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Review Article

Outcome Comparison Between Percutaneous Vertebroplasty Versus Conservative Treatment in Osteoporotic Vertebral Compression Fracture: A Systematic Review and Meta Analysis

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Abstract

Introduction:
Osteoporotic vertebral compression fractures (OVCFs) are common in older adults and cause chronic back discomfort and kyphotic deformity. Percutaneous vertebroplasty (PVP) is preferred over conservative treatment (CT) for pain relief and quality of life improvement. However, there are ongoing debates about PVP's effectiveness and safety, with some suggesting it should only be available to patients who have exhausted other non-invasive options.

Methods:
A systematic review was conducted following the principles outlined in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). A thorough literature search was conducted to get a complete, peer-reviewed manuscript in English that compares the outcomes of vertebroplasty versus conservative therapy in osteoporotic compression fractures. We conducted a comprehensive search on PubMed, Google Scholar, and Cochrane Library. This systematic study aims to compare the therapeutic efficacy of vertebroplasty versus conservative therapy.

Results:
The electronic investigation identified 236 entries from various databases, screening them for eligibility, assessing duplicates, and eliminating duplicates, resulting in 9 studies for qualitative and quantitative synthesis. The heterogeneity across studies was examined throughout the I2 statistic described as follows: low, 25% to 50%; moderate 50% to 75%; or high>75%. There is no significant difference found in 1 week and 3 months of pain relief in these two groups in pain relief (mean difference 0.73 (-0.52, 1.96); 95% CI, P = 0,25); (mean difference -0.76 (-2.02, 0.49); 95% CI, =0.23). we found no statistically significant difference between those two groups favoring the PVP group in terms of quality-of-life outcome (mean difference -0.76 (-2.02, 0.49); 95% CI, P < 0.23); (mean difference 1.75 (-0.87, 4.38); 95% CI, P < 0.19). PVP has no association with new adjacent vertebral fractures. (M-H, Fixed, 95% CI -0.07 (-0.17, 0.03); I2 = 0%, P = 0.16).

Conclusion:
Comparatively, percutaneous vertebroplasty was determined to be more effective in alleviating pain and enhancing quality of life, without posing an elevated risk of nearby vertebral fracture as compared to the CT group. Therefore, it is necessary to conduct a more extensive investigation to determine which patients with osteoporotic vertebral compression fractures (OVCFs) are most likely to experience a positive outcome following percutaneous vertebroplasty (PVP) with little risk of sequelae.

Introduction

Osteoporotic vertebral compression fracture (OVCFs) commonly occurs in the elderly, which usually causes chronic back pain, and progressive kyphotic deformity with sagitta imbalance, it also decreases quality of life and survival.[1]

There is extensive literature suggesting that treatment such as percutaneous vertebroplasty (PVP) is favored to relieve pain and improve quality of life compared to conservative treatment,emt (CT) such as (e.g., oral analgesics, rehabilitation exercise, bisphosphonates, orthotics, and multimodal therapy).[2,3]

However, debates clinging in this topic comparing PVP and CT in an osteoporotic vertebral compression fracture. Some have suggested that PVP should only be offered to patients after conservative treatment has failed.[4] Some studies also suggested that the PVP did not incur more pain relief than the conservative group.[5]

Therefore this systematic review and meta-analysis of randomized controlled trials (RCTs) aims to evaluate the efficacy and safety in PVP and CT for OVCFs.

Materials & Method

Search Strategy

A systematic review was conducted in accordance to Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Figure 1). A comprehensive literature search was performed to gather a full-length, peer-reviewed paper in English on the comparison of outcomes between vertebroplasty and conservative treatment in osteoporotic compression fracture. We searched PubMed, Google Scholar, and Cochrane Library. The focus in this systematic review is to compare treatment between vertebroplasty and conservative treatment. Keywords in the search matched the MeSH rule and term used are ("Percutaneous Vertebroplasty"), AND ("Conservative Treatment"), AND ("Osteoporotic Vertebral Compression Fracture").

Inclusion Criteria

The inclusion criteria were any studies about 1) osteoporotic vertebral compression fractures; 2) percutaneous vertebroplasty versus conservative treatment; 3) pain relief outcomes, quality of life outcome, and the rate of adjacent vertebral fractures; and 4) RCTs design. The outcomes assessed using the forest plot include pain relief, quality of life using EuroQol and Roland-Morris Disability Questionnaire, and new adjacent vertebral fractures rate.

Quality Evaluation

Assessment of study quality and risk of bias assessed using criteria developed by the Oxford Center for Evidence-based Medicine, perspicacity defined by the Grades of Recommendation Assessment, Development and Evaluation (GRADE) Working Group, and sanction made by the Agency for Healthcare Research and Quality (AHRQ). The class of evidence is categorized into "class I" for good quality RCT, "class II" for moderate to poor quality RCT and good quality cohort, "class III" for moderate or poor-quality cohorts and case-control studies, "class IV" for the case series.

