

# SELECTIVE POSTERIOR RHIZOTOMY FOR PAINFUL SPASTICITY IN THE LOWER LIMBS OF HEMIPLEGIC PATIENTS AFTER STROKE: REPORT OF TWO CASES

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**OBJECTIVE AND IMPORTANCE:** Selective posterior rhizotomy (SPR) has been performed mainly in children with cerebral palsy. Seldom has the use of SPR been reported for reduction of spasticity after stroke. We describe two elderly patients with hemiplegia who underwent unilateral SPR for pain caused by spasticity after stroke.

**CLINICAL PRESENTATION:** The first patient was a 68-year-old woman who experienced spasticity and pain in her right leg during the chronic stage of a left cerebral infarction. The second patient was an 89-year-old man who had intolerable spastic pain in his left hemiplegic leg 3 months after a right cerebral infarction.

**INTERVENTION:** Both patients underwent unilateral SPR on the spastic side to reduce the pain. After surgery, the patients' pain resolved. In the first patient, the ability to perform activities of daily living also improved.

**CONCLUSION:** Antispastic medications are often sufficient for treatment of post-stroke spasticity. In selected cases, however, SPR can be beneficial for improving painful spasticity.

**KEY WORDS:** Posterior rhizotomy, Spasticity, Stroke

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Selective posterior rhizotomy (SPR) usually is performed to reduce spasticity in children with cerebral palsy (7–9, 17, 18, 21). Although most adult patients who manifest spasticity are elderly and have had a stroke, SPR has not been recognized as an effective intervention for these patients. Improvement in an elderly patient's ability to perform activities of daily living after SPR may be considered unlikely because of underlying paralysis, cognitive disturbances, and/or physical weakness. Furthermore, the spasticity of elderly patients probably is different from that of children, whose brains are still developing (15). We performed unilateral SPR in two elderly patients who had painful spasticity several months after their stroke. The details of this experience and the indications for SPR for post-stroke spasticity are discussed.

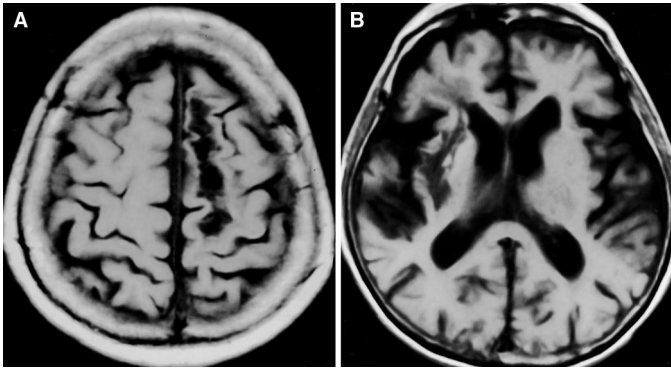
## CASE REPORTS

### Patient 1

A 68-year-old woman with well-controlled hypertension developed sudden-onset right hemiparesis and difficulty speaking. Her initial magnetic resonance imaging (MRI) scan revealed acute cerebral infarction in the left frontoparietal lobe, which was visualized clearly with follow-up MRI (*Fig. 1A*). Cerebral angiography confirmed that the left distal anterior cerebral artery was obstructed. One week after conservative therapy, she began a program of rehabilitation. Her right hemiparesis was dominant

in the leg. The patient did well for the next 3 months, and the weakness in her right arm resolved. She was able to take a few steps with a cane, but her walking ability declined as spasticity in the right leg increased. Antispastic medications tizanidine and dantrolene were prescribed, but the effects were insufficient to resolve her spasticity. Orally administered baclofen also was tried; however, it caused drowsiness and light-headedness. Even with physical therapy, she had difficulty taking a step, and her foot was almost fixed at plantar flexion. She began to experience pain in the ankle when standing and could not continue her rehabilitation program. Six months after her stroke, the patient could stand with a cane but preferred to be in bed because of pain in her right leg when she moved (*Fig. 2*). Her muscle tones in the affected lower limb, expressed with a modified Ashworth scale (MAS) score (21), were 2 for hamstrings, 3 for hip adductors and quadriceps, and 4 for plantar flexors of the ankle. Passive movement against spastic muscles in the right lower limb induced the pain. The patient also had mild spasticity in the right upper limb, which was not painful. Treatment with local tendon lengthening or a local botulinum toxin injection for ankle pain was insufficient; the patient reported pain not only around the ankle but also throughout her right leg as generalized discomfort during passive movement against spasticity.

