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Kyphoplasty vs Vertebroplasty: A Systematic Review of Height Restoration in Osteoporotic Vertebral Compression Fractures

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Background – Back pain & OVCF

- Back pain is a leading cause of morbidity in older US adults, especially those with osteoporosis
- Osteoporotic vertebral compression fractures (OVCF) commonly occur in people with osteoporosis
- ~1/3 of OVCF are symptomatic with acute or chronic low back pain
- Annual US cases of osteoporosis with OVCF are ~700,000/year
- OVCF and osteoporosis cause high levels of morbidity, decreased functional independence, and chronic pain
- Conservative treatment for OVCF is often insufficient for many patients
- Insufficient vertebral height caused by OVCF can lead to spinal deformities, reduced pulmonary function, depression, reduced mobility, and lower quality of life
- Surgical correction is a viable option for increasing vertebral height in patients with OVCF

Background – Kyphoplasty & Vertebroplasty

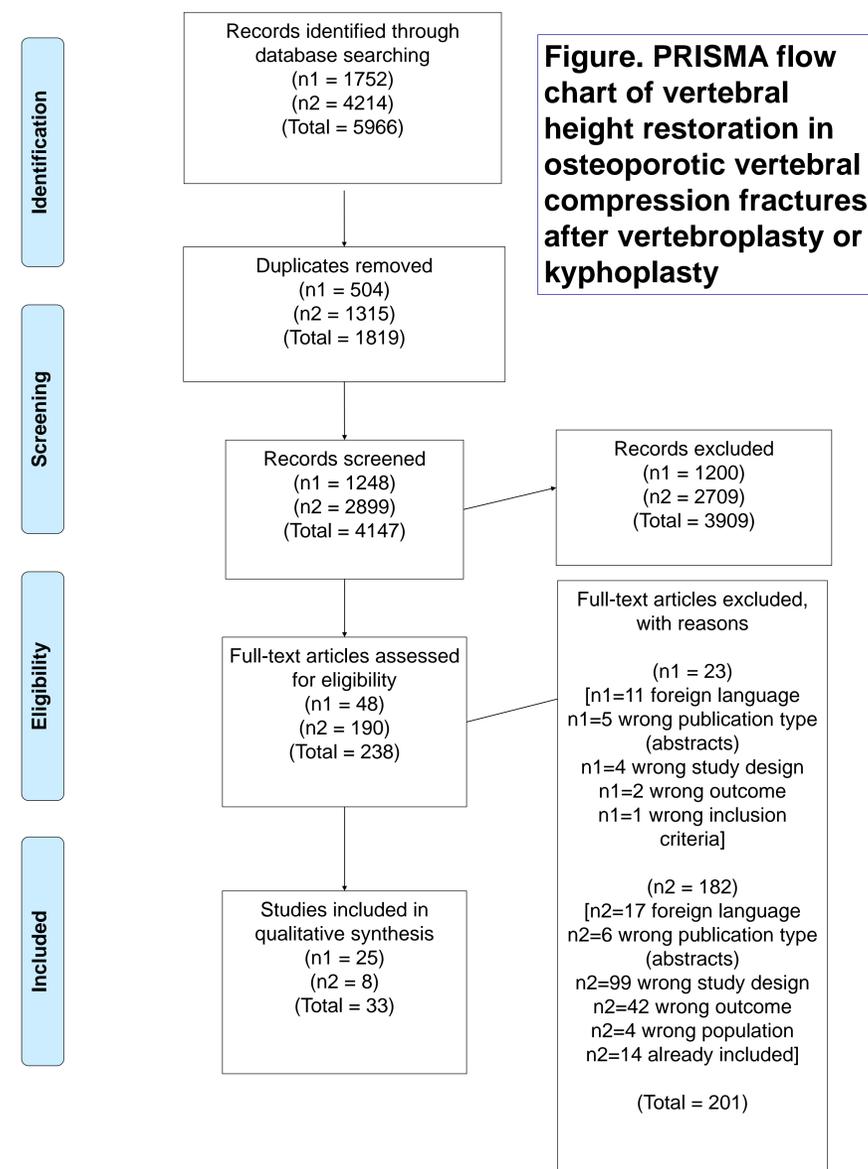
- Kyphoplasty and vertebroplasty are vertebral augmentation therapies that can restore bone height for the alleviation of OVCF
- Both procedures involve injection of a polymer cement into sites of fracture
- Only kyphoplasty involves using an inflatable balloon to first make space for polymer injection.
- These minimally invasive procedures are recommended for patients who have OVCF but are refractory to conventional therapies.
- Also, patients with benign bone tumors or traumatic acute vertebral compression fractures with a local kyphotic angle greater than 15 degrees can benefit from these procedures.
- The aim of our systematic review was to identify the overall effectiveness of kyphoplasty and vertebroplasty
- Height restoration after treatment was used as the key indicator of therapeutic success
- Restoration of function and pain relief were also assessed

Hypothesis and Purpose

- **Purpose:** To critically investigate whether vertebral body height restoration correlates with pain relief after **kyphoplasty and vertebroplasty**.
- **Primary Outcome:** height restoration
- **Secondary Outcomes:** pain relief, functionality, cement leakage, Cobb's Angle, wedge angle restoration, kyphosis angle restoration, and Gardner's angle
- We assessed only **randomized controlled trials (RCTs)** to generate a more robust and clinically applicable. review
- We also provide an update on the literature comparing **kyphoplasty versus vertebroplasty** for height restoration, pain relief, and function restoration.
- We searched 6 databases to ensure that the review was comprehensive.

Methods

- We performed a systematic review per the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) protocol (Figure) ¹
- Level II randomized controlled trials assessing kyphoplasty and/or vertebroplasty were included
- Study selection inclusion criteria: patients > 18 years, in English, study of OVCF, active comparator vs placebo, outcome measure of height restoration, with pain relief and functionality as secondary outcomes
- Of 4147 individual articles, 238 articles were screened, and 33 were analyzed
- Of the 33 analyzed studies, 6 compared kyphoplasty to vertebroplasty



Results

Vertebral Height Restoration

7 studies of vertebroplasty

- 2 showed height loss
- 1 showed height restoration
- 2 showed absolute height gain

20 studies of kyphoplasty

- None showed height loss
- 8 showed height restoration
- 8 showed absolute height gain

6 head-to-head comparisons

- 3 showed correlation of cement injection volume with improved height
- 5 favored kyphoplasty for height restoration

Alleviation of Pain

- Assessed by visual analogue scale (VAS) score
- 6 of 6 **vertebroplasty** studies showed reduced postop pain
- 6 of 18 **kyphoplasty** studies showed sustained reduced pain at 12 months
- 6 studies compared **kyphoplasty & vertebroplasty** and none saw a difference between the 2 for reducing postop pain

Restoration of Function

- Assessed by Oswestry disability index (ODI)
- 3 studies showed improved ODI after vertebroplasty at 18 to 36 months postop
- 4 studies showed improved ODI at 12 months after kyphoplasty
- 3 studies compared kyphoplasty & vertebroplasty and all showed lower postop ODI

Conclusions

- Both kyphoplasty and vertebroplasty are effective treatments for OVCF and are viable options for OVCF patients
- Both treatments restored some vertebral body height, reduced kyphosis angle, improved Cobbs angle, and improved wedge angle
- Both treatments showed similar benefits of pain reduction and improved functionality
- It was unclear whether fracture type or age of fracture influence procedure outcomes
- Kyphoplasty has the possibility of cement leakage, which can lead to negative outcomes
- It was not possible to conclude whether one approach was superior

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