Evidence Tables: Neuroablation - DREZ

Neuroablation: Dorsal Root Entry Zone (DREZ) Lesioning

Evidence of effectiveness

1 health technology assessment (1 included)  +
1 systematic review (1 included)  ~
1 experimental study (0 included)  −
1 observational study (0 included)  0

Evidence of safety and harm

6 other reports
2 studies appraised as low quality

Generic legend:
n/a - not applicable
n/s - not stated
n/r - not relevant
? - unsure or unclear
# Evidence Tables: Neuroablation - DREZ

## Health Technology Assessment

<table>
<thead>
<tr>
<th>study authors and year</th>
<th>study design</th>
<th>exposure / comparison treatment (number of studies included)</th>
<th>common outcomes among studies</th>
<th>results</th>
<th>validity / applicability</th>
<th>conclusions, comments and quality scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jadad, A., O’Brien, M. A., Wingerchuk, D., Angle, P., Biagi, H., Tamayo, C., et al. (2001). Management of Chronic Neuropathic Pain following Traumatic Spinal Cord Injury. Rockville, MD: Agency for Healthcare Research and Quality. U.S. Department of Health and Human Services.</td>
<td>all primary studies on adult patients with central neuropathic pain caused by traumatic spinal cord injury. Included studies: RF: Friedman 1986; Nashold, 1981; Nashold, 1990; Rath, 1997; Sampson, 1995; Wiegand, 1985 RF vs CO₂ laser: Young, 1990 computer assisted RF: Edgar, J spinal disord, 1993 CO₂ vs argon vs Nd:YAG laser: Powers, Barbaro &amp; Levy, 1988</td>
<td>DREZ of any kind, no restrictions on comparator (n=9: 6 radiofrequency, 1 radiofrequency vs laser, 1 computer assisted radiofrequency, 1 laser) all were uncontrolled studies, two were prospective – others retrospective or unclear</td>
<td>no common analysis – heterogeneity between studies of outcome definition</td>
<td>excellent or good or fair pain relief: between 50% and 100%</td>
<td>focussed question: yes thorough search strategy: yes search terms defined: no appropriate inclusion / exclusion criteria: yes two reviewers - selection: yes study validity rated: yes two reviewers - validity: yes valid combination of studies: n/a appropriate analysis: yes all important outcomes considered: yes balance between benefits and harms: no fair conclusions from evidence: yes</td>
<td>validity: + precision: ~/− applicability: ~/− Overall quality of evidence: + authors’ conclusions: considerable variation in reporting / outcomes between studies – all included studies were of poor quality, but report favourable outcome in more than half of patients. Poor reporting of adverse events in most studies. reviewer’s comments: good review of poor literature, can only indicate that technique is promising but more work with improved reporting is required</td>
</tr>
</tbody>
</table>
**Systematic Review**

<table>
<thead>
<tr>
<th>study authors and year</th>
<th>study design</th>
<th>exposure / comparison treatment (number of studies included)</th>
<th>common outcomes among studies</th>
<th>results</th>
<th>validity / applicability</th>
<th>conclusions, comments and quality scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any type of primary study on patients with central neuropathic pain (“at-level” or “below-level” pain) related to traumatic spinal cord injury, population must include some patients at least 13 years of age. Included papers: RF DREZ: Friedman, 1986; Nashold, 1981; Nashold, 1990; Rath, 1997; Samii, 1984; Sampson, 1995 computer assisted RF DREZ: Edgar, 1993 laser DREZ: Powers, 1988; Wiegand, 1985 microsurgical DREZ: Spaic, 1999 radiofrequency, laser DREZ: Young, 1990</td>
<td>only one additional paper to Jadad: Edgar: 50-100% pain relief</td>
<td>search terms defined</td>
<td>yes?</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>adverse events in Edgar:</td>
<td>appropriate inclusion / exclusion criteria</td>
<td>yes</td>
<td></td>
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<tr>
<td></td>
<td>neurologic deficit</td>
<td>two reviewers - selection</td>
<td>yes</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>n=5</td>
<td>study validity rated</td>
<td>yes</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>sensory deficit</td>
<td>valid combination of studies</td>
<td>n/a</td>
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<tr>
<td></td>
<td>n=2</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>CSF leak</td>
<td>appropriate analysis</td>
<td>yes</td>
<td></td>
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<tr>
<td></td>
<td>n=3</td>
<td></td>
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<tr>
<td></td>
<td>pulmonary embolus</td>
<td>all important outcomes considered</td>
<td>yes</td>
<td></td>
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<tr>
<td></td>
<td>n=2</td>
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<tr>
<td></td>
<td>posttraumatic autogenic myelopathic myoclonus</td>
<td>balance between benefits and harms</td>
<td>no</td>
<td></td>
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<tr>
<td></td>
<td>n=5</td>
<td>fair conclusions from evidence</td>
<td>yes</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>wound infection</td>
<td></td>
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<tr>
<td></td>
<td>n=0</td>
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</tbody>
</table>
### Evidence Tables: Neuroablation - DREZ

