RESEARCH ANALYSIS PolyMem[®] dressings decrease inflammation and wound pain — the evidence

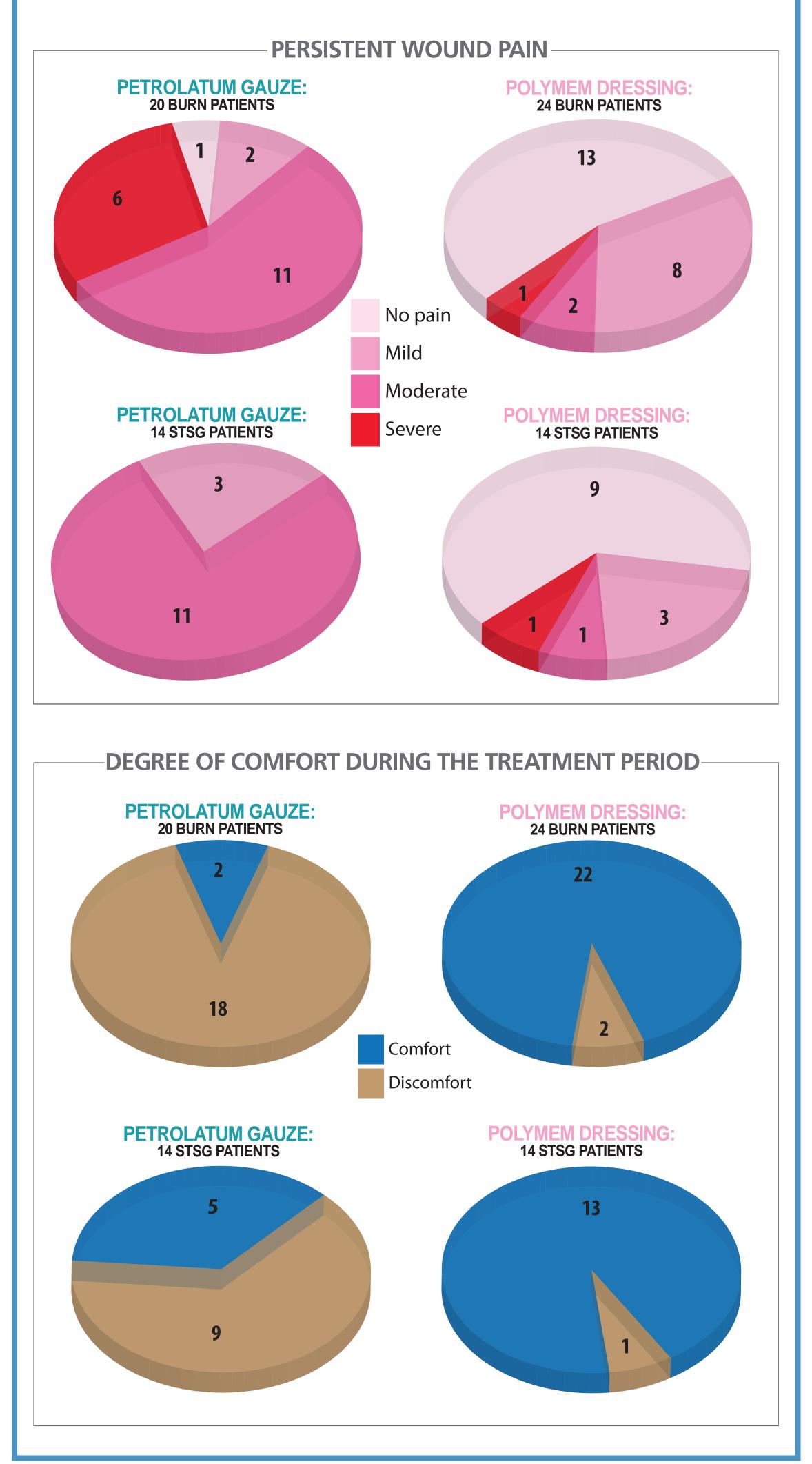
PURPOSE

Persistent wound pain not only decreases the quality of life for the patient, but it also directly inhibits healing by producing a stress response, which promotes a catabolic state.^{1,2} In addition, wound pain predisposes the patient for wound infection through depression of the immune system.² Patients with multiple comorbidities and the elderly are often poor candidates for systemic pharmaceutical pain relievers. Even when they are prescribed, systemic products do not always address wound pain well.

