META-ANALYSIS: COMBINING NPWT + TOT

11 RCTS
844 PATIENTS

Su J, Zhang D, Du J, et al. The Efficacy of Negative Pressure Wound Therapy Combined with Topical Oxygen Therapy in Treating Chronic Refractory Wounds: A Systematic Review and Meta-Analysis. *Adv Wound Care*. Published online August 13, 2025.

Study Objective

To evaluate the clinical efficacy of combining **Negative Pressure Wound Therapy (NPWT)** with **Topical Oxygen Therapy (TOT)** for treating chronic refractory wounds (CRWs).

Rationale: *NPWT often induces local hypoxia. TOT supplements oxygen to restore metabolic function and optimize the wound microenvironment.*

1.51×
Healing Rate
(RR: 1.51)

73%
Lower Infection
(RR: 0.27)

-9.1
Days to Heal
(Mean Diff)

Methodology

- **Design:** 11 Randomized Controlled Trials (RCTs)
- **Participants:** 844 patients with chronic refractory wounds
- **Protocol:** PRISMA 2015 guidelines (PROSPERO: CRD42024618561)
- **Data Sources:** PubMed, Cochrane, Embase, Web of Science, CNKI (through Oct 2024)

Meta-Analysis Results Summary

Comparison: NPWT+TOT vs. NPWT Alone

Complete Wound Healing Rate	RR	**1.51**	1.36 – 1.69
Bacterial Positivity Rate	RR	**0.27**	0.18 – 0.41
Overall Healing Time	MD (days)	**-9.09**	-11.98 to -6.20
Time to Skin Grafting	MD (days)	**-2.82**	-3.15 to -2.50
Granulation Coverage	MD (%)	**+7.56**	6.09 to 9.03

RR = Risk Ratio; MD = Mean Difference; CI = Confidence Interval

Included Wound Etiologies:

Diabetic Foot Ulcers | Pressure Injuries | Venous Ulcers | Mixed Etiologies

Key Outcomes & Conclusion

Subgroup Analysis & Clinical Implications

Subgroup Analysis: Healing Rates

Pressure Injuries

RR 1.89

Highest Efficacy

Mixed CRWs

RR 1.38

Significant Benefit

Diabetic Foot

RR 1.75 (Trend Only)

Small Sample Size

Why NPWT + TOT Works

Reverses Hypoxia
Counteracts oxygen deficiency from negative pressure suction.

Promotes Angiogenesis
Stimulates VEGF expression to build new capillaries.

Bactericidal Effect
Enhances neutrophil respiratory burst to clear infection.

Accerelates Repair
Supports mitochondrial energy for tissue regeneration.

Clinical Benefits

- Significant reduction in time to skin grafting (-2.82 days)
- Cleaner wound bed with significantly lower bacterial load
- Potential for reduced hospital stay and resource utilization
- Helps transition stuck wounds from inflammatory to proliferative phase

Conclusion

Adding Topical Oxygen Therapy to NPWT is a synergistic strategy that significantly improves healing rates and reduces infection risks in chronic refractory wounds, particularly pressure injuries.

Recommendation

Consider adopting combined protocol for wounds that fail to progress with standard NPWT alone.

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