To decrease the patient's right leg pain and possibly improve her leg motion, SPR was performed only on the right side with the patient under general anesthesia. An L2–S1



**FIGURE 1.** A, Patient 1. Axial T1-weighted MRI scan of the brain obtained 3 months after stroke. The hypointense lesion is observed in the left parasagittal frontoparietal region. B, Patient 2. Axial T1-weighted MRI scan of the brain obtained 2 weeks before SPR. The hypointense lesion is observed in the lateral part of the right putamen.

laminotomy was performed. The rootlets to be sectioned were chosen according to the protocol described previously (9), with a modification of the limits of sectioning to 25% from L2 to L4 to preserve muscle tone of the quadriceps for standing. With intraoperative stimulation, we observed neither clonus nor bilateral reaction, which were considered abnormal in our protocol; however, some hyperactive reactions were observed. The actual sectioning rates were 20% in L2 and L4, 25% in L3, and 50% in L5 and S1. After surgery, the patient's right leg was flaccid for a few days, but muscle tone then began to recover. The pain in her leg resolved, and all sensation was preserved. At 1 week, the muscle tone in her leg was almost normal, and there was only some residual spasticity in her hip adductors and hamstrings, both of which were given an MAS score of 2 because of a minimal resistance. She could stand with support and resumed her rehabilitation program. One month after SPR, with an improving range of motion in her right leg (Fig. 2), the patient's ability to perform activities of daily living had improved. She could stand without support and walk with a cane. She was discharged to a nursing home 6 months after surgery and has been able to perform basic daily activities without assistance for more than 1 year after surgery. Spasticity in her right leg has not worsened.

### Patient 2

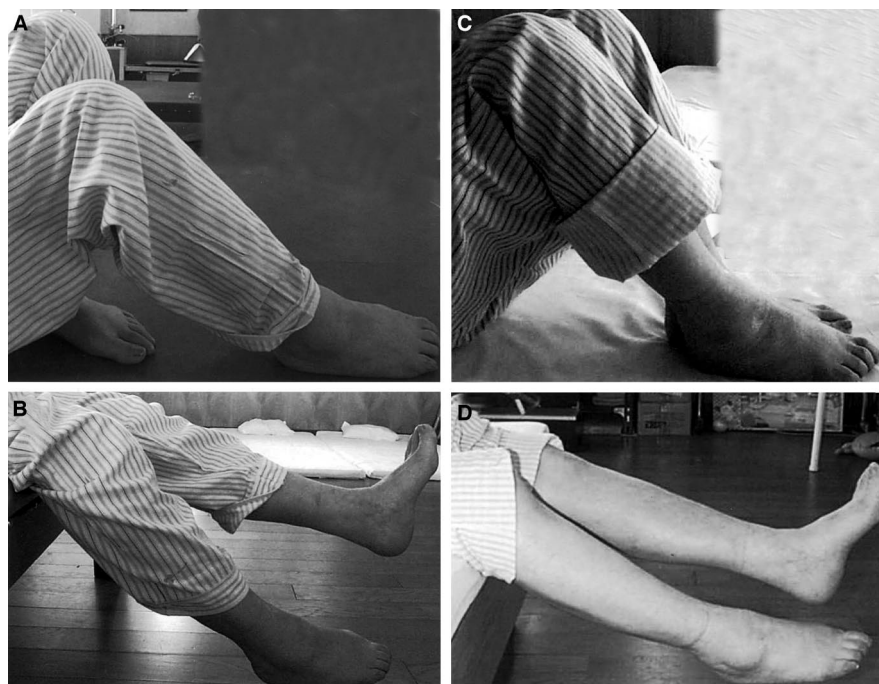
An 89-year-old man with no significant risk factors developed sudden-onset hemiparesis on his left side. MRI revealed an infarction in the lateral part of the right putamen (Fig. 1B). After 1 week of bed rest, he began a rehabilitation program. Initially, the patient had nearly complete hemiparesis on the left side. Within 1 month of rehabilitation, his left leg began to move. The patient could flex his left knee, but he could not move his left arm. Although he had been able to stand with support, gradually he began to experience spastic pain in the left knee and ankle. Antispastic medications tizanidine and dantrolene were not at all effective. Diazepam caused drowsiness, and orally administered baclofen caused confusion. The

