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Selective dorsal rhizotomy (SDR)

What is selective dorsal rhizotomy? (SDR)

Selective Dorsal (or Posterior) Rhizotomy is a neurosurgical technique used to treat spasticity (increased muscle tone) in the lower limbs.

What selective dorsal rhizotomy is not:

SDR is not a cure for cerebral palsy, nor is it suitable for the treatment of abnormal movements or balance problems. This is not a 'stand-alone' treatment as intensive post-operative physiotherapy is required. The operation is irreversible and it is recommended that people gain as much information and evidence as possible before proceeding.

Origins of the technique

SDR is still not widely available in the UK. However, the technique itself is not new, having evolved from treatment first carried out in the late nineteenth century to alleviate unremitting limb pain. Its apparent effect on the reduction of spasticity was discovered almost by accident. Subsequent modifications led to a revival of interest in the mid-1980s, predominantly in the USA where it has since been used extensively in the treatment of cerebral palsy.

What does the term mean and what does the technique involve?

Selective Dorsal Rhizotomy describes a surgical procedure carried out to the lower area of the back (usually between the bottom of the rib cage and the top of the hips). Sensory nerve fibres in the spinal cord are identified, then selectively cut (rhizotomy). Unlike other forms of surgery, this technique aims to tackle the cause, rather than the effects, of cerebral palsy.

In simple terms, the brain informs the spinal cord how much tone or tightness each muscle should have. This information is carried via the sensory nerve fibres. In cerebral palsy this communication route does not function effectively, and it is the loss of this regulating influence which is thought to contribute to spasticity. By identifying and cutting those nerve fibres which are not 'transmitting' effectively; it is generally considered that a reduction in muscle tone will result.

The sensory nerve roots are first of all separated from the motor ones. Identification of the nerve fibres to be cut is then made by means of electrical stimulation – those which generate unusual electrical activity are considered to be those which contribute to too much muscle tone. The remaining 'routes' carrying the correct messages remain intact. The duration of the operation is likely to be about five hours – this is major surgery requiring a general anaesthetic.

Aims

Principally, the surgery aims to:

- reduce spasticity
- improve function
- improve walking in those who can
- increase range of motion and improve body positioning in those who do not walk and require assistance with personal care

Who is suitable?

Factors which appear to contribute to success include:

- age two years +
- spastic diplegia or quadriplegia
- premature birth
- ability to participate in post-operative therapy

Primarily used with children, reports have also been made of successful interventions with adults.

Factors likely to inhibit success, especially where the aim is to improve walking, include:

- muscle-tendon contractures (fixed tightness)

- previous surgery (especially multiple operations)
- hip displacement
- mixed cerebral palsy/athetosis/ataxia or dystonia

In cases of mild spasticity a less extensive procedure, such as a tendonotomy (surgical cutting of a tendon) or botulinum toxin treatment is likely to be more appropriate.

Assessment

Potential candidates participate in a rigorous assessment by an expert, multi-disciplinary team drawn from the fields of neurosurgery, neurology, physiotherapy and occupational therapy. The criteria used comprise a combination of clinical, laboratory and behavioural guidelines. Gait (walking) analysis and MRI scans (a type of brain scan) are possible components.

Assurance of the parent/carer to adhere to the follow-up programme is also sought, as post-operative physiotherapy is crucial – success and family involvement appear to be closely linked.

Post-operative procedures

Intensive physiotherapy will be required for around three months to one year. In effect, the patient who was previously able to walk has to learn to walk again. Other potential post-operative procedures include bracing and further surgery such as hip osteotomies (cutting of the bone) or tendonotomies.

Potential side-effects

Evidence of side-effects is incomplete and based on the publication of several case studies and conferences. Furthermore, the full effects may not be appreciated until full body growth is achieved. Reported side-effects, many of which appear to be temporary, include:

- sensory loss, numbness or uncomfortable sensations in limb area which was served by cut nerve
- increased sensitivity
- difficulty with bladder and/or bowel control
- hip dislocation in children who had previous hip alignment problems

- concern of late onset scoliosis (curvature of the spine)

Discouragement in the patient, due to the long follow-on process, has also been reported.

SDR can highlight weaknesses elsewhere, for example, where muscles working alongside the spastic muscles have adapted to compensate for the increase in muscle tone.

Where and how is SDR available?

As far as Scope is aware, the only UK centre currently offering this treatment is the Robert Jones and Agnes Hunt Orthopaedic and District Hospital, Oswestry, Shropshire. Their criteria for selection are restricted to children aged six and upwards who already walk easily over fairly long distances, usually without aids such as sticks or crutches. Referrals, including birth history and details of paediatricians and physiotherapists involved with the child's care, must be made via your GP. Some Health Authorities have agreed funding for this treatment.

Conclusion

Selective Dorsal Rhizotomy is in some ways a controversial intervention, which has not yet been subjected to adequate controlled trials. As with all surgical intervention the potential gains must be weighed against the possible sensory loss, the trauma of intervention and the need for lengthy and intensive post-operative therapy. Decrease in muscle tone has been consistently reported in treatment carried out to date – reports are mixed regarding the long-term effects on function. Full evidence of side-effects is not yet available.

As with any therapy or treatment, Scope would advise people with cerebral palsy, their carers or parents to consult their GP, consultant or health professional before starting or paying for any treatment. Due to the individual nature of cerebral palsy some children will benefit from specific treatments and therapies, others will not. Assessment of your child's individual needs is very important.

Further information

The Robert Jones and Agnes Hunt Orthopaedic and District Hospital
NHS Trust
Oswestry
Shropshire

SY10 7AG

Telephone: 01691 404000

Fax: 01691 404050

Web: www.rjah.nhs.uk

Useful websites:

There are some useful websites containing extensive information about SDR -

<http://cerebralpalsy.wustl.edu/rhizotomy0.html>

<http://www.orlau.com/Sdrframe.htm>

http://www.capability-scotland.org.uk/upload%5Cdocuments%5Ccerebralpalsy%5CMedical_surgical_treatments.doc

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