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Navigation-Guided Chest Wall Resection in Patient with a History of Resected Sarcoma with Compromised Oncological Margins☆

Resección de pared torácica guiada por navegación en paciente con antecedente de resección de sarcoma con márgenes oncológicos comprometidos

To the Editor:

Computer-assisted surgery is an extremely useful tool for planning the resection of tumors that require anatomical accuracy to achieve tumor-free margins. This technique offers the surgeon precise information on the extent of such margins during the procedure, thus avoiding unnecessary resections.

We report the case of a female patient who underwent navigation-guided resection of a chest wall sarcoma that had been excised in a previous procedure, with positive surgical margins.

This was a 43-year-old woman with a history of resection of a tumor in her back, without resection of thoracic wall. The postoperative pathology report confirmed soft-tissue sarcoma with positive surgical margins.

The case was discussed by the multidisciplinary committee, and given that the resection showed positive margins, oncological surgery was planned with *en bloc* chest wall resection including soft tissues affected by the previous surgery.

In our patient, we used 2 approaches that are routine in chest wall tumors: virtual surgical planning and navigation, performed

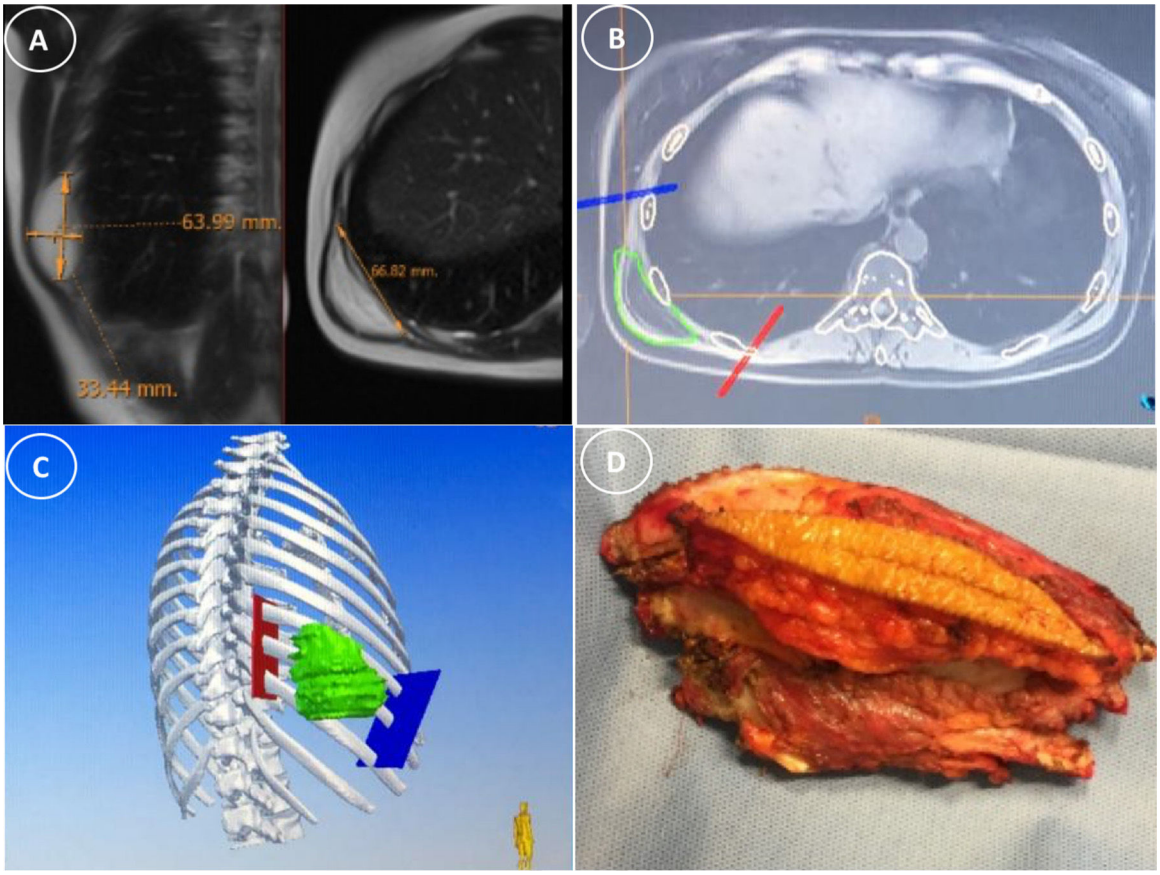

Fig. 1. A) Magnetic resonance imaging (MRI) of the patient's chest before the initial surgery. B) Tomographic reconstruction of the original injury generated from the MRI. C) Intraoperative navigation. D) resection.

