Introduction
This overview has been prepared to assist members of the Interventional Procedures Advisory Committee (IPAC) advise on the safety and efficacy of an interventional procedure previously reviewed by SERNIP. It is based on a rapid survey of published literature, review of the procedure by Specialist Advisors and review of the content of the SERNIP file. It should not be regarded as a definitive assessment of the procedure.

Date prepared
The overview was prepared by Bazian Ltd in December 2002.

Procedure name
Subthalamotomy for Parkinson’s disease

Synonyms: lesioning of the subthalamic nucleus; subthalamic nucleotomy

Specialty society
Society of British Neurological Surgeons

Indication
Parkinson’s disease.

Parkinson’s disease is a chronic disease of the brain characterised by gradually worsening tremor, muscle rigidity and difficulties with starting and stopping movements. The condition is usually treated with drugs. Surgery may be considered in people who have responded poorly to drugs, who have severe side-effects from medication, or who have severe fluctuations in response to drugs (on-off syndrome).

Parkinson’s disease is common, affecting about 0.5% of people aged 65 to 74 and 1-2% of people aged 75 and over. Experts believe that 1 to 10% of people with Parkinson’s disease might be suitable for brain surgery.¹

Summary of procedure
Surgery for Parkinson’s disease is carried out on structures within the brain that are responsible for the modification of movements, such as the thalamus, the globus pallidus and the subthalamic nucleus. Each of these structures consists of two parts; one on the left hand side of the brain and one on the right. Surgery may be carried out on one or both sides.
Surgical treatment aims to correct the imbalance created by diminished function of the substantia negra, the underlying abnormality in Parkinson’s Disease. Surgery alters, through either destruction or electrical stimulation, the function of brain nuclei, such as the thalamus, globus pallidus or subthalamus that interact functionally with the substantia negra. All these procedures carry the risk of stroke, confusion and speech and visual problems.

Surgery involves inserting very fine needles into the brain through small holes made in the skull. The exact points of insertion may be different in each patient. In subthalamotomy, a part of the subthalamic nucleus is destroyed using heat or radiofrequency. The procedure is usually carried out under local anaesthetic. Patients remain awake during the procedure so that effects on movements can be monitored.

**Literature review**

**Appraisal criteria**
We included studies on subthalamotomy in people with Parkinson’s disease.

**List of studies found**
We found one systematic review.¹

We found no randomised controlled trials.

We found only case series or case reports. The table give details of the five largest²-⁶, including one study that was identified during the consultation process in February 2004.

References to smaller studies are given in the Annex.
### Summary of key efficacy and safety findings (1)

<table>
<thead>
<tr>
<th>Authors, location, date, patients</th>
<th>Key efficacy findings</th>
<th>Key safety findings</th>
<th>Key reliability and validity issues</th>
</tr>
</thead>
</table>
| Nicholson T<sup>1</sup> Systematic review  
Search date: September 1999 | • found no controlled studies  
• found two case series  
Efficacy ‘not yet established’ | Safety not yet established | Search date and primary sources described  
Selection criteria for studies described  
Quality of included studies assessed: all papers had methodological limitations |
| Yasui N<sup>2</sup>  
Case series  
Tokyo, Japan  
Date not stated (published 1976)  
n=66 patients had subthalamotomy  
Inclusion/exclusion criteria not reported  
Follow up: 2 weeks | None reported | Cerebellar signs (reduced muscle tone and difficult placing limbs accurately) persisting after 2 weeks: 41% | Uncontrolled case series  
Very limited description of surgical technique and of patients.  
Very short follow up |
| McCarter R<sup>3</sup>  
Case series  
Bristol, UK  
Date not stated (published 2000)  
n=12 subthalamotomy, age range 42 to 69 years (4 had subthalamic nucleus stimulator implanted on the opposite side in addition)  
Inclusion criteria:  
• disabling motor function despite medical management  
Exclusion criteria:  
• dementia or depressive illness  
Mean follow up: 6 months (minimum 3.5 months) | None reported | • No change in overall cognitive test results  
• Learning and retrieval deteriorated in 20-30%  
• Spatial working memory and planning: deteriorated in 28% | Uncontrolled case series |
## Summary of key efficacy and safety findings (2)

