

Surgery In The Treatment of Pain Conditions

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The sensory nerve fibres from the body enter the spinal cord through the posterior roots, passing to the dorsal horn of the spinal cord. Here the nerve fibres have complex connections (synapses) with other nerve fibres which pass eventually to the brain and so the individual experiences the various sensations such as touch, vibration, pain, temperature, and position awareness. Of particular interest to the patient considering a Dorsal Root Entry Zone Lesion (D R E Z Lesion) are the nerve fibres which carry pain sensation.

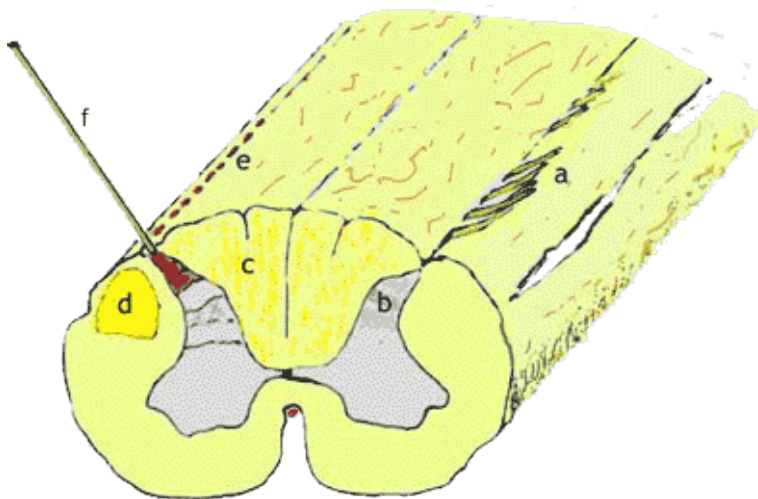
The pain fibres, after entering the spinal cord, synapse in that portion of the dorsal horn closest to the surface of the spinal cord, that is laminae 1 and 2 of the dorsal horn. The pattern of nerve impulse transmission to the brain is not a simple one-to-one event but a highly complex event which is influenced by many factors, including the activity of other nerve fibres which have their origins in other parts of the nervous system, including the spinal cord and peripheral nerves. Some of these additional influences will tend to dampen (inhibit) the transmission of pain impulses; while others will tend to increase (excite) the transmission of nerve impulses and so increase the awareness of pain. There is thus a complex system of checks and balances, much of which takes place in the Dorsal Horn laminae 1 through to 5.. After an injury to the sensory nerves the balance of inhibition and excitation may be disturbed and so cause abnormal pain sensations to develop. These may be described as allodynia (pain caused by light touch) or hyperalgesia (a lowering of the pain threshold) or pain may occur spontaneously. All this can be ascribed to changes which take place in the dorsal horn cells which become abnormally active. Thus, in a few carefully selected patients the key to the treatment of their pain lies in destroying the abnormally active nerve cells residing in the dorsal horn of the spinal cord.

The DREZ Lesion is particularly beneficial to patients suffering from Brachial Plexus Avulsion Injury, and Sacral Plexus Avulsion. Other pain states which may benefit from the operation include pain following Spinal Cord Injury.

The DREZ Lesion Operation

The DREZ Lesion operation is performed with the intention of destroying the posterior horn cells which are believed to be responsible for the continued abnormal pain experienced by the patient, at the same time important normally functioning nerve tissue must be preserved. If the adjacent normally functioning nerve tissue is damaged the patient may experience complications such as weakness of muscle in the leg or arm on the side of the operation, or abnormalities in position sense in the body below the operation may occur. The surgeon must plan the operation very accurately. The spine is opened over the selected site of operation, this is called a laminectomy. The spinal cord within the spine is then exposed and the point where the dorsal sensory nerve roots enter the spinal cord is identified. Using an operating microscope to improve accuracy, a 2mm long probe is passed down to the offending dorsal horn cells which are then destroyed using a radiofrequency current which causes a heat injury at 75 degrees C for 15 seconds. This process must then be repeated at 1mm intervals along the length of the spinal cord from which the pain impulses have their origin.

When the lesioning is complete the surgical wound is closed carefully so as to produce a healthy end result with a minimal risk of local wound complications. The patient is admitted to the high care unit for overnight observation before returning to the ward. It is usually possible to get out of bed 2 or 3 days after the operation. At this time it may become apparent that there is some difficulty with walking during the first week or two after the operation. Physiotherapy assistance is given. On occasions a catheter in the bladder may be required for a few days after the operation. The patient should be able to leave hospital 7 to 10 days after the operation.



In the illustration the normal dorsal nerve roots (a) and the posterior horn (b) on the right are shown. On the left there has been an avulsion injury of the nerve roots and the point of entry for each DREZ lesion is shown (e). The radiofrequency probe (f) is shown entering the spinal cord at the lateral sulcus and a lesion is produced in the superficial part of the dorsal horn. The important structures on either side of the dorsal horn, the posterior columns (c) and the corticospinal tract (d) are to be avoided during the operation.

Brachial Plexus Avulsion and the DREZ Lesion.

90% of patients with brachial plexus avulsion injury will experience pain early after the injury. In 25% of cases the pain subsides during the first year, and in about 30% of cases the pain persists as an intolerable experience as long as 3 years after the injury. The debilitating chronic pain may commence immediately after the injury or may develop days or months after the injury. The pain is characteristically burning, crushing or electric in nature when constant, while paroxysms of sharp, shooting, stabbing pain or electric shocks may constitute a second component of the pain experienced.

A study of the 91 patients with brachial plexus avulsion treated with the DREZ Lesion at the Duke University Medical Centre has revealed the following results. (Similar results have been reported from other centres in Germany and the United Kingdom.)

Pain relief

90% of patients reported relief of pain immediately after surgery.

60% of patients had sustained relief after one year, and a further 35% had partial relief, with 5% recording "no relief".

It is estimated that in the long term, (1 to 16 years) 73% had good relief of pain, 14% had fair pain relief and 13% had a poor long term result.

Rarely there is an aggravation of the patients pain immediately after the operation, this soon subsides.

When pain recurred this took place anything from a few weeks to years after the operation.

In 5% of cases a new and different pain may develop in the area treated by the DREZ Lesion.

Complications

All operations carry some risk for the patient, the DREZ Lesion operation is no exception. The Duke Medical Centre reported the following uncommon problems in this respect.

Pneumothorax; (this is an abnormal collection of air in the chest cavity) in 2% of cases.

Cerebrospinal fluid leak; (this may occur in any operation to the spinal cord or brain, but is very uncommon, and is certainly not specific to the DREZ Lesion operation.) in 1% of cases.

Leg weakness; after the DREZ Lesion operation many patients described a feeling of weakness in the leg on the side of the affected arm. This invariably recovered soon after the operation but in 18% of cases there was a mild degree of reportable long term leg weakness.

Sustained adverse sensory changes; in 11% of cases new adverse changes in sensation persisted after the operation.