Neurophysiologic approach for intraoperative identification of the injury level after spinal cord damage during spine surgery. A new experimental method tested in pigs

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INTRODUCTION

Intraoperative spinal cord injury is a complication that may have important clinical consequences.

In most instances, the intraoperative identification of the injury level might allow immediate spinal decompression, increasing the chance for later recovery.

OBJECTIVE

This study presents a new neurophysiologic method for identification of the injury level that was experimentally tested in a pig model.
MATERIAL AND METHODS

Five industrial pigs were included in the experiment.

EXPERIMENTAL DESIGN:

Bilateral laminectomies were performed to expose the spinal cord at T4-T5, T7-T9 and T12-T13 segments.

Pedicle screws were inserted left at T5, T7, T9 and T12.

Four epidural catheters were placed sublaminar for neurophysiologic recording in T3, T6, T11 and L1.
Neurophysiologic techniques

a) cord-to-cord motor spinal-evoked potentials between the epidural catheters
b) recording of the sensory epidural potential after stimulation of a mixed nerve of the lower limb
c) recording of the motor D-wave in the epidural catheters after transcranial stimulation
d) Pulse-train stimulation of the 4 screws and recording of the responses in epidural catheters.
After basal recording, the spinal cord was sectioned with a scalpel at T8 pedicle level and the neurophysiologic study was repeated for determining the level of injury.
RESULTS
Cord-to-cord MEP

In all cases, there was a lack of caudal cord-to-cord motor potential when the spinal cord was stimulated just above the section.
RESULTS

The **epidural sensory potentials** were normal in the two levels caudal to the medullary section and absent in the two segments cranial to the section.
RESULTS

The **motor D-wave** was completely normal at the levels above the injury, and absent in the two caudal segments.

**Pulse-train stimulation** of the screws cranial to the spinal cord section showed absence of caudal response.

However, the stimulation of the screws immediately cranial to the cord section elicited a response in the distal epidural catheters in 3 cases.
CONCLUSIONS

It is feasible to identify intraoperatively the level of an spinal cord injury by neurophysiologic methods.

✓ Cord-to-cord stimulation techniques, epidural sensory evoked potentials and the D-wave recorded at various levels permit to identify the exact location of the spinal cord injury.

✓ The pulse-train screw stimulation technique is less accurate in identifying the level of injury.
Disclosure information

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