Results

Literature Search, Study Selection, and Study Characteristics

The electronic research resulted in 236 records from various databases. After the process of identification, screening, eligibility, duplication elimination, and exclusion, the remaining 9 studies were included in qualitative and quantitative synthesis. The remaining articles were excluded due to a lack of mean and standard deviation data and did not meet the inclusion and exclusion criteria.

Statistical Analysis

We utilized the Review Manager version 5.3 software (RevMan; The Cochrane Collaboration Oxford, England) to perform all statistical analyses. Based on the heterogeneity of the current study, we performed a sensitivity analysis to further assess the overall results. The heterogeneity across studies was examined through the I^2 statistic describing as follows: low, 25% to 50%; moderate 50% to 75%; or high>75%. We applied the fixed-effect models to calculate the total MDs/ORs when low heterogeneity was seen in studies. In other cases, we used the random effects model. Studies with a P values less than .05 were thought to have statistical significance. Forest plots showed the findings of our meta-analysis.

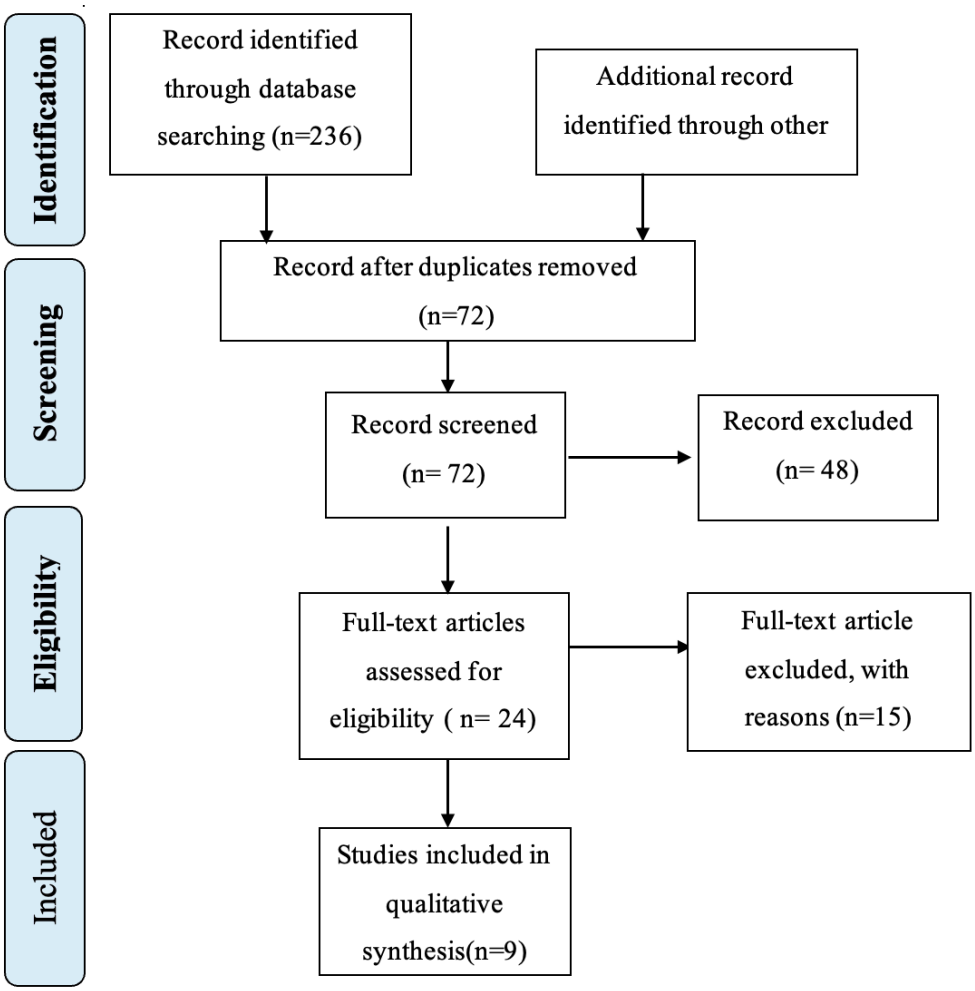

Figure 1. Flow diagram based on PRISMA Guideline describing the strategy for conducting this study.

Table 1. List of studies included

No	Reference	Journal	Study Design	Level of Evidence
1	Klazen, et al, 2010	The Lancet	Prospective randomized trial	II
2	Farrokhi *et al*, 2011	Journal Neurosurgery Spine	Randomized controlled trial	II
3	Comstock *et al*, 2013	Neuroradiology	Randomized controlled trial	II
4	Firanescu *et al*, 2022	British Medical Journal	Randomized controlled clinical trial	II
5	Clark *et al*, 2016	The Lancet	Randomized Multicenter Placebo Controlled Trial	II
6	Buchbinder *et al*, 2009	The New England Journal of Medicine	Randomized Multicenter Placebo Controlled Trial	III
7	Hnasen *et al*, 2016	Global Spine Journal	Double blind Placebo-controlled triam	III
8	Chen *et al*, 2014	Journal of Clinical Neuroscience	Randomized Controlled trial	I
9	Kroon *et al, 2014*	Journal of Bone and Mineral Research	Randomized controlled trial	I

