Endplate Anatomical Restoration May Reduce Adjacent Fracture Occurrence when Using a New Cranio-caudal Expandable Implant for Vertebral Compression Fracture Treatment

D. Noriega, N. Hansen-Algenstaedt, J. Beyerlein

University Hospital Valladolid, Royal Academy of Medicine and Surgery, Valladolid, Spain; University Medical Center Hamburg-Eppendorf, Spine Center, Hamburg, Germany

Background: Literature about subsequent adjacent vertebral fractures occurring after VCF treatment has shown that there are fewer subsequent fractures when using balloon kyphoplasty than with non-surgical care. In the same time, a recent biomechanical study has demonstrated the role that can play the endplate deformity on the disc pressure profile load sharing and then on the adjacent fracture occurrence.

Purpose: The purpose of this study is therefore to analyze the occurrence rate of subsequent adjacent vertebral fractures when using a new vertebral cranio-caudal expandable implant (VCCEI) in combination with PMMA cement injection.

Study design: A prospective observational study enrolling 134 patients has been designed to evaluate the ability of the VCCEI to restore the anatomy of the fractured vertebrae and to limit the occurrence of adjacent fractures.

Patient sample: Mean fracture age was 32.4 days at the time of surgery. Assessments of clinical and radiological parameters were performed prior to surgery, after surgery, 6 months postop [30 patients - 34 VCF], 12 month postop [14 patients - 16 VCF] and 18 month postop.

Outcome measures: Using CTscans images, heights restoration, endplates’ angles changes were obtained for each scheduled visit [preop/exit/6m/12m]. Any subsequent fracture was registered within the follow-up period using XRay and CTscan exams.

Methods: CT scan data were analyzed by an independent laboratory (LBM, ENSAM - PARIS) to build a 3D reconstruction of the involved vertebra for each evaluation step. Then, 3D reconstructions were superimposed using a validated matching algorithm based on anatomical points on the posterior arch to evaluate the study parameters.

Results: The VCCEI allows achieving VCF reduction thanks to an anatomical restoration of the injured endplate as well as a kyphotic angle improvement up to 92%, and up to 10.8 mm height increase in the anterior part. More interestingly only 2 subsequent fractures were reported at 6 month (none at 12month) over 34VCF corresponding to a lower rate of adjacent fractures when compared to balloon kyphoplasty and non surgical care.

Conclusion: While providing an anatomical restoration of the vertebral body including the vertebral endplates, this new procedure could be of interest when looking at the adjacent fracture occurrence rate in the mid and long-term results.