SELECTIVE DORSAL RHIZOTOMY: PATIENT MANAGEMENT

PRACTICE GUIDELINE ©

DOCUMENT SUMMARY/KEY POINTS

- Children and adolescents with cerebral palsy (CP) often have spasticity that interferes with mobility and participation in activities of daily living.
- Selective Dorsal Rhizotomy (SDR) is a neurosurgical intervention for reducing spasticity in children with cerebral palsy (1). The neurosurgeon divides the dorsal sensory spinal roots of L2-S1 and stimulates each rootlet under clinical and electromyographic (EMG) guidance. Sensory nerve rootlets with abnormal, excessive and contralateral EMG responses are surgically sectioned.
- The goal of SDR is to reduce the spasticity in the lower limbs permanently by interrupting the abnormal spinal reflex arc, in order to improve motor function (2-4).
- It is suitable for a small selection of children with bilateral spasticity, fulfilling strict selection criteria (3).
- There is a protocol for post-operative nursing and therapy.
- This practice guideline includes the pre/post-operative care.

READ ACKNOWLEDGEMENT

- All clinical staff (medical, nursing and allied health) who are involved in the patient care of children undergoing SDR surgery.

This document reflects what is currently regarded as safe practice. However, as in any clinical situation, there may be factors which cannot be covered by a single set of guidelines. This document does not replace the need for the application of clinical judgement to each individual presentation.

Approved by:	SCHN Policy, Procedure and Guideline Committee	
Date Effective:	1st October 2016	**Review Period**: 3 years
Team Leader:	Senior Physiotherapist	**Area/Dept**: Cerebral Palsy Service

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Selective Dorsal Rhizotomy

Definition

Selective Dorsal Rhizotomy (SDR) is a neurosurgical intervention for reducing spasticity in children with cerebral palsy (CP). The goal of SDR is to reduce the spasticity in the lower limbs permanently by interrupting the abnormal spinal reflex arc, in order to improve motor function.

General Principles

Pre-operative preparation

A comprehensive multidisciplinary assessment is conducted by Kids Rehab prior to confirming a date for SDR surgery (appendix 1). An assessment by the social worker is conducted as per appendix 3. The patient commences pregabalin 2 days prior to the surgery date. As SDR is offered at CHW to eligible patients from interstate, timing of assessments and appointments may vary.

Prior to surgery, the child is seen in the pre-admission clinic for evaluation and potential investigations as decided by the anaesthetist and neurosurgeon. A 4-6 week admission for rehabilitation is expected. A separate appointment will be scheduled with the community therapists and/or the Kids Rehab therapists to discuss goals and outcomes associated with the procedure and to obtain a baseline for subsequent reviews as stated in the National Minimum Data Set as per appendix 2.

Process for Request For Admission

A joint appointment with the Kids Rehab Specialist and Neurosurgeon will be organised with the family. The RFA will be completed at this time. Preadmission clinic appointment will be organised the week prior to the scheduled surgery.

Equipment/Requirements for Admission

Equipment required during the inpatient stay will be checked and/or arranged by the Kids Rehab allied health professionals:

- Manual wheelchair or stroller
- Foam block for foot plate
- 2 pairs of leg wraparounds
- SAFOs that fit comfortably
- Well-padded bivalve casts for lower limbs
- Prone cart for early mobilising
- Standing frame

- Kaye-walker
- Toilet/shower chair eg Goanna chair

NUM on orthopaedic ward to arrange:

- Copies of post-operative protocol for day 0-3 in front of patient's file and at the bedside
- Electric up / down bed
- High profile foam pressure mattress
- Bed cradle- as supplied by Kids Rehab
- Inservice slot for Kids Rehab CNC and PT to conduct an education inservice with nursing staff

Post-operative management

Bed, mattress and bed cradle should be sent to theatres prior to the end of the surgery so the child can be transferred directly onto this bed and avoid unnecessary transfers in the immediate post op period.

Observations

- Vital observations (blood pressure, heart rate, respiratory rate, oxygen saturation, body temperature) hourly for 4 hours, then 2-4th hourly
- Limb observations (colour, sensation, movement) with vital observations
- Pain assessment – Nurse Controlled Analgesia plus other analgesia as reviewed by the pain team in consultation with the neurosurgical/rehabilitation teams. (Refer to Guideline No: 1/C/06:8215-02:01 Guideline: Pain Management – CHW).

