

Postoperative dressing and management strategies for transtibial amputations: A critical review

Douglas G. Smith, MD; Lynne V. McFarland, PhD, MS; Bruce J. Sangeorzan, MD; Gayle E. Reiber, PhD, MPH; Joseph M. Czerniecki, MD

Journal of Rehabilitation Research and Development Vol. 40, No. 3, May/June 2003 Pages 213–224

Background: Postamputation management is an important determinant of recovery from amputation. However, consensus on the most effective postoperative management strategies for individuals undergoing transtibial amputation (TTA) is lacking. Dressings can include simple soft gauze dressings, thigh-high rigid cast dressings, shorter removable rigid dressings, and prefabricated pneumatic dressings. Postoperative prosthetic attachments can be added to all but simple soft dressings. These dressings address the need to cleanly cover a fresh surgical wound, but not all postoperative dressings are designed to facilitate the strategic goals of preventing knee contractures, reducing edema, protecting from external trauma, or facilitating early weight bearing. The type of dressing and management strategy often overlap and are certainly interrelated. Current protocols and decisions are based on local practice, skill, and intuition. The current available literature is challenging, and difficulties include variations in healing potential, in comorbidity, in surgical- level selection, in techniques and skill, in experience with postoperative strategies, and with poorly defined outcome criteria.

Objectives: This paper reviews the published literature and compares measures of safety, efficacy, and clinical outcomes of the various techniques.

Criteria for selecting studies for this review:

- **Types of studies:** 10 TTA controlled studies (Table 1,2,3)
- **Types of participants:** TTA
- **Types of interventions:** Table 1,2,3
- **Types of outcome measures:** Table 1,2,3

Search strategy for identification of studies: The sources that we searched to obtain data for this review were PubMed (from 1960 to March 2002), Index Medica using MEDLINE (from 1960 to March 2002), reference lists from articles, reviews and book chapters, and personal communication with content experts.

Conclusion: The literature supports that rigid plaster cast dressings result in significantly accelerated rehabilitation times and significantly less edema compared to soft gauze dressings, and prefabricated pneumatic prostheses were found to have significantly fewer postsurgical complications and required fewer higher-level revisions compared to soft gauze dressings. No studies directly compared pneumatic prostheses with rigid dressings, and no reports compared all types of dressings within one study. In conclusion, the literature and evidence to date is primarily antidotal and insufficient to support many of the claims. Future randomized trials on TTA dressing and management strategies are clearly needed to collect the evidence needed to best guide clinicians with the decision.

Postoperative dressing and management strategies for transtibial amputations: A critical review

Table 1.

Postoperative outcomes of different types of TTA dressing and management strategies from descriptive studies.

Type of Dressing	Study Design	Number of TTA Patients	Reported Claims	Reference
Soft Gauze	Case series	17	Tourniquet effect	Isherwood et al. [13]
Rigid Cast No IPOP	Case review	100	Less swelling, prevents knee contracture protective of trauma	Golbranson et al. [33]
Rigid Cast No IPOP	Case series	186	Time to final prosthesis 7 weeks less swelling, 76% rehabilitated, 4.5% mortality	Cummings [34]
IPOP	Case series	134	64% rehabilitated, 5% mortality	Samiento et al. [35]
IPOP	Case series	20	90% 1° healing, time to permanent prosthesis 27 days, 0% mortality, 10% higher-level revisions	Moore et al. [36]
IPOP	Case series	10	60% 1° healing, 20% mortality	Warren & Moseley [37]
IPOP	Case series	37	60.5% 1° healing, 30% no postoperative narcotics for pain, 10.8% higher level revisions, 8% mortality	Condon & Jordon [38]
IPOP	Case control survey*	161	Rehabilitated 78% if ischemic, 98% nonischemic, 12% mortality if ischemic, 0% if nonischemic	Kihn et al. [39]
IPOP	Case series	11	91% 1° healing, time to permanent prosthesis 32 days, 0% mortality, 82% use of permanent prosthesis	Kraeger [40]
IPOP	Case survey	170	76% rehabilitated, 8% mortality	Jones & Burniston [41]
IPOP	Case survey	17	76% rehabilitated, 12% mortality	Weinstein et al. [16]
IPOP	Case control*	59	86% rehabilitated, time to rehabilitation 15 days, 5% mortality	Folsom et al. [42]
Air Splint	Case series	11	Time to rehabilitation 6–8 weeks, no knee contractures	Kerstein [43]
Air Splint	Case histories	3	100% rehabilitated, 0% mortality	Bonner & Green [21]
Air Limb	Case series	38	86% rehabilitated, 0% mortality	Pinzur et al. [44]

IPOP = immediate postoperative prosthesis

TTA = transtibial amputation

*No data on controls provided.

Postoperative dressing and management strategies for transtibial amputations: A critical review

Table 2.

Postoperative outcomes associated with wound healing in different types of TTA dressing and management strategies from controlled or comparative studies.