Topical pharmaceutical pain relievers such as ibuprofen and lidocaine have local sideeffects that can increase infection risks and/ or directly impair wound healing.³⁻⁹ Studies indicate that inflammation often plays a critical role in the etiology of many wound types, but anti-inflammatory drugs such as prednisone inhibit wound healing. Can any intervention truly promote wound healing while decreasing inflammation and persistent wound pain?

BURN AND GRAFT PATIENT STUDY¹¹

A Korean group investigated the effects of PolyMem dressings on wound healing and pain in 1999. Their work was published in a peer-reviewed journal, but since it was in Korean, it went largely unnoticed. Later, the authors directed a translation into English, from which this information was obtained. Using anesthetized rabbits, the authors determined that epithelization was significantly increased with PolyMem dressings (p < 0.05). They went on to test PolyMem dressings in a 72-patient controlled study of pain, healing time and comfort level on patients with burns and on patients with split-thickness skin graft (STSG) donor sites. PolyMem dressings were significantly superior to standard care for each of the three parameters (p<0.01). The authors reported that the dressings were also easy to use and economical.



RATIONALE

Pain and trauma associated with dressing changes (procedural pain) can be minimized by using a non-adherent dressing,¹⁰ such as PolyMem dressings.^{11,12} Components of these sophisticated dressings also work synergistically to provide continuous cleansing of the wound bed, usually completely eliminating the need for manual wound bed cleansing or even rinsing at dressing changes.¹²⁻¹⁶ Wound bed cleansing pain.1

But this study focuses on persistent wound pain, including examining the scientific physiological explanation for claims that PolyMem dressings inhibit the nociceptor response, even through intact skin.^{12-16,18} The resulting decreased pain and inflammation should dramatically improve wound healing.^{1,2} In addition, any drug-free persistent wound pain relief would avoid negative side-effects inherent in the use of currently available systemic and topical pharmaceutical agents.

BLUNT TRAUMA ANIMAL MODEL¹⁹

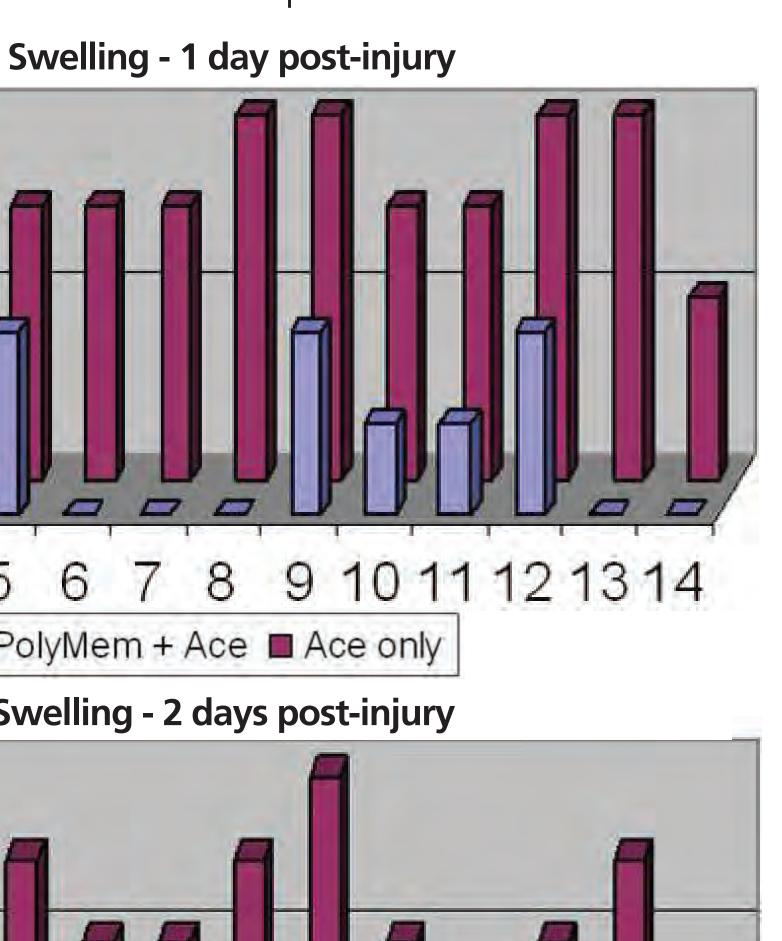
A woman fell from a ladder, leaving a significantly painful area with a very slight abrasion. She placed a PolyMem dressing on the area, hoping that it would alleviate the pain.

