

◆ Case Reports

Stimulating Catheter as a Tool to Evaluate Peripheral Nerve Function During Hip Rotationplasty

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Objective: Stimulating catheters have been introduced into clinical practice to confirm perineural localization of the catheters. The muscular twitch induced over the catheter may be used to evaluate nerve function intraoperatively. Therefore, the function of the sciatic nerve was evaluated during major cancer surgery of the femur.

Case Report: A 7-year-old boy (29 kg) was scheduled for hip rotationplasty for resection of an osteosarcoma of the left femur under general anesthesia and postoperative pain therapy with an epidural stimulating catheter. In hip rotationplasty the femur is resected, the lower limb and foot are rotated 180 degrees and the tibia plateau is attached to the pelvic acetabulum to form a new hip joint. During preparation of the left thigh and the sciatic nerve, motor responses to stimulation of the catheter were preserved, but the stimulation threshold increased. After vascular anastomosis the foot remained cold, therefore ropivacaine was applied epidurally and subsequently a warming of the foot was observed. At the end of the operation, the patient was free of pain, a good capillary pulse of the leg was observed, and the patient was able to move the foot and toes of the rotated leg.

Conclusions: The use of epidural stimulating catheters as a tool to monitor nerve function is a novel and simple procedure to monitor nerve function intraoperatively and to enable good postoperative pain control. *Reg Anesth Pain Med 2007;32:528-532.*

Key Words: Epidural anesthesia, Stimulating catheter, Skin temperature, Thermographic imaging, Neuro-monitoring.

Stimulating catheters have been recently introduced into clinical practice.¹ Electrical stimulation of epidural catheters has been used to verify correct epidural placement of the catheter.²⁻⁵ Additionally, stimulating catheters may be used to monitor nerve function under general anesthesia. Here we describe the application of a stimulating catheter to evaluate sciatic nerve function in a child undergoing hip rotationplasty.

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Hip rotationplasty is performed for treatment of juvenile malignant tumors that require resection of the whole femur or tibia.^{6,7} In this procedure the lower limb is disarticulated at the hip and knee joints and the lower limb rotated 180 degrees and attached to the pelvis. This operation is performed as a surgical alternative to hip disarticulation or hemipelvectomy in patients who are still growing. Other options such as extendable prosthesis are associated with considerable complications.⁸ In type B III hip arthroplasty the lower limb (calf) and foot are rotated 180 degrees and the tibia plateau is attached to the pelvic acetabulum to form a new hip joint.⁸ The advantage of this operation is to enable the patient with a malignant tumor of the femur to walk with prosthesis, while an amputation at the pelvis would lead to a higher degree of disability. During the operation the sciatic nerve is dissected completely along the thigh and therefore its function is at risk. Furthermore, the femoral artery and vein are resected segmentally and an anastomosis

of the vessels is performed. Finally, the sciatic nerve is tension-free looped subcutaneously. Thus, sciatic nerve function is endangered during all stages of the operation by dissection, hypothermia, ischemia, reperfusion, and manipulation of the isolated nerve. Postoperatively, a preservation of sciatic nerve function is mandatory, because the former ankle joint acts as a new knee joint.

Hitherto, no monitoring technique to evaluate nerve function during hip rotationplasty has been described. Although somatosensory or motor evoked potentials may be suitable for this purpose,⁹ they are very sensitive to limb ischemia.¹⁰ Stimulating catheters placed in the lumbar epidural space may be used to induce motor responses of gastrocnemius muscle during the whole operation as a potential indicator of sciatic nerve function. Limb ischemia and reperfusion after vascular anastomosis and epidural sympathetic block were monitored by thermography.