patient had no spontaneous leg movement 3 months after his stroke. Even with extensive physical therapy, his lower left leg became fixed with the knee and plantar flexed (Fig. 3A). Passive movement against this leg posture induced the pain, although no spontaneous pain was reported in the fixed leg position. The pain in his left leg made transfer to a wheelchair and toileting intolerable. Five months after the stroke, the patient's muscle tones expressed as MAS scores were 2 for quadriceps and hamstrings, 4 for hip adductors, and 5 for plantar flexors. His spasticity apparently was generalized on his left side, including his upper limb; however, intolerable pain during wheelchair transfer was localized in his lower limb. All treatment for local muscle spasticity seemed inadequate. Unilateral SPR was explained as a possible treatment to the patient and his family, and they elected that he undergo SPR to decrease the pain. SPR was performed on the left side 5 months after stroke.

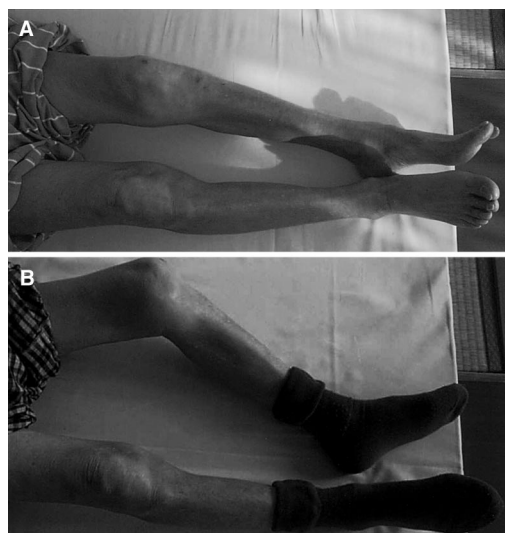
Surgery was performed with the same protocol as described in Patient 1. With intraoperative stimulation, neither clonus nor bilateral reaction was observed. Rootlets with hyperactive reactions were sectioned, and actual sectioning rates were 20% in L2 and L3, 25% in L4, 40% in L5, and 50% in S1. After surgery, the pain in the patient's left leg during passive movement resolved, and his sensation was preserved; however, the left leg tended to abduct and rotate outward with hypotonia of the hip adductors and inward rotators (Fig. 3B). The patient resumed his rehabilitation program but did not gain any voluntary movement in his left leg. Muscle tones in hip adductors and plantar flexors were both normal (MAS score, 1) but relatively hypotonic in quadriceps and hamstrings (MAS score, 0) 1 month after surgery. He was discharged to a nursing home 2 months after surgery and was dependent on others for his activities of daily living. However, recurrence of spastic pain has not been reported for approximately 8 months after surgery, and the patient has stable muscle tones in his left lower limb.

## DISCUSSION

An increase in muscle tone a few weeks or months after an acute cerebral lesion is a familiar phenomenon to clinicians (3). This change is thought to be caused by hyperexcitability of the stretch reflex as a component of the upper motor neuron syndrome (27), and it is termed *spasticity*. This spasticity can hinder or even prevent voluntary movement (26), and it is often painful (23, 28). Physical therapy (19, 25) combined with orally administered medication, including tizanidine (13), diazepam, dantrolene, and baclofen (27, 28), often works well to control post-stroke spasticity and should be the first-line treatment modality. For some patients, side effects of oral medication, typically drowsiness and sedation, may affect their activity levels. Intramuscular neurolysis can be considered with botulinum toxin (5, 6) or phenol (10); however, these injections are effective for focal spasticity and usually require repetition. Orally administered medication failed in our patients because the effects were insufficient. Because there seemed to be mul-



**FIGURE 2.** Patient 1. A, preoperative voluntary knee flexion showing limited motion on the right compared with the unaffected left side. B, preoperative voluntary knee extension showing difficulty raising the right leg. C, voluntary knee flexion 1 month after SPR showing improvement on the right to almost the same level as the unaffected left side. D, voluntary knee extension 1 month after SPR showing clear improvement on the right side, although the extension does not equal the height of the left leg.