Table 2. Characteristic of patient

No	Reference	Total Sample Size	Treatment Protocol					Mean Age (SD)					Gender (Male/Female Ratio)				
			PV	OMT	Sham Procedure	Control Procedure	Conservative Treatment	PV	OMT	Sham Procedure	Control Procedure	Conservative Treatment	PV	OMT	Sham Procedure	Control Procedure	Conservative Treatment
1	Klazen, et al. 2010	202	101	-	-	-	101	75.2 (9.8)	-	-	-	75.4 (8.4)	-	-	-	-	-
2	Farrokhi et al. 2011	82	40	42	-	-	-	72 (59~90)	74 (55~86)	-	-	-	10/30	12/30	-	-	-
3	Comstock et al. 2013	131	68	-	-	63	-	-	-	-	-	-	-	-	-	-	-
4	Firanescu et al. 2018	180	91	-	89	-	-	74.7 (10.7)	-	76.9 (8.1)	-	-	24/67	-	23/66		-
5	Clark et al. 2016	120	61	-	-	-	59	80	-	-	-	81	13/48	-	-	-	19/40
6	Buchbinder et al. 2009	78	38	-	-	-	40	74.2± 14.0	-	-	-	78.9±9.5	7/31	-	-	-	9/31
7	Hnasen et al. 2016	46	22	-	-	-	24	70.6	-	-	-	69.03.00	4/18	-	-	-	2/22
8	Chen et al. 2014	96	46	-	-	-	50	64.63+ 9.10	-	-	-	66.49+9.11	14/32	-	-	-	13/30
9	Kroon et al. 2014	78	29	-	28	-	21	76.7+ 9.4	-	77.7+0.2	-	77.2+9.2	23 female	-	24 female	-	15 female

PV= Percutaneous Vertebroplasty; OMT=Optimal Medical Therapy

Table 3. Outcome Characteristics

No	Reference	Study Comparison	Follow up Duration	Clinical Outcomes	Complications
1	Klazen, et al, 2010	To compare vertebroplasty and conservative treatment in acute osteoporotic vertebral compression fractures	12 months	VAS	-
2	Farrokhi et al, 2011	To asses the short and long-term effect of PV on pain relief and QOL in comparison with OMT in patients with osteoporotic VCFs	15 months	VAS, Oswetry LBP disability scale	Cement extravasation
3	Comstock et al, 2013	To evaluate 1-year outcomes of the investigational vertebroplasty safety and efficacy trial (INVEST) to investigate the effectiveness of percutaneous vertebroplasty in the treatment of osteoporotic vertebral compression fractures	12 months	RDQ score Average pain intensity	-
4	Firanescu et al, 2018	To asses whether percutaneous vertebroplasty results in more pain relief than a sham procedure in patients with acute osteoporotic compression fractures of the vertebral body	12 months	VAS, QUALEFO, RMDQ	-
5	Clark et al, 2016	To measured safety and efficacy vertebroplasty for acute painful osteoporotic (VAPOUR) in patients with poorly controlled pain and osteoporotic spinal fractures of less than 6 weeks' duration	6 months	NRS pain score, RDQ score, VAS pain score, QUALEFFO score, EQ-5D score, Analgesic use	-
6	Buchbinder et al, 2009	To compare outcome treatment by vertebroplasty for one or two painful osteoporotic vertebral fractures patients that were of less than 12 months' duration and unhealed.	6 months	Pain score, QUALEFFO total score, AQoL score, EQ–5D score, Perceived pain	Multiple drug allergies, Adjacent new fractur, Osteomyelitis
7	Hansen et al, 2016	investigate the clinical effects of PVP compared with a SHAM procedure when treateing acute osteoporotic VCFs	3 months	VAS, QUALEFFO, RMDQ	-
8	Chen et al, 2014	Compare the efficacy of PVP with that of CT in terms of pain and functional outcome in patients with chronic compression fractures and persistent severe pain	1 week, 1 months, 3 months, 6 months, 12 months	VAS, ODI, RMDQ	-
9	Kroon et al, 2014	to report clinical outcome in pain and functional outcomes related to cement volume and cement leakage in 12 months and 24 months	12 months. 24 months	AS, QUALEFFO, AQoL, RDQ, EQ5	-