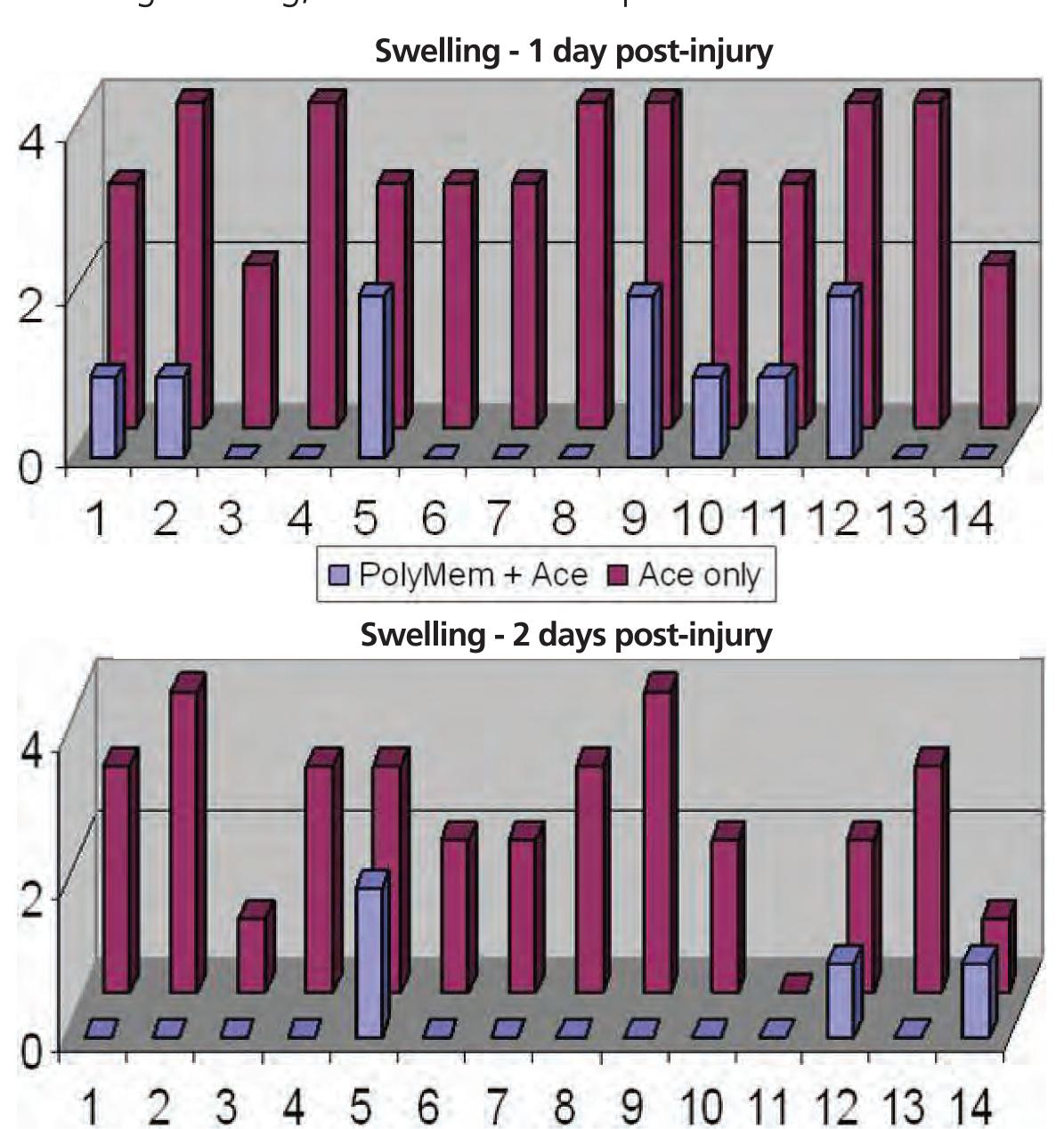
The woman experienced a complete absence of tenderness, swelling and bruising in the area covered by the dressing, but the injured area that was left exposed exhibited the expected response – note the line of ecchymosis (photo,

