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Does scaffold enhancement show significant superiority over microfracture alone for treating knee chondral defects? A systematic review and meta-analysis of randomised clinical trials.

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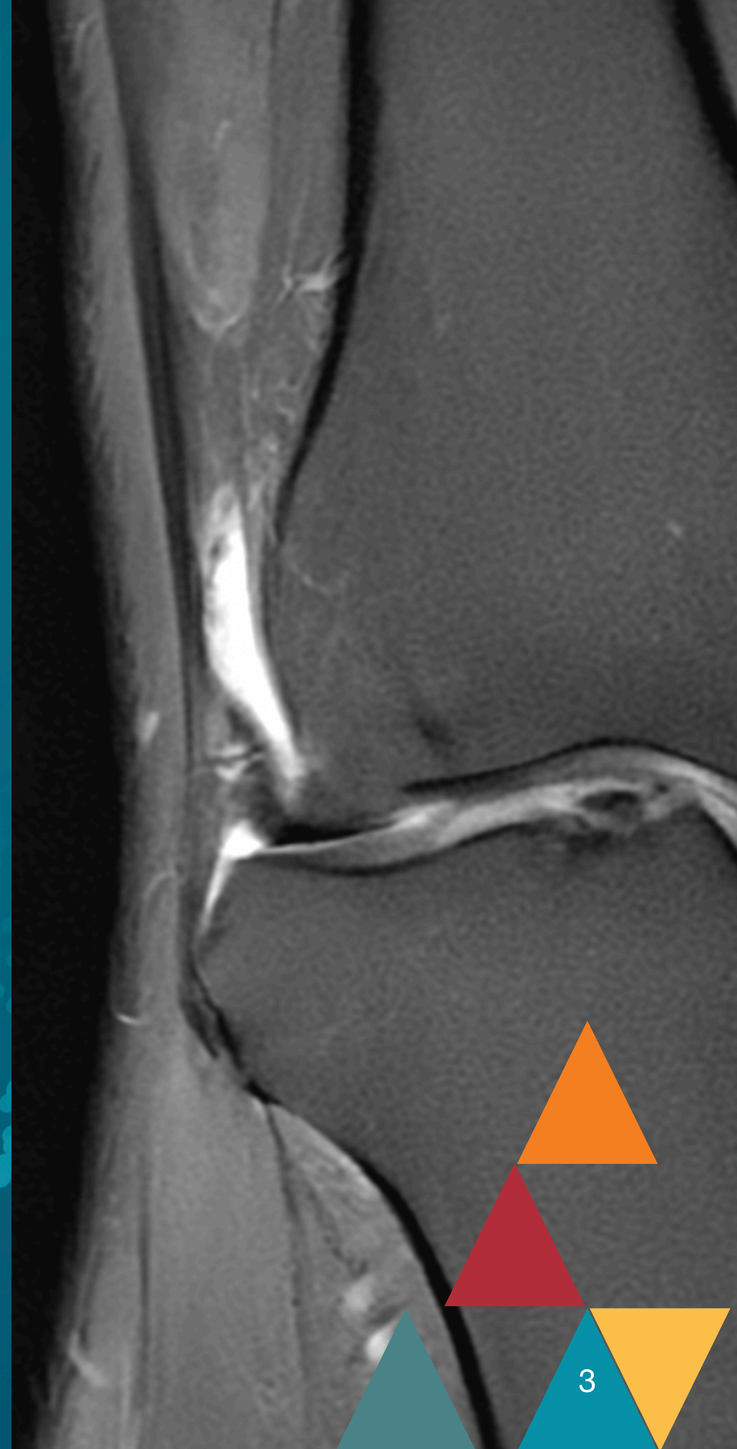
Faculty Disclosure Information

