



## Drezotomy Revisited : Our Initial Experience

### KEYWORDS

Severe Spasticity, lower extremity, spinal cord, drezotomy

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**ABSTRACT** *Objective:* To share our experience of microsurgical drezotomy in the management of severe spasticity and to assess the results of microsurgical drezotomy for the treatment of lower-extremity spasticity.

*Method:* Records of four patients with Severe Spasticity Grade 4 who underwent microsurgical L1-S2 drezotomy were analyzed. In all patients, drezotomy was performed on all roots of the lower limbs (from L1 to S2) for spasticity of the lower extremity. The degree of spasticity was measured by the Modified Ashworth scale (grade 0-4). Spasticity relief in the immediate postoperative period, 6 weeks, 6 months, 12 months & 24 months was analyzed.

*Results:* Total of 4 patients from July 2013 to May 2015 were included in the study.

Mean age was 52 yrs. All were male patients having spastic quadriplegia following traumatic injury of the spinal cord. All patients had grade 4 Spasticity of both lower limbs according to Modified Ashworth Score. Patient's spasticity was not relieved by maximal medications and they had extensive flexors spasms which was affecting their activities of daily living (ADL). Comparing the preoperative and postoperative spasticity using the Modified Ashworth Scale, we observed improvement in all patients. None of the patients experienced severe, life-threatening postoperative complications.

*Conclusion:* Patients who are affected by severe spasticity, microsurgical drezotomy can provide good relief thereby helping them to get back to a better quality of life post trauma.

### INTRODUCTION

Spasticity is one of the most common sequelae in patients of traumatic spinal cord injury. In most patients spasticity is useful in compensating for lost motor strength. Nevertheless, in a significant number of patients, it may become excessive and harmful, leading to further functional loss and hampering in the ADL.

When uncontrolled by other forms of physiotherapy and drug treatment, spasticity can benefit from functional neurosurgical procedures[1]. Microsurgical drezotomy [2,3,4] consists of dividing only the ventral portion at the entry zone if the dorsal root including the area extending up to 5 zones of the posterior gray matter. This technique was developed especially for treating neurogenic pain secondary to a brachial plexus avulsion [2,5], but also has role in the treatment of severe spasticity[6].

The purpose of the present study is to assess the results of microsurgical drezotomy in management of lower extremity spasticity and to share our experience of microsurgical drezotomy in patients of traumatic spinal cord injury.

### MATERIALS AND METHODS

Between July 2013 to March 2015 microsurgical DREZOTOMY done in 4 patients with Grade 4 spasticity of lower extremities in patients of traumatic spinal cord injury with quadriplegia. An interview of patients was carried out. The demographic details, mode of injury type, medications used were documented.

All patients were male. The age of patients ranged from 45 years to 59 years (mean age being 52 years). The mechanism of injury was secondary to road traffic accident involving motorcyclists in 3 and toppling of four wheeler in

one patient. All injuries were cervical cord injury resulting in quadriplegia. All were managed conservatively. In their mean post injury period of 5 years they developed spasticity. Antispastic medication was started and over period of few years they developed rigid flexor spasm of both lower limbs to such an extent that it was not responding to high doses of multiple medication, traction and immobilization.

All patients were evaluated with preoperative and postoperative modified Ashworth spasticity score. The radiological images of the patients were analyzed which included screening of whole spine with MRI. Patients were counselled regarding the procedure and the expected degree of spasticity relief as well as probability of continuing antispastic medications postoperatively. Intraoperative findings and postoperative complications if any were recorded and documented. Follow assessment was done at 6 weeks, 6 months, 12 months & 24 months during OPD visits when the spasticity score were reassessed.

### SURGERY AND OPERATIVE FINDINGS

Drezotomy was performed in a standard microsurgical method. Under General anaesthesia the patient was placed in prone position. Laminectomy D11 to SV1 was done. Midline durotomy was done. Dorsal roots were retracted medially to expose DREZ region. A bipolar cautery with a 0.5 mm diameter and insulated at a distance of 2 mm from the tip was used. The lesions were made at an interval of 2 mm from each other at the junction of the ventrolateral region of the rootlet entry zone in the posterolateral sulcus. Depth of individual lesions was 2-3 mm. Angle was obliquely oriented at 35° down to the apex of the dorsal horn. Lesioning done from L1-S2 DREZ region. Post operatively one patient out of the four had faecal incontinence which was managed conservatively.

**RESULTS**

The average patient age was 52 years (range 45-59). All patients were male (Table 1). Maximum follow-up duration was 24 months. Comparing the preoperative spasticity to post op, 6 weeks, 6 months, 12 months and 24 months during follow up (using the Modified Ashworth scale, Table 2), we observed improvement in all patients. Most notable was relief from flexor spasms in all four patients and spasticity remained to be grade 1. In the follow up period, all patients continued to have grade 1 spasticity. Regarding patient satisfaction, two patients had excellent and remaining two had good response. There was one postoperative complication noted in the form of faecal incontinence which improved over two weeks. None of the patients experienced severe postoperative complications (Table 3).