Table 4. Characteristic of Outcome of studies

No	Reference	Outcome Measure					
1	Klazen, et al. 2010	**VAS**					
		Vertebroplasty			Conservative Treatment		
		1 day: 3·7 [SD 2·4] 1 week: 3·5 [2·5] 1 month: 2·5 [2·5] 3 months: 2·5 [2·7] 6 months: 2·3 [2·7] 1 year: 2·2 [2·7]			1 day: 6·7 [2·1] 1 week: 5·6 [2·5] 1 month: 4·9 [2·6] 3 months: 3·9 [2·8] 6 months: 3·9 [2·9] 1 year: 3·8 [2·8]		
2	Farrokhi et al, 2011	**VAS**			**Oswetry LBP**		
		PV	OMT		PV	OMT	
		Baseline: 8.4 ± 1.6 1 wk: 3.3 + 1.5 2 mos: 3.2 + 2.2 6 mos: 2.2 + 2.1 12 mos: 2.2 + 2.1 24 mos: 2.8 + 2.0 36 mos: 1.8 + 1.7	Baseline: 7.2 ± 1.7 1 wk: 6.4 + 2.1 2 mos: 6.1 + 2.1 6 mos: 4.1 + 1.5 12 mos: 4.1 + 1.8 24 mos: 3.7 + 2.0 36 mos: 3.7 + 2.5		Baseline: 52.2 ± 2.4 1 wk: 30.1 + 3.0 2 mos: 15.0 + 2.2 6 mos: 10.0 + 2.0 12 mos: 8.0 + 3.2 24 mos: 8.0 + 2.2 36 mos: 8.0 + 1.7	Baseline: 52.2 2.4 1 wk: 30.1 + 3.0 2 mos: 15.0 + 2.2 6 mos: 10.0 + 2.0 12 mos: 8.0 + 3.2 24 mos: 8.0 + 2.2	
3	Comstock *et al*, 2013	**RDQ**			**Average pain intensity**		
		Vertebroplasty	Control procedure		Vertebroplasty	Control procedure	
		1 month : 11.97 ± 6.32 3 months : 10.84 ± 5.68 6 months : 9.44 ± 6.12 12 months : 10.19 ± 6.46	1 month : 12.97 ± 6.38 3 months : 11.89 ± 6.37 6 months : 11.38 ± 6.35 12 months : 11.89 ± 6.24		1 month : 3.85 ± 2.91 3 months : 3.55 ± 2.81 6 months : 3.67 ± 2.98 12 months : 3.52 ± 2.89	1 month : 4.57 ± 2.97 3 months : 4.26 ± 2.85 6 months : 4.43 ± 2.89 12 months : 4.50 ± 2.70	
4	Firanescu *et al*, 2018	**VAS**		**QUALEFFO**		**RMDQ**	
		PV	Sham	PV	Sham	PV	Sham
		Baseline: 7.72 (0.2) 1 day: 5.24 (-0.43) 1 wk: 4.38 (-0.11) 1 mo: 3.32 (0.41) 3 mos: 2.69 (0.21) 6 mos: 3.02 (0.39) 12 mos: 2.72 (0.45)	Baseline: 7.92 (0.2) 1 day: 4.82 (-0.43) 1 wk: 4.27 (-0.11) 1 mo: 3.73 (0.41) 3 mos: 2.90 (0.21) 6 mos: 3.41 (0.39) 12 mos: 3.17 (0.45)	Baseline: 68.4 (17.1)	Baseline: 69.7 (17.9)	Baseline: 18 (4.5)	Baseline: 17.8 (4.7)
5	Clark *et al*, 2016	**Reduction in NRS pain score**	**Reduction in RDQ score**	**VAS pain score**	**QUALEFFO score**	**EQ-5D score**	**Analgesic use**
		Vertebroplasty: 3 days: 3·5 (2·6) 14 days: 4·2 (2·7) 1 month: 4·6 (3·0) 3 months: 5·4 (3·5) 6 months: 6·1 (3·3) Placebo: 3 days: 1·8 (2·3) 14 days: 3·0 (3·0) 1 month: 3·2 (2·7) 3 months: 4·1 (3·1) 6 months: 4·8 (3·1)	Vertebroplasty: 3 days: 4·5 (6·2) 14 days: 5·9 (5·8) 1 month: 6·9 (6·0) 3 months: 9·6 (7·7) 6 months: 11·7 (6·5) Placebo: 3 days: 2·9 (4·4) 14 days: 4·1 (6·3) 1 month: 4·3 (5·6) 3 months6·4 (7·0) 6 months: 7·4 (6·9)	Vertebroplasty (patient reported): 14 days: 39 (28) 6 months: 23 (26) (researcher observed): 14 days: 25 (23) 6 months: 14 (21) Placebo: (patient reported): 14 days: 49 (28) 6 months: 34 (27) (researcher observed): 14 days: 39 (29) 6 months: 19 (20)	Vertebroplasty: 14 days: 49 (13) 1 month: 49 (17) 6 months: 38 (15) Placebo: 14 days: 55 (14) 1 month: 52 (15) 6 months: 45 (16)	Vertebroplasty: 3 days: 0·69 (0·11) 14 days: 0·69 (0·10) 1 month: 0·75 (0·11) 3 months: 0·75 (0·12) 6 months: 0·80 (0·11) Placebo: 3 days: 0·65 (0·09) 14 days: 0·69 (0·10) 1 month: 0·75 (0·11) 3 months: 0·75 (0·12) 6 months: 0·80 (0·11)	Vertebroplasty: 3 days: 57 (97%) 14 days: 49 (88%) 1 month: 41 (75%) 3 months: 34 (64%) 6 months: 29 (58%) Placebo: 3 days: 56 (98%) 14 days: 52 (91%) 1 month: 50 (88%) 3 months: 44 (83%) 6 months: 39 (76%)
6	Buchbinder *et al*, 2009	**Pain score**	**RDQ score**	**AQoL score**	**QUALEFFO score**	**EQ–5D score**	**Perceived pain**