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on virtual simulation platforms that can be used to merge digital images (MRI pre, MRI post, 2D tomographies, 3D tomographies). Once the virtual surgical planning had been completed, navigation-guided surgery can be used to achieve tumor-free margins with an accuracy of millimeters.

As the tumor had been resected in a previous procedure, we had to decide the anatomical limits for oncological resection with tumor-free margins. We decided to use virtual surgical planning based on a magnetic resonance image obtained prior to the initial surgery, which showed the soft-tissue lesion in contact with the 8th, 9th, and 10th ribs (Fig. 1A). The lesion was reconstructed virtually in a new CT scan performed on the same day of surgery (Fig. 1B). Using the intraoperative navigation system, oncological resection of the chest wall *en bloc* with soft tissues was performed, and 3 rib sections were resected (Fig. 1C and D) and reconstructed with osteosynthesis material. The postoperative period was incident-free, and the patient was discharged on day 6 post-procedure.

Primary tumors of the chest wall are rare cancers that represent less than 5% of all thoracic tumors. The 3 most common subtypes are chondrosarcomas, liposarcomas, and fibrosarcomas. Surgical resection with adequate tumor-free margins is critical to achieve the best oncological outcome. Surgeons should have a broad knowledge of the principles and different methods of chest wall resection and reconstruction.[1]

The importance of computer-assisted surgery in providing support for both preoperative and intraoperative planning, especially in patients with oncological disease, has already been established in the literature.[2]

In chest wall tumors, intraoperative navigation is used to orient the surgeon in the 3-dimensional space and guide the surgery by matching the images acquired and processed before surgery with real anatomical landmarks.[3]

We report a situation which, to our knowledge, has not been previously described in the literature. Magnetic resonance images obtained before the initial surgery were merged with images of a subsequent computed tomography in which the lesion was no longer present (per surgical history). Virtual reconstruction of the resected lesion allowed us to perform oncological surgery obtaining tumor-free margins in a previously operated patient.

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Biophysically Preconditioning Mesenchymal Stem Cells Improves Treatment of Ventilator-Induced Lung Injury

El precondicionamiento biofísico de las células madre mesenquimales mejora el tratamiento del daño pulmonar inducido por ventilación

Dear Editor:

Acute respiratory distress syndrome (ARDS) is still associated with high mortality despite the considerable efforts devoted to improving its treatment from the perspectives of basic science and clinical research. Cell therapy was proposed as a potential new tool for treating ARDS and the results obtained so far from preclinical research are encouraging.[1] Mesenchymal stem (stromal) cells (MSCs) are particularly interesting for this application, not because of their potential differentiation into lung cell phenotypes, but because of their ability to release agents (*e.g.*, paracrine factors, microvesicles, mitochondria) with immunomodulatory, anti-inflammatory and antimicrobial effects.[2–4] The promising results obtained using MSCs in animal and *ex vivo* human lung ARDS models provided background to launch the first clinical trials which have recently finished or are still in progress.[5,6] However, determining the technical details (*e.g.* cell origin and preparation, administration procedure and dosage) to optimize the potential therapeutic effects of MSCs in ARDS is still an open issue.[1]

Preconditioning MSCs before their application to patients could be relevant since it would pre-activate repair physiological pathways in these cells. It is known that modifying the microenvironment of MSCs modulates their paracrine signalling.[7] In particular, MSCs sense and actively respond to their biophysical microenvironment. For example, secretion of a wide range of cytokines is regulated by the stiffness of MSCs microenvironment[8] and stretching enhances angiogenic and anti-apoptotic capacities in these cells.[9,10] The fact that MSCs exhibit such responses to biophysical stimuli is particularly interesting for treating ARDS since cells in the target organ are placed on microenvironments with different stiffness[11] and undergo continuous mechanical stretching owing to ventilation. Therefore, we hypothesized that preconditioning MSCs by subjecting them to conditions realistically mimicking the biophysical microenvironment in the lung would improve their effectiveness in the treatment of ARDS. Here we describe a proof of concept test of this hypothesis. The study (approved by the Institutional Ethics Board) was carried out on a rat model (Sprague Dawley, male, 200–300 g) of ventilator-induced lung injury (VILI). Specifically, we biophysically preconditioned MSCs by culturing the cells on lung extracellular matrix (ECM) to expose them to realistic biochemical and stiffness substrate cues and by simultaneously subjecting MSCs to cyclical stretch simulating ventilation.