



Commentary



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Commentary on “Quantitative Comparison of Vertebral Structural Changes After Percutaneous Vertebroplasty Between Unilateral Extrapedicular Approach and Bilateral Transpedicular Approach Using Voxel-Based Morphometry”

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Osteoporotic vertebral compression fractures (OVCFs) in the thoracic and lumbar spine significantly impair the quality of life of patients, causing severe back pain and spinal deformities. As society ages, the number of patients suffering from OVCF continues to rise,¹ making the selection of minimally invasive and effective treatment methods increasingly important. In most cases, OVCF can be treated safely and effectively using conservative or surgical treatments. Percutaneous vertebroplasty (PVP) has become a primary method of surgical intervention due to its benefits of immediate pain relief, stabilization of the fractured vertebrae, and minimal invasiveness. Recent meta-analyses² comparing conservative treatments with PVP have stated that “despite divided opinions, PVP should be offered to patients with OVCF as an alternative to conservative treatment.” However, the long-term effects and safety of PVP are still subject to debate, with some studies^{2,3} raising concerns about the risk of new fractures after PVP and placebo effects. PVP, particularly bilateral transpedicular vertebroplasty (BTVP), has been a mainstay in surgical intervention for many years. However, its unilateral version, unilateral transpedicular vertebroplasty (UTVP), has been widely adopted due to its less invasive nature, including shorter surgery times and reduced radiation exposure. Nevertheless, in regard to bone cement volume (BCV) and bone cement distribution (BCD) which is strongly associated with the most problematic complication post-PVP, subsequent vertebral compression fracture (SVCF),⁴ UTVP is theoretically considered to be inferior to BTVP. This study was conducted to address the significant issue of the widespread practice of UTVP, despite the lack of objective, accurate, and quantitative comparative evaluations regarding BCV and BCD.

This paper⁵ provides important insights by comparing 2 different techniques of PVP—unilateral extrapedicular vertebroplasty (UEVP), which is theoretically expected to be superior to UTVP in terms of BCV and BCD, and BTVP. The study focuses on evaluating their clinical efficacy, complication rates, and the incidence of SVCF. Particularly, the innovative

approach of using volume-based morphometry (VBM) for assessing BCV and BCD represents a significant advancement in this field. This retrospective study scrutinizes OVCF treatments conducted from 2014 to 2019, focusing on patients treated with either UEV or BTV. By employing strict inclusion and exclusion criteria, the analysis ensures a focus on single-level OVCF. This approach is significant in isolating specific surgical outcomes, but it is important to be aware that including only patients who received postoperative computed tomography scans during the follow-up period introduces a selection bias.

The use of VBM for precise evaluation of BCD and volume is impressive, providing more detailed analysis than traditional x-ray or magnetic resonance imaging techniques. However, it is known that the analysis in VBM can vary significantly depending on the software and processing pipeline used.⁶ Given the “techniques and algorithms” employed in this study, coupled with “highly accurate segmentation” and “volumetric analysis using 3-dimensional models,” the study’s pipeline can be considered appropriate for analyzing structural changes in vertebrae after vertebroplasty, utilizing advanced technology and a systematic approach.

The technique of far-lateral UEV used in this study is detailed in 2 cited prior studies,^{7,8} with slight differences in the approach. For lumbar vertebrae, the approach through the transverse process is the same, but in the latter published article,⁸ it appears that the entry is made not by means of penetrating the cortex but rather along the upper edge of the transverse process. In thoracic vertebrae, the earlier⁷ reports penetrating the cortex of the costovertebral joint, whereas the latter⁸ reports through the ligament complex of the costovertebral joint, creating an entry point on the lateral side of the pedicle base. Although not detailed in this paper, Fig. 1B in this study appears to have the same layout as Fig. 2 in the earlier⁷ of the 2 cited studies. It would have been better if the authors explicitly indicated which surgical technique they recommend. Additionally, potential risks associated with this technique, such as fractures of the lumbar transverse process or damage to the medial branch of the lumbar dorsal rami, must be considered. These risks should be communicated to patients during the informed consent process.

The main findings from the study indicate that UEV, despite being less invasive, does not compromise pain relief or complication rates compared to BTV. This challenges the traditional assumption that more invasive procedures, BTV, yield better results. The similar outcomes in BCD and volume achieved with UEV offer an alternative perspective to the conventional view of the superiority of BTV. There was also no significant differ-

ence in the incidence of SVCFs between the 2 methods. It’s important to note that preventing SVCFs is crucial for the success of vertebroplasty. The implications of this study for spinal surgery practice are profound. UEV offers an alternative that is less invasive yet comparable in effectiveness to BTV, potentially changing clinical choices for patients seeking minimally invasive options. However, due caution is needed in interpreting the results due to the retrospective nature of the study and its inherent limitations. Further prospective studies, such as randomized controlled trials, exploring long-term outcomes and complications are necessary to solidify these findings.

In conclusion, this retrospective study sheds new light on the ongoing debate between unilateral and bilateral vertebroplasty approaches. The study results suggest that while there is a need to become proficient in accurately placing the vertebral entry point at the lateral base of the pedicle, UEV could be a viable, less invasive and more cost-effective alternative to BTV in the treatment of thoracolumbar OVCF, offering comparable efficacy and safety. This can significantly influence clinical decision-making, moving towards a direction of minimal invasiveness without compromising patient outcomes. The vertebral augmentation technique for OVCF involves various surgical procedures⁹ aimed at maximizing positive effects and minimizing negative effects, with many types reporting favorable outcomes. However, choosing the optimal method is not always straightforward. Therefore, in choosing a surgical method, it is important to emphasize that considerations should include not only effectiveness, safety, minimally invasive nature, and simplicity, but also cost-effectiveness, from the perspective of professional autonomy, as a crucial aspect in decision-making.

• **Conflicts of Interest:** The author has nothing to disclose.

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