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Utilizing Microwave Ablation in Combination with Vertebroplasty Is an Effective Method in Reducing Cancer Related Back Pain, Disability, and Opioid Use: A Systematic Review and Meta-Analysis

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Objectives

- To assess the 4-week and 12-week outcomes of utilizing microwave ablation (MWA) followed by vertebroplasty (VP) on metastatic spinal cancer.
- To evaluate whether the combinatorial treatment improves pain, disability, and daily morphine equivalent consumption.

Methods

- A systematic review and meta-analysis were conducted following the 2020 PRISMA guidelines.
- Five online databases (Cochrane, Embase, PubMed, Web Of Science, Scopus) were screened.
- Included studies were those that assessed 4-week and 12-week Visual Analogue Scales (VAS) scores, Oswestry Disability Index (ODI) measures, Daily Morphine Consumption (DMC).
- 4 retrospective studies were included in the final analysis, yielding 117 distinct patient evaluations.

Results

- We analyzed strong clinically significant differences in VAS, ODI, and DMC at 4-weeks and 12-weeks.

Time Post-Treatment	VAS	ODI	DMC
4-Weeks			
Subgroup Overall Effect Size (Cohen's D)	4.00	3.29	4.50
95% Confidence Interval	2.83 - 5.17	2.75 - 3.84	1.26 - 7.73
Standard Error	0.59	0.28	4.50
12-Weeks			
Subgroup Overall Effect Size (Cohen's D)	4.34	N/A	4.56
95% Confidence Interval	3.00 - 5.67	N/A	1.14 - 7.99
Standard Error	0.68	N/A	4.56
Difference of Effect Size Between Timeframes	0.34	N/A	0.06

Table 1. Summary of data comparing pre-treatment VAS, ODI, and DMC at 4-weeks and 12-weeks

Author	Lung	Esophagus	Breast	Other	Total
Wu et al.	12	5	x	6	23
Motaghi et al.	7	x	11	10	28
Liu et al.	28	x	x	x	28
Fan et al.	14	5	7	12	38
Total	61	10	18	28	117

Table 2. Quantity of primary metastasis origin.