#### Other Reports (safety and harm)

<table>
<thead>
<tr>
<th>study authors and year</th>
<th>participants inclusion exclusion</th>
<th>exposure / comparison treatment (number in each group)</th>
<th>outcomes (including adverse events)</th>
<th>results</th>
<th>conclusions, comments, and quality scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Husain, A. M., Elliott, S. L., &amp; Gorecki, J. P. (2002). Neurophysiological monitoring for the nucleus caudalis dorsal root entry zone operation. Neurosurgery., 50(4), 822-827; discussion 827-828. case series n&lt; 50</td>
<td>patients with intractable facial pain. no inclusions / exclusions listed deafferentation pain after trauma to face / trigeminal nerve, postherpetic pain (not relevant to this study), migraine variant, unknown etiology.</td>
<td>nucleus caudalis DREZ surgery with neurophysiological monitoring (n=5, 2 patients had bilateral procedures, reported as n=7, but post-herpetic patient not reported here)</td>
<td>immediate pain relief</td>
<td>n=5</td>
<td>authors' conclusions: comparable effectiveness to other studies with fewer complications – neurophysiological monitoring should be used</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>sustained pain relief (to last follow up, 3-22 months, mean 14)</td>
<td>n=4</td>
<td>reviewer's comments: very small series, no details on how selection for procedure was made</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>complications</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>temporary truncial ataxia</td>
<td>n=1</td>
<td></td>
</tr>
<tr>
<td>study authors and year</td>
<td>study design</td>
<td>participants</td>
<td>exposure / comparison treatment (number in each group)</td>
<td>outcomes (including adverse events)</td>
<td>results</td>
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<tr>
<td>Samii, M., Bear-Henney, S., Ludemann, W., Tatagiba, M., &amp; Blomer, U. (2001). Treatment of refractory pain after brachial plexus avulsion with dorsal root entry zone lesions. Neurosurgery, 48(6), 1269-1275.</td>
<td>case series n&lt;50</td>
<td>consecutive cases of refractory pain after brachial plexus avulsion</td>
<td>DREZ lesion, patient semi-sitting position, full laminotomy performed, lesions applied to all affected segments and one above/below. Electrode inserted to 2mm depth, lesions placed at 1mm intervals, heated to 75°C for 15 seconds (in early cases a different electrode was used) (n=47)</td>
<td>pain reduction @ follow up (complete lesion n=41) mean 14 year</td>
<td>80 ± 22%</td>
</tr>
<tr>
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<td>pain reduction @ follow up (incomplete lesion n=6) (mean 14 years)</td>
<td>64 ± 15%</td>
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<td>complications</td>
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<td></td>
<td>post operative weakness (all using early type of electrode)</td>
<td>n=7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>subdural haematoma</td>
<td>n=2</td>
</tr>
<tr>
<td>study authors and year</td>
<td>participants inclusion exclusion</td>
<td>exposure / comparison treatment (number in each group)</td>
<td>outcomes (including adverse events)</td>
<td>results</td>
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<tr>
<td>Emery, E., Blondet, E., Mertens, P., &amp; Sindou, M. (1997).</td>
<td>no explicit inclusions / exclusions. Patients all had chronic pain due to brachial plexus avulsion after vehicle / industrial accidents or falls, all had been treated unsuccessfully with analgesic drugs, tricyclic antidepressants and anticonvulsants before surgery, many had other surgeries, pain duration range 1-450 months (mean 100 months)</td>
<td>microsurgical DREZotomy, incision and bipolar coagulations inside dorsolateral sulcus, along avulsed segments and ventrolaterally at entrance of rootlets, lesion 3-4mm deep (temp / duration not provided) (n=37)</td>
<td>pain relief &gt;75%, no medication, unlimited activity</td>
<td>n=29 (65%) n=18 (66.5%)</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>fair 25-75%, non-narcotic medication required</td>
<td>n=10 (27%) n=5 (18.5%)</td>
<td></td>
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<tr>
<td></td>
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<td></td>
<td>poor &lt;25%, narcotics required or activities limited</td>
<td>n=3 (8%) n=6 (16%)</td>
<td></td>
</tr>
</tbody>
</table>