**FIGURE 3.** Patient 2. A, preoperative leg position showing the left knee and plantar flexion. Severe spasticity is observed in the hip adductors and plantar flexors. No voluntary movement is observed. B, leg position 1 month after SPR showing the outward-rotated and abducted leg with some improvement in the flexed plantar. The muscle became flaccid, and no voluntary movement was observed in the left leg.

multiple muscles causing spastic pain during passive movement, we thought local neurolysis might be inadequate. Trials of botulinum toxin injection in multiple muscles may prove effective; however, the use of botulinum toxin has been approved only for facial spasm, blepharospasm, and torticollis in Japan. For these patients' medically refractory pain, further surgical options were considered. However, spastic pain refractory to medical treatment is rare, and invasive options usually are avoidable.

SPR is a common procedure (2) that improves the activities of daily living in pediatric patients with spasticity (17, 18). In addition to its use in pediatric patients, SPR has been used for patients with multiple sclerosis (12, 24) or spinal injury (12, 22) but rarely for elderly patients with post-stroke spasticity. Trials of treatment to reduce spasticity in the arms after stroke have included cervical rhizotomy (12) and brachial plexus rhizotomy (4). To our knowledge, however, the use of SPR for post-stroke patients or for those older than 60 years has not been reported. Neurosurgeons may be reluctant to attempt SPR in these patients because functional recoveries are uncertain. The mechanism of spasticity after stroke probably is different from that of cerebral palsy (15), so the efficacy of SPR

must be different for post-stroke patients than it is for children. Furthermore, some authors think that post-stroke spasticity is not a cause of problems in walking (1). Spasticity is not always a handicap; conversely, in certain situations, it helps the patient to stand and walk (22). Many post-stroke patients use the spasticity of their legs as intrinsic bracing to walk and stand despite motor deficits (27), and treatment to decrease spasticity can be harmful in many instances.

Differences in rehabilitation programs also may affect the functional outcome after SPR for the elderly. Diplegic children with cerebral palsy must undergo lengthy, intensive physical therapy to improve their ability to perform activities of daily living (14). Although muscle weakness and cognitive dysfunction occurs in both children with cerebral palsy and post-stroke patients, the general physical weakness attributable to advanced age often prevents post-stroke patients from undertaking prolonged exercise. The quality and duration of rehabilitation programs also may differ between children and elderly patients, whose physical therapy often lasts only as long as the hospital stay.

Considering the uncertainties of functional recovery, indications for use of SPR in patients with post-stroke spasticity should be limited to generalized lower limb spastic pain. Preoperatively, the pain should be carefully evaluated, as the pain after stroke can have other causes such as joint problems

subsequent to rehabilitation or deafferentation pain. Only the pain that is induced maximally during passive movement against spasticity should be regarded as spasticity-related pain. We think the cessation of pain in our patients resulted from the relief of spasticity, as postoperative sensation was fully preserved. However, pain relief may be attributable to damage to the afferent systems rather than to reflex arcs thought to be important in the control of spasticity, as SPR can alter the sensation of pain.

As demonstrated by treatment results in Patient 1, SPR can improve the ability to perform activities of daily living even after stroke. Although the group of patients who might benefit functionally from this procedure is uncertain, the degree of functional improvement after SPR in patients who have had a stroke is attractive. Factors that support the use of SPR for functional improvement may include 1) evidence of voluntary movement in the affected leg, 2) preserved cognitive function and motivation for physical therapy after SPR, and 3) a general physical tolerance of surgery and intensive physical therapy. Patient 2 had some voluntary movement in his affected leg, and his desire for rehabilitation was strong even after surgery. Unfortunately, he had profound muscle atrophy even after SPR, which was performed 5 months after his stroke, and he never regained strength in the leg. This result suggests that the period between the stroke and SPR should be shorter, especially for patients of advanced age. Another possible factor is the stroke lesion, which also must affect the functional recovery course. The lesion in Patient 2 involved the basal ganglia and internal capsule, whereas in Patient 1, the lesion was subcortical and cortical in the leg area predominantly, and therefore, it more closely approximated the injuries produced in premature children and resulted in better function after SPR.

Orthopedic tenotomy (7, 10) can be considered a surgical alternative; however, this is usually performed for focal spasticity with surgical elongation of tendons. Symptoms often recur because the abnormal muscle activity usually persists (19). As another potent alternative to reduce post-stroke spasticity, intrathecally administered baclofen infusion should be considered (2, 16), although the baclofen pump is not yet available in Japan. The major advantages of intrathecal baclofen infusion over SPR are reversibility and adjustability for individual patient condition. However, this procedure also has disadvantages, including a cosmetic issue attributable to a pump implantation, cost (23), skin breakdown around the pump (11), and a higher rate of infections such as meningitis (2). During intrathecal administration of baclofen to patients who have had a stroke, it should be considered that the effects extend to the unaffected side. It has been reported that muscle strength is maintained, although deep tendon reflexes are affected on the normal side (16). After consideration of these issues, the decision as to whether to use SPR or baclofen pump implantation should be made on a case-by-case basis. For patients undergoing SPR, we have performed five-level laminotomy, as we have experience with this procedure; however,

a less invasive procedure that may be a better choice in elderly patients is one- to two-level laminectomy (20).

