally and peripherally. In situations where standard analgesic options have failed, ketamine is a reasonable option for severe chronic pain. The mechanism of action in the reversal of opioid tolerance by ketamine is believed to involve an interaction between NMDA receptors, the nitric oxide pathway and  $\mu$ -opioid receptors. Ketamine also inhibits serotonin and dopamine reuptake and inhibits voltage-gated Na and K channels.<sup>6</sup> Takahashi H and Miyazaki M reported complete pain relief using ketamine by the epidural route in patients refractory to other pain treatments.<sup>7</sup>

SCS is one of the most effective modalities for management of refractory neuropathic pain unresponsive to conservative therapies. The mechanism action is based on Gate control theory postulating a spinal modulation of noxious inflow. In combination with comprehensive medical management like physical and psychotherapy, SCS can provide long term pain relief with concomitant improvement in the quality of life, daily function and patient satisfaction. This technique is cost effective in the long term despite its high cost.<sup>8</sup> In a prospective study of 19 patients treated with SCS, Oakley et al shown that 80% of patients experienced at least 50% improvement in pain rating scale, Sickness impact profile and VAS after an average follow up period of 7.9 months.<sup>9</sup>

Pulsed radiofrequency (RF) lesioning of stellate ganglion (SG) is useful in the management of neuropathic pain. It seems to alter the synaptic transmission, producing a neuromodulatory effect, thus providing analgesia without causing any tissue destruction or painful after effects. A retrospective study of 86 RF-SG block shown benefits for patients suffering from complex regional pain syndrome type 2, cervicobrachialgia or post thoracotomy pain.<sup>10</sup>

In patients with central deafferentation pain that persists and becomes intractable to other treatments, DREZ lesioning of cervical root gives long lasting satisfactory pain relief with acceptable morbidity rates.<sup>3</sup>

The concept of DREZ lesion involves surgical destruction of second order neurons of the ascending nociceptive pathway. Destruction of the DREZ and superficial dorsal horn is thought to abolish this abnormal electrical activity and thus help relieve pain.<sup>1</sup> Twenty-six patients with intractable deafferentation pain after brachial plexus avulsion lesion treated with DREZ lesioning showed that analgesic effect of DREZ micro coagulation surgery gradually decreased over the longer period of time. However, this technique is still effective treatment of brachial plexus avulsion pain, as most patients had >50% pain reduction even after 5 years of surgery without the need for additional analgesic therapy.<sup>11</sup>

In our case also the pain of brachial plexus injury was refractory to different medical and surgical pain modalities and was treated with DREZ lesioning of cervical root with excellent pain relief. After surgery patient developed pad like feeling and heaviness in right lower limb within 48 hours however he was able to walk for which he was treated with drugs Pregabalin and Vitamin B<sub>12</sub>. At 6 months and 2 years follow up patient had complete pain relief and right lower limb problems gradually abated.

#### IV. CONCLUSION

Patients with severe disabling pain of brachial plexus avulsion refractory to various medical and surgical pain procedures benefit with DREZ lessening of cervical root with an acceptable morbidity.

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