

CLINICAL EFFECTIVENESS OF NEGATIVE PRESSURE THERAPY FOR WOUND HEALING: A SYSTEMATIC REVIEW

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BACKGROUND

Increasing use of negative pressure wound therapy (NPWT) for the treatment of acute and chronic wounds was observed in the last decade.

OBJECTIVE

To assess the clinical effectiveness of NPWT for different wound etiologies in comparison with other conventional therapies.

METHODS

Systematic reviews (SRs) and randomized controlled trials (RCTs) on NPWT were retrieved in Pubmed, Embase and the Cochrane Library (until August 2009). Grey literature was also searched. Primary endpoints were incidence of complete wound healing and time to wound closure (Table 1). Article selection, quality assessment, data extraction and synthesis were done independently by two authors (Figure 1).

RESULTS

Figure 1. Flow diagram of study selection

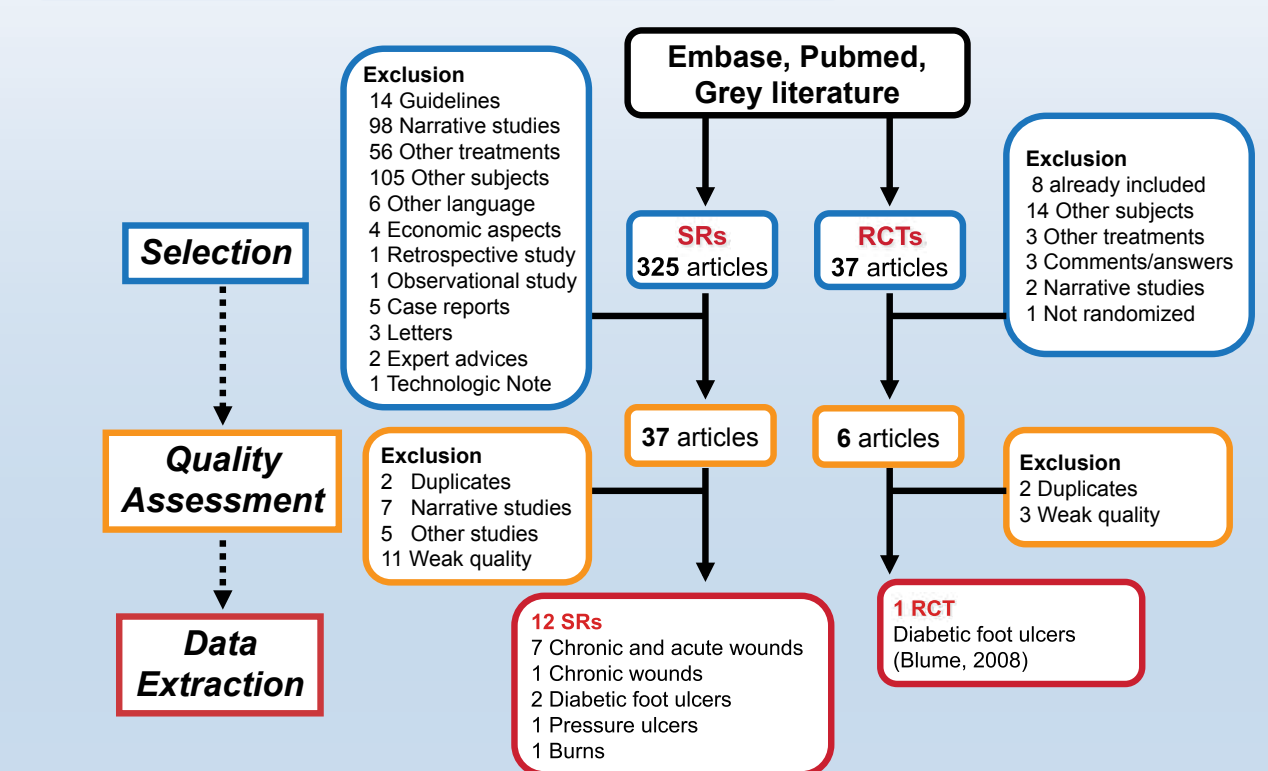


Table 2. Primary studies included in systematic reviews

Authors	Ref	Wounds etiologies	Comparator (dressings)	Number of patients (NPWT vs control)	Follow up days (d) or months (m)	Complete wound closure	Time for complete wound closure
RCT							
Armstrong 2005	A	Amputation	Modern	77 vs 85	112 d	×	×
Blume 2008	B	Diabetic foot ulcers	Modern	169 vs 166	112 d	×	×
Eginton 2003	C	Diabetic foot ulcers	Modern or gauzes	11 vs 11	14 d		
Etoz 2004	D	Diabetic foot ulcers	Saline	12 vs 12	4-24 d		
McCallon 2000	E	Diabetic foot ulcers	Saline	5 vs 5	43 d	×	×
Greer 1999	F	Pressure ulcers	Wet	8 vs 3	20 d		
Ford 2002	G	Pressure ulcers	Gel	20 vs 15	42 d		×
Wanner 2003	H	Pressure ulcers	Gauzes	11 vs 11	15-56 d		
Heath 2002	I	Skin grafts	Compressive	10 half wounds	14 d		
Jeschke 2004	J	Skin grafts	Compressive	6 +fibrin vs 6	27 d		
Lianos 2006	K	Skin grafts	Saline	30 vs 30	11-22 d		×
Moisisdis 2004	L	Skin grafts	Compressive	22 half wounds	14 d		