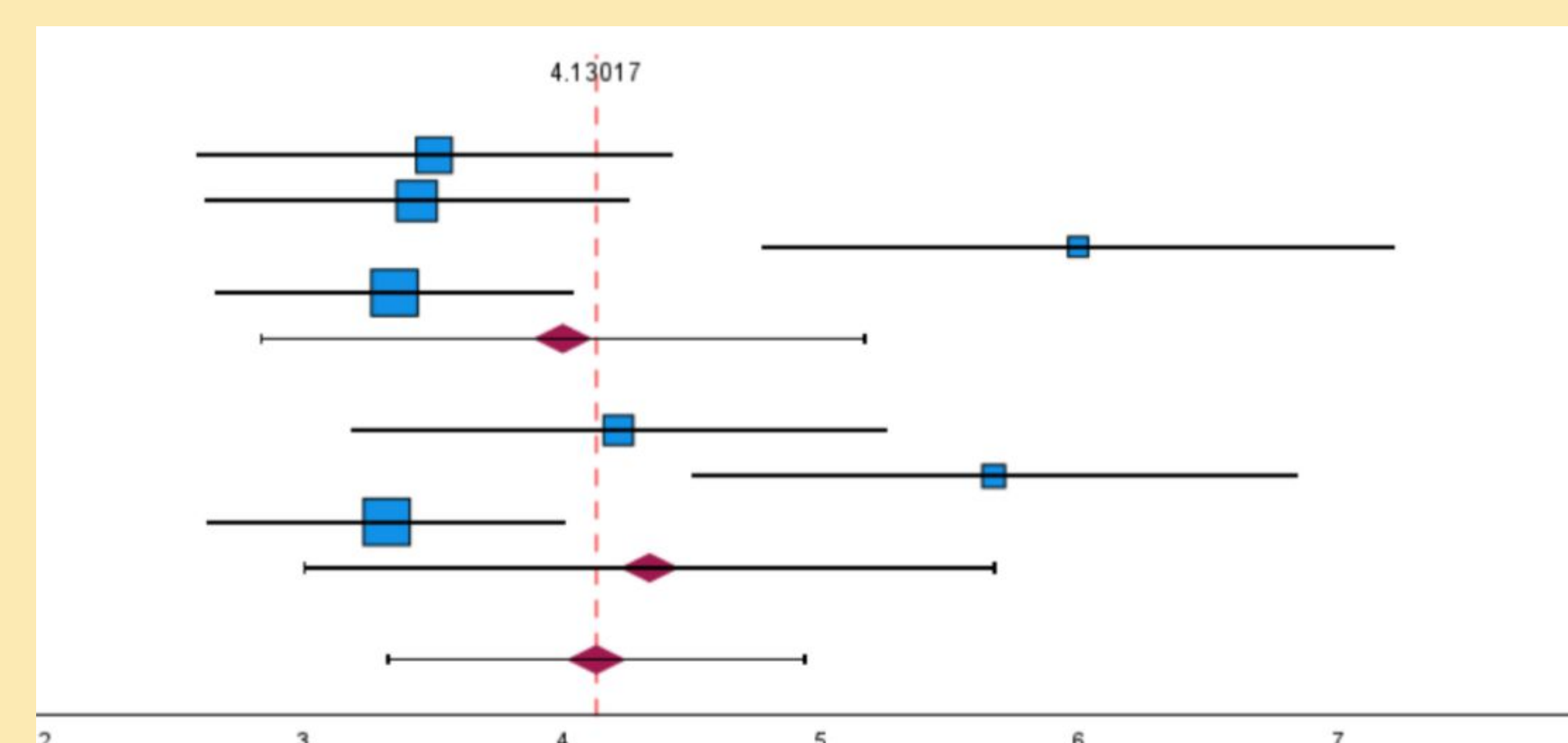


Figure 1. Forest plot analyzing effect size comparing VAS scores pre-treatment to 4-weeks and 12-weeks post-treatment.

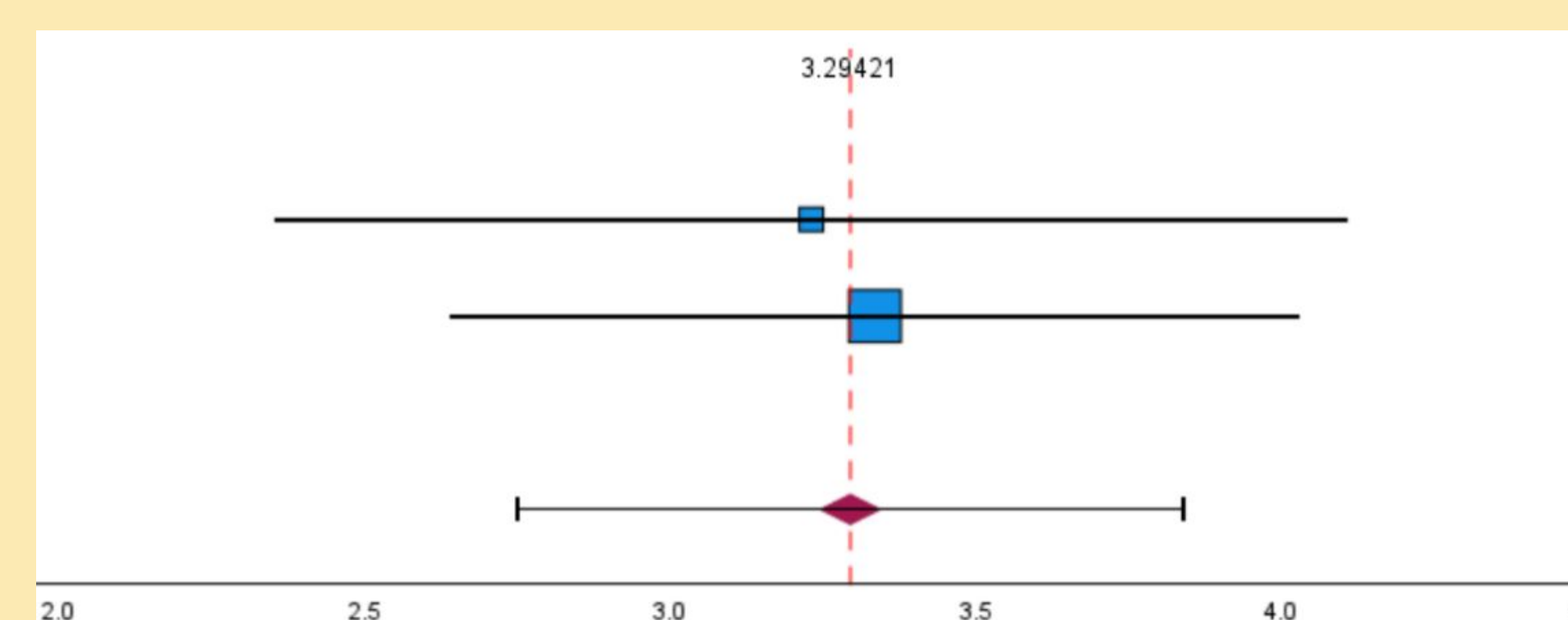


Figure 2. Forest plot analyzing effect size comparing ODI scores pre-treatment to 4-weeks post-treatment

