PROTECTION OF PERIPHERAL MOTOR NERVES IN TRAUMA CASES USING A STERILE HANDHELD NEUROSTIMULATOR

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The recent availability of a hand-held, sterile, biphasic stimulator (Checkpoint Surgical®, Cleveland, Ohio) has provided surgeons with a reliable tool to evaluate nerve location and excitability. This provides the surgeon with information that allows intraoperative decisions to be made with greater confidence in many orthopedic procedures. The following two cases highlight examples of the use of this technology in orthopedic surgery practice to protect nerves.

CASE 1. Failed Total Elbow

Case 1 concerns a failed total elbow requiring revision. Identification and protection of the ulnar nerve is one of the more challenging aspects of revision elbow surgery[1], especially when there is considerable scarring yet the clinical examination shows normal nerve function.

Specific dissection and mobilization of the nerve is intended to identify and isolate the location of the nerve so that injury can be avoided. This process is laborious and, not infrequently, actually causes the very nerve deficit that we try to avoid. This dissection may be avoided if the surgeon has a reliable alternate means to locate the nerve.

The Checkpoint nerve stimulator/locator was used initially at 2mA and a pulse width of approximately 200 microseconds to locate the nerve through the surrounding tissue. Once a motor response was identified, the pulse width was decreased to more closely identify and "hone in" on the nerve location.

Using this procedure I was able to identify the course of the ulnar nerve in the tissue both proximal to and through the elbow. At that point, knowing the course of the nerve, rather than having to dissect the nerve, I could mobilize a cuff of tissue containing the nerve, without dissecting and exposing the nerve itself. This minimized manipulation of the nerve and also allowed quick dissection. In a sense, the "region" of the nerve was identified with the Checkpoint to permit a safe, "regional" dissection of the nerve with a protective margin of tissue, rather than specifically dissecting the nerve itself. This saved considerable operating time and I could confirm both during the procedure and prior to closure that the ulnar nerve was in good working order. Postoperatively, the patient had normal ulnar nerve function.

CASE 2. Scapular Fracture Repair

Another example of "regional dissection" involved a scapular fracture requiring surgical repair. This surgical approach and exposure can put the suprascapular and axillary nerves at risk for injury [2]. In this type of case, exposure of the nerve can be

avoided if the surgeon can identify the course of the nerve with confidence. Beginning at 20mA and decreasing the stimulus to the 2mA range as I approached the nerve, the Checkpoint was used to locate the nerve. Once this general region of the nerve was identified, a tissue envelope in which the nerves were located was mobilized, allowing ORIF of the scapula fracture.

The stimulator was used according to instructions with the amplitude set at 20mA and pulse width set at 0. The stimulating tip was placed over the exposed subcutaneous region. A sweeping motion was used over the area where the nerve was expected to be located, while gradually increasing pulse width and watching for a motor response. After the intended motor response was elicited, we gradually reduced pulse width and the current to the 2mA range and continued probing to specify the site immediately overlying the motor nerve. This was repeated as necessary to continue to identify the course of the nerve so that an envelope of tissue containing the nerve could be safely dissected and mobilized.

The advantage of this approach in both cases was that the nerve could be identified without significant dissection and with reduced potential for iatrogenic injury. The Checkpoint's variable pulse width and amplitude, combined with the use of a biphasic waveform make it an effective new tool for the surgeon in these difficult cases.

References:

1. Athwal GS, Morrey BF. Revision total elbow arthroplasty for prosthetic fractures. J Bone Joint Surg Am. 2006 Sep;88(9):2017-26.

2. Wijdicks CA, Armitage BM, Anavian J, Schroder LK, Cole PA. Vulnerable neuro-vasculature with a posterior approach to the scapula. Clin Orthop Relat Res. 2009 Aug; 467(8):2011-7. Epub 2008 Dec 4.

Do NOT use this Stimulator when paralyzing anesthetic agents are in effect, as an absent or inconsistent response to stimulation may result in inaccurate assessment of nerve and muscle function. See www.checkpointsurgical.com for indications, contraindications, precautions and warnings

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