

## Letter to the Editor Regarding “Lumbar Interbody Fusion: Techniques, Pearls and Pitfalls”

We appreciated and read with great interest the manuscript by Kim *et al.*<sup>[1]</sup> entitled “Lumbar Interbody Fusion (LIF): Techniques, Pearls and Pitfalls” published in October 2020 in *Asian Spine Journal*.

In their review, the authors analyzed literature reports about LIF pearls and pitfalls, providing useful indications and contraindications according to the recent literature evidence.

The authors summarize the approaches through which LIF can be performed in posterior, transforaminal, anterior, and lateral approaches by open surgery or minimally invasive surgery (MIS). Of course, each technique shows advantages and disadvantages. Posterior LIF is the most familiar procedure, which offers good fusion rates and low complication rates. Iatrogenic injuries to the neural structures and paraspinal muscles are its most important disadvantages. MIS transforaminal LIF reduces these iatrogenic injuries. Anterior LIF (ALIF) can restore the disk height and sagittal alignment but with risks of visceral and vascular complications. Lateral LIF and oblique LIF are performed using the MIS technique and have shown postoperative outcomes like ALIF; however, these approaches carry a risk of injury to psoas, lumbar plexus, and vascular structures.

We found this manuscript of great value, we agree with the authors' suggestions, and we are glad to share with the international scientific community our concept and vision of minimally invasive neurosurgery, in spine and brain surgery, as a unitary concept. The development of new tools, materials, and technologies promoted minimally invasive techniques work wide, like the application of neuronavigation in spine surgery.<sup>[2-4]</sup> Intraoperative imaging devices such intraoperative computed tomography, O-ARM, Ziehm rfd, and Loop-X allow to verify the accuracy during the entire time of the procedure making misplacement impossible since the trajectory can be modified until getting the desired result, thus avoiding redo surgery with its high medicolegal risks.<sup>[5-11]</sup> Moving toward the cranial direction, also approaches to the craniovertebral junction are performed reducing of surgical damage to soft tissues; the use of endonasal approaches to C1–C2 has decreased morbidity and the odontoid screw fixation has been reported to be performed percutaneously.<sup>[12-14]</sup> Furthermore, vertebral corpectomy, invasive as well all know, can be accomplished with MIS technique for both traumatic and tumoral diseases, reducing surgical blood loss, patient's morbidity, and hospital stay saving costs.<sup>[5,15]</sup> In brain surgery, endoscopic assisted brain surgery is a well-established technique and with proved efficacy. While if we look back in the past, transsphenoidal approaches aimed to reduce brain manipulation with direct access to

the pathology, reducing morbidity and mortality.<sup>[16-19]</sup> In the end, the most common pathology of modern times of neurosurgery, the surgical evacuation of chronic subdural hematomas, experienced a progressive reduction of invasively shifting from craniotomy to burr hole or to the twist drill craniostomy.<sup>[20-22]</sup> In consideration of the present study and based on our institutional experience, we think that the MIS technique must be advocated and powered by technological innovations. Experienced surgeons should support younger colleagues in using approaches with reduced invasiveness. The association of senior surgeons and ingenious, innovative, tech-friendly junior colleagues is a powerful alliance to boost MIS with special benefit for patients, reducing direct (hospital stay, redo surgery) and indirect (medico-legal issues) costs.

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### Conflicts of interest

There are no conflicts of interest.

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