## CONCLUSION

SPR for patients who have spasticity after stroke is used mainly to decrease spastic pain. The indications for its use should be carefully evaluated, however, as spasticity can be useful in some patients. SPR improves the ability to perform activities of daily living in some patients, but this benefit should not be overemphasized before further clinical experience has accumulated.

## REFERENCES

1. Ada L, Vattanasilp W, O'Dwyer NJ, Crosbie J: Does spasticity contribute to walking dysfunction after stroke? *J Neurol Neurosurg Psychiatry* 64:628-635, 1998.
2. Albright AL: Neurosurgical treatment of spasticity: Selective posterior rhizotomy and intrathecal baclofen. *Stereotact Funct Neurosurg* 58:3-13, 1992.
3. Ashby P, Verrier M: Neurophysiologic changes in hemiplegia: Possible explanation for the initial disparity between muscle tone and tendon reflexes. *Neurology* 26:1145-1151, 1976.
4. Bertelli JA, Ghizoni MF, Michels A: Brachial plexus dorsal rhizotomy in the treatment of upper-limb spasticity. *J Neurosurg* 93:26-32, 2000.
5. Brashear A, Gordon MF, Elovic E, Kassicieh D, Marciniak C, Do M, Lee C-H, Jenkins S, Turkel C: Intramuscular injection of botulinum toxin for the treatment of wrist and finger spasticity after a stroke. *N Engl J Med* 347:395-400, 2002.
6. Burbaud P, Wiart L, Dubos JL, Gaujard E, Debelleix X, Joseph PA, Mazaux JM, Bioulac B, Barat M, Laguery A: A randomized, double blind, placebo controlled trial of botulinum toxin in the treatment of spastic foot in hemiparetic patients. *J Neurol Neurosurg Psychiatry* 61:265-269, 1996.
7. Chicoine MR, Park TS, Kaufman BA: Selective dorsal rhizotomy and rates of orthopedic surgery in children with spastic cerebral palsy. *J Neurosurg* 86:34-39, 1997.
8. Fasano VA: Surgical treatment of spasticity in cerebral palsy. *Childs Brain* 4:289-305, 1978.
9. Fukuhara T, Najm IM, Levin KH, Luciano MG, Brant CL: Nerve rootlets to be sectioned for spasticity resolution in selective dorsal rhizotomy. *Surg Neurol* 54:126-133, 2000.
10. Herz DA, Looman JE, Tiberio A, Ketterling K, Kreitsch RK, Colwill JC, Grin OD Jr: The management of paralytic spasticity. *Neurosurgery* 26:300-306, 1990.
11. Kopell BH, Sala D, Doyle WK, Feldman DS, Wisoff JH, Weiner HL: Subfascial implantation of intrathecal baclofen pumps in children: Technical note. *Neurosurgery* 49:753-757, 2001.
12. Laitinen LV, Nilsson S, Fugl-Meyer AR: Selective posterior rhizotomy for treatment of spasticity. *J Neurosurg* 58:895-899, 1983.
13. Lataste X, Emre M, Davis C, Groves L: Comparative profile of tizanidine in the management of spasticity. *Neurology* 44[Suppl 9]:S53-S59, 1994.
14. Lin J-P: Dorsal rhizotomy and physical therapy. *Dev Med Child Neurol* 40:219, 1998.
15. Lin J-P, Brown JK, Brotherstone R: Assessment of spasticity in hemiplegic cerebral palsy: Part I—Proximal lower-limb reflex excitability. *Dev Med Child Neurol* 36:116-129, 1994.
16. Meythaler JM, Guin-Renfroe S, Brunner RC, Hadley MN: Intrathecal baclofen for spastic hypertonia from stroke. *Stroke* 32:2099-2109, 2001.
17. Mittal S, Farmer J-P, Al-Atassi B, Gibis J, Kennedy E, Galli C, Courchesnes G, Poulin C, Cantin M-A, Benaroch TE: Long-term functional outcome after selective posterior rhizotomy. *J Neurosurg* 97:315-325, 2002.
18. Mittal S, Farmer J-P, Al-Atassi B, Montpetit K, Gervais N, Poulin C, Benaroch TE, Cantin M-A: Functional performance following selective posterior rhizotomy: Long-term results determined using a validated evaluative measure. *J Neurosurg* 97:510-518, 2002.

