



Inadvertent inhibitory effect of epidural anesthesia on motor-evoked potential (MEP) monitoring in a patient undergoing total hip arthroplasty

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To the Editor:

The motor-evoked potential (MEP) monitoring is sometimes used during total hip arthroplasty (THA), to prevent the sciatic nerve and the femoral nerve damage [1, 2]. We present a failed MEP monitoring in a patient, to whom general anesthesia and epidural anesthesia were provided during THA.

Written consent for the presentation was obtained from the patient. A 71-year-old woman (145 cm, 45 kg) with right dysplastic hip arthroplasty was scheduled for right THA with MEP monitoring. Her medical history included type-2 diabetes mellitus, and she was taking hypoglycemic medication (preoperative HbA1c: 7.3).

In the operating room, after applying routine monitors, an epidural catheter was inserted at the L2/L3 intervertebral space and advanced 5 cm cephalad. Three milliliters of 1% lidocaine was infused through the epidural catheter, followed by 6 ml of 0.3% ropivacaine. General anesthesia was then induced with intravenous target-controlled infusion (TCI) of propofol with a target of 3 µg/ml, fentanyl 100 µg, and remifentanyl 0.2 µg/kg/min. Tracheal intubation was performed after obtaining neuromuscular blockade with rocuronium 30 mg. Anesthesia was maintained using total intravenous anesthesia (TIVA) with TCI of propofol with a target of 1.6–2.5 µg/ml and remifentanyl 0.1–0.3 µg/kg/min. Sugammadex 200 mg was used to antagonize neuromuscular blockade before the start of the surgery (see Fig. 1).

When MEP monitoring was performed, after the reversal of neuromuscular blockade, no amplitude of MEPs was detected in the quadriceps, the tibialis anterior, and the adductor pollicis brevis muscles. In contrast, there was no suppression of the amplitude of MEPs in the short abductor pollicis brevis muscle. These results indicated that epidural anesthesia was likely to be the main reason for blocking the motor nerves derived from the lumbosacral plexus.

Because it was difficult to antagonize the effect of local anesthetics infused to the epidural space, and thus we decided to disregard the results of MEP monitoring and proceed with the surgery. The surgery was completed, and no adverse events, such as sciatic neuropathy, were observed postoperatively. The patient's postoperative course was uneventful, and she was discharged from our hospital on the 18th postoperative day.

In this case, epidural anesthesia, which is frequently used for THA, inadvertently suppressed the MEPs. Suppressions of MEPs by high-dose ropivacaine have been reported [3, 4]. Therefore, no local anesthetics or low-dose local anesthetics (e.g., 0.2% ropivacaine) should be used during THA under MEP monitoring.

The PROSPECT guideline recommends a single-shot fascia iliac block for THA analgesia [5] and fascia iliac block is frequently used for THA [6]. Nevertheless, similar to epidural anesthesia, fascia iliac block may suppress the MEP. In addition, femoral nerve block or lumbar plexus block has the same risk. Therefore, it may be desirable to avoid epidural anesthesia, or these blocks for THA, when MEP monitoring is planned. When MEP monitoring during surgery and postoperative epidural analgesia is planned, infusion of a “test dose” of a local anesthetic should be kept minimum after insertion of an epidural catheter (and if used after a test dose, low-dose local anesthetics should only be used). Alternatively, non-steroidal anti-inflammatory drugs