Nutrition and Hydration

- Nil by mouth until bowel sounds resume. A naso-gastric tube will be insitu post-op. This is to facilitate administration of medications rather than for enteral nutrition.
- Ice to suck over the first 24 hours is permitted. Diet is upgraded as tolerated.

Intravenous therapy

- Monitor and record fluid balance
- An in dwelling catheter is left in situ while intravenous therapy is running at full maintenance (refer to Guideline No: 1/C/09:8070-01:03 Guideline: Intravenous Fluid Management – CHW). Once diet and oral fluids are tolerated, the indwelling catheter is removed, ideally around day 3.

Wound care

- The wound site is dressed with primipore over nylon skin closure in theatres. Recommended daily dressing changes for the first week by the neurosurgical team. This is increased to every alternate day or as required. Wash with chlorhexidine solution. No ointments to be used. Sutures removed on day 14 by the neurosurgical team, under nitrous oxide in the clinic room on the orthopaedic ward.

Hygiene

- 4/24 mouth care required when nil by mouth
- 4/24 perineal care while IDC insitu
- Daily sponge/wash whilst on bed rest
- Can be showered in a shower chair once stitches have dissolved and suture line has completely healed. This will be cleared by the Neurosurgical & Kids Rehab teams.
- Use slipper pan for toileting

Positioning (Days 0-3)

- Patient to remain in supine position for 72 hours following surgery to avoid spinal headache (no pillow to be used)
- Wear leg wraparounds - these are to be applied in theatre to keep knees gently extended. To be worn at all times and only removed for skin checks and gentle lower limb movements 2-4th hourly
- Bed cradle to keep sheets off the feet
- Log rolled with the assistance of no less than 2 staff members, in the bed - position in supine and quarter turn positions maintaining good alignment of head, trunk and lower limbs with the use of pillows
- Head of bed elevation to 30º may be introduced under physio instruction after day 3

See Appendix for further post op details during admission as specific patient protocols will be made available to parents and staff as the child progresses in their rehabilitation.

Sub-acute care

1 week post op – consider type change from acute (neurosurgical) to sub-acute care (Rehab). Decision to be confirmed by Kids Rehab consultant. Kids Rehab team ward rounds scheduled into timetable on Tuesday at 8.30am and Thursday at 1pm.

Participation In School

This should be coordinated by the Kids Rehab team in conjunction with the Hospital School to ensure patient safety and fatigue factors are considered.

Precautions During Inpatient Stay

- No forced movement of the spine which includes rotation, lateral flexion or forward flexion of the trunk
- No vigorous hamstring stretching- no passive straight leg raises (SLR) past 30 degrees and no long sitting that is sitting in a stroller or bed with hips at 90 degrees with leg wraparounds
- Allow active movement within the child's pain tolerance
- No lumbar hyperextension
- Be aware of hip joint status such as subluxation and dislocation

- See SDR protocol for detailed summary of care (Appendix 4)

Immediate Post Operative Escalation protocol

- Contact the neurosurgical registrar via hospital page.
- If no response within 10 minutes, contact the neurosurgery fellow via switchboard.
- If no response, contact the neurosurgery consultant via switchboard.

Potential Complications

Pulmonary Complications

Pneumonia: Potential complication from lying flat, anaesthetic and opioids. Vital observations (respiratory rate and oxygen saturation) and deep breathing exercises in physiotherapy are required to decrease the risk of respiratory complications.

Neuropathic Pain

Dysaesthesia or abnormal sensitivity of the skin on the feet and legs is relatively common after SDR, but usually resolves within 6 weeks. This is treated with the oral medication, pregabalin, which is commenced 2-3 days prior to surgery and continued for 3 months post surgery. Firm but gentle handling and wearing of leg wraparounds can minimize pain.

Pressure ulcers

Strict pressure care is required to reduce the risk of developing pressure areas. The heels, shoulders, hips and back should be routinely examined for skin breakdown. Rolled up towel under lower legs or pressure pads under heels to prevent pressure under heels.

Wound Infection

Wound infections are a common complication of surgical procedures. Protection of the wound post-operatively is essential.

Urinary Tract Infection

Urinary tract infections are common when an IDC is inserted. Signs and symptoms of a urinary tract infection must be monitored (refer to Guideline No: 1/C/09:8038-01:00 Guideline: Urinary Tract Infection (Typical) Identification and Management).

