

## SHORT REPORT

## Long term follow up of dorsal root entry zone lesions in brachial plexus avulsion

D G T Thomas, N D Kitchen

### Abstract

The long term results of 44 patients who underwent dorsal root entry zone (DREZ) lesioning for pain secondary to brachial plexus avulsion are reported with a mean clinical follow up period of 63 months. The postoperative analgesic effect was judged by the patients as being good (greater than 75% pain reduction), fair (25-75% pain reduction), or poor (0-25% pain reduction). With these criteria 35 patients (77%) had continuing good (30 cases, 68%) or fair (five cases, 11%) pain relief at the time of final follow up. Eight cases (18%) had persisting neurological deficits, although these were generally mild. DREZ thermocoagulation is an effective procedure for relieving deafferentation pain. The analgesic effect which is produced in the early postoperative period seems to be maintained in the long term.

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In 1974 Sindou *et al* described the neuroanatomical basis for DREZ lesioning<sup>1</sup> as well as certain clinical indications for the procedure.<sup>2</sup> In 1976 Nashold *et al*<sup>3</sup> described the use of DREZ lesioning for brachialgia after brachial plexus avulsion injury. One of us (DGT) has previously described the operative technique and early results of personal experience<sup>4</sup> using a method similar to that employed by Nashold *et al*.<sup>5</sup> We now describe the longer term results in 44 patients who underwent DREZ lesioning to treat pain secondary to brachial plexus avulsion.

### Patients and methods

Between 1982 and 1992 a total of 62 DREZ lesions were performed on 62 patients. In 44 cases the indication was deafferentation pain resulting from brachial plexus avulsion injury. Of these 44 patients 42 were men and two were women. The mean age was 38 (SD 13) (range 19-66) years. In 39 cases the injury was secondary to a road traffic accident, mostly involving motorcyclists. The remaining five cases resulted from industrial injury. In 29 cases the lesion was on the right and in the other 15 on the left. There were no

bilateral cases. No patient was considered for DREZ lesioning within 12 months of injury or with brachialgia of less than 12 months' duration.

The deafferentation pain was characteristically of a constant burning or crushing nature usually affecting the whole limb in a non-dermatomal manner, although in some cases either the distal or the proximal part of the limb was most severely affected (10 and 12 cases respectively). The pain was typically unremitting but with frequent superimposed sharp exacerbations. The pain generally came on within days of the accident, although in one case the onset was two years after injury. Many of the patients had had pain for a considerable time with a mean symptom duration of 88 (70) (range 12-370) months.

In all cases there had been no, or only a temporary, response to a wide variety of medications including narcotic analgesics, tricyclic antidepressants, and anticonvulsants used either as monotherapy or in combination. Most patients had, as a result, ceased any form of drug treatment. Stellate ganglion blockade and transcutaneous stimulation had also been tried in most patients without success. In addition, the following surgical procedures had been performed without any sustained analgesic effect: amputation (13 cases), brachial plexus exploration and attempted reconstruction (five cases), sympathectomy (two cases), arthrodesis, dorsal column stimulation, and deep brain stimulation (one case of each).

After operation all patients were followed up clinically, initially by outpatient review and then by postal questionnaire if the patients' symptoms and signs were static. According to the method described in previous reports<sup>4,5</sup> three levels of postoperative pain relief were defined by asking the patients themselves to grade the outcome as good when the patient judged there had been a 75% or greater reduction in pain, fair when there was a 25-75% pain reduction, and poor when pain relief was less than 25%.

### Results

The mean period of follow up for the 44 patients was 63 (48) (range 15-150) months. Thirty patients (68%) judged that they had had good pain relief, five patients (11%)

Gough-Cooper  
Department of  
Neurological Surgery,  
Institute of Neurology,  
National Hospital for  
Neurology and  
Neurosurgery, Queen  
Square, London, UK  
D G T Thomas  
N D Kitchen

Correspondence to:  
Dr N D Kitchen, Institute  
of Neurology, National  
Hospital for Neurology  
and Neurosurgery,  
Queen Square, London  
WC1N 3BG.

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thought that their pain relief had been fair, and nine (21%) thought that their pain relief was poor. Thus in 79% of cases the long term analgesic effect of the DREZ lesioning procedure was satisfactory or better.

In 16 patients there was worsening in postoperative neurological functioning of the ipsilateral lower limb (either motor changes (eight patients), sensory changes (six patients), or both (two patients)). Thus overall there were 10 cases of a postoperative motor deficit, which, although generally mild and improving with time, had persisted in eight at the time of final follow up. In six of these cases the power was grade 4/5 and in two the power was 3/5. All eight remained ambulant. The sensory deficits recorded in a total of eight patients after operation affected proprioception and vibration sense, but did not involve other sensory modalities. In four cases these changes in sensibility had persisted at the time of follow up, all of which were mild and limited to proprioceptive disturbances. There were no cases of bilateral lower limb disturbance or sphincter problems.

In 64% of cases (28 out of the 44) DREZ lesioning has been performed without any complications and has achieved good or fair pain relief that had persisted at the time of final follow up. Furthermore, of the nine patients who had a poor result in terms of pain relief, this was evident less than six months after operation in seven out of the nine cases. In only one patient was there a deterioration in analgesic effect to less than 25% more than one year after the procedure.

### Discussion

Chronic severe deafferentation pain secondary to brachial plexus avulsion injury is highly characteristic<sup>6</sup> and the prime indication for DREZ lesioning. In most patients with brachial plexus avulsion brachialgia the pain settles spontaneously or can be controlled by non-surgical means especially when these modalities (such as transcutaneous nerve stimulation and tricyclic antidepressants) are tried early after injury. Patients who have had a trial of conservative measures and continue to experience severe pain are candidates for DREZ thermocoagulation (probably 5%–10% of the total). Although the mechanism

of the beneficial therapeutic effect of DREZ lesioning is unclear, it may be due to interference with hyperactive neuronal pools in the posterior horn caused by the deafferentation process.<sup>7</sup>

Our long term results of DREZ lesioning in brachial plexus avulsion are encouraging and are in broad agreement with those described by Bronec *et al* (75% or better pain relief in 69% of patients).<sup>8</sup> Our findings suggest that the analgesic effect is long lasting and that any poor results present themselves early in the postoperative period. However, DREZ lesioning is an invasive procedure and we have found persistent, albeit mild, neurological deficits at the time of final follow up in 10 cases (23%).

The number of patients referred for DREZ lesioning has fallen in recent years, probably as a result of a more aggressive approach to brachial plexus reconstruction after avulsion injury. Even partial reinnervation using such techniques may improve limb function considerably and also prevent the development of deafferentation pain severe enough to require DREZ lesioning. Where such reconstructive procedures have been unsuccessful, however, and severe pain persists, as was the case in five patients in our series, DREZ lesioning may be extremely effective.

In general we have found DREZ lesioning to be an extremely effective method of ameliorating long standing incapacitating deafferentation pain unresponsive to other therapeutic options.

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