The surprising dressing-shaped area without ecchymosis exhibited by the woman who fell in the office, coupled with amazing results when PolyMem dressings were used postarthroscopic knee surgery on a 65-year-old man, led Dr. Kahn of the University of Minnesota to do studies using the dressings over intact skin. The results were presented at the World Pain Conference in 2000.

- Uniform blunt trauma was applied to both legs on 14 anesthetized animals
- A PolyMem dressing plus a compression wrap were applied to one leo
- Only the compression wrap was applied to the other leg
- Two independent blinded observers evaluated swelling on a 0 - 4 scale at 24 and 48 hours

The author concluded: "Preliminary experimental evidence suggests that this cutaneous dressing inhibits the activity of the nociceptive neurons in the epithelium which, in turn, blocks the response of the spinal dorsal root mechanism that is responsible for generating swelling, inflammation and pain."¹⁹





MKL-402, REV-0, 0509

Roger C. Sessions, DO, FACEP | Chairman and CEO, Ferris Mfg. Corp., 16W300 83rd Street, Burr Ridge, IL 60527 USA

METHODOLOGY

A thorough search of the peer-reviewed published data discussing this dressing's possible effect on inflammation and wound pain was performed to determine the robustness of the evidence for its ability to decrease inflammation and persistent wound pain. We identified four scientific studies: a 72-patient controlled study of pain and comfort level on burn and split-thickness skin graft patients, a 24-patient controlled study of pain and inflammation following arthroscopy and two rigorous animal studies performed by independent laboratories. We also examined the four published large facility-based product evaluations. Finally, we did a meta-analysis of is an often overlooked source of procedural every published peer-reviewed patient case study or series (187 individual patients) to identify how PolyMem dressings may influence persistent wound pain in clinical practice.