**conclusions, comments, and quality scores**

**authors’ conclusions:** good long term outcome in 2/3 of patients, low level of morbidity

**reviewer’s comments:** good range of outcomes and follow up procedure

<table>
<thead>
<tr>
<th>complications</th>
<th>mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>transient CSF fistula</td>
<td>n=1</td>
</tr>
<tr>
<td>meningitis</td>
<td>n=1</td>
</tr>
<tr>
<td>ataxia lower limb</td>
<td>n=5</td>
</tr>
<tr>
<td>dysesthesia upper limb</td>
<td>n=2</td>
</tr>
<tr>
<td>Study Authors and Year</td>
<td>Study Design</td>
</tr>
<tr>
<td>------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Rath, S. A., Braun, V., Soliman, N., Antoniadis, G., &amp; Richter, H. P. (1996). Results of DREZ coagulations for pain related to plexus lesions, spinal cord injuries and postherpetic neuralgia. Acta Neurochirurgica, 138(4), 364-369.</td>
<td>Case series n&lt;50</td>
</tr>
</tbody>
</table>

<p>| | | | Fair pain relief (25-75%) n=2 n=0 n=1 | | | |
| | | | Complications | Death n=1 n=2 n=0 | | |
| | | | Severe neurological deficit n=1 n=0 n=0 | | | |
| | | | Transient gait ataxia n=2 n=1 n=0 | | | |
| | | | Unilateral sensory impairment n=5 n=0 n=0 | | | |
| | | | Paresthesia n=0 n=0 n=2 | | | |</p>
<table>
<thead>
<tr>
<th>Study Authors and Year</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Study Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case series n&lt; 50</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Participants Inclusion Exclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>No specific inclusions / exclusions, or details on selection for this study patients aged 31-74, with complete or partial brachial plexus avulsion (BPA) (n=6), spinal cord trauma (SCT) (n=5), causalgia (C) caused by nerve trauma (n=2), pain related to systemic lupus erythematosus (n=1) and cancer (n=1), 1-25 years pain history, all previously treated unsuccessfully with analgesics drugs, nerve blocks and epidural spinal cord stimulation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Exposure / Comparison Treatment (Number in Each Group)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DREZ lesion under general anaesthetic, patient prone, Nashold method. Lesions made at 50mA for 5 seconds spaced 1-2mm apart along the DREZ at 26-188 points depending on extend of lesion. (n=13, excluding the lupus and cancer patient, note - one person with BPA had two segments treated)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outcomes (Including Adverse Events)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50-90% pain relief at 2-3 month follow up n=2</td>
</tr>
<tr>
<td>0-50% pain relief at 2-3 month follow up n=5</td>
</tr>
<tr>
<td>Complications (All 15 patients)</td>
</tr>
<tr>
<td>Changed phantom limb sensations n=2</td>
</tr>
<tr>
<td>Slight motor weakness n=7</td>
</tr>
<tr>
<td>Walking assistance required n=1</td>
</tr>
<tr>
<td>Sensory loss / weakness, sometimes with dysesthesia n=12</td>
</tr>
<tr>
<td>Slight new pain n=6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>BPA</td>
</tr>
<tr>
<td>SCT</td>
</tr>
<tr>
<td>C</td>
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<tr>
<td>---------</td>
</tr>
<tr>
<td>n=2</td>
</tr>
<tr>
<td>n=1</td>
</tr>
<tr>
<td>n=2</td>
</tr>
<tr>
<td>n=5</td>
</tr>
<tr>
<td>n=4</td>
</tr>
<tr>
<td>n=0</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Conclusions, Comments, and Quality Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initially good levels of pain relief decreased within 2-3 months, sensory loss / weakness was common.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reviewer's Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small study, not clear on why these patients were selected – several different conditions, duration of pain etc. paper examined correlation between patient and observer reporting of pain relief after DREZ</td>
</tr>
<tr>
<td>study authors and year</td>
</tr>
<tr>
<td>------------------------</td>
</tr>
<tr>
<td>Spiegelmann, R., Friedman, W. A., Ballinger, W. E., &amp; Tedeschi, H. (1991).</td>
</tr>
</tbody>
</table>
## Evidence Tables: Neuroablation - DREZ