- Nothing to disclosure
- Carolina Hospital - Warsaw, Poland

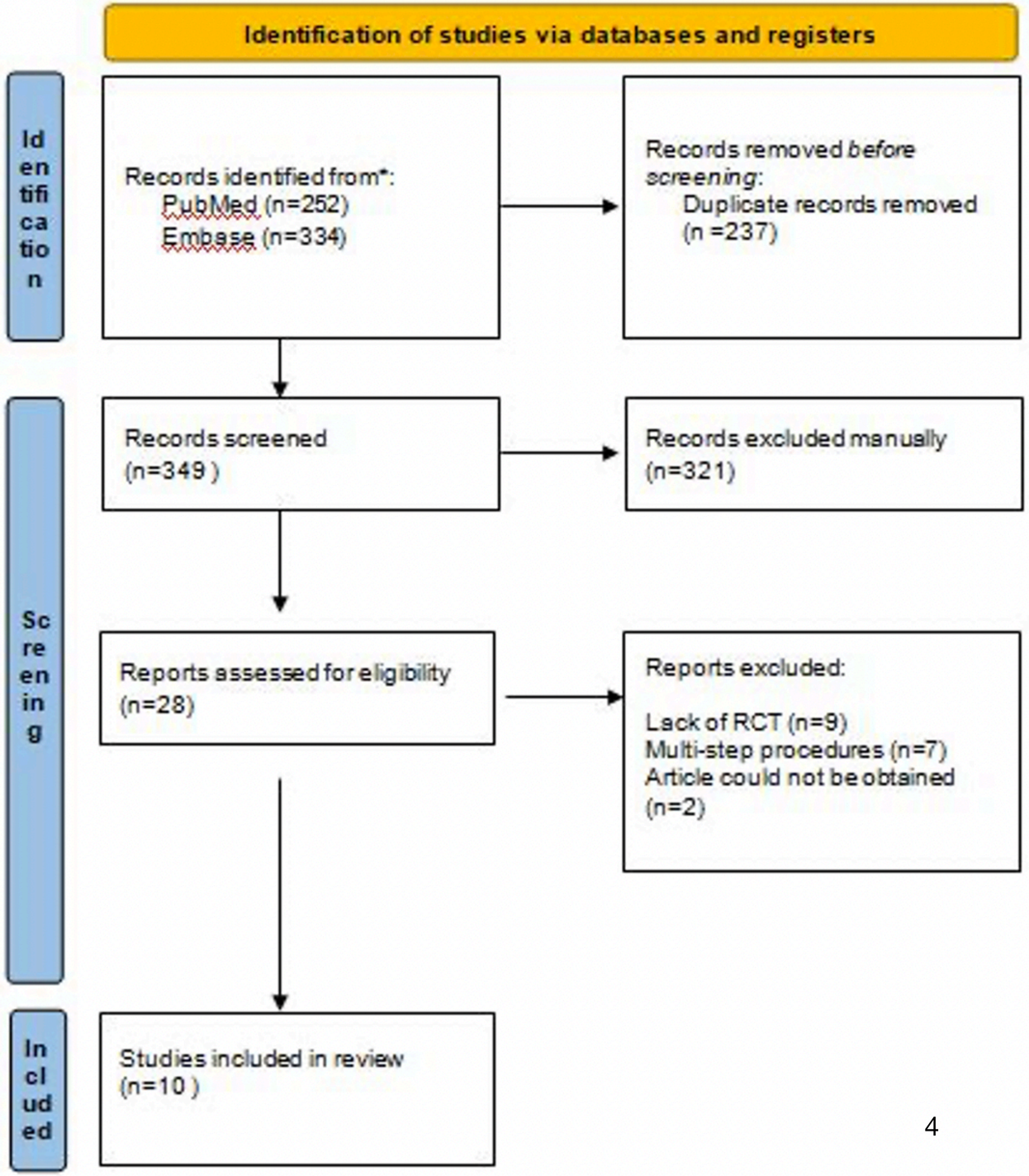
PURPOSE

Chondral and osteochondral lesions in the knee are common conditions that significantly impair individuals' well-being and can lead to osteoarthritis, imposing substantial burdens on healthcare systems. The limited natural healing capacity of articular cartilage necessitates innovative treatment strategies. Microfracture (MF) is a widely used technique for knee chondral defects, but its long-term efficacy is often inadequate. Although recent randomised controlled trials have compared microfractures with scaffold-enhanced therapies, a comprehensive systematic review andmeta-analysis are lacking.



METHODS

An extensive literature search was conducted in PubMed and EMBASE databases following PRISMA guidelines. Inclusion criteria focused on randomised controlled trials (RCTs) comparing microfractures alone to matrix-induced chondrogenesis for knee chondral defects with at least a 12-month follow-up. Ten randomised controlled trials conducted between 2013 and 2024, enroling 378 patients, were included.