		Vertebroplasty: 1 week: (Overall): 1.5±2.5 (At rest): 0.8±3.0 (In bed at night): 0.9±2.7 1 months: (Overall): 2.3±2.6 (At rest): 1.2±4.0 (In bed at night): 0.5±3.3 3 month: (Overall): 2.6±2.9 (At rest): 1.4±3.4 (In bed at night): 1.6±2.9 6 months: (Overall): 2.4±3.3 (At rest): 2.0±3.2 (In bed at night): 1.5±3.6 Plasebo: 1 week: (Overall): 2.1±2.8 (At rest): 1.3±3.9 (In bed at night): 0.4±2.8 1 months: (Overall): 1.7±3.3 (At rest): 1.2±4.0 (In bed at night): 0.5±3.3 3 month: (Overall): 1.9±3.3 (At rest): 1.5±3.7 (In bed at night): 0.8±3.4 6 months: (Overall): 2.1±3.3 (At rest): 0.9±3.2 (In bed at night): 1.6±3.6	Vertebroplasty: 1 week: 1.8±5.0 1 months: 4.4±6.6 3 month: 3.7±5.4 6 months: 4.1±5.8 Plasebo: 1 week: 4.0±6.8 1 months: 3.1±6.8 3 month: 5.3±7.2 6 months: 3.7±5.8	Vertebroplasty: 1 week: 0.0±0.2 1 months: 0.0±0.2 3 month: 3.7±5.4 6 months: 0.0±0.3 Plasebo: 1 week: 0.0±0.2 1 months: 0.1±0.3 3 month: 0.1±0.3 6 months: 0.1±0.3	Vertebroplasty: 1 week: −0.5±7.4 1 months: 2.8±9.3 3 month: 6.0±9.6 6 months: 6.4±13.4 Plasebo: 1 week: 3.6±9.2 1 months: 2.4±12.3 3 month: 6.1±13.7 6 months: 6.1±13.4	Vertebroplasty: 1 week: 0.1±0.3 1 months: 0.1±0.3 3 month: 0.2±0.3 6 months: 0.2±0.4 Plasebo: 1 week: 0.1±0.3 1 months: 0.1±0.3 3 month: 0.2±0.4 6 months: 0.2±0.4	Vertebroplasty: 1 week: (Better): 6 (16) (No change): 26 (70) (Worse): 5 (14) 1 months: (Better): 12 (34) (No change): 21 (60) (Worse): 2 (6) 3 month: (Better): 14 (39) (No change): 19 (53) (Worse): 3 (8) 6 months: (Better): 16 (46) (No change): 12 (34) (Worse): 7 (20) Plasebo: 1 week: (Better): 13 (35) (No change): 23 (62) (Worse): 1 (3) 1 months: (Better): 9 (24) (No change): 20 (53) (Worse): 9 (24) 3 month: (Better): 12 (32) (No change): 18 (49) (Worse): 7 (19) 6 months: (Better): 15 (42) (No change): 16 (44) (Worse): 5 (14)
7	Hansen *et al*, 2016	**Pain score**		**RMDQ**		**QUALEFFO**	
		baseline VAS PVP: 5.3+0.4 baseline VAS CT: 4.6+0.46		-		-	
8	Chen *et al*, 2014	**VAS**		**ODI**		**RMDQ**	
		1 week PVP: 3.4+05 1week CT: 5.0+0.7 1 months PVP: 2.8+0.4 1months CT: 4.0+0.6 3 months PVP: 2.5+0.5 3 months CT: 3.9+0.7 6 months PVP: 2.6+0.6 6 months CT: 4.0+0.8 1 year PVP: 2.5+0.5 1 year CT: 4.1+0.8		1 week PVP: 30.3+3.2 1week CT: 44.5+3.9 1 months PVP: 20.4+3.1 1months CT: 35.4+2.9 3 months PVP: 16.6+1.6 3 months CT: 30.0+2.4 6 months PVP: 15.5+1.1 6 months CT: 31.3+3.5 1 year PVP: 15.0+1.3 1 year CT: 32.1+4.5		1 week PVP: 17 1week CT: 43 1 months PVP: 13 1months CT: 33 3 months PVP: 7 3 months CT: 26 6 months PVP: 6 6 months CT: 24 1 year PVP: 7 1 year CT: 28	
9	Kroon et al, 2014	**Pain Score**	**QUALEFFO**	**AQoL**	**RDQ**	**EQ5D**	
		12 months in VP group: 2.4+2.7 12 months in sham procedure: 1.9+2.8 24 months in PVP group: 3.0+3.1 24 months in sham procedure: 1.9+.3.0	12 months in VP groups: 6.7+12.2 12 months in sham procedure: 8.8+13.3 24 months in PVP group: 5.9+10.7 24 months in sham procedure: 4.6+15.0	12 months in VP groups: 0.1+0.3 12 months in sham procedure: 0.2.+0.3 24 months in PVP group: 0.1+0.3 24 months in sham procedure: 0.1+0.3	12 months in VP groups: 2.0+5.7 12 months in sham procedure: 2.6+6.9 24 months in PVP group: 2.6+7.0 24 months in sham procedure: 2.7+5.6	12 months in VP groups: 0.2+0.4 12 months in sham procedure: 0.2+0.4 24 months in PVP group: 0.2+0.4 24 months in sham procedure: 0.2+0.4	