Davidov 1994	M	Chronic surgical	Conventional	26 vs 53	2 d		
Molnar 2004	N	Burns	Silver	2 wounds/10 patients	30 d		
Stannard 2006	O	post-traumatic	Post-surgical	13 vs 31	8-m		
Vuerstaek 2006	P	Chronic leg ulcers	Modern	30 vs 30	12 m	×	×
Braakenburg 2006	Q	Various	Modern	32 vs 33	80 d	×	×
Moues 2004	R	Various	Wet	29 vs 25	30 d		×
Joseph 2000	S	Various	Saline	18 vs 18	42 d		

Non RCT	Ref	Wounds etiologies	Case studies	Ref	Wounds etiologies
Stone 2004	3	Skin grafts	Armstrong 2002	13	Diabetic foot ulcers
Scherer 2002	4	Skin grafts	Deva 2000	17	Pressure ulcers
Kamoliz 2004	1	Burns	Genecov 1998	18	Skin grafts
Schrank 2004	2	Burns	Avery 2000	11	Skin grafts
Shilt 2004	9	Traumatic	Meara 1999	12	Skin grafts
Song 2003	5	Sternal	Mooney 2000	14	Chronic and acute
Doss 2000	6	Sternal	Lang 1997	15	Chronic and acute
Catarino 2000	7	Sternal	Gustafsson 2002	16	Sternal
Wild 2004	10	Abdominal			
Page 2004	8	Foot wounds			

* Include surgery closure

Table 3. Conclusions in systematic reviews

Authors	RCT	Non RCT	Case studies	Conclusions
DIABETIC WOUNDS				
Pham 2006	C, E		18	+
Ubbink 2008b	A, C, D, E			+ / -
Gregor 2008	A, C	D, E		+ / -
Vikatmaa 2008	A, C, D, E			+
Noble Bell 2008	A, C, D, E			+ / -
Hinchcliffe 2008	A, C, E			+ / -
Blume 2008 (update)	B			+
PRESSURE ULCERS				
Pham 2006	F, G, H		15	-
Van den Boogard 2008	G, H, Q, R, S,			-
BURNS				
Wasiak 2007	N			-
INFECTED STERNAL WOUNDS				
Pham 2006		5, 6, 9	14	+
CHRONIC AND ACUTE WOUNDS				
Samson 2004	C, E, G, H, R, S			-
Costa 2005	C, G, H, L, R, S	2, 5, 6, 7, 9, 10, 16		-
OHTAC 2006	A, G, H, L, R, S			-
Ubbink 2008a	C, E, G, H, P, R, S			-
Gregor 2008	A, C, G, H, L, R, S	1, 2, 3, 4, 5, 8, 13, 16, D, E		+ / -
Pham 2006	M, R, S		12, 18	+
Ubbink 2008b	P, Q, R, S			-
Vikatmaa 2008	L, O, P, Q, R, S			+
SKIN GRAFTS				
Pham 2006	F, I, J, L	2	13, 16	+
Vikatmaa 2008	K, L			+
ABDOMINAL WOUNDS				
Gregor 2008		8		+

