

Prospective study of standalone balloon kyphoplasty with calcium phosphate cement augmentation in traumatic fractures (G. Maestretti et al.)

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The substitution of PMMA with an injectable, osteoconductive material for balloon Kyphoplasty such as calcium phosphate cement (CPC) is highly attractive for obvious reasons. While PMMA is a well known compound in bone and joint surgery, less experience exists with the various CPC compounds and several caveats should however be recognised.

CPC is an inherently brittle substance with inferior tensile qualities compared to PMMA. Little is known about the biomechanical behaviour of CPC under long-term cyclic loading in a stand-alone vertebral fracture setting as applied by the authors. Experimentally, cement fissures have been observed under long-term cyclic loading in an osteoporotic vertebral model [2]. In this respect, the authors' observance of obvious cement cracks in the CT follow-up and an average of 20.3% resorption of applied cement volume is of note. It is not clear whether such marked resorption is part of the expected bone replacement or a pathological resorption process aggravated by fissuring of the material and potential formation of fibrous tissue. The presented histology of the single biopsy in Fig. 6 does not convincingly support substitution of CPC with bone as osteogenesis is not convincingly demonstrated. The authors do not point out where the cement is located, or should be, in the sections in order for the reader to follow their argument of there being no inflammatory reaction. This finding

cannot be taken as evidence that inflammation does not occur in those vertebral bodies with significant cement resorption. The case presented by the authors in Fig. 5 shows considerable resorption of cement and partially of the endplate with subsequent loss of the initially excellent correction. Several other cases (2, 7, 10, 11, 16, 20, 22 and 28 in Table 2) also reveal 6–10° progression of segmental kyphosis at follow-up. The CT follow-up of these cases is however not made available and it is not commented on whether these cases presented with a greater degree of cement resorption than those with maintained correction. While these findings do not appear to have had an impact on clinical outcome in this series, they clearly indicate that the knowledge of CPC is not yet sufficient to recommend it for routine application in a stand-alone fashion in vertebral trauma.

Further biomechanical investigations with regard to the behaviour of CPC in a stand-alone vertebral fracture model under long-term cyclic loading are needed. Future clinical studies involving any calcium phosphate compound should address the fracture morphology more closely, including the degree of injury of the endplate and vertebral body as described by Oner et al. [1], in order to identify a possible correlation with excessive cement resorption or fissuring.

References

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