Constipation

The use of opioids when managing post-operative pain and bed rest can result in constipation. Children with a history of constipation require aperients pre surgery to ensure no faecal loading. Aperients to be charted post operatively to maintain bowel hygiene.

Requirements for Discharge

For NSW referrals:

- Child can mobilise safely, either with wheelchair or walking with Kaye-walker, depending on child's individual needs
- Standing transfers are performed safely and independently
- Parents educated on scar management
- Prescriptions for medications (pregabalin) arranged and weaning plan given
- Follow up appointments arranged:
  - Neurosurgeon at 6-8 weeks post surgery
  - Physiotherapist at 3 months post surgery
  - Rehabilitation Specialist and physiotherapist at 6 months post surgery
- Contact phone numbers of health professionals given to parents/carer
- Community physiotherapy is informed of discharge date and a discharge planning meeting is arranged with the community team

For Interstate referrals:

- As above, excluding follow up appointments, which will be organised by the referring Rehabilitation Specialist with the appropriate clinicians at the referring hospital.
- Travel arrangements are co-ordinated between the referring hospital and Kids Rehab SDR co-ordinator at CHW. Refer to Guideline No: 1/A/06:8105-01:02 Transferring Paediatric Patients and Related Transport Requirements Practice Guideline (section 2.2, 7.1, 7.2, 7.3 and 7.6
- Referring hospital's rehabilitation team is to assess the wound at discharge and refer to local neurosurgeon as needed. If follow up by a neurosurgeon has been deemed necessary by the Kids Rehab team and neurosurgeon, this needs to be flagged in the discharge letter so appropriate referral to local neurosurgeon can be made.

Equipment Required at Discharge

This will be coordinated by the Kids Rehab Physio, depending on the functional level of the child being discharged.

Appendix 1: Pre SDR work up.

This includes:

Review of the child in the National SDR Videoconference. These videoconferences are held twice a year and are attended at the local site by clinicians from all states. Children from tertiary paediatric hospitals around Australia and New Zealand present potential candidates with the following assessments:

- Birth history
- MRI of the brain and spine
- 3- Dimensional gait analysis including physical assessment
- History of current medical management of their CP and spasticity management
- Strength and selective motor control
- Family goals
- Availability of community therapy service to perform intensive rehabilitation program post-operatively

Any further assessments will be recommended at this stage.

Appendix 2: National Minimum Data Set

Outcome Measures	Baseline	3 mos	6 mos	12 mos	2 years	3 & 4 years	5 years	10 &15 years
Physical Assessment	✓	✓	✓	✓	✓	✓	✓	✓
X-rays pelvis for hip Migration %	✓		**Prn**	✓	✓	✓	✓	**Prn**
X-rays PA & lat feet / spine (standing)	✓			✓			✓	✓
3-Dimensional Gait Analysis	✓			✓	✓		✓	✓
GMFM-66 scales: subsets C,D&E	✓		✓	✓	✓		✓	
Timed Up & Go; Functional Mobility Scale	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓
Gillette Functional Assessment Qu;	✓		✓	✓	✓		✓	✓

6 minute walk test	✓		✓	✓	✓	✓	✓	✓
SCALE (Selective Motor Control)	✓			✓			✓	
Canadian Occ Performance Measure	✓	✓	✓	✓	✓			
Pediatric Evaluation of Disability Inventory	✓			✓	✓			
ASIA (sensation); Child & Adol Scale of Participation; Cerebral Palsy Quality of Life-Child	✓ ✓ ✓			✓ ✓ ✓			✓ ✓ ✓	✓ ✓
Pain Scale	✓	✓	✓	✓				

Appendix 3: Social work assessment

A Social Work assessment is conducted to:

- Identify motivation of the patient and family to attend an intensive rehabilitation program post-operatively;
- Assess personal, family and environmental limitations which may affect the desired outcome for the patient as well as protective and supportive factors for the patient;
- Develop a care plan to support the patient and family during their inpatient stay and liaise with the referring hospital's social worker (if applicable) for continuation of support following discharge from hospital;
- Assess practical support required by the family during the inpatient period.