### Studies appraised as low quality

<table>
<thead>
<tr>
<th>Study authors and year</th>
<th>Participants inclusion exclusion</th>
<th>Exposure / comparison treatment (number in each group)</th>
<th>Outcomes (include adverse events)</th>
<th>Results</th>
<th>Validity / applicability</th>
<th>Conclusions, comments, and quality scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rath, S. A., Seitz, K., Soliman, N., Kahamba, J. F., Antoniadis, G., &amp; Richter, H. P. (1997). DREZ coagulations for deafferentation pain related to spinal and peripheral nerve lesions: indication and results of 79 consecutive procedures. Stereotactic &amp; Functional Neurosurgery, 68(1-4 Pt 1), 161-167.</td>
<td>no inclusion criteria listed. Characteristics: deafferentation pain related to cervical root avulsion (CRA) (n=23), spinal cord injury (SCI) (n=23), non-traumatic spinal cord lesion (NT SCI) (n=3), brachial plexus other than root avulsion (BP) (n=7), phantom limb pain (PL) (n=2), postherpetic pain (n=10 - not relevant to this project).</td>
<td>DREZ lesions, Nashold technique, coagulations about 1-2mm apart at 75°C for 15 seconds per lesion (n=58)</td>
<td>good pain relief (&gt;75%)</td>
<td>CRA (n=12) SCI (n=11) BP (n=1) NT SCI/PL (n=0)</td>
<td>randomised</td>
<td>n/a</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>fair pain relief (25-75%)</td>
<td>n=6     n=2     n=1     n=0</td>
<td>similar at baseline</td>
<td>n/a</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>complications death</td>
<td>n=1     n=0     n=2     n=0</td>
<td>intention to treat</td>
<td>n/a</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>&quot;major&quot; (persistent gait ataxia, marked paresis (leg), late spondylodiscitis, wound infection, septicaemia)</td>
<td>n=1     n=0     n=0     n=0</td>
<td>single blind</td>
<td>n/a</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>&quot;minor&quot; (temporary gait ataxia, slight paresis (foot), hypaesthesia below lesion, temporary bladder dysfunction, paresthesias, disturbed wound healing)</td>
<td>n=9     n=2     n=0     n=0</td>
<td>follow-up OK</td>
<td>no</td>
</tr>
</tbody>
</table>

**validity:** --
**precision:** --
**applicability:** --
**overall quality:** --

**Authors’ conclusions:** Effective procedure for cervical root avulsion, reasonable for spinal cord injuries but not for other brachial plexus lesions / phantom limb pain.