Outcomes	Number in Study	Soft Dressings	Thigh-Level Rigid Cast	Thigh-Level Rigid with IPOP	Short Removable Rigid Cast	Prefabricated Pneumatic IPOP	Reference
Time to Wound Healing (days)*	49	109.5	—	—	46.2	—	Wu et al. [18]
1° Wound Healing†	27	11 (78%)	13 (100%)	—	—	—	Nicholas & DeMuth [45]
	100	—	43 (53%)	40 (85%)	—	—	Moore et al. [17]
	51	14 (58.3%)	18 (66.7%)	—	—	—	Baker et al. [30]
	48	35 (89.5%)	—	4 (44%)	—	—	Cohen et al. [46]
	70	19 (56%)	23 (68%)	—	—	—	Barber et al. [47]
2° Wound Healing‡	100	—	12 (23%)	2 (4%)	—	—	Moore et al. [17]
	51	6 (25%)	5 (18.5%)	—	—	—	Baker et al. [30]
	70	8 (23%)	8 (23%)	—	—	—	Barber et al. [47]
Postoperative Pain§	27	48.4 m.e.	41.6 m.e.	—	—	—	Nicholas & DeMuth [45]
	52	3.47 mg/d	—	3.9 mg/d	—	—	Kane & Pollak [48]
Postoperative Complications¶	100	—	7 (14%)	1 (2%)	—	—	Moore et al. [17]
	52	3 (17%)	—	7 (21%)	—	—	Kane & Pollak [48]
	42	15 (65.2%)	—	—	—	3 (15.8%)**	Schon et al. [20]
Higher-Level Revision Required	100	—	13 (24%)	5 (11%)	—	—	Moore et al. [17]
	182	17 (22%)	3 (6%)	7 (12%)	—	—	Mooney et al. [12]
	48	1 (2.7%)	—	3 (33%)	—	—	Cohen et al. [46]
	42	10 (43.5%)	—	—	—	0 (0%)**	Schon et al. [20]
		4 (16.7%)	4 (14.8%)	—	—	—	Baker et al. [30]
		8 (44%)	—	9 (26%)	—	—	Kane & Pollak [48]
Volume Decrease	16	31.2 ± 49	—	—	70.1 ± 21.3**	—	Mueller [14]

*Interval between amputation and ordering prosthesis; statistical significance not addressed by authors.

†1° healing = uncomplicated residual-limb healing

‡2° healing = delay in healing

§Measured by either number morphine equivalents (m.e.)/wk or mg/d.

¶Post-op complications include residual-limb infections, bruising, burns, ulcers, and necrosis.

** $p < 0.05$

Postoperative dressing and management strategies for transtibial amputations: A critical review

Table 3.

Postoperative outcomes associated with rehabilitation in different types of TTA dressing and management strategies from controlled or comparative studies.

Outcomes	Number in Study	Soft Dressings	Thigh-Level Rigid Cast	Thigh-Level Rigid with IPOP	Short Removable Rigid Cast	Prefabricated Pneumatic IPOP	Reference
Use of Prosthesis	27	12 (85.7%)	10 (76.9%)	—	—	—	Nicholas & DeMuth [45]
	52	4 (22%)	—	19 (56%)	—	—	Kane & Pollak [48]
	182	45 (59%)	34 (65%)	40 (74%)	—	—	Mooney et al. [12]
	48	31 (79.8%)	—	8 (83%)	—	—	Cohen et al. [46]
Time to Initial Rehabilitation (days)	51	35.5	29.6*	—	—	—	Baker et al. [30]
Weeks to Permanent Prosthesis or Final Ambulation	49	27.0	—	—	14.6	—	Wu et al. [18]
	100	—	17.8	4.6	—	—	Moore et al. [17]
	182	40.0	32.0	34.0	—	—	Mooney et al. [12]
	42	13.6	—	—	—	20.4	Schon et al. [20]
Number of Falls	42	11 ± 0.18	—	—	—	34 ± 0.42	Schon et al. [20]
Length of Stay (days)	27	34.0	35.0	—	—	—	Nicholas & DeMuth [45]
	52	25.0	—	34.0	—	—	Kane & Pollak [48]
	51	22.3	22.6	—	—	—	Baker et al. [30]
Rehabilitation Failure	52	5 (28%)	—	4 (12%)	—	—	Kane & Pollak [48]
	51	4 (17%)	4 (15%)	—	—	—	Baker et al. [30]
	48	1 (2.7%)	—	7 (78%) [†]	—	—	Cohen et al. [46]
	70	7 (20%)	3 (8.6%)	—	—	—	Barber et al. [47]
Mortality (%)	182	8.0	5.0	6.0	—	—	Mooney et al. [12]
	100	—	8.0	0.0	—	—	Moore et al. [17]
	48	2.7	—	0.0	—	—	Cohen et al. [46]
	52	11.0	—	12.0	—	—	Kane & Pollak [48]
	70	5.7	8.6	—	—	—	Barber et al. [47]

* $p < 0.05$

[†]Four of the seven caused by blistering secondary to incorrect technique (hot plaster).