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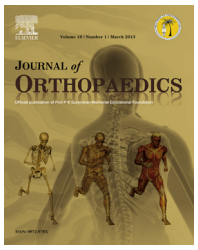

Original Article

Trends in vertebroplasty and kyphoplasty after thoracolumbar osteoporotic fracture: A large database study from 2005 to 2012

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ABSTRACT

Purpose: The aim of our study was to investigate the trends and incidence of vertebral augmentation procedures (VAPs) in treating osteoporotic vertebral compression fractures.
Results: In total, 118,074 patients were analyzed. The overall incidence of VAPs was 15.2%. The incidence of VAPs was significantly higher in those 75–79 years old (20.4%), significantly higher in females than males (15.6% versus 14.9%), and most commonly performed in the South (17.7%).
Conclusion: There was a decline in the frequency of these procedures since 2008, but physicians are still performing these procedures, albeit at a much lower frequency than before 2009.

1. Introduction

Osteoporosis can prove to be a debilitating disease, and its effects are becoming more prevalent as the proportion of the world's population made up of the elderly continues to increase. One common manifestation of osteoporosis is an osteoporotic vertebral compression fracture (OVCF), affecting over 750,000 individuals each year,[1] the majority in women,[2] and most often in the thoracolumbar spine.[3] OCVFs can result in severe deformity and immobility related complications, accruing an annual medical cost of over $740 million in the U.S.[2,3] Therapeutic options include bed rest, bracing, physical therapy, analgesia, bisphosphonates, and

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Table 1 – Diagnosis and procedure codes.

Reoperation cohort	Included billing codes
Osteoporosis	ICD-9-D-73300, ICD-9-D-73301, ICD-9-D-73302, ICD-9-D-73303, ICD-9-D-73309
Thoracic or lumbar Spine fracture	ICD-9-D-80520, ICD-9-D-80522-80526, ICD-9-D-80528, ICD-9-D-80540-80545, ICD-9-D-80548, ICD-9-D-80560-80561, ICD-9-D-73313
Percutaneous procedure	CPT-22520, CPT-22521, CPT-22522, CPT-22523, CPT-22524, CPT-22525, ICD-9-P-8165, ICD-9-P-8166

calcitonin.[4,5] However, patients with intractable pain refractory to conservative management may opt for vertebral augmentation procedures (VAPs), including vertebroplasty (VP) and kyphoplasty (KP).

These two procedures gained popularity in the early 2000s,[6] until 2009, when two randomized controlled trials (RCTs) questioned the efficacy of VP.[7,8] Since, the number of patients undergoing VAPs for OVCFs began to decline, and has been reported to decline further once the *J Am Acad Orthop Surg* (JAAOS) published guidelines recommending against routine VAPs to treat OVCFs.[9,10] No conclusions were drawn about KP, and there are evident doubts over the validity of these two RCTs,[11–13] leaving no consensus on the true efficacy of VAPs. Although VAPs are still being performed regularly in the U.S.,[10] the recent national trends have not yet been reported. In the present study, we examined the incidence of VAPs in treating thoracolumbar OVCFs, and analyzed the U.S. demographics and trends of those undergoing VAPs before and after publication of two RCTs in 2009.

2. Materials and methods

Our study was deemed exempt from Institutional Review Board evaluation as all patient data were de-identified before being made available to us. Final data were obtained using the standard analytical files of the Medicare data set from the PearlDiver database (PearlDiver Inc., Warsaw, IN, USA), which is a national database of insurance billing records from roughly 45 million patients each year between 2005 and 2012. We identified cohorts of patients by using Current Procedural Terminology (CPT) and International Classification of Diseases, ninth edition (ICD-9) procedure codes (Table 1).

By constructing a database algorithm and query, inclusion required a diagnosis of osteoporosis and closed thoracolumbar vertebral fracture, and 4 years of follow-up in the database. From this cohort of patients, we created a second cohort that required the patients from the first cohort to undergo a percutaneous VAP within 4 years of fracture. We selected to follow patients for 4 years to ensure that we capture any patient who underwent VAP after sustaining a vertebral fracture, although we expect most to have undergone the procedure within 1 year.[14] The total number from each cohort (reported as 'total') indicates unique patients. However, because patients from one year may be included in subsequent years, individual yearly data are not exclusive. Statistical analysis was completed using GraphPad Prism statistical software version 6 (GraphPad Software Inc.). Data were analyzed using a Chi-square analysis with two-tailed p-values, and the significance level set at $\alpha = 0.05$. In analyses with more than 2 groups, we used the group with the highest incidence to compare all others to. To protect patient privacy, and due to contractual agreements with PearlDiver Inc., we did not report data on cohorts with less than 11 patients.

3. Results

3.1. *Baseline data*

From 2005 through 2008, 118,074 patients with a diagnosis of osteoporosis experienced a thoracolumbar fracture, and had 4 years of follow up in the database. Of these patients, the 80–84 age group had the highest number of osteoporotic fractures, making up 26.5% of the total (n = 31,253) (Fig. 1). Of the four U.S. regions, the South had the highest number of OVCFs, making

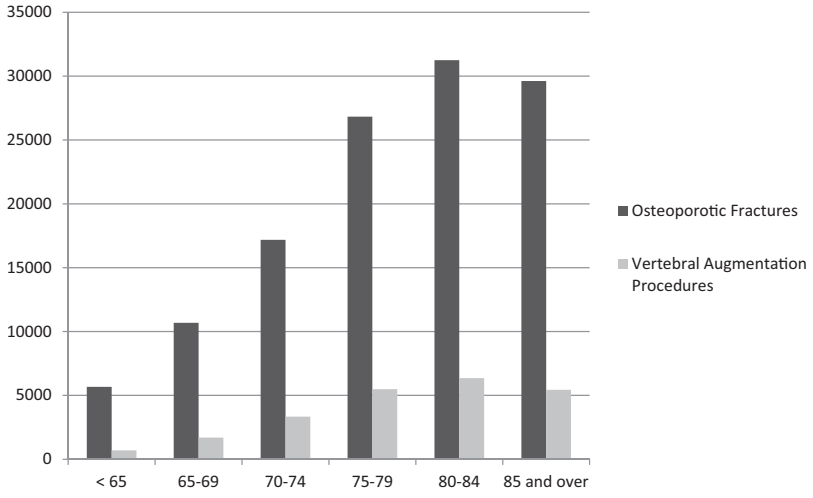

Fig. 1 – Demographic stratification based on age.