

Does Fat Injection Alter Scar Tissue? A Systematic Review

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Background

Scar formation is a common sequela of surgery, trauma, burns, and radiation therapy, often resulting in pain, contracture, and functional limitation. Autologous fat injection has been increasingly applied across diverse scar etiologies with reported improvements in pliability, pain, and appearance. Multiple processing techniques exist, including microfat, nanofat, and stromal vascular fraction (SVF), yet published data remains heterogeneous in study design, processing methods, and outcome assessment. This systematic review evaluates the clinical literature on autologous fat injection for scar management.

Methods

A systematic search of PubMed, Embase, Web of Science, and Scopus was performed using terms including *fat grafting, lipofilling, nanofat, stromal vascular fraction, adipose-derived stem cells, and scar*.

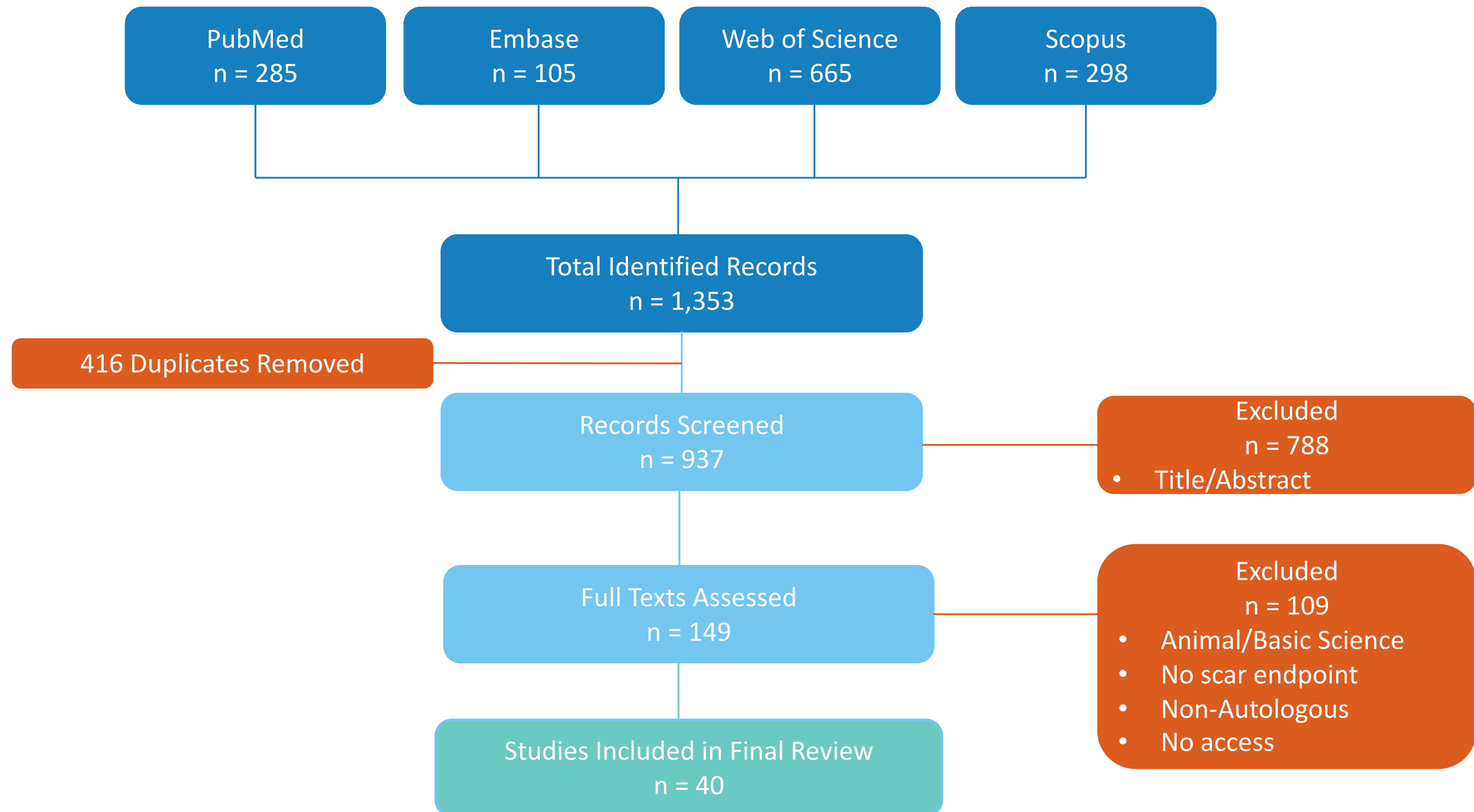
Inclusion:

- Human cohort studies, RCTs, or case series >5 patients
- Autologous fat-based injection targeting established scars
- Outcomes reported using validated scar scales (POSAS, VSS, VAS, ROM) or structured clinical measures.

Exclusion

- Animal studies, reviews, single case reports
- Prophylactic or intraoperative use without established scar endpoint
- Non-autologous adjuncts or fat used solely for volume restoration
- Unstructured or unquantified outcome reporting.

Study Selection



Emerging Technique-Scar Type Pairings

| Fat Processing Technique | No. of Studies | Best Supported Scar Types | Key Outcomes |
|--------------------------|----------------|--|--|
| Microfat | 22 | Radiation-Associated, adherent/fibrotic, post-surgical | ↓ Pain (VAS); ↑ pliability; ↑ POSAS and VSS scores; ↑ range of motion |
| Nanofat | 10 | Acne/Atrophic, depressed facial scars | ↓ Scar volume and depth; ↑ POSAS and GAIS scores; ↑ collagen density |
| SVF-Based | 6 | Early remodeling across all scar types | ↑ POSAS scores at 6 months; benefits not consistently sustained at 12 months |
| Chyle Fat | 1 | Hypertrophic burn scars | ↓ Fibroblast density; ↑ collagen organization; ↑ elasticity and softness |
| ECM/SVF-Gel | 2 | Atrophic acne/morphea | ↓ Scar volume; ↑ LoSDI scores; ↓ dermal sclerosis |

Conclusions

- Autologous fat injection is associated with measurable clinical improvement across all scar types studied
- Pliability, pain, and patient/observer-reported scar scores were the most consistently improved outcomes
- No single fat processing technique demonstrated consistent superiority over another
- Current evidence suggests specific technique to scar pairings: nanofat appears better suited for superficial and atrophic scars; microfat for adherent, fibrotic, and radiation-associated scars; and SVF-based preparations may have implications in early remodeling
- Evidence remains heterogeneous; variability in study design, processing methods, and outcome assessments limits definitive conclusions

Future Directions

- Standardization of outcome assessment tools across scar categories would allow for more meaningful comparisons between studies
- Comparable randomized trials comparing fat techniques within specific scar types
- Histological and biological outcomes should be incorporated as primary outcomes to better understand mechanisms that lead to clinical improvements

Conflicts of Interest/Funding

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References

A full reference list is available upon request or via scanning of the QR code below.