19. O'Dwyer N, Neilson P, Nash J: Reduction of spasticity in cerebral palsy using feedback of the tonic stretch reflex: A controlled study. *Dev Med Child Neurol* 36:770-786, 1994.
20. Park TS, Gaffney PE, Kaufman BA, Molleston MC: Selective lumbosacral dorsal rhizotomy immediately caudal to the conus medullaris for cerebral palsy spasticity. *Neurosurgery* 33:929-934, 1993.
21. Peacock WJ, Staudt LA: Functional outcomes following selective posterior rhizotomy in children with cerebral palsy. *J Neurosurg* 74:380-385, 1991.
22. Privat JM, Benezech J, Frerebeau P, Gros C: Sectorial posterior rhizotomy, a new technique of surgical treatment for spasticity. *Acta Neurochir (Wien)* 35:181-195, 1976.
23. Sampson FC, Hayward A, Evans G, Morton R, Collett B: Functional benefits and cost/benefit analysis of continuous intrathecal baclofen infusion for the management of severe spasticity. *J Neurosurg* 96:1052-1057, 2002.
24. Sindou M, Millet MF, Mortamais J, Eyssette M: Results of selective posterior rhizotomy in the treatment of painful and spastic paraplegia secondary to multiple sclerosis. *Appl Neurophysiol* 45:335-340, 1982.
25. Smith GV, Silver KHC, Goldberg AP, Macko RF: "Task-oriented" exercise improves hamstring strength and spastic reflexes in chronic stroke patients. *Stroke* 30:2112-2118, 1999.
26. Thilmann AF, Fellows SJ, Ross HF: Biomechanical changes at the ankle joint after stroke. *J Neurol Neurosurg Psychiatry* 54:134-139, 1991.
27. Young RR, Delwaide PJ: Drug therapy: Spasticity (first of two parts). *N Engl J Med* 304:28-33, 1981.
28. Young RR, Delwaide PJ: Drug therapy: Spasticity (second of two parts). *N Engl J Med* 304:96-99, 1981.

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**COMMENTS**

In this report, Fukuhara and Kamata revisit the application of dorsal selective posterior rhizotomy (SPR) in adults for post-stroke spastic pain and improved rehabilitation. Their success in treating their patients' pain is compelling. Nonetheless, it is possible that pain in the current context was relieved by damage to the afferent input to the spinal cord rather than a reduction in spasticity per se. Although spasticity was reduced in both patients, functional improvement in the affected limb was limited because of persistent weakness. Given the invasiveness of SPR, we think that this therapy should be reserved for patients with pain that is refractory to intrathecally administered baclofen. The latter therapy is adjustable, reversible, and significantly less invasive than SPR. Such a therapy would seem superior in the elderly population. The success of SPR in the current application implies the utility of selective cervical rhizotomy for upper-extremity spasticity. This spasticity is often refractory to intrathecal baclofen given the limitations of intrathecal baclofen delivery to the cervical spinal cord. In addition, that SPR eliminates the need for expensive implanted hardware may make this a superior therapy for patients with limited access to baclofen refills and a longitudinal relationship with a neurosurgeon and neurologist, and when resource limitations prevent the application of intrathecal baclofen pumps. This procedure may provide a

useful alternative to intrathecally administered baclofen in resource-poor regions.

**Nicholas Boulis**  
*Cleveland, Ohio*

This report of two patients who underwent open rhizotomy for post-stroke spasticity does not address the central question of whether the procedure is better than less invasive methods of controlling spasticity such as phenol or botulinum toxin injections or intrathecally administered baclofen. To immediately use an open spinal procedure in elderly, vascularly compromised patients does not seem warranted. Decreasing sensory input to the spinal cord by cutting dorsal roots lessens spasticity, so the findings are not surprising. Furthermore, as the authors point out, it is difficult to predict functional outcome of the operation. The idea of performing SPR earlier in the course of the development of spasticity after stroke makes it even more difficult to predict the outcome.