OBJECTIVES

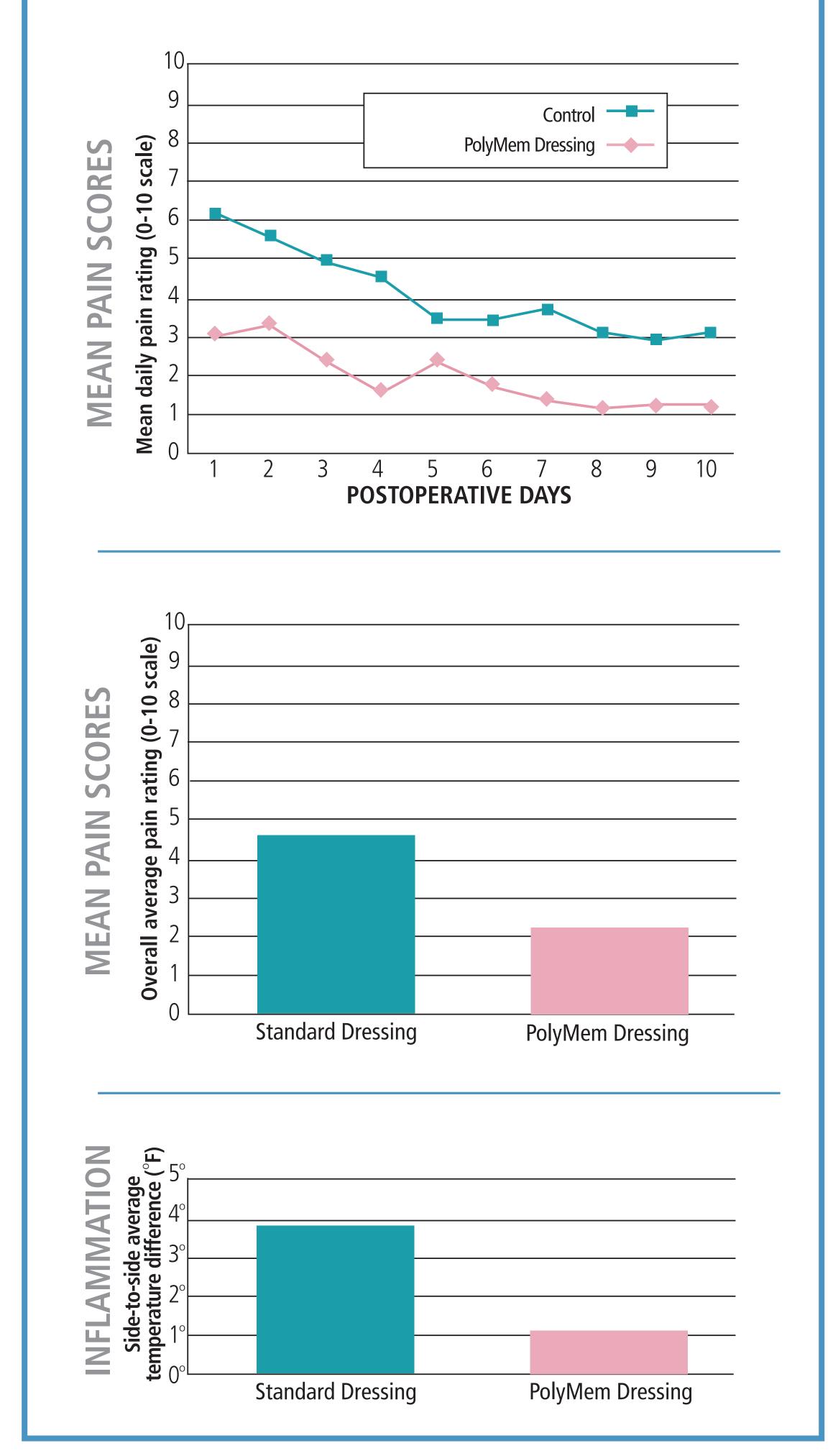
- 1. Recognize that side effects of many pharmaceuticals currently available for wound pain can hinder healing.³⁻⁹
- 2. Review the evidence found in patient case studies and in rigorous scientific studies, for PolyMem dressings' ability to influence the nociceptor response, which can often decrease wound pain.
- 3. Consider the advantages of using a drug-free dressing over using systemic or topical medications for the relief of wound pain.





A 24-patient randomized controlled study of pain and inflammation using PolyMem dressings following arthroscopy was performed. The results were published in the Medline indexed journal, Orthopedics, in 2003.

Pain and skin temperature (an indicator of inflammation) were compared in 24 patients randomized to the use of PolyMem wraps or standard dressings following minor arthroscopic knee surgery over a ten day period. The treating surgeon, who performed the post-operative evaluation on day 10, was blinded. Despite equal use of pain medication, pain scores were significantly lower for the PolyMem group on each of the ten days, when compared to the controls. The PolyMem group demonstrated lower overall pain scores (p=0.03) and also lower temperatures (p=0.02) than the control group.



RESULTS

Laboratory research unequivocally concludes that PolyMem dressings achieve significant pain relief by inhibiting the nociceptor response both locally and centrally.¹⁹⁻²¹ It appears that the dressing is also influencing other receptors resulting in additional analgesia beyond that anticipated by its antinociceptive properties (see data, below).²⁰⁻²¹

The facility-based evaluations found decreased pain, spasticity and bruising and increased patient mobility when PolyMem dressings were used. The decrease in persistent wound pain provided by PolyMem dressings was one of the critical factors influencing the choice to use PolyMem dressings (see map) in each of the four large evaluations. 13, 16, 23, 24

Persistent wound pain was mentioned as a problem for 88 of the 187 case study/series patients. The independent clinician authors attributed a reduction in persistent wound pain to PolyMem dressings in 83 of these patients (94%). In 67 cases (76%), the pain reduction was described as dramatic, very significant, etc. (see chart, right).

