

Thoraco-lumbar vertebral fractures with posterior wall retropulsion: room and importance for an effective minimally invasive treatment

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We read with interest the Editorial “*Percutaneous treatment for thoraco-lumbar osteoporotic vertebral body fractures (TLOVF): current trends, limitations, and suggested approaches*” by Salle *et al.* (1). In the limitations section, the authors describe the issues posed by posterior wall protrusion (PWP). We substantially agree with the authors that, despite the lack of conclusive data in the literature, especially regarding osteoporotic and neoplastic fractures, PWP should not in and of itself, represent a contraindication to percutaneous treatment. An article we authored was cited in a fashion that might be confusing to readers of the original Salle article (2). In fact, the authors reference our article while stating that some authors and scientific societies consider a percutaneous treatment not suitable in presence of PWP. We author this letter to clarify the principal points of that incorrectly cited article.

The referenced study “*Armed Kyphoplasty: an indirect central canal decompression technique in burst fractures*”, actually states that percutaneous techniques of “armed kyphoplasty”, including vertebral body stenting, stent-screw-assisted internal fixation (SAIF), SpineJack, used in burst fractures with PWP and no neurological deficit, as a stand-alone technique, or in combination with posterior stabilization, were able to obtain fracture reduction and

indirect central canal decompression. This study aimed at measuring the radiological effect of ligamentotaxis induced by vertebral height restoration obtained with armed kyphoplasty reporting the results in 53 burst fractures, of traumatic nature (32/53), but also of osteoporotic (12/53) and neoplastic (9/53) nature, and the PWP was measured pre- and post-procedure with computed tomography (CT). The study documented some degree of PWP correction in 41/53 cases, PWP stability in 6/53, and some degree of PWP worsening in 6/53 cases. There were no cases (0/53) with neurological worsening. No re-treatment was necessary or even considered at the target level during the follow-up period.

The result of this study reinforces other studies from our group. The issue posed by middle column and therefore posterior wall injuries, mainly in osteoporotic and neoplastic fractures, has been indeed a “fil rouge” in our research focus.

One of our first studies on the subject investigated feasibility, safety and clinical efficacy of vertebral augmentation, preceded by coblation cavity creation in the vertebral body in a series of 70 cases of neoplastic vertebral lesions with lytic erosion of the posterior wall and concurrent presence of an epidural mass in 31/70, and

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reported high safety profiles (3). A biomechanical finite element analysis (FEM) study showed how a SAIF construct could restore the strain pattern on the superior endplate, anterior wall, and namely the posterior wall, under different axial load conditions, in an extreme osteolysis lumbar vertebral model, with advantage over a model of surgical posterior spinal fixation (4). The subsequent published clinical studies reported on the successful use of vertebral body stenting and SAIF in neoplastic extreme osteolysis, with the majority of patients presenting with a PWP caused by an epidural neoplastic mass (5,6). Another biomechanical FEM study on an osteoporotic lumbar spine model showed that trans-pedicular augmented screws used in the SAIF technique could stabilize the middle column and reduce the strain distribution on the posterior wall in osteoporotic vertebral fractures treated with augmentation techniques (7). This biomechanical evidence paved the way for three subsequent studies on the SAIF technique in the treatment of severe unstable osteoporotic fractures, in vertebra plana, and a rescue procedure in middle column re-fractures, post-vertebroplasty (8-10).

We hope this body of literature is able to offer some useful information to clinicians facing a vertebral fracture with PWP, and to stimulate interest for future research advancement. This might ultimately expand indications and possibilities for minimally invasive treatments to help a particularly frail patient population suffering from vertebral fractures of osteoporotic or neoplastic etiology.

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Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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References

1. Salle H, Khalil W, Faure P, et al. Percutaneous treatment for thoraco-lumbar osteoporotic vertebral body fractures (TLOVF): current trends, limitations, and suggested approaches. *Ann Palliat Med* 2023;12:254-7.
2. Venier A, Roccatagliata L, Isalberti M, et al. Armed Kyphoplasty: An Indirect Central Canal Decompression Technique in Burst Fractures. *AJNR Am J Neuroradiol* 2019;40:1965-72.
3. Cianfoni A, Raz E, Mauri S, et al. Vertebral augmentation for neoplastic lesions with posterior wall erosion and epidural mass. *AJNR Am J Neuroradiol* 2015;36:210-8.
4. La Barbera L, Cianfoni A, Ferrari A, et al. Stent Screw-Assisted Internal Fixation (SAIF) of Severe Lytic Spinal Metastases: A Comparative Finite Element Analysis of the SAIF Technique. *World Neurosurg* 2019;128:e370-7.
5. Cianfoni A, Distefano D, Scarone P, et al. Stent screw-assisted internal fixation (SAIF): clinical report of a novel approach to stabilizing and internally fixating vertebrae destroyed by malignancy. *J Neurosurg Spine* 2019. [Epub ahead of print]. doi: 10.3171/2019.9.SPINE19711.
6. Cianfoni A, Distefano D, Pravatà E, et al. Vertebral body stent augmentation to reconstruct the anterior column in neoplastic extreme osteolysis. *J Neurointerv Surg* 2019;11:313-8.
7. La Barbera L, Cianfoni A, Ferrari A, et al. Stent-Screw Assisted Internal Fixation of Osteoporotic Vertebrae: A Comparative Finite Element Analysis on SAIF Technique. *Front Bioeng Biotechnol* 2019;7:291.
8. Distefano D, Scarone P, Isalberti M, et al. The 'armed concrete' approach: stent-screw-assisted internal fixation (SAIF) reconstructs and internally fixates the most severe

- osteoporotic vertebral fractures. *J Neurointerv Surg* 2021;13:63-8.
9. Cianfoni A, Delfanti RL, Isalberti M, et al. Minimally Invasive Stent Screw-Assisted Internal Fixation Technique Corrects Kyphosis in Osteoporotic Vertebral Fractures with Severe Collapse: A Pilot "Vertebra Plana" Series. *AJNR Am J Neuroradiol* 2022;43:776-83.
 10. Di Caterino F, Koetsier E, Hirsch JA, et al. Middle column Stent-screw Assisted Internal Fixation (SAIF): a modified minimally-invasive approach to rescue vertebral middle column re-fractures. *J Neurointerv Surg* 2023;jnis-2022-019752.

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