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Schekelmann R

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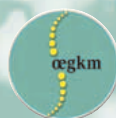
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Radiofrequency kyphoplasty – a case report on multiple osteoporotic sintering of the lumbar spine

R. Schekelmann

Abstract: At St. Marien Hospital, 176 patients with osteoporotic vertebral fractures were treated with balloon kyphoplasty (BKP) from January 2007 to September 2009. The functional outcome was good and no relevant complications were encountered. Since September 2009, a further

41 patients with the same indication have been treated with the new procedure of radiofrequency (RF) kyphoplasty (DFine). Operating times were markedly shorter and the extravasation of cement was reduced by two thirds. We encountered no complications or circulatory problems. The new

procedure (RF kyphoplasty) resulted in equally good functional results as did BKP, required less time in the operating room, and reduced the number of negative side effects. **J Miner Stoffwechs 2011; 18 (Supplement 1): 32–4.**

■ Introduction

Vertebroplasty was first described in France in the year 1984 for the treatment of fracture-prone hemangiomas in the spine. The authors Galibert and Deramond published their article in 1987. From this time on, the procedure has been increasingly used for the treatment of osteoporotic fractures of the spine as well. However, the complication rate – especially cement leakages – was relatively high. The numbers reported in the published literature vary widely from 20 % to 50 % [1–3].

After 1998 the procedure was developed further by Reiley in Berkeley, CA, USA, into balloon kyphoplasty (BKP) [4]. This method permits height restoration in compressed vertebral bodies. The cavity created by the system is filled with PMMA cement. Complication rates were lower than those for vertebroplasty. The restoration of height of the vertebral body was favorable from a mechanical point of view, and counteracted the patients' advancing age-related kyphosis.

Indications for this procedure include osteoporotic vertebral body fractures as well as traumatic fractures of types A1.1, A1.2, A1.3 and A3.1 according to Magerl's classification [5], which are treated with consensus [4, 6].

Experiments conducted in the very recent past have shown that the displacing construction of cavities and subsequent cement filling in balloon kyphoplasty cause stress shielding and lead to a higher risk of subsequent fractures [7]. Depending on the rigidity of the cement, secondary failure in vertebral bodies treated with balloon-kyphoplasty has been reported in the published literature [8–10].

The possibility to successfully straighten and stabilize fractured vertebral bodies by means of a percutaneous procedure led to the development of rival products. The basic feature shared by all of these procedures is that an expandable implant is introduced into the vertebral body which is filled with a viscous cement [11]. Widespread displacement of autochthonic (intact) cancellous bone by the implant does not permit primary fixation to occur (Vertebral Body Stent, Synthes). This is achieved secondarily by causing the implant surface to become permeable in targeted fashion from a specific level of filling onward; the outflowing cement ensures fixation in the compressed cancellous bone (Vessel X; A-Spine). Some implants are not designed to remain permanently in the body and must be removed during the operation within a short period of time before the cement hardens (Perimeter; DePuy). The dimensions of the implants in relation to the vertebral body differ from one manufacturer to the other. Besides, the pain-relieving effect of the intervention does not always equal that of BKP (the author's experience).

■ Method

At St. Marien Hospital in Ratingen, 176 patients were treated with the BKP of Medtronic Company (previously Kyphon Company) from January 2006 to September 2009. In all 385 vertebral bodies were stabilized.

The radiofrequency kyphoplasty system (DFine Inc.) that we have been using since October 2009 is a new and promising approach [12]. We have operated on 41 patients by this procedure and have stabilized 86 vertebral bodies.

■ Results

In 176 patients augmented with BKP, cement leakage occurred in 35 % of cases. The mean operating time was 58 minutes. Complications requiring treatment did not occur. However, circulatory stress was observed regularly by the anesthesia team in cases of multiple stabilizations. In these cases, postoperative X-rays of the lung showed cement residues. In patients treated

From the Clinic of Traumatology, Orthopedics and Hand Surgery, St. Marien Hospital, Ratingen, Germany

Correspondence address: Dr. med. Rainer Schekelmann, Klinik für Unfallchirurgie, Orthopädie und Handchirurgie, St. Marien-Krankenhaus, Werdener Strasse 3; D-40878 Ratingen. E-Mail: dr.schekelmann@smkr.de