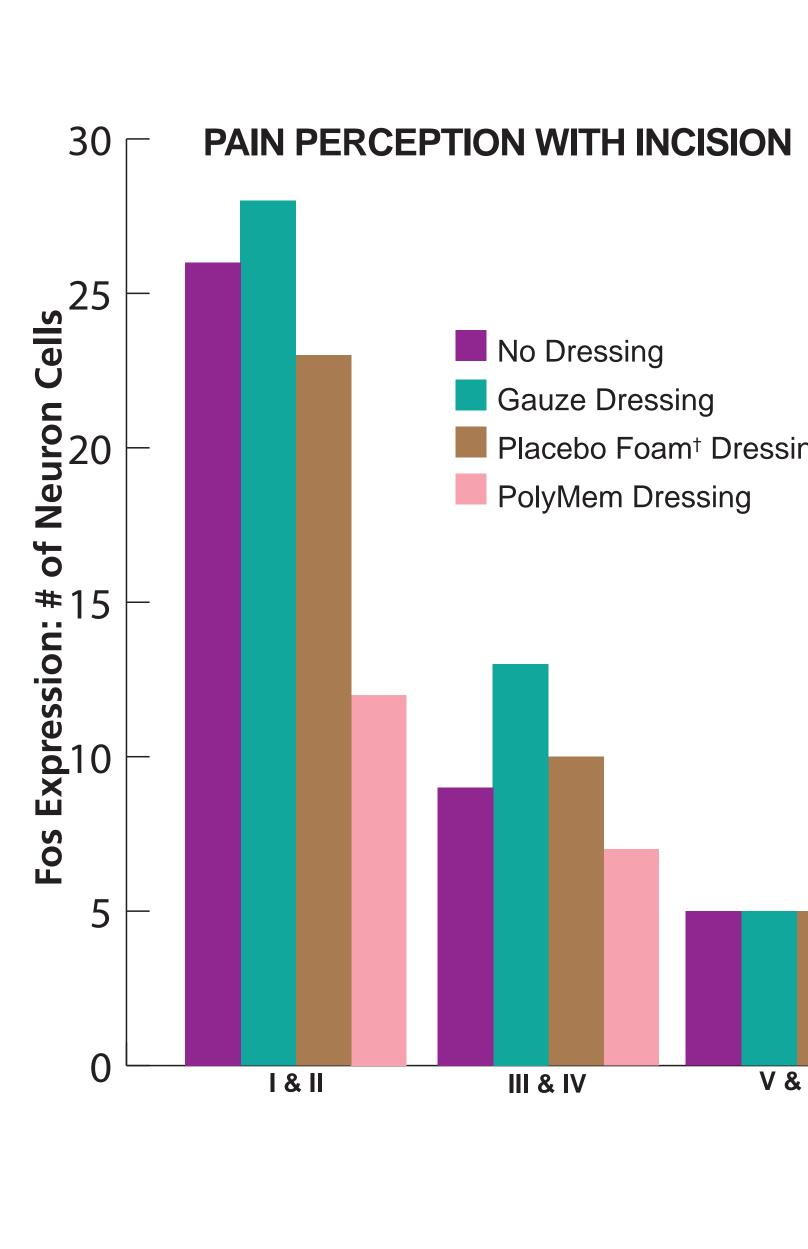
Preliminary findings (graphs below) showed a statistically significant decrease in spinal cord Fos labeling when animals with incisions wrapped with PolyMem dressings were compared to those wrapped with a placebo foam⁺ (p=0.005), gauze (P<0.0001) and no dressing at all (p=0.0017). Since the performance of the placebo foam⁺ on the animals receiving incisions was not statistically different from that of gauze (p=0.1740) or no wrap (p=0.8397), it was not included in the main study (histological slides, below, and graphs, far right). ⁺the same foam substrate found in PolyMem dressings, but without the added components

