Paper

Percutaneous vertebroplasty in vertebral crush fractures – a descriptive analysis

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Abstract

Introduction: Efficacy of Vertebroplasty (VP) in acute vertebral crush fractures has been questioned. We support that VP is an effective treatment in selected patients.

Method: Retrospective study of 47 (37 female) patients admitted to a private hospital between 2006 to 2011 with pain due to acute vertebral crush fractures and received VP were interviewed by phone following reviewing of notes.

Results: Forty seven (65-90y) were of two distinct populations, younger group was 67 to 70y. Duration of pain was 9.5 days (range 2-21 days). Hospital length of stay (LOS) was 2-33 days. Total of 31 (66%), females 23, reported VP as satisfactory (good, very good, excellent). All had VP within 15 days of admission. Twenty two (71%) of 31 were independent prior to the back injury. Fifteen (48%) were over 85y (very elderly) and 15 (48%) were between 70 - 85y. Very elderly (5 males, 10 females) reported a favourable outcome and their LOS was 14-33 days. Twenty-two of the elderly (total 25) had LOS greater than 7 days and reported a favourable outcome. Two reported no effect.

Younger patients (7) were independent in daily activities. Five reported the procedure as satisfactory and were discharged within two weeks.

LOS increased with age. Majority (98%) received either rehabilitation (80%) or returned home (17%). Significant associations were noted in relation to younger age, post procedure pain perception, and premorbid independence with early discharge (CI 95%).

Conclusion: VP is a safe and a useful treatment where conservative management has failed.

Background

Approximately 1-4 million patients present with vertebral compression fractures worldwide every year leading to significant pain, disability, diminished quality of life as well as increase risk of further vertebral fractures[1]. Vertebroplasty was first introduced in 1987 by Galibert and Deramond et al, pioneered to be used in aggressive vertebral angiomas[2]. Subsequent work has shown it to be of value in treating osteoporotic compression fractures. Although the early literature related to VP treatment in osteoporotic vertebral crush fractures have shown some success, there has been notable criticism in relation to the treatment efficacy[3].

Method

A retrospective study of 47 (10 male, 37 female) patients admitted to a private hospital between 2006 to 2011 with back pain due to vertebral crush fractures and received VP were interviewed by phone following reviewing of case notes. Where possible patients were contacted or otherwise their carers were interviewed. Descriptive statistics and multiple variable analyses using split modelling decision tree were performed using JMP 10 statistical software. Pain perception was grouped as Excellent (resolution of pain within 24h), very good (resolution of pain within 48h), good (resolution of pain within 96h), and no effect when satisfactory pain resolution was not achieved.

Two experienced interventional radiologists carried out the VPs. Procedure was performed by placing a 11 or 13 gauge needle as close to the centre of the vertebral body, directing the bevel toward either the centre, or superior/ inferior endplate as may be required for particular fracture morphology using a transpedicular approach. The injection of cement (polymethylmethacrylate) was performed under lateral screening, carefully watching for any retrograde flow of cement toward or into the epidural space. Intermittent antero-posterior screening was used to check for the position of cement.

Results

Baseline characteristics of the study participants are shown in Table[1]. Age range of the 47 patients were 65-90 years and was of two distinct populations as noted by normal quantile plot analysis, where the younger age group was between 67 to 70 years. The mean duration of back pain on presentation was 9.5 days (range 2-21 days).

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Table 1. Baseline characteristics of the study participants

Total number of subjects	47
Male	10
Female	37
Age range	65 to 90 years
Duration of back pain	2-21 days (mean 9.5)
Previous crush fractures	13
Hospital length of stay	2-33 days
Indication for VP	Intractable pain despite analgesia 43 Intolerable to Opiates 4
Phone contact on follow up with patient	30
Phone contact on follow up with next of kin	17

Hospital length of stay ranged between 2-33 days. There were no adverse outcomes noted as a direct result of the VP procedure. Total of 31 (66%) patients (males 8, females 23) reported the outcome of VP as satisfactory (good, very good, excellent). All had VP within 15 days of admission and 4 had the procedure within 2 days. Twenty two (71%) of 31 patients were independent prior to the back injury and 9 were semi-independent. Fifteen (48%) were over 85 years of age (very elderly) and 15 (48%) patients were between 70-85 years (elderly). All very elderly (5 males, 10 females) reported a favourable outcome and their length of hospital stay ranged between 14 to 33 days (Figure 1).

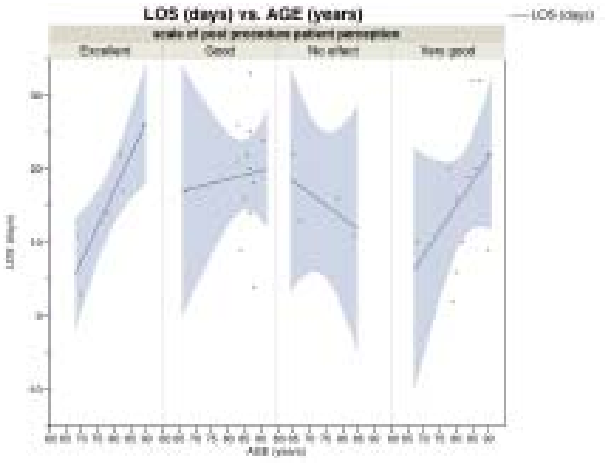

Figure 1. Graphical representation of length of stay in days vs. age in years plotted against perceived outcome of VP. 43 of 47 patients were satisfied of the outcome of VP.