Pain Relief Outcome

We performed a subgroup analysis to evaluate pain relief between PVP and CT in osteoporotic vertebral compression fracture in 1 week,1 month and 3 months. There is no significant difference found in 1 week and 3 months pain relief these two groups in pain relief (mean difference 0.73 (-0.52, 1.96) ; 95% CI, P = 0,25); (mean difference -0.76 (-2.02, 0.49); 95% CI, =0.23), therefore in 1 month we found statistically significant difference in pain relief. [6–12]

Quality of life outcome

We performed a subgroup analysis to evaluate quality of life using EuroQol and RMDQ to compare PVP and CT groups. In these studies, the PVP group showed better outcomes in EuroQol, but different in RMDQ showing slightly favored to CT group. Hence, we found no statistically significant difference in between those two groups favoring the PVP group in term of quality of life outcome (mean difference -0.76 (-2.02, 0.49); 95% CI, P < 0.23); (mean difference 1.75 (-0.87, 4.38); 95% CI, P < 0.19)[13]

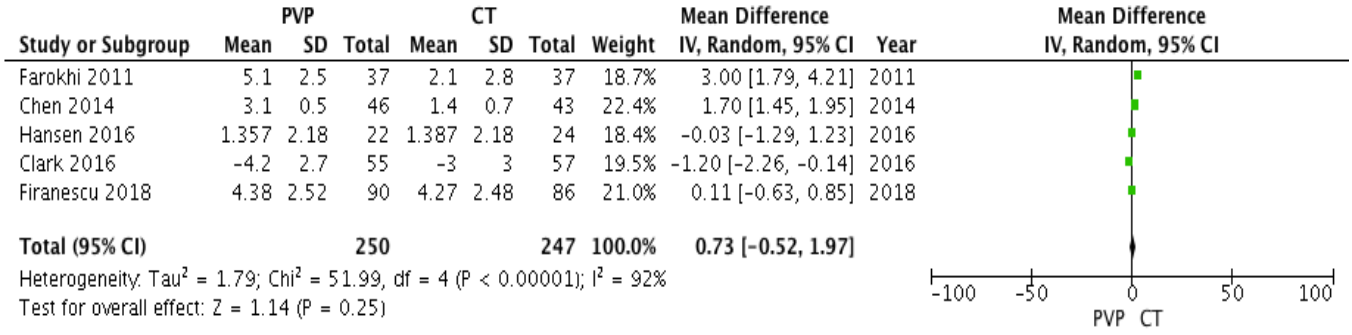

Figure 2. Pooled analysis of pain relief outcome between PVP and CT in 1

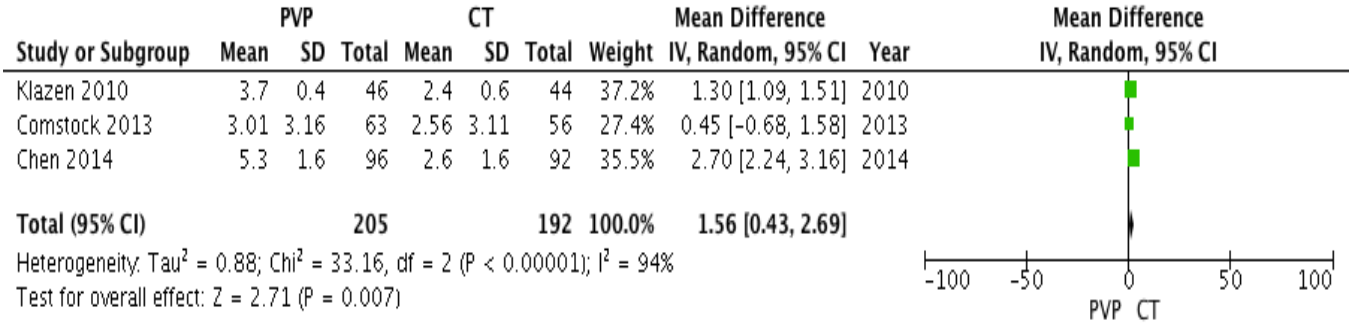

Figure 3. Pooled analysis of pain relief outcome between PVP and CT in 1 week

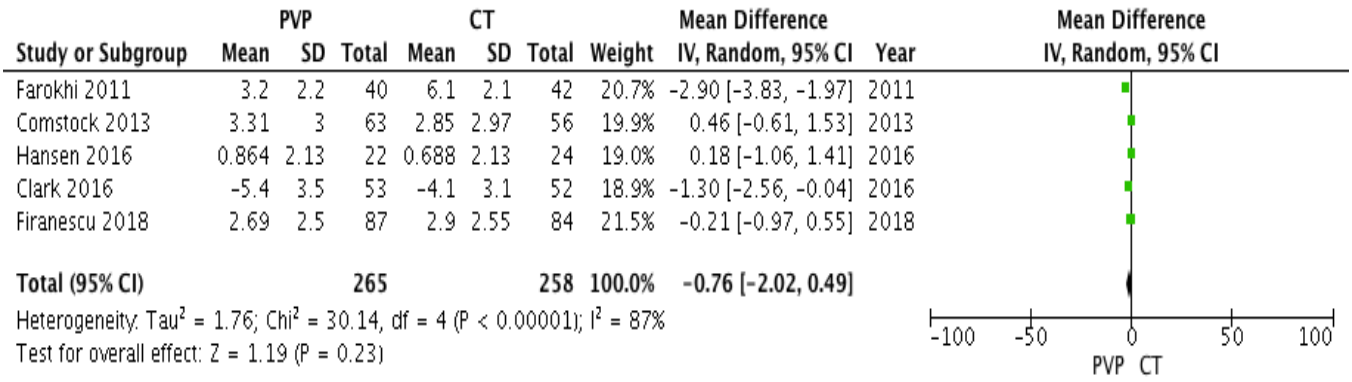

Figure 4. Pooled analysis of pain relief outcome between PVP and CT in 3 months

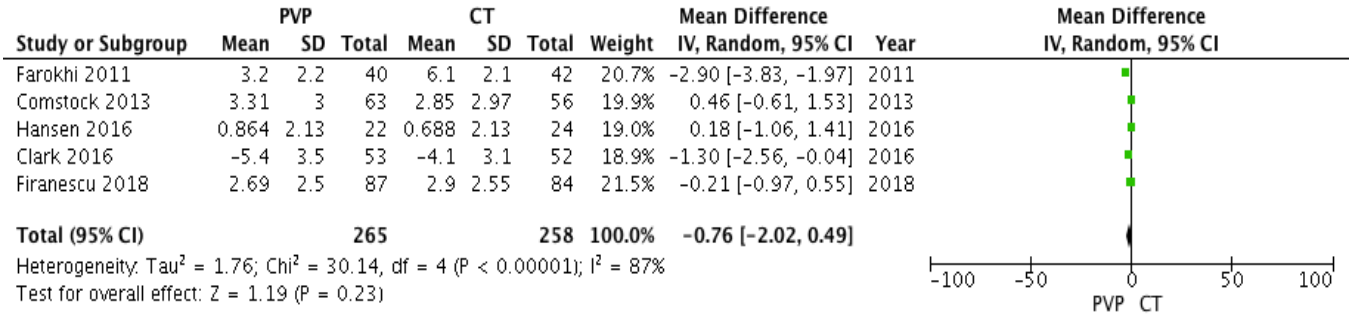

Figure 5. Pooled analysis of EuroQol outcome between PVP and CT groups

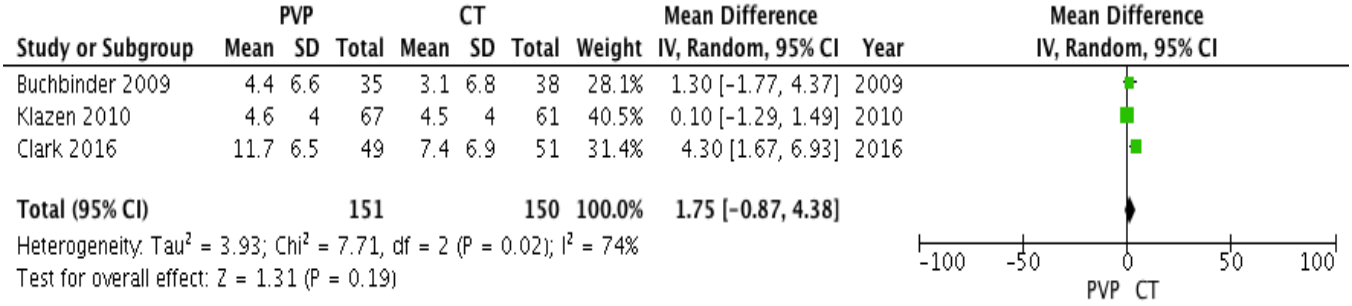

Figure 6. Pooled analysis of Roland Morris Questionaire outcome between PVP and CT groups