No Dressing

Gauze Dressing

Placebo Foam⁺ Dressing

PolyMem Dressing



The vertical lines (photos, right) on the histological slides measure the extent of the inflammation (purple stained cells) at the incision site. inflammatory cells are dramatically more localized with PolyMem dressings

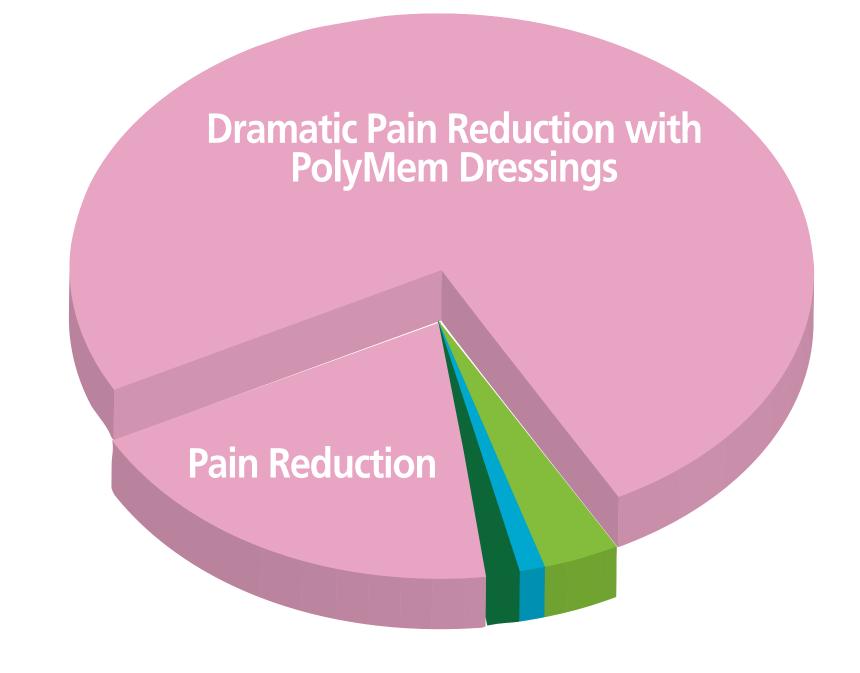
PolyMem dressings help reduce the spread of the inflammatory reaction into surrounding, uninjured areas. But there is no reduction in the robust localized inflammatory response required for healing the injury. Suppression of the spread of the inflammation and swelling cascade into the surrounding, uninjured tissues helps accelerate the healing process.

Based on Poster # WHS 104, Wound Healing Society, April 2009, Grapevine, Texas USA

CONCLUSION

PolyMem dressings definitely inhibit the nerve conduction that normally leads to pain and the inflammatory response, not only on wounds, but also when applied to intact skin. This reduction in the nociceptor response occurs without interfering with the robust localized inflammatory response required for healing the injury. These insights into the actions of this dressing formulation have exciting implications for persistent wound pain relief and wound healing in both chronic and acute wounds.

CASE STUDY META-ANALYSIS No Data: 3 Same Pain: 1 Worse: 1



A WOCN consultant evaluated various modern dressings for skin tears at nine long-term care facilities in the Chicago area: "...PolyMem dressings reliabl and reproducibly relieve the pain associated with skin tears both during dressing changes and during Activities of Daily Living." 24

INCISIONAL STUDY ON A RODENT MODEL^{20,21}

Surprisingly, when PolyMem dressings were applied to animals without incisions in the preliminary study, they showed significantly more Fos labeling than animals wrapped in the placebo foam^{\dagger} (p<0.0001) or no dressing at all (p=0.0042). The authors suggested that, while clearly the incised animals were exhibiting decreased nociceptor activity, PolyMem dressings must be activating non-nociceptive peripheral nerve fibers in the animals without incisions.

At the conclusion of the main study, the pain specialists hypothesized that PolyMem dressings use the same mechanisms as acupuncture and nitrous oxide administration. But, PolyMem dressings are noninvasive and do not have systemic effects.