Twenty-two of the elderly (total 25) group had a length of hospital admission greater than 7 days and all reported a favourable outcome. Two patients reported that procedure had no effect and one patient was from high-level residential care.

Of the younger patients (65-70 years), all seven were independent in daily activities and five were ambulating unaided prior to the injury. One used a walking stick and the other a walking frame. All had acute vertebral crush fractures and two were bedridden. Five reported the procedure as satisfactory and were discharged within 2 weeks.

Overall length of hospital stay increased with age in the study population. Majority (98%) received either rehabilitation (80%) or returned home (17%) following discharge from the hospital (Figure 2).

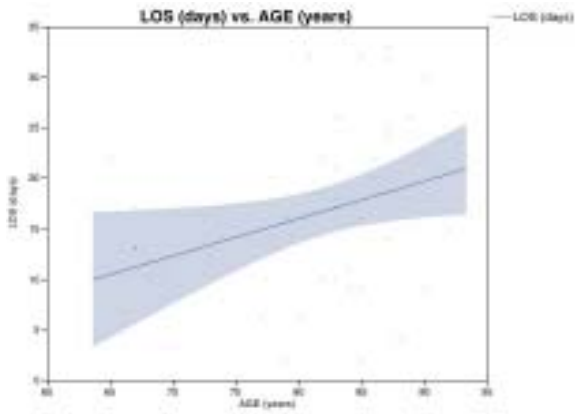

Figure 2. Graph showing the increase in length of stay in day with increase in age.

Split modelling decision tree analysis revealed an association between improved pain perception, younger age, and premorbid degree of independence in decreasing order as statistically significant associations in relation to early discharge (CI 95%). Patient variables such as sex, cohabitants, support where patient was admitted from, and post injury disability did not show a significant association with early discharge.

Discussion

Our case series show that VP is a safe and an effective procedure often providing rapid pain relief in the frail elderly. All subjects reported no adverse outcome, or dissatisfaction. Of 47 patients, 45 reported a favourable outcome, which included the very elderly group. Of the two patients who reported no change to pain, post procedure, one was a high level of care nursing home resident with advance arthritis. As expected, overall length of stay increased with advancing age and every one over the age of 85y received rehabilitation. There is a considerable body of literature upholding efficacy of VP in reducing pain and improving quality of life both in the elderly and the very elderly[4]. Fractures of the adjacent vertebral bodies to that of the VP treated vertebral body have been of some concern. However, this is a rare complication. In one study adjacent fracturing to the treated was associated with higher height restoration of the treated vertebra, location of the adjacent vertebra in the TL junction, the shorter distance between the treated and the adjacent vertebra[5], and cement leakage into the disk[6]. In their study of 104 consecutive patients and predictors of new vertebral body fractures, Komemushi et al has shown that increased fracture risk was not associated with age, gender, bone mineral density, the number of vertebrae treated per procedure, the cumulative number of vertebrae treated, the presence of a single untreated vertebrae between treated vertebrae, the presence of multiple untreated vertebrae between treated vertebrae, the amount of bone cement injected per procedure, the cumulative amount of bone cement injected, cement leakage into the soft tissue around the vertebrae, and cement leakage in to the vein[6]. Bone cement leakage is by far the commonest reported complication[7]. Whilst this often is of benign nature, there have been significant number of case reports describing nerve root irritation[8] pulmonary embolism[9], cerebral cement embolism[10], and fatalities[11]. Nevertheless, larger studies have demonstrated that VP recipients have much the same mortality rates as for untreated symptomatic patients[12].

Care with accurate needle placement, adequate barium radio-opacification of bone cement, viscous low pressure delivery, delivery under direct fluoroscopic visualisation, and use of appropriate delivery systems have reduced these complications[13]. Operator experience have also shown to improve short term outcome of VP[14]. In our study, approximately two third of patients were followed over 24 months and none were noted to have had an adjacent vertebral fracture. Furthermore, two of the authors of our study group are highly experienced interventional radiologists who have performed VP for over 5 years and have had no significant adverse effects. Contraindications to VP include unstable fracture, lack of definable vertebral collapse, radicular pain, cord compression, destruction of the posterior wall of the vertebral body, and infection in the area[15,16].

Referrals for VP have declined in the United States of America[17] since recent blinded placebo-controlled trials[3,18]. We believe this to be true in Australia as well. These two randomised control trials (RCTs) published in the *New England Journal of Medicine* concluded that there was no significant difference in pain relief between VP group and the control group one month following treatment. We believe the patient cohort in these studies is different to that of ours. The patients enrolled in these studies had duration of pain for far too long and the RCTs took over 4 years to complete. Whilst it is conceivable from these studies that long duration of pain and inadequate imaging techniques could potentially cause treatment failure, careful patient selection with duration of pain less than 6-8 weeks (not adequately controlled by analgesics or analgesic intolerability) and appropriate use of imaging to identify acute fractures (bone scan or MRI) has proven in our case series as well as in others[19] to be key factors in high success rate.

In experienced hands, with careful case selection, the procedure carries a low risk of short term and long-term morbidity. The overall impression is a positive one and we believe improvement in quality of life is sustained.

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