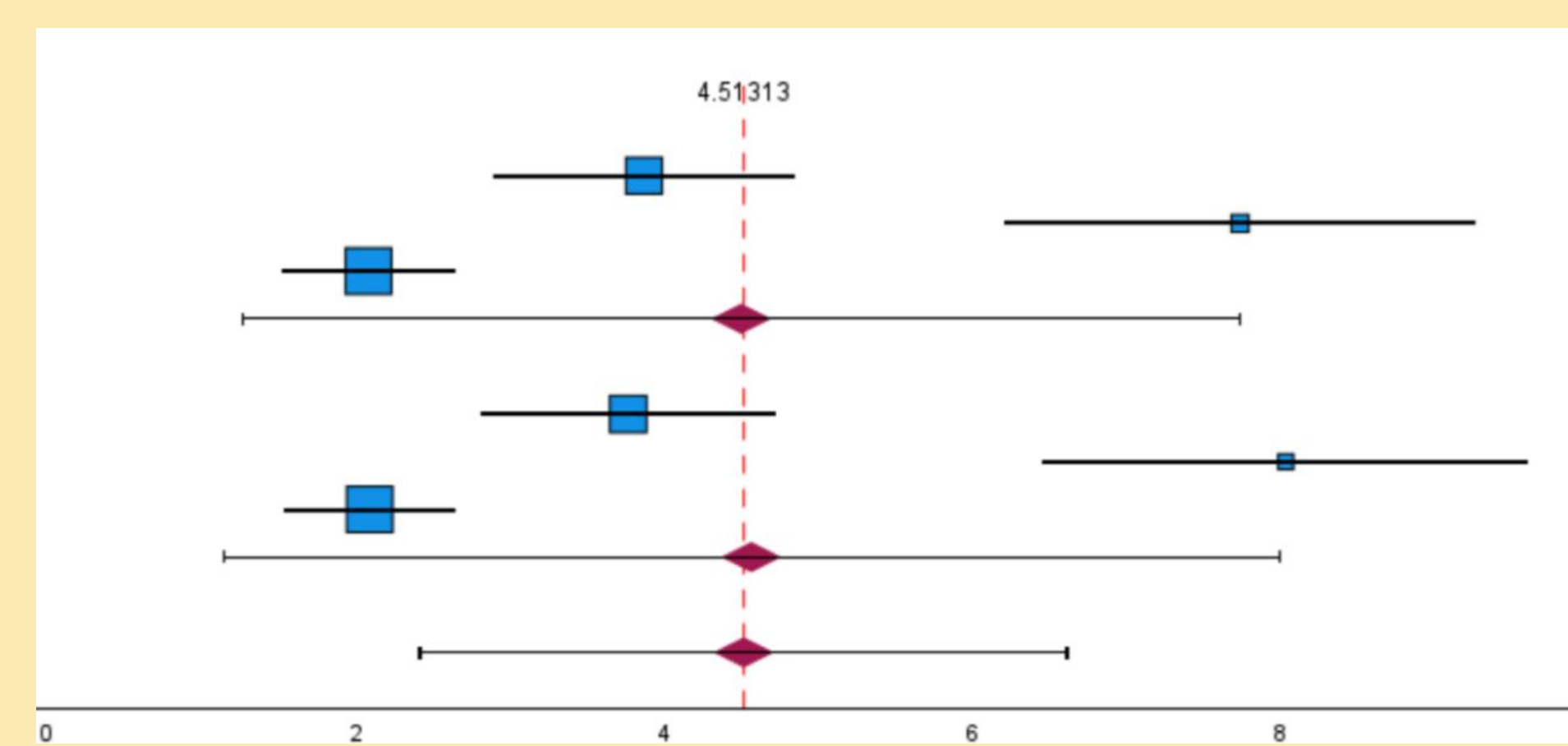


Figure 3. Forest plot analyzing effect size comparing DMC scores pre-treatment to 4-weeks and 12-weeks post-treatment.

Conclusion

- Utilizing microwave ablation followed by a vertebroplasty greatly reduced pain, disability, and opioid consumption in patients with metastatic spinal cancer over a 4-week and 12-week timeline.
- Between 30-70% of people with cancer develop metastatic spinal cancer, often leaving patients with weak or fractured vertebrae due to the osteolytic metastases.
- With many cancer patients needing to rely on opioids as an analgesic to the tremendous pain of the disease, it is pertinent that innovations in medicine work to reduce the use of opioids.

Study Limitations

- The limited sample size of 117 patients makes it difficult to come to a true conclusion in regards to the effectiveness of MWA followed by VP. Future research with larger sample sizes are needed.
- Only retrospective studies were able to meet the inclusion criteria. Comparative randomized controlled trials assessing the significance of utilizing MWA with VP, compared to VP alone could further exemplify the importance of MWA to the treatment.

Search String

- (“Microwave ablation” OR “MWA”) AND (“Percutaneous Vertebroplasty”) AND (“VAS” OR “NRS” OR “Pain”)

References

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