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Technological advances in the surgical management of cervical myelopathy: Computer-assisted surgery and multimodal intraoperative neurophysiological monitoring

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Resumen

Surgical treatment of cervical spondylotic myelopathy (CSM) may be complex, especially when multisegmental disease with circumferential involvement of the spinal cord is seen in neuroimaging, and patient's neurological preoperative status is poor. It is not a secret that surgical success rests on a correct selection not only of the adequate patient but also of the appropriate surgical approach. But even when the surgical indication has been exquisite, the patient is exposed to devastating complications related to the surgical procedure: during posterior cervical instrumentation 11.15% of implants are misplaced, and 9.30% of patients develop a new neurological deficit.

Advances in intraoperative technology like multimodal intraoperative neurophysiological monitoring (MIONM) or computer assisted surgery guided by intraoperative CT (ioCT-CAS) may improve patient safety during cervical spine surgery.

ioCT-CAS allows the cervical spine to be navigated both anteriorly and posteriorly: it reduces the rate of implant malposition to 3.7%, diminishes the radiation exposure to the patient and the surgical team, and grant an on-flight decompression of the neural structures tailored to the individual needs of each patient. It has been demonstrated especially useful in the cervical-thoracic junction, an area in which it is relatively frequent to find limitations in the quality of the image obtained with the C-arm.

MIONM with free running EMG, somatosensory evoked potentials and transcranial motor evoked potentials can detect neurological dysfunction before it become irreversible, allowing the surgical team to take the corrective measures necessary to avoid a definitive neurological injury. The use of MIONM decreases the appearance of new myelopathy from 2.71% to 0.91%, of C5 root palsy from 4.56% to 0.84%, and of recurrent laryngeal nerve injury from 9.48% to 2.3%.