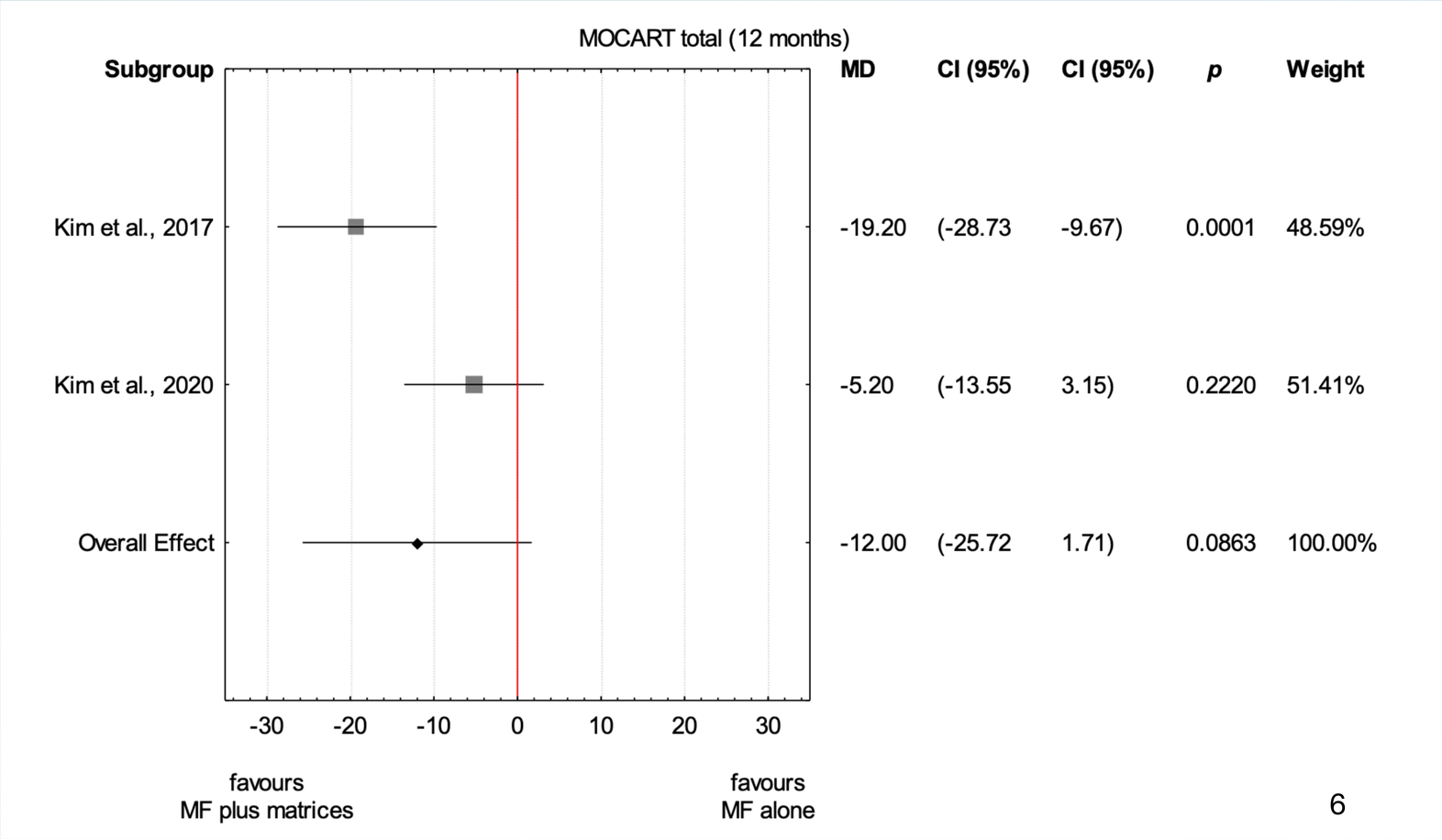
RESULTS

Cohort studies included in meta-analysis and the results of the modified Coleman Methodology Score (mCMS)