<table>
<thead>
<tr>
<th>Study details</th>
<th>Key efficacy findings</th>
<th>Key safety findings</th>
<th>Comments</th>
</tr>
</thead>
</table>
| **Alvarez**   | • ‘average’ reduction in motor ability score off medication: 50%  
                • ‘significant’ improvements in freezing gait, postural stability and facial expression  
                • bradykinesia and rigidity ‘improved’ bilaterally  
                • tremor ‘significantly ameliorated’ in whole group  
                • mean time to turn in bed reduced from 17 to 6 seconds  
                Follow up: 12 months  
                Inclusion criteria:  
                        • mainly axial motor manifestations  
                        • absent or mild levodopa-induced dyskinesia  
                n=11, average age 60 years (range 53 to 69 years)  
                Date not stated (published 2001)  
                n=11, average age 60 years (range 53 to 69 years)  
                | No intraoperative complications  
                Postoperative complications:  
                        • dyskinesia: 5 people  
                        • chorea: 1 person  
                        • no cognitive, sensory, motor or speech deficits occurred  
                | Uncontrolled case series  
                Losses to follow up  
                No patient assessment of outcome |
| **Diederich** | Only one person had subthalamotomy alone  
                No efficacy data presented separately  
                Mean follow up: 11 years  
                n=17 people  
                • 13 combined subthalamotomy and thalamotomy  
                • 1 subthalamotomy alone  
                • 1 thalamotomy alone  
                • 1 not known  
                Minimum age at surgery 35 years – maximum age at re-examination 71 years.  
                | No complications or adverse effects reported  
                | Uncontrolled case series  
                Data for thalamotomy and subthalamotomy group not reported separately  
                Information of people who were dead and people who did not wish to provide information not given (17 people) |
<table>
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<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patel, N (2003)</td>
<td>Unified Parkinson’s Disease Rating Scale (UPDRS) II – activities of daily living; III – motor examinations</td>
<td>1 patient had dyskinesia</td>
<td>This study was identified during the consultation process.</td>
</tr>
<tr>
<td>Case series</td>
<td>Significant reduction in the motor UPDRS III scores for patients OFF and ON medication.</td>
<td>1 patients sustained a post-operative grand mal seizure and Todd’s paresis (transient)</td>
<td>12 of the patients included in this paper were included in an earlier study</td>
</tr>
<tr>
<td>1997 -2000</td>
<td>Significant reduction in the activities of daily living UPDRS II scores for patients OFF and ON medication.</td>
<td>No patients developed sensory or speech deficits</td>
<td>Originally 26 patients – five lost to follow-up (two failed to attend clinic, two lived abroad and unable to return and one patients developed metastatic disease)</td>
</tr>
</tbody>
</table>
Validity and generalisability of the studies
The studies were all carried out in settings appropriate to the UK.

We found only case series, all of which were small. Only one provided any efficacy data.4

Bazian comments
The systematic review1 states that ‘the Parkinson’s Disease Society and the Medical Research Council are currently establishing a trial protocol for a multicentre randomised controlled trial of early compared with deferred lesioning or stimulation of the subthalamic nucleus’.

Specialist advisor’s opinion / advisors’ opinions
Specialist advice was sought from consultants who have been nominated or ratified by their Specialist Society or Royal College.

The Specialist Advisors commented that there were not enough data to assess the long-term benefits of subthalamotomy for Parkinson’s disease, and that subthalamic electrical stimulation had become the preferred intervention.

This overview was amended by NICE in May 2004
References


### Annex: References to studies not described in the table

<table>
<thead>
<tr>
<th>Reference</th>
<th>Number of study participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Su PC, Tseng HM. Subthalamotomy for end-stage severe Parkinson's disease. Movement Disorders 2002; 17: 625-627</td>
<td>1</td>
</tr>
</tbody>
</table>