NWPT effectiveness → +: Superior; +/-: Unclear; - Inferior

REFERENCES:

- Blume, PA et al. coll., 2008. Diabetes Care, (Vol.31, pp.631-636);
- Costa, VJ et al., 2007. McGill University Health Centre;
- Gregor, SM et al., 2008. Archives of Surgery, (Vol.143, pp.189-196);
- Hinchcliffe, RJ et al., 2008. Diabetes/Metabolism Research and Reviews, (Vol.24, pp.S119-S144);
- Noble-Bell, G et Forbes, A., 2008. International Wound Journal, (Vol.5, pp.233-242);
- OHTAC, 2006. Ontario Health technology assessment series, (Vol.6);
- Pham, CT et al., 2006. Journal of Wound Care, (Vol.15, pp.240-250); Samson, D et al., 2004. Evidence Report Technology Assessment, pp.1-6.; Sauerland, S et al., 2006. Institute for Quality and Efficiency in Health Care (IQWiG), pp.Final report No.04);
- Ubbink, DT et al., 2008a. Cochrane Database Systematic Reviews, pp.CD001898);
- Ubbink, DT et al., 2008b. British Journal of Surgery, (Vol.95, pp.685-692); Van Den Boogaard, ME et al., 2008. European Journal of Plastic Surgery, (Vol.31, pp.1-7);
- Vikatmaa, P et al., 2008. European Journal of Vascular and Endovascular Surgery, (Vol.36, pp.438-448);
- Wasiak, J et Cleland H., 2007. Cochrane Database Systematic Reviews, CD006215).

Table 1. Search strategy

Study types	<ul style="list-style-type: none"> Systematic reviews Randomized controlled studies Meta analysis HTA reports
Patients	Treated for a complex wound (hospital or homecare)
Intervention	NPWT
Comparator	Other wound treatments
Primary Outcome	<ul style="list-style-type: none"> Complete wound closure Time for complete wound closure
Wound etiologies	<ul style="list-style-type: none"> Chronic and acute wounds Diabetic foot ulcers Pressure ulcers Burns Abdominal wounds Sternal wounds Graft

WOUNDS	
Pubmed	"Wounds and Injuries"[Mesh] OR "Wound Healing"[Mesh] OR wound*
Embase	'wound'/exp OR 'wound' OR wound* OR 'wound care'/exp OR 'wound care'
NPWT	
Pubmed	"Negative-Pressure Wound Therapy"[Mesh] OR "Negative-Pressure Wound Therapy" OR "topical negative pressure" OR "Vacuum" OR "vacuum-assisted" OR "negative pressure" OR VAC OR "suction dressing" OR "sub-atmospheric" OR "subatmospheric" OR NPWT OR V.A.C.
Embase	'negative-pressure wound therapy'/exp OR 'negative-pressure wound therapy' OR 'topical negative pressure'/exp OR 'topical negative pressure' OR 'vacuum'/exp OR 'vacuum' OR 'vacuum-assisted' OR 'negative pressure' OR vac OR 'suction dressing' OR 'sub-atmospheric' OR 'subatmospheric' OR npwt OR v.a.c.

Overall quality of primary studies was low (small number of participants, random assignment, short follow-up, inappropriate comparator, various outcome indicators, high rate of loss to follow-up, lack of blinding, company funding...) (Table 2)

NPWT may be more effective than modern dressings for diabetic wounds (ulcers or amputation) (Table 3). However, primary studies contained important limits (high rate of loss to follow-up, company funding, choice of the duration of the studies). Level of evidence is weak.

For other category of wounds, the clinical effectiveness of NPWT is unclear (Table 3). Level of evidence is undetermined.

CONCLUSION

Well designed studies are needed to assess NPWT effectiveness and safety in the management of acute and chronic wounds. Although this technology is broadly used in healthcare settings, high quality data could allow the development of good clinical practices.

FUNDING:
Agence de la sant  et des services sociaux de la Capitale-Nationale

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