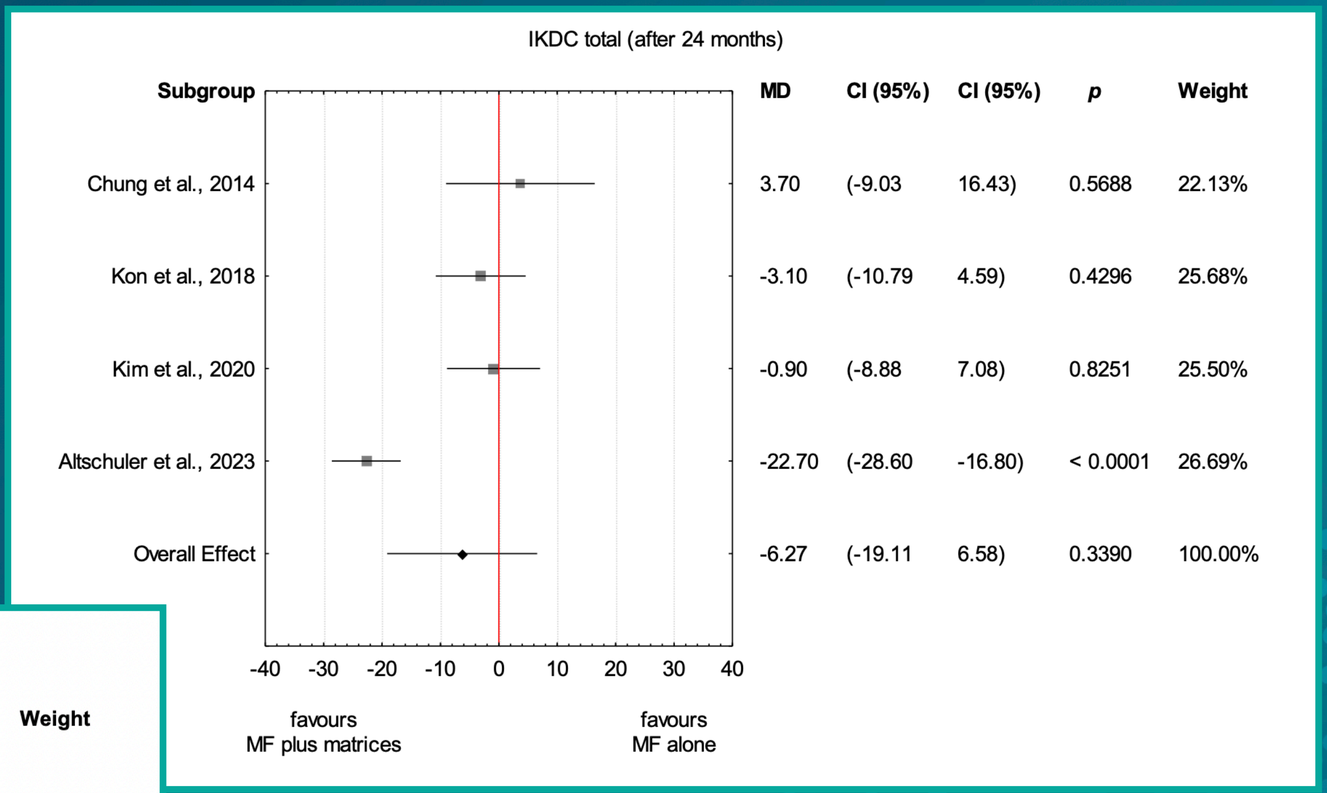
Authors	Anders et al. [2]	Chung et al. [10]	Kon et al. [30]	Volz et al. [51]	Kim et al. [27]	Kim et al. [26]	Shive et al. [43]	Stanish et al. [44]	Glasbrenner et al. [18]	Altschuler et al. [1]
Part A										
1. Study size	7	10	10	7	4	10	10	10	4	10
2. Mean duration of follow-up	2	2	2	5	2	2	5	2	5	2
3. Number of treatment procedures	10	10	10	10	10	10	10	10	10	10
4. Type of study	15	15	15	15	15	15	15	15	15	15
5. Diagnostic certainty	5	5	5	5	5	5	5	5	5	5
6. Description of surgical procedure	5	5	5	5	5	5	5	5	5	5
7. Description of rehabilitation procedures	10	10	5	10	5	5	10	10	10	10
Part B										
1. Outcome criteria										
1a	2	2	2	2	2	2	2	2	2	2
1b	2	2	2	2	2	2	2	2	2	2
1c	4	4	4	4	4	4	4	4	4	4
2. Procedure for assessing outcomes										
2a	5	5	5	5	5	5	5	5	5	5
2b		4	4		4	4		4		
2c	3	3	3	3	3	3	3	3	3	3
2d	3	3	3	3	3	3	3	3	3	3
3. Subject selection process										
3a	5	5	5	5	5	5	5	5	5	
3b										
3c										
Total Part A (max 60)	54	57	52	57	46	52	60	57	54	57
Total Part B (max 40)	24	28	28	24	28	28	24	28	24	19
Total mCMS	78	85	80	81	74	80	84	85	78	76