Appendix 4: Summary of care post SDR

Selective Dorsal Rhizotomy (SDR) - therapy and nursing management - DAYS 0-3 inclusive

GOALS	ACTIONS
Bed rest in good alignment	• Nurse flat for 72 hours following surgery to avoid spinal headache (no pillow) • Wear leg wraparounds- these to be applied in theatre to keep knees gently extended. To be worn at all times, only being removed for skin checks and gentle lower limb movements 2-4th hourly. • Bed cradle to keep sheets off the feet. • To be log rolled with the assistance of 2, in the bed-position in supine and quarter turn positions maintaining good alignment of head, trunk and lower limbs with the use of pillows. • Bathing and toileting in bed.
Pain and spasm management	• Pain management team involved. • Dysaesthesia in lower limbs especially feet, managed by pain relief, firm gentle handling and wearing of leg wraparounds
Prevention of complications	• Nurse flat for 72 hours on foam pressure mattress • Vital observations hourly for 4 hours, then 2-4th hourly. Include limb observations (colour, sensation, movement) with vital obs. • Indwelling catheter in situ while on IV fluids • NG tube in situ • Pain assessment important- NCA plus other analgesia as reviewed by medical teams • Rolled up towel under lower legs or pressure pads under heels to prevent pressure under heels • Respiratory management- deep breathing exercises (bubbles, balloons) and coughing as required

Precautions:

1. No straight leg raises- do not lift legs straight up in the air, always log roll
2. If the child chooses to roll and is comfortable, this is OK but when assisting the child to log roll, ensure their whole body rolls in a straight line, do not force the child's hips to roll separately.
3. Do not allow the child to bend their hips past a right angle (90 degrees)

In summary:

- No passive spine rotation, lateral flexion or forward flexion of the trunk
- No lumbar hyperextension
- No vigorous hamstring stretching
- Allow active movement within the child's pain tolerance
- Be aware of hip joint status such as subluxation and dislocation

SDR PROTOCOL- therapy and nursing protocols - DAYS 4-7

GOALS	ACTIONS
Bed rest in good alignment	• Wear leg wraparounds- to be worn at all times, only being removed for skin checks and gentle lower limb movements 2-4th hourly. • Bed cradle to keep sheets off the feet. • To be log rolled with the assistance of 2, in the bed-position in supine and quarter turn positions maintaining good alignment of head, trunk and lower limbs with the use of pillows. • Bathing and toileting in bed.
Pain and spasm management	• Pain management team involved. • Dysaesthesia may still be present- manage with pain relief. As it settles, introduce cast back slabs with leg wraparounds as tolerated.
Commence elevation of bed head slowly (<30 degrees)	• To be done at mealtimes only, for up to 15 minutes at a time (starting Friday- physio to confrim). Fatigue may occur so prop with pillows by side of trunk as required.
Early commencement of active movement in bed	• Gentle range of motion leg exercises commenced as tolerated (active,assist/active, and passive) • Slowly encourage active participation in rolling
Introduce prone lying in bed	• Put small wedge under chest for comfort and folded towel under pelvis to avoid spinal hyperextension.
Prevention of complications	• Nurse on foam pressure mattress • Pain assessment important- NCA plus other analgesia as reviewed by medical teams • Rolled up towel under lower legs or pressure pads under heels to prevent pressure under heels • Respiratory management- deep breathing exercises (bubbles, balloons) and coughing as required

Precautions:

1. No straight leg raises- do not lift legs straight up in the air, always log roll
2. If the child chooses to roll and is comfortable, this is OK but when assisting him to log roll, ensure his whole body rolls in a straight line, do not force his hips to roll separately.
3. Do not allow the child to bend his hips past a right angle (90 degrees)

In summary:

- No passive spine rotation, lateral flexion or forward flexion of the trunk
- No vigorous hamstring stretching
- Allow active movement within the child's pain tolerance
- No lumbar hyperextension