**Reviewer's comments:**
- huge variation in follow up, not clear on level of drop out at each stage. No information on how patients selected for procedures.
<table>
<thead>
<tr>
<th>authors and year</th>
<th>participants</th>
<th>exposure / comparison treatment (number in each group)</th>
<th>outcomes (including adverse events)</th>
<th>results</th>
<th>validity / applicability</th>
<th>conclusions, comments, and quality scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>study design</td>
<td></td>
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</tr>
<tr>
<td>retrospective</td>
<td>nucleus</td>
<td>excellent pain relief of those treated 1989 onwards @ mean 3 months</td>
<td>n=12</td>
<td>randomised</td>
<td>n/a</td>
<td>case series score: 0 / 3</td>
</tr>
<tr>
<td>review of patients treated for facial pain who failed maximum medical and surgical treatment and were previously evaluated in a multidisciplinary pain clinic prior to referral anaesthesia dolorosa (n=14), atypical facial pain (n=8), post herpetic pain (n=8), stroke (n=5), facial trauma/dental or nasal surgery (n=4), headache (n=4), multiple sclerosis (n=1), trigeminal tumour (n=1), gamma knife radiation for acoustic tumour (n=1).</td>
<td></td>
<td>method described</td>
<td>n/a</td>
<td>authors' conclusions: outcome was fair or better in 56% of patients, a minority of those followed up said they would have the procedure again.</td>
<td></td>
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</tr>
<tr>
<td>retrospective</td>
<td>nucleus</td>
<td>good pain relief of those treated 1989 onwards mean 3 mo</td>
<td>n=14</td>
<td>similar at baseline</td>
<td>n/a</td>
<td>reviewer's comments: poor paper, results badly presented, very poor follow up</td>
</tr>
<tr>
<td>review of patients treated for facial pain who failed maximum medical and surgical treatment and were previously evaluated in a multidisciplinary pain clinic prior to referral anaesthesia dolorosa (n=14), atypical facial pain (n=8), post herpetic pain (n=8), stroke (n=5), facial trauma/dental or nasal surgery (n=4), headache (n=4), multiple sclerosis (n=1), trigeminal tumour (n=1), gamma knife radiation for acoustic tumour (n=1).</td>
<td></td>
<td>concealment</td>
<td>n/a</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>retrospective</td>
<td>nucleus</td>
<td>complications</td>
<td>n=1</td>
<td>intention to treat</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td>review of patients treated for facial pain who failed maximum medical and surgical treatment and were previously evaluated in a multidisciplinary pain clinic prior to referral anaesthesia dolorosa (n=14), atypical facial pain (n=8), post herpetic pain (n=8), stroke (n=5), facial trauma/dental or nasal surgery (n=4), headache (n=4), multiple sclerosis (n=1), trigeminal tumour (n=1), gamma knife radiation for acoustic tumour (n=1).</td>
<td></td>
<td>blinding appropriate</td>
<td>n/a</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>retrospective</td>
<td>nucleus</td>
<td>death (whole group n=101)</td>
<td>n=1</td>
<td>single blind</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td>review of patients treated for facial pain who failed maximum medical and surgical treatment and were previously evaluated in a multidisciplinary pain clinic prior to referral anaesthesia dolorosa (n=14), atypical facial pain (n=8), post herpetic pain (n=8), stroke (n=5), facial trauma/dental or nasal surgery (n=4), headache (n=4), multiple sclerosis (n=1), trigeminal tumour (n=1), gamma knife radiation for acoustic tumour (n=1).</td>
<td></td>
<td>double blind</td>
<td>n/a</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>retrospective</td>
<td>nucleus</td>
<td>ataxia (1989 onwards n=46)</td>
<td>n=18</td>
<td>blind outcome assessment</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td>review of patients treated for facial pain who failed maximum medical and surgical treatment and were previously evaluated in a multidisciplinary pain clinic prior to referral anaesthesia dolorosa (n=14), atypical facial pain (n=8), post herpetic pain (n=8), stroke (n=5), facial trauma/dental or nasal surgery (n=4), headache (n=4), multiple sclerosis (n=1), trigeminal tumour (n=1), gamma knife radiation for acoustic tumour (n=1).</td>
<td></td>
<td>compliance OK</td>
<td>n/a</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>retrospective</td>
<td>nucleus</td>
<td></td>
<td></td>
<td>Follow-up OK</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>review of patients treated for facial pain who failed maximum medical and surgical treatment and were previously evaluated in a multidisciplinary pain clinic prior to referral anaesthesia dolorosa (n=14), atypical facial pain (n=8), post herpetic pain (n=8), stroke (n=5), facial trauma/dental or nasal surgery (n=4), headache (n=4), multiple sclerosis (n=1), trigeminal tumour (n=1), gamma knife radiation for acoustic tumour (n=1).</td>
<td></td>
<td>drop outs &lt;20%</td>
<td>no</td>
<td></td>
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</tr>
<tr>
<td>retrospective</td>
<td>nucleus</td>
<td></td>
<td></td>
<td>generalisability</td>
<td>no</td>
<td></td>
</tr>
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<td></td>
<td>feasible / affordable</td>
<td>?</td>
<td></td>
<td></td>
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<tr>
<td>retrospective</td>
<td>nucleus</td>
<td></td>
<td></td>
<td>all important outcomes considered</td>
<td>no</td>
<td></td>
</tr>
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<td></td>
<td>balance between benefits and harms</td>
<td>no</td>
<td></td>
<td></td>
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</table>