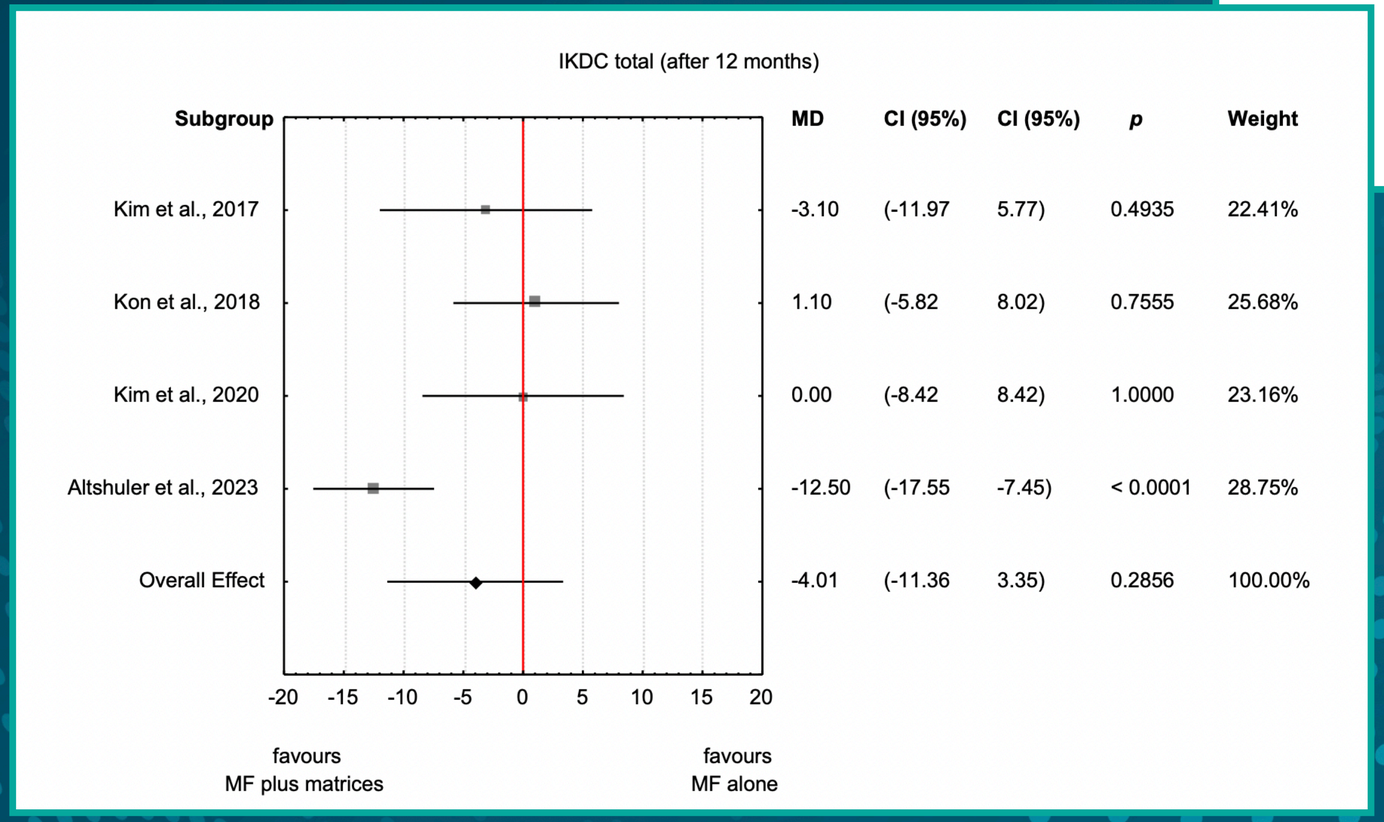
The meta-analysis showed no significant superiority of scaffoldsover MF ($p > 0.05$) in International Knee Documentation Committee, Knee Injury and Osteoarthritis Outcome, Visual Analog Scale, and Magnetic Resonance Observation of Cartilage Repair Tissue scores at 12 and 24 months. However, individual studies suggested the potential benefits of scaffolds, especially in long-term outcomes. Clinical improvements from MF typically decline after 2–3 years, underscoring the need for long-term follow-up in future research.