**Richard D. Penn**  
*Chicago, Illinois*

In this article, the authors address the potential role of selective dorsal rhizotomy for the management of post-stroke painful spasticity in the lower extremities of hemiplegic patients. It is important to place this relatively aggressive mode of therapy in proper perspective regarding elderly patients who develop painful spasticity after the onset of their hemiplegia. Often, spasticity is beneficial to these patients' mobility and transfer. If the spasticity is harmful or, in particular, if it is painful, treatment should be initiated. Treatment should escalate from orally administered therapies to intramuscular treatment, possibly to intrathecal delivery of baclofen, and ultimately to more aggressive surgical techniques as described in this article. Considerations related to availability of the mode of therapy and of intolerable side effects must be weighed. When a rhizotomy procedure is selected in this context, care must be taken to analyze the location of the cerebrovascular accident. Rhizotomy is more likely to be beneficial to patients who have a cerebrovascular accident predominantly of anterior cerebral artery distribution in the subcortical white matter, as this more closely mimics the periventricular leukomalacia injury of the premature child, in whom selective dorsal rhizotomy has a proven record.

**Jean-Pierre Farmer**  
*Montreal, Quebec, Canada*

This article reports the use of SPR for treatment of spasticity with pain in the lower limb of patients who acquired hemiplegia after stroke. Although the use of surgery in the dorsal roots (or the dorsal root entry zone) for harmful spasticity in the lower limb of patients with hemiplegia has been reported (2, 4, 5), its use is scarce compared with its application in patients with cerebral palsy (1, 4).

Intrathecally administered baclofen, with a few exceptions, has not been used in hemiplegic patients. The ratio-

nale for use of intrathecally administered baclofen does not include spastic hemiplegia. Intrathecally administered baclofen is mainly effective in spasticity of spinal cord origin. Furthermore, a decrease in tone on the nonspastic side weakens the ability to walk. Peripheral neurotomy is used relatively frequently for treatment of focalized spasticity, especially tibial neurotomy in the popliteal fossa for the so-called spastic foot, which is associated with talipes equinus and varus in the ankle and eventually tonic flexion of the toes (3, 4). Neurotomy of the hamstring branches of the sciatic nerve at the buttock can be effective for reduction of spastic flexion of the knee (4). Combined peripheral neurotomies may be an alternative to SPR. In addition, botulinum toxin injections could have been attempted in the two reported patients. According to the authors, however, botulinum toxin injections were not approved in Japan for treatment of spasticity at that time. If botulinum toxin is effective in the long term, it may become the treatment of choice for focalized spasticity. If botulinum toxin is effective but only transiently so, injection constitutes a positive test for performing ablative surgery (especially neurotomy but also dorsal rhizotomy) on the corresponding neural structures.

We agree with the authors that, in patients such as the two reported herein, dorsal rhizotomy that spares the roots with antigravity function is appropriate treatment. We would have

performed SPR through a hemilaminectomy, which is less invasive than complete laminectomy. We also support the authors' opinion that hemiplegic patients with harmful spasticity and pain benefit from ablative surgery, namely dorsal rhizotomy, rather than high-dose medication, especially when the excess of spasticity is focalized (1, 2, 4, 6). In focalized hyperspasticity, even high doses of myorelaxants are not always effective; in addition, they may generate disabling side effects.

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1. Decq P, Mertens P: Neurosurgery of spasticity: Introduction [in French]. *Neurochirurgie* 49:135-136, 2003.
2. Sindou M, Jeanmonod D: Microsurgical DREZ-otomy for the treatment of spasticity and/or pain in the lower limbs. *Neurosurgery* 24:655-670, 1989.
3. Sindou M, Mertens P: Selective neurotomy of the tibial nerve for treatment of the spastic foot. *Neurosurgery* 23:738-744, 1988.
4. Sindou M, Abbott R, Keravel Y: *Neurosurgery for Spasticity: A Multidisciplinary Approach*. New York, Springer-Verlag, 1991.
5. Sindou M, Fischer G, Goutelle R, Schott B, Mansuy L: Selective posterior rhizotomy in the treatment of spasticity [in French]. *Rev Neurol (Paris)* 130:201-215, 1974.
6. Sindou M, Mifsud JJ, Boisson D, Goutelle A: Selective posterior rhizotomy in the dorsal root entry zone for treatment of hyperspasticity and pain in the hemiplegic upper limb. *Neurosurgery* 18:587-595, 1986.

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