Key messages

- SDR appears to be somewhat effective for a subgroup of children with cerebral palsy whose mobility is limited by excessive spasticity.
- Although any improvements seem to be maintained in the medium to long term, the results are sometimes disappointing.
- There are a number of potential short and/or long term adverse side effects from SDR; these are pain, deterioration in walking ability, bowel and bladder functioning, and spinal deformity.

What were we asked?
Is Selective Dorsal Rhizotomy (SDR) an effective procedure for children with cerebral palsy?

What did we do?
In 2011 we searched the Cochrane Library, TRIP database, Pubmed, NHS Evidence, and reviewed guidance issued by the National Institute for Health & Clinical Excellence (NICE). This search was last updated in April 2013.

We contacted the Robert Jones & Agnes Hunt NHS Trust in Oswestry, and an orthopaedic surgeon with expertise in cerebral palsy not working at the Oswestry hospital.

What did we find?
Three randomised controlled trials have been published, and the results brought together in a meta-analysis.\(^1\) A meta-analysis is a statistical strategy that is used to bring together the results of several studies into a single result. The studies showed, on average, a small improvement in movement ability in children who had SDR and physiotherapy compared to physiotherapy alone after one year follow up. These authors suggested that SDR is likely to be of most benefit to children between 3 and 8 years of age who walk with walking aids, external support or assistance (GMFCS levels III and IV). The meta-analysis was found to be of ‘reasonable quality’ by the Centre for Reviews and Dissemination at the University of York.\(^2\) This enhances the credibility and reliability of the conclusions of the study.

A prospective cohort study published in 2013 followed up a group of 29 children aged 2-12 at baseline.\(^3\)

- Measures of Gross Motor Function Measure-66 (GMFM-66) were taken at baseline and at 5 and 10 years follow up. These measures were compared to reference centiles, adjusted to GMFCS levels.
- The study found that the majority of children who underwent SDR showed improvements in GMFM-66 scores compared to the reference centiles.
This suggests that SDR can have long term positive impacts on the child’s movement abilities.

However, reference centiles were only available for children up to age 12, so the reference centile for 12 years was used for the older children as well. The children would have been aged 12-22 by the final follow up measurement was taken. Most children would have been measured on a reference scale below their age. Although the authors of this study suggest that there is little change in GMFCS levels between the ages of 12 and 21 years, using the reference centile for a 12 year old for all participants could result in an overestimate of the benefits of this therapy.

NICE have evaluated SDR and considered the findings of the meta-analysis, and also evidence from non-randomised clinical trials and case series. We have not repeated this work because it is available as part of their 2006 report, which was updated in 2010.  

There are a number of potential short and/or long term adverse outcomes from SDR highlighted in the 2010 NICE report; these are pain, deterioration in walking ability, bowel and bladder functioning, and spinal deformity. The current NICE guidance states that, ‘Current evidence on selective dorsal rhizotomy for spasticity in cerebral palsy shows that there is a risk of serious but well-recognised complications. The evidence on efficacy is adequate’.  

Experience of SDR in the UK has largely been amongst patients treated in Oswestry.  This centre has reported their experience and patient outcomes in a peer-reviewed publication. A strict process for selecting patients appropriate for SDR is described, and only half of the children originally referred for assessment actually had SDR. Walking ability and gait improved among the selected patients.

Recent publications have included further follow up of patients who had SDR, and suggest that walking ability is maintained in the long term. Other studies have examined factors associated with better outcomes, identifying some associations between movement ability and MRI brain scan findings, and to a lesser extent measures of spasticity, strength and gait.

A review published in 2011 found that data on the long term outcomes of SDR are limited. There is ‘poor to moderate’ evidence that the procedure has positive long term effects on body structure and function. It was noted that spinal deformities are often observed in patients with CP who underwent SDR, but it is not clear to what extent these abnormalities are due to SDR.

What do we think?

There has been considerable evaluation of the effectiveness of SDR for children with cerebral palsy. Overall the evidence suggests a beneficial effect on reduction of spasticity and a small or moderate improvement in movement ability in a carefully selected group of patients. There has been some controversy about which children are likely to benefit from SDR. North Bristol NHS Trust have a webpage with some guidance on suitability for SDR.

When considering children for the procedure, surgeons in the UK centre appear to prefer that children are slightly older than in the USA. The hospital in Oswestry does not usually consider using SDR with children under 5 years so that their mobility and gait have matured. However surgeons in the USA appear willing to consider using SDR with children as young as 2 years old. It is important to note that SDR does not resolve fixed lower limb deformities. When children are found to have fixed deformities, consideration will be given to addressing
these with orthopaedic surgery. In principle, permanently reducing lower limb spasticity with SDR in younger children might prevent the development of deformity and reduce the need for orthopaedic surgery as children get older. This has been studied, though the evidence is not conclusive.\textsuperscript{11}

The authors of the meta-analysis suggested the procedure was most likely to benefit children in GMFCS levels III and IV (who need mobility aids to walk); however more recent publications include some children in GMFCS levels I and II (who may not use walking aids).

There appears to be a difference in the proportion of nerves which are severed during the procedure, with more extensive surgery being carried out in the USA. The more nerves that are severed then the greater the consequent reduction in spasticity.

The revised guidance issued by NICE in December 2010 means that SDR can be used as a treatment in the NHS subject to the necessary arrangements being in place. We heard recently from a parent of a child who was being considered for the procedure at a hospital in Bristol.

**Our recommendations:**

The answer to the question we were posed is not straightforward. SDR appears to be somewhat effective for a subgroup of children with cerebral palsy whose mobility is limited by excessive spasticity. Improvements in movement ability may be achieved following the procedure by reducing the spasticity. When improvements occur they appear to be maintained in the medium to long term.

Although there is some guidance from NICE on which children might be suitable for SDR, and the outcomes are occasionally disappointing.

Any families wishing to find out more about SDR should read the guidance published by NICE on their website.\textsuperscript{4}

Information last updated April 2013.

We would like to hear your feedback on this summary – please email us at pencru@exeter.ac.uk if you have any comments or questions.
References:


Note: This information is produced by PenCRU researchers and reviewed by external experts. The views expressed are those of PenCRU at the University of Exeter Medical School and do not represent the views of the Cerebra charity, or any other parties mentioned. We strongly recommend seeking medical advice before undertaking any treatments/therapies.

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