MOCART -magnetic resonance observation of cartilage repair tissue

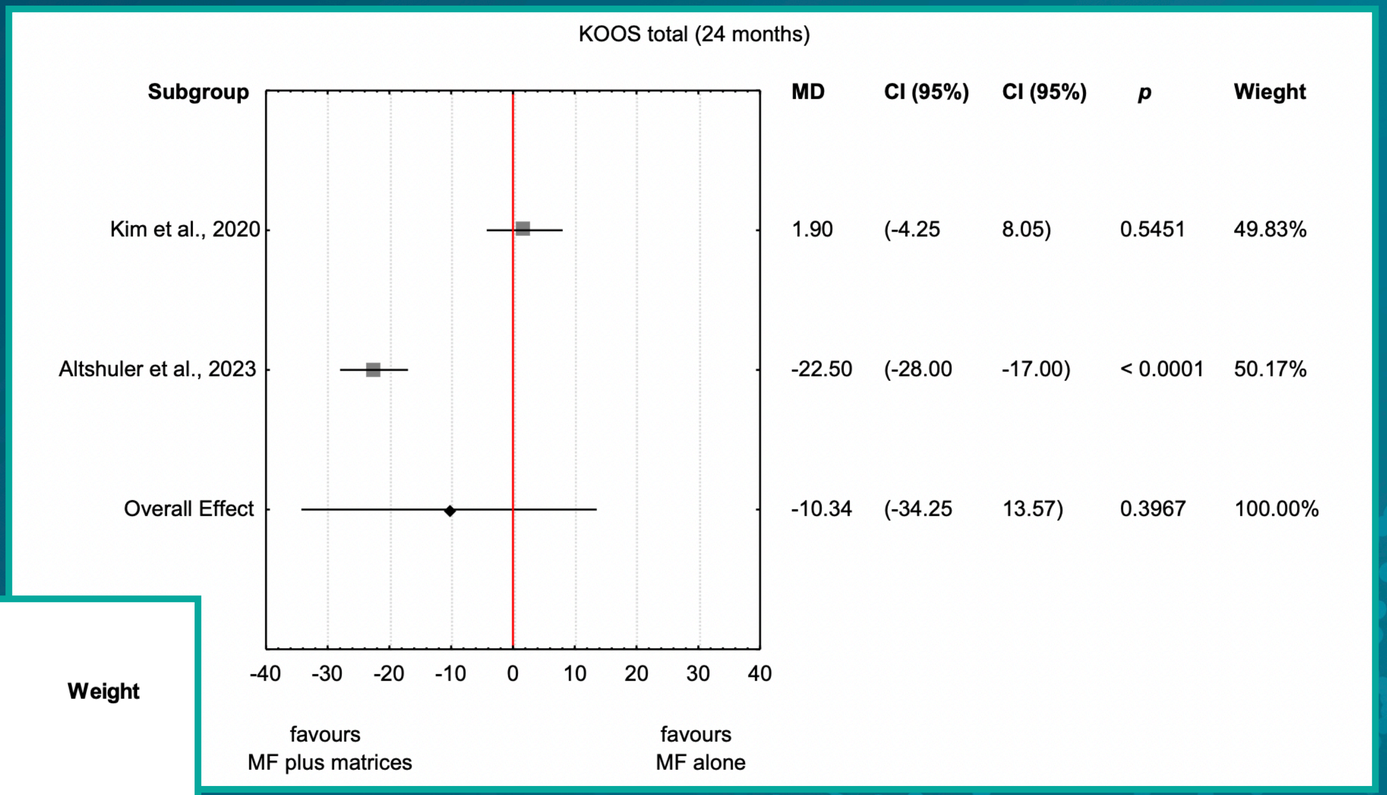


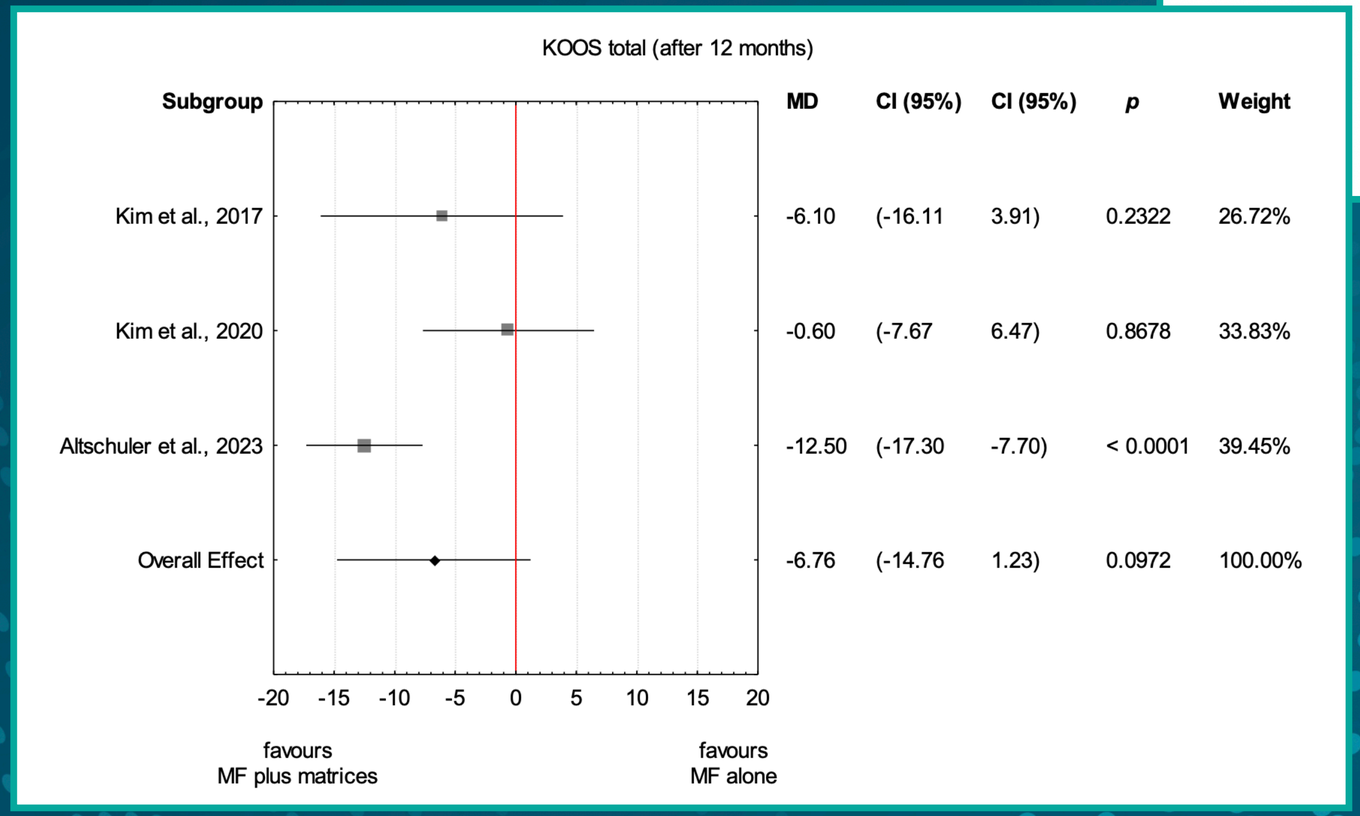
IKDC - International Knee Documentation Committee Scores