SDR PROTOCOL- therapy and nursing protocols WEEK 2 – DAYS 8 - 14

GOALS	ACTIONS
Positioning in good alignment	Wear leg wraparounds at all times- only to be removed for sponges in bed, when doing leg exercises and when bed head is elevated more than 60 degrees. Combine leg wraparounds with the use of bivalve casts. Encourage active participation in rolling, remembering to avoid any forced trunk movement. Prone lying- encourage active trunk extension onto forearms- place folded towel under pelvis to avoid spinal hyperextension. Bathing and toileting in bed.
Pain and spasm management	This should be settling. Pain relief often indicated prior to therapy session.
Continue with elevation of bed head slowly (up to 60 degrees) to assist with trunk strengthening.	To be done at mealtimes and for toileting only, for up to 15 minutes at a time. Leg wraps to be removed. Place rolled-up towel under knees if discomfort experienced. Fatigue may occur so prop with pillows by side of trunk as required.
Continue with leg exercises in bed for strengthening	Range of motion leg exercises as tolerated (active, assisted/active, and passive). Family encouraged to do twice daily- program to be provided by PT.
Commence on prone scooter board	PT to transfer with assistance on/off board from bed initially. This can be done by nursing staff & family once OK'd by PT. Position in good alignment with foam pieces/towels. Leg wraps and AFOs/bivalve casts to be worn. Ankles at 90 degrees over end of board.
Commence rehabilitation with early trunk strengthening, floor and bed mobility	Once mobilizing with prone scooter board, child to attend therapy sessions twice daily in gym (approx ½ hr)- primarily PT, with joint sessions from OT and play therapist
Prevention of complications	Nurse on foam pressure mattress. Pain assessment by medical teams. Rolled up towel under lower legs or pressure pads under heels to prevent pressure under heels Respiratory management- deep breathing exercises (bubbles, balloons) and coughing as required
Precautions: • No passive spine rotation, lateral flexion or forward flexion of the trunk • No vigorous hamstring stretching- no straight leg raises or long sitting • Allow active movement within the child's pain tolerance • No lumbar hyperextension • Be aware of hip joint status such as subluxation and dislocation	

SDR PROTOCOL- therapy and nursing protocols - WEEK 3 - DAYS 15-21

GOALS	ACTIONS
Positioning in good alignment	Sitting in the wheelchair for 15 minutes max twice a day with leg wraps off, once approved by PT/OT Sitting in the bed for meal times only- bed rest at max 60 degrees, with leg wraps off and rolled up towel under knees if discomfort experienced Prone lying in bed or on the prone scooter board for up to 1 hour twice a day with leg wraps on. Standing frame once a day for up to 1 hour as tolerated. Leg wraparounds at night
Pain and spasm management	Pain relief may be indicated prior to therapy session.
Strengthening	Range of motion leg exercises as tolerated (active, assisted/active, and passive). Family encouraged to do twice daily- program to be provided by PT.
Participation in playgroup/school	Daily school attendance to be scheduled into timetable.
Commence rehabilitation with early trunk strengthening, floor and bed mobility, standing with standing frame.	Once mobilizing with prone scooter board, child to attend therapy sessions twice daily in gym (approx ½ hr)- primarily PT, with joint sessions from OT and play therapist. To be transferred in & out of bed with 2 person lift
Precautions: • No passive spine rotation, lateral flexion or forward flexion of the trunk • No vigorous hamstring stretching- no passive straight leg raises past 30 degrees and no long sitting that is sitting in a stroller or bed with hips at 90 degrees and leg wraps on • Allow active movement within the child's pain tolerance • No lumbar hyperextension • Be aware of hip joint status such as subluxation and dislocation	

SDR PROTOCOL- therapy and nursing protocols WEEKS 4-6 – DAYS 22 - 42

GOALS	ACTIONS
Positioning in good alignment	Able to increase period of sitting in any one time for school and outings only, otherwise sitting in stroller/wheelchair is to be restricted to < 30 minutes max twice a day with leg wraps off and at mealtimes. Prone lying in bed or on the prone scooter board for up to 1 hour twice a day with leg wraps on. Standing frame for up to an hour (as tolerated) Leg wraps +/- AFOs at night
Hydrotherapy	Hydrotherapy to continue 2-3 times a week
Strengthening	Range of motion leg exercises as tolerated (active, assisted/active, and passive). Family encouraged to do twice daily- program to be provided by PT.
Participation in playgroup/school	Daily school/playgroup to be scheduled into timetable.
Commence rehabilitation with trunk strengthening, floor mobility, standing with standing frame and assistance, and gait retraining with assistive walking device.	To attend therapy sessions twice daily in gym (approx 1 hr duration)- primarily PT, with joint sessions from OT and play therapist. To be transferred in & out of bed with assisted standing transfer. Commence gait retraining with walker +/- litegait and treadmill during therapy only.
Discharge planning and transition to outpatient program	Transfer to care by parent ward. Trial of weekend leave. Scheduled combined therapy session with community therapy team.
Precautions: • No passive spine rotation, lateral flexion or forward flexion of the trunk • No vigorous hamstring stretching- able to long sit in bed with leg wraps on and bed elevated to 60 degrees only • Time in sitting to be restricted (as above) • Be aware of hip joint status such as subluxation and dislocation	

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