**DISCUSSION:**

Spasticity can be defined as a condition in which there is a velocity-dependent increase in the resistance of the muscle group to passive stretching, with a "clasp-knife" -type component associated with hyperactive tendon reflexes[7]. Spasticity affects both children and adults and arises from a number of neurological disorders, including cerebral palsy, multiple sclerosis, cerebrovascular accidents, spinal cord injury, and head trauma. Proposed mechanisms of spasticity include the loss of several types of inhibition. The loss of inhibition of the motor neuron pool at the segmental spinal level is an accepted view, but the exact types of inhibition lost are not clearly defined and may vary in different patient populations[8].

Considering the indication for neurosurgical intervention in patients with spasticity, we have to carefully define the goals of the patients, i.e. increase comfort, decrease pain and spasticity, improve function and autonomy, and prevent orthopaedic disorders. Surgery is not without its consequences, and the surgical procedure must be highly selective in order to diminish the excessive hypertonia without suppressing useful muscle tone and limb function. More recently, we have seen the development of totally conservative operations that can increase the inhibitory mechanisms and decrease reflex hyperactivity at the spinal cord level. Chronic cerebellar stimulation techniques were developed by Cooper[9] for cerebral palsy. Cervical spinal cord stimulation was developed for spinal spasticity by Cook and Weinstein[10] and for cerebral palsy by Waltz et al[11]. Chronic neurostimulation has very few indications at the present time. The main conservative technique is now intrathecal baclofen infusion with implantable pumps, proposed by Penn and Kroin[12].

Dorsal rhizotomy is the oldest standard surgical technique for treating spasticity, but it has been modified and improved by many neurosurgeons, especially by Gros et al [13]. He developed the functional and selective posterior rhizotomy for pediatric cerebral palsy. Modern approach is dorsal root entry zone (DREZ) Lesioning. Sindou et al[14] and Nashold and Ostdahl[15] refined these procedures even further. The technique of DREZ consists of lesioning only the ventral portion at the entry zone, including a large area up to the superficial layers of the posterior gray matter. It must be performed under general anaesthesia, with an initial, short lasting, non-depolarizing muscle block.

The goal of the DREZ procedure is to destroy Rexed layers 1, 2, and 5, as well as the medial portion of the tract of Lissauer[16]. It is important to spare the lateral portion of Lissauer's tract, which has been recognized to possess an inhibitory inter-segmental function that modulates dorsal horn

pain[2]. Microsurgical drezotomy based on microsurgical incisions and bipolar coagulations was introduced by Sindou in 1979, and since that time, several authors have extended the technique to other lesion modalities, such as thermo coagulation, laser light and ultrasounds [17,6]. Sindou et al [4] reported a series of 16 hemiplegic patients suffering from harmful spasticity in the upper limb and treated with selective posterior rhizotomy (SPR) in the DREZ.

In this study, the excess of spasticity was markedly reduced in all 4 cases. Severe flexor spasms were abolished. Our study showed that spasticity improved by three grades (Grade 1 on the Modified Ashworth Scale). Complications after the procedure have been reported to include loss of bowel, bladder, or sexual function, sensory loss, dysaesthesia, and weakness of the lower extremities[18]. This procedure is cost-effective as compared to the baclofen pump therapy which has initial high cost along with recurrent expenditure on refilling of the reservoir and also requiring repeated adjustment of the delivered dose.

**CONCLUSION**

This study shows that Microsurgical DREZOTOMY provides a significant, long term reduction of harmful spasticity in lower limbs. For maximized, consistent long-term results, sophisticated rehabilitation and physical treatment might be necessary.

**TABLE - 1: CLINICAL DATA OF PATIENTS**

Sr No	Sex/ Age(yrs)	Interval from injury	Radiologic findings	Pre op A/S
1.	M/59	23 years	Myelomalacia at C5, C6 level	4
2.	M/51	26 years	Myelomalacia at C5, C6 level	4
3.	M/49	22 years	Myelomalacia at C7 level	4
4.	M/45	17 years	Myelomalacia at C6,C7 level	4

(A/S : Ashworth scale, F : female, M : male)

**TABLE- 2: MODIFIED ASHWORTH SCORE**

Grade 0	No increase in tone
Grade 1	Slight increase in muscle tone, manifested by a catch and release or minimal resistance through the remainder (less than half) of the ROM when the affected part(s) is moved in flexion or extension
Grade 2	More marked increase in muscle tone through most of the ROM, but affected part(s) easily moved
Grade 3	Considerable increase in muscle tone, passive movement difficult
Grade 4	Affected part(s) rigid in flexion or extension

(ROM-Range of motions)

**TABLE- 3 :OUTCOME OF PATIENTS AFTER MICROSURGICAL DREZOTOMY**

Sr No	F/U (months)	Pre-op A/S Score	Post-op A/S Score	6 wks	6 ms	12 ms	24 ms	P/S	Complication
1	24	4	1	1	1	1	1	G	NONE
2	12	4	1	1	1	1	-	E	FEACAL INCONTINENCE

3	12	4	1	1	1	1	-	G	NONE
4	6wks	4	1	1	-	-	-	E	NONE

(F/U : follow up, A/S : Ashworth scale, P/S : patient satisfaction, E : excellent, G : good, F : fair)

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