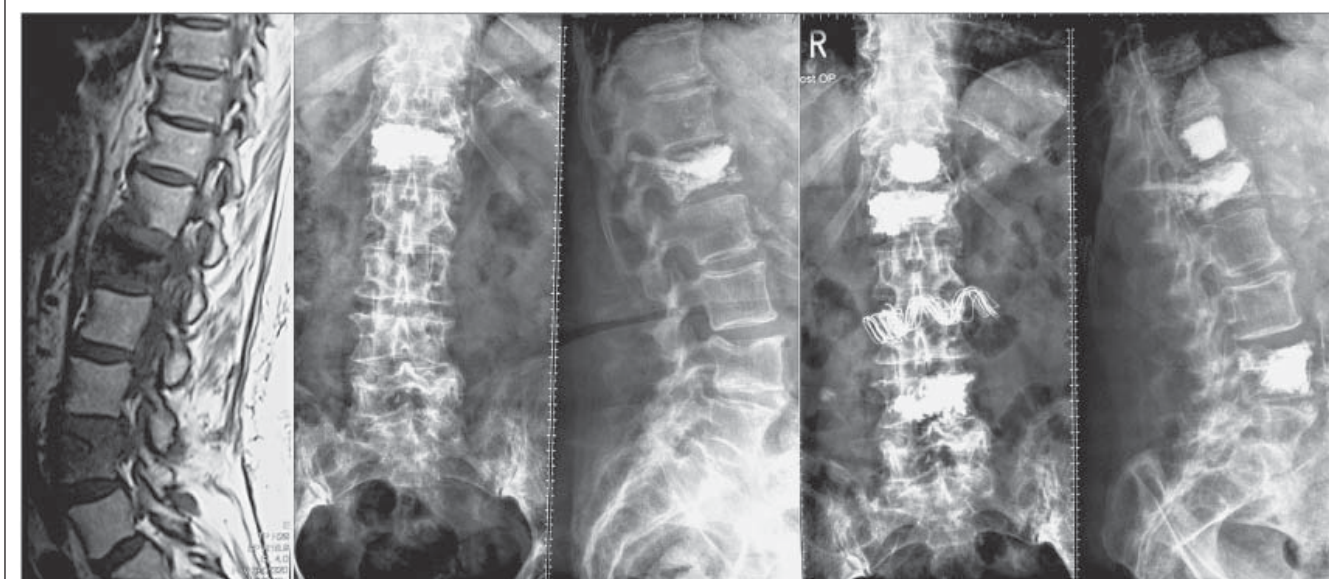


Figure 1: 87-year-old woman, MRI STIR sequence prior to surgery, conventional X-rays obtained preoperatively and postoperatively.

with radiofrequency kyphoplasty, the mean operating time was 39 minutes. Cement leakage was observed in no more than 10 % of cases and was less than that associated with BKP. We observed none of the so-called thread-like extravasations of outflowing cement which would be evidence of pulmonary embolism. No circulatory reactions occurred in patients who underwent stabilization of up to 5 vertebral bodies in a single session.

■ Case report

The photographs in Figure 1 demonstrate the case of an 87-year-old woman with pre-existing COPD and pain of three weeks' duration after experiencing minor trauma by way of a sudden fall into a chair. Conventional X-rays show no definite signs of a recent fracture. The first lumbar vertebra had been stabilized by BKP one year previously (Figure 1).

MRI revealed edema in the fourth lumbar vertebra and along the inferior endplate of the twelfth thoracic vertebra.

The operation was performed under general anesthesia and in prone position by means of a unilateral transpedicular puncture. The accesses were positioned alternately on the left and the right side. Good cement filling was achieved in both cases and no perceptible leakage occurred. The operating time was 25 minutes.

The patient was entirely free of fracture pain immediately after the operation. Pain due to the percutaneous accesses was mild and resolved completely after three days. Analgesia with conventional NSAID was only required for 48 hours.

■ Conclusion

From the author's point of view, the following is specifically required for safe and effective performance of the kyphoplasty procedure:

- as far as possible unilateral and simple puncture of the vertebral body,
- pre-determined implant size should impose no limitations on the intraosseous procedure,
- targeted height restoration of compressed vertebral bodies,
- the cement should provide the option of a long working time without hardening,
- avoidance of intraoperative correction loss when the implant has to be removed,
- a low risk of cement leakage and least possible generation of heat in order to minimize the resulting complications (lung embolism, compression of the spinal canal, destruction of intervertebral disks and thermal damage to the spinal cord),
- gentle handling and maximum conservation of vital bone,
- spatial fixation of cement in bone and minimal shifting into vital bone,
- least possible radiation load for the surgeon and shortest possible operating time.

Thus, the procedure of radiofrequency kyphoplasty is a promising advancement of BKP. Operating times as well as circulatory stress are markedly lower and complications rates are possibly also reduced.

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Conflict of interests

The corresponding author has occasionally served as lecturer and adviser for DFine Inc.

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