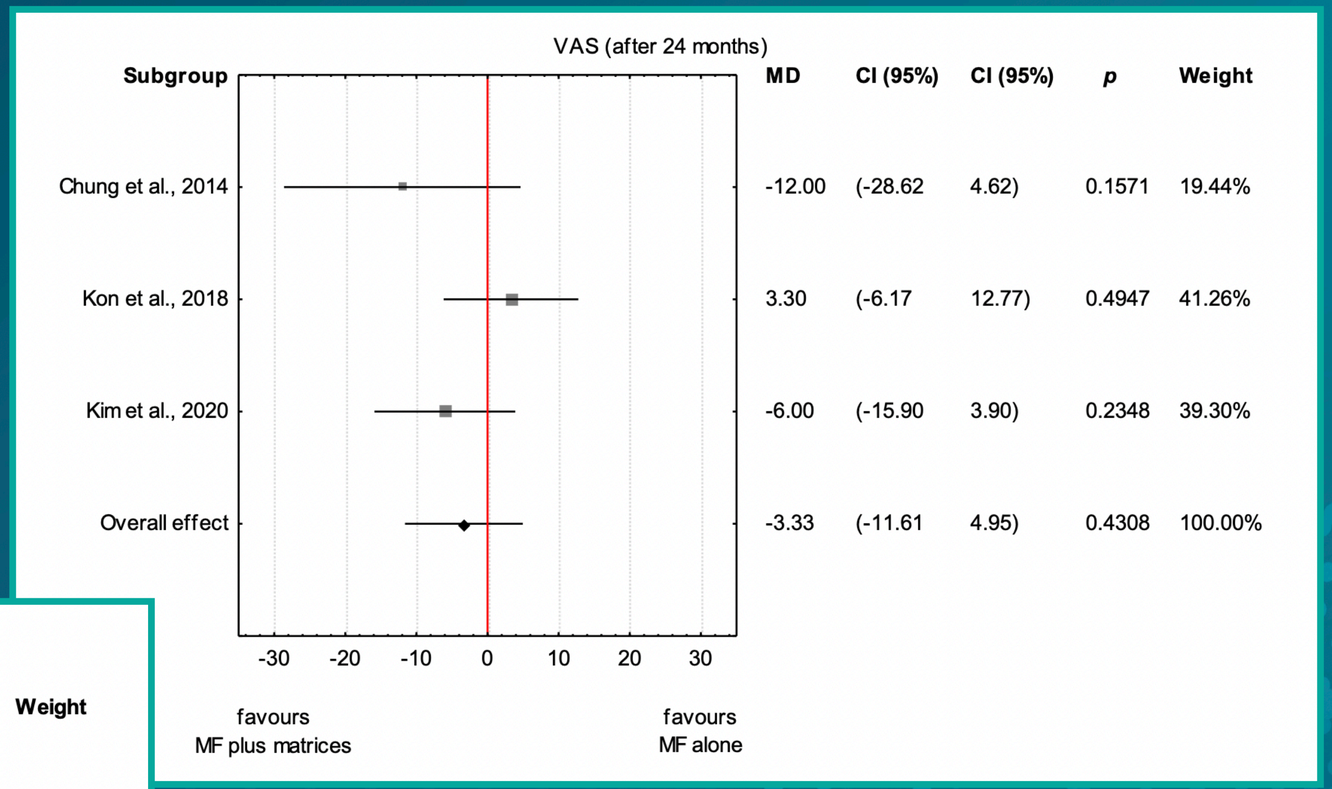


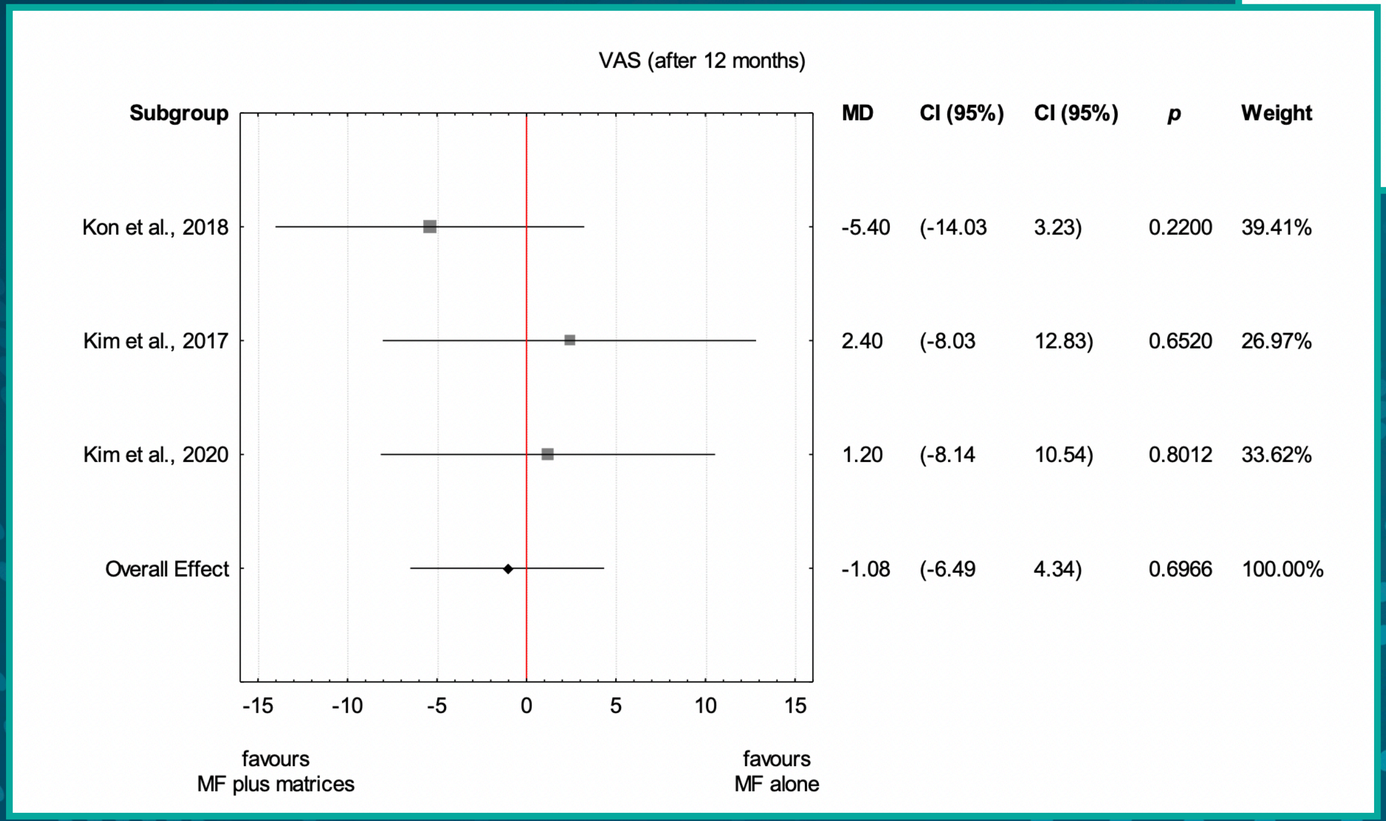
KOOS - Knee Injury and Osteoarthritis Outcome Scores





VAS - Visual Analog Scale





CONCLUSION

Our meta-analysis shows no significant difference between MF and MF with scaffold in treating knee cartilage defects, though some long-term RCTs demonstrate statistically significant differences. The absence of a universally accepted algorithm for analysing knee chondral defects limits this study. Establishing reliable guidelines and standardised study protocols is essential to improve long-term patient outcomes and the quality of future papers.

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