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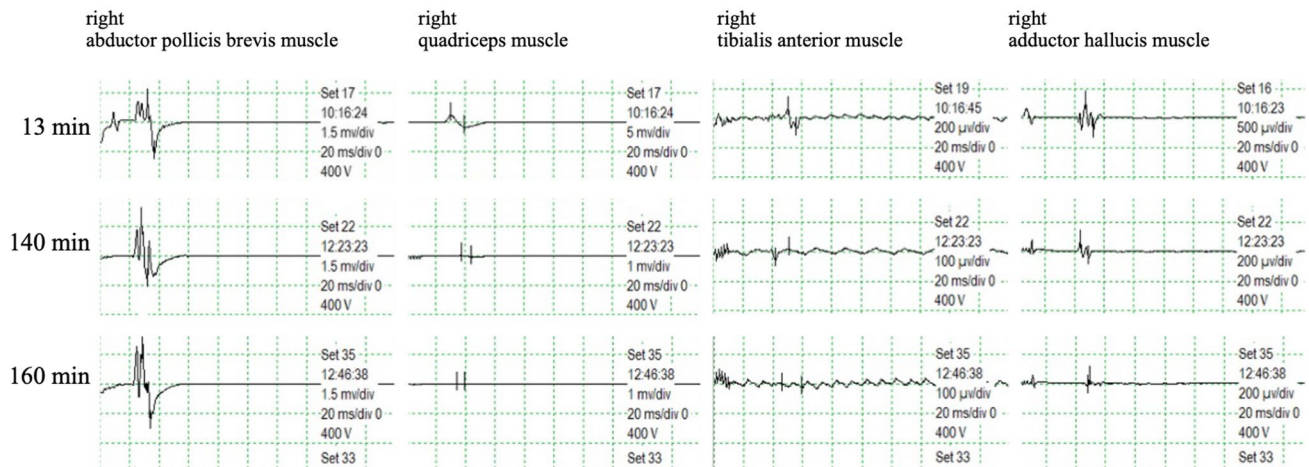


Fig. 1 Intraoperative recording of motor-evoked potential in the abductor pollicis brevis, the quadriceps, the tibialis anterior, and the adductor hallucis muscles. The numbers on the left represent the time elapsed since the ropivacaine was infused

(NSAIDs), cyclo-oxygenase-2 (COX-2)-selective inhibitors, local infiltration analgesia, or opioids (as rescue analgesics) may be used [5].

In conclusion, epidural anesthesia (with high-dose local anesthetics) and nerve blocks (such as fascia iliac block, femoral nerve block, and lumbar plexus block) should be avoided for THA under MEP monitoring.

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Data availability The data are available from the authors.

Declarations

Conflict of interest All the authors have no financial support and potential conflict of interest for this presentation.

References

- Satcher RL, Noss RS, Yingling CD, Ressler J, Ries M. The use of motor-evoked potentials to monitor sciatic nerve status during revision total hip arthroplasty. *J Arthroplast.* 2003;18:329–32.
- Ishimatsu T, Kinoshita K, Nishio J, Tanaka J, Ishii S, Yamamoto T. Motor-evoked potential analysis of femoral nerve status during the direct anterior approach for total hip arthroplasty. *Bone Joint Surg Am.* 2018;100:572–7.
- Furutani K, Tobita T, Ishii H, Deguchi H, Mitsuma Y, Kamiya Y, Baba H. Epidural administration of ropivacaine reduces the amplitude of transcranial electrical motor-evoked potentials: a double-blinded, randomized, controlled trial. *Anesth Analg.* 2021;132:1092–100.
- Souvatzis X, Askitopoulou H, Katonis P. Effect of epidural ropivacaine on somatosensory and motor evoked potentials. *J Clin Anesth.* 2009;21:209–12.
- Anger M, Valovska T, Beloeil H, Lirk P, Joshi GP, Velde MV, Raeder J, PROSPECT Working Group and the European Society of Regional Anaesthesia and Pain Therapy. PROSPECT guideline for total hip arthroplasty: a systematic review and procedure-specific postoperative pain management recommendations. *Anaesthesia.* 2021;76:1082–97.
- Liang L, Zhang C, Dai W, He K. Comparison between pericapsular nerve group (PENG) block with lateral femoral cutaneous nerve block and supra-inguinal fascia iliaca compartment block (S-FICB) for total hip arthroplasty: a randomized controlled trial. *J Anesth.* 2023;37:503–10.

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