Case Report

A 7-year-old boy (29 kg) was scheduled for resection of an osteosarcoma of the left femur under general anesthesia and postoperative pain therapy with an epidural catheter. The parents of the patient gave informed consent for this off-label use of a stimulating nerve catheter epidurally and publication of this case report. General anesthesia was induced and maintained with a combination of propofol and remifentanyl. Relaxants were not used throughout the whole operation, because they would have reduced or abolished the elicited muscle twitches. After identification of the epidural space at the L4-5 interspace by loss of resistance method and by induction of muscular twitches by electrical stimulation via an insulated Tuohy needle, a stimulating catheter (StimuCath®, 19-gauge, Arrow, Erding, Germany) was advanced through the needle until a plantar extension of the left foot could be elicited over the catheter (frequency: 2 Hz; stimulus width: 1.0 ms; Stimuplex® HNS 11; B. Braun, Melsungen, Germany) as an indicator of sciatic nerve function. The catheter was advanced 4 cm over the needle tip until this response could be elicited (threshold 0.4 mA). Before incision 20 µg of sufentanil was injected over the epidural catheter. Surgery was performed as planned. During preparation of the left thigh and the sciatic nerve, motor responses were elicited intermittently via the epidural stimulating catheter and the stimulation threshold was evaluated. The sciatic nerve was dissected free and the left femur and its surrounding soft tissue were resected. Thereafter, the femoral artery was clamped, resected, and anastomosed and after 109 minutes of ischemia the lower leg was

reperfused. The intensity needed to elicit a foot movement gradually increased during preparation and ischemia from 0.4 mA up to 1.3 mA, but visible movement could still be elicited (Fig 1).

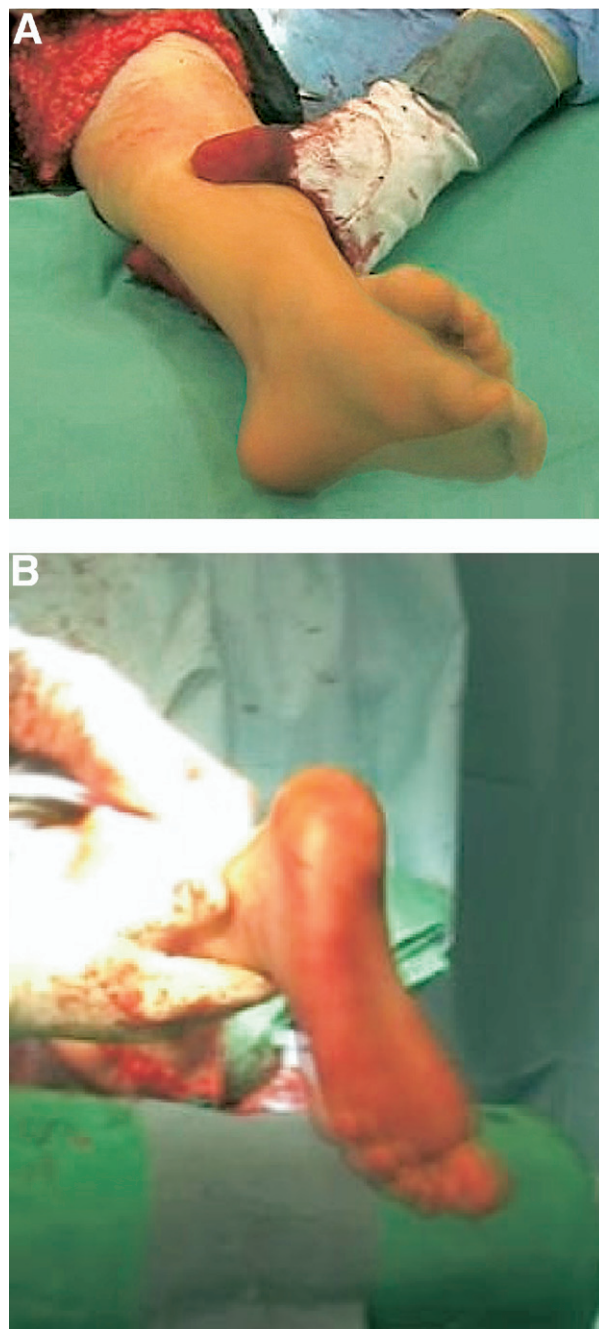


Fig 1. Neuromonitoring during hip rotationplasty by epidural catheter stimulation: Motor response to epidural stimulation was performed intraoperatively. As depicted (fused photographs), a motor response in form of a plantar-extending muscle twitch was seen after resection of the femur (A). At the end of limb ischemia (B) a motor response could be elicited only with an increased stimulation threshold, indicating that nerve/muscle function was diminished probably due to hypothermia and ischemia.

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