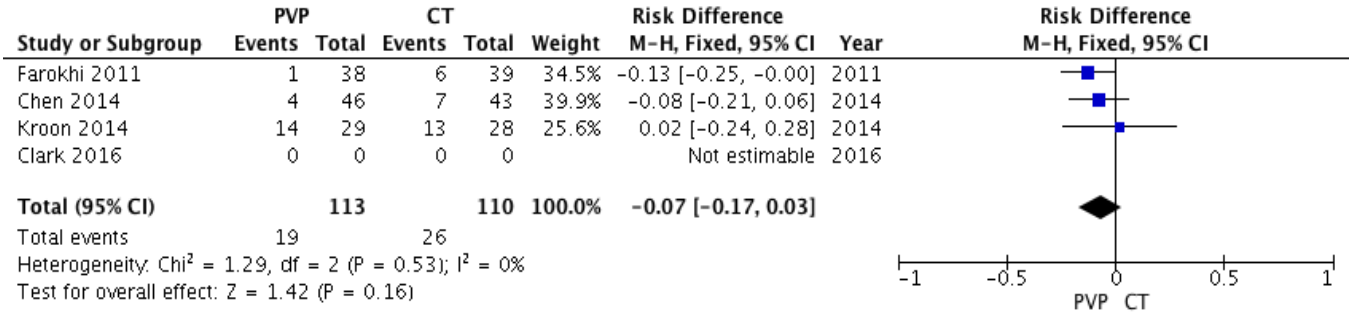

Figure 7. Pooled analysis of EuroQol outcome between PVP and CT groups

New adjacent vertebral fracture outcome

We also performed a subgroup analysis to evaluate new adjacent vertebral fractures comparing methods between PVP and CT groups. In these studies, the PVP group showed no statistically significant difference between CT groups. It may show that PVP has no association to new adjacent vertebral fractures. (M-H, Fixed, 95% CI -0.07 (-0.17, 0.03); $I^2 = 0\%$, P = 0.16).

Osteoporotic vertebral compression fractures (OVCFs) usually occur in the elderly and are associated with chronic back pain, functional disability, decreased quality of life, progressive kyphotic deformity, and increased risk of adjacent vertebral fractures that can lead to mortality. Recommended treatment for OVCFs is CT, including orthosis, pain intervention using medication, bisphosphonates, bed rest, and activity modification. Although OVCFs also can be treated using PVP, which was introduced in 1987. [14–16] These methods consist of injection of PMMA (polymethylmethacrylate) within the vertebral body via a percutaneous approach.[17]

Both PVP and CT have advantages and disadvantages which still give debates regarding the best option therapy for OVCFs. This study is designed to compare both groups and assess efficacy in patients with OVCFs. The pain relief studies assessed the outcomes using Visual Analogue Scale (VAS). From the pooled data we found a statistically significant result regarding outcomes of pain relief for patients treated with PVP compared to CT at 1 week and not statistically significant at 3 months, although it was not statistically significant many of the patient's reports of satisfactory results in PVP group after the procedure this was regarding quality of life. We pooled the data

and got statistically significant differences showing improvement in quality of life in the PVP group compared to the CT group.

In PVP the mechanism of pain relief remains unknown, this may possibly be achieved in at least 2 known ways, which were mechanical stabilization reduced microfractures of the site applied to nociceptive endings within the bone, also thermal necrosis or chemo toxicity of intraosseous pain receptors. [17,18]

Based on a previous study, injection of cement via PVP gave effective stabilization at the site of the vertebral fracture level and may relieve pain and improve daily activity. [6] Early mobilization may only be seen in the VP group rather than in the CT group.[19]

Early mobilization made the duration of bed rest much shorter than that in the CV group. Therefore, VP has greater potential to avoid various problems associated with prolonged bed rest, such as pneumonia, deep vein thrombosis, UTI, function of the musculoskeletal system, and progression of osteopenia. Also, usage of analgesics by the patients was less in the VP group compared to the CT group, resulting in a reduction rate of adverse effects. This maybe the reason that a better quality of life is seen in the PVP group than that in the CV group. With the improvement of pain relief and quality of life, PVP would be a better treatment of choice for the patients.

Adjacent vertebral fractures may cause acute and intense lumbar back pain, that will decrease the quality of life for osteoporotic patients. From our studies, we observed that the PVP group did not increase the incidence of adjacent vertebral fracture compared to the CT group. The possibility of this explanation may be caused by to associated number of vertebrae treated during VP procedure.

The main strength of our study is that we included updated and well-maintained studies that were designed as RCTs. More larger studies may also be needed to confirm the efficacy of PVP and CT for OVCF patients.

Conclusion

Summarizing our study, we conduct a systematic review and meta-analysis with evidence-based data comparing both groups (PVP and CT) in treating OVCF patients. Percutaneous vertebroplasty was found to be better in improving pain relief, and quality of life without giving an increased risk of adjacent vertebral fracture compared to the CT group. Hence, a further study is clearly required to identify which patients of OVCFs would likely get beneficial effects from PVP with low risk for complications.

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