Trends of treatment of vertebral fractures

P.F. Heini
Department of Orthopadic surgery, University of Bern, CH

Introduction: The challenge for the next decades for clinicians, scientist and for the society as a whole represents the increasing amount of elderly people, especially the group of people older than 80 years of age is expected to quadruple and reach up to 10% of the whole population within the next 40 years. Vertebral body compression fractures (VBCF) are the hallmark of osteoporosis and the incidence shows an exponential increase with age and VBCF are observed in about 50% of women at the age of 80[7]. Osteoporotic VBCF are a leading cause of disability and morbidity in the elderly[4]. More and more patients present with complex fractures; which means a severe spinal deformity, or concomitant neurological involvement.

Today's situation: Reinforcement of bone has gained fast and widespread acceptance as a treatment option for osteoporotic VBCF[1]. The reinforcement material of choice at this time is PMMA. It is cheap, easy to handle and mechanically solid. However the potential disadvantage represents its toxicity, the exothermic reaction and its inertness, it will not be incorporated or remodeled over time. On the other hand it seems to have good long term properties, however hard data thereabout are lacking.

The technique of reinforcement was refined and became safer by addressing the importance of viscosity[2]. The injection of high viscous PMMA for reinforcement of vertebral bodies is a standard today.

Injectable CaP cements for vertebral augmentation were promoted in the last years, however the breakthrough for clinical application is still lacking. Few clinical studies have been published and, although promising results are reported, there remains an important reservation against this material; two aspects seem of importance: Handling and application and the mechanical properties. They might be interlinked as improper application will lead uncontrolled setting and this in consequence means mechanical inferior properties with fragmentation of the cement. Systemic reactions due to CaP cement injection are discussed based on some animal studies; its clinical impact remains obscure[3; 6].

Future directions: Based on the very positive clinical experience with bone reinforcement using PMMA this material represents the benchmark for further developments. Optimized materials regarding viscosity, radioopacity and handling time will be available soon.

The issue of prophylactic treatement and multilevel injections of non fractured vertebrae will become of more importance as soon as the individual fractures risk can be assessed more exactly.

The solution for complex spine problems is becoming more reliable as the combination of bone reinforcement with internal fixation on one hand and the use of bone substitutes for spine fusion on the other hand will provide consistent treatment options also for this geriatric patient group. Implants need to be adapted in order to allow direct reinforcement via cannulated pedicle screws[5].

The importance and the potential of application of substances for bone regeneration is widely discussed, some materials seem to work in vitro, but the step to clinical use will take time; two aspects need to be addressed: (1) For fractured vertebra a carrier that provides a certain mechanical stability is necessary, and (2) the indication for the treatment of non fractured vertebra is not clear yet.

Based on the experience with the treatment osteoporotic vertebral fractures also some types of traumatic vertebral fractures will be addressed by percutaneous cement reinforcement. The reservation against PMMA for this usually younger patient group is given, the shortcomings of the actual CaP cements as well, so the optimal material is still lacking.

References

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