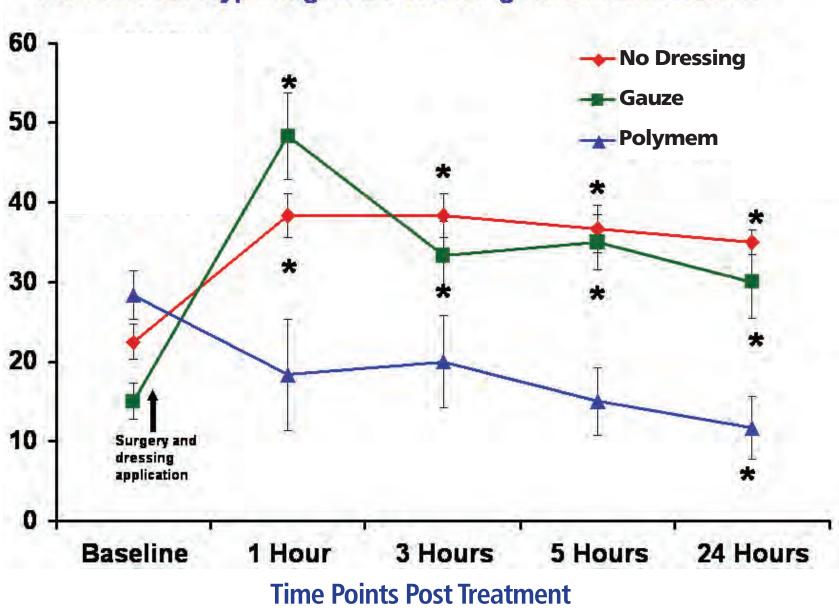
ANALGESIA WITH NO INCISION

No Dressing

15

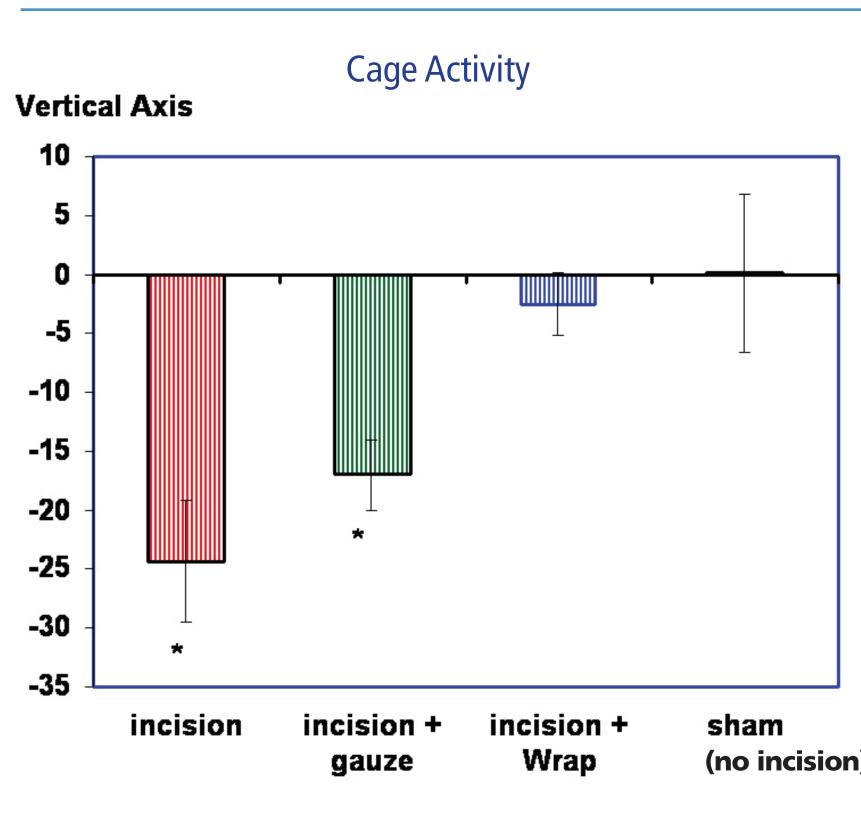
Placebo Foam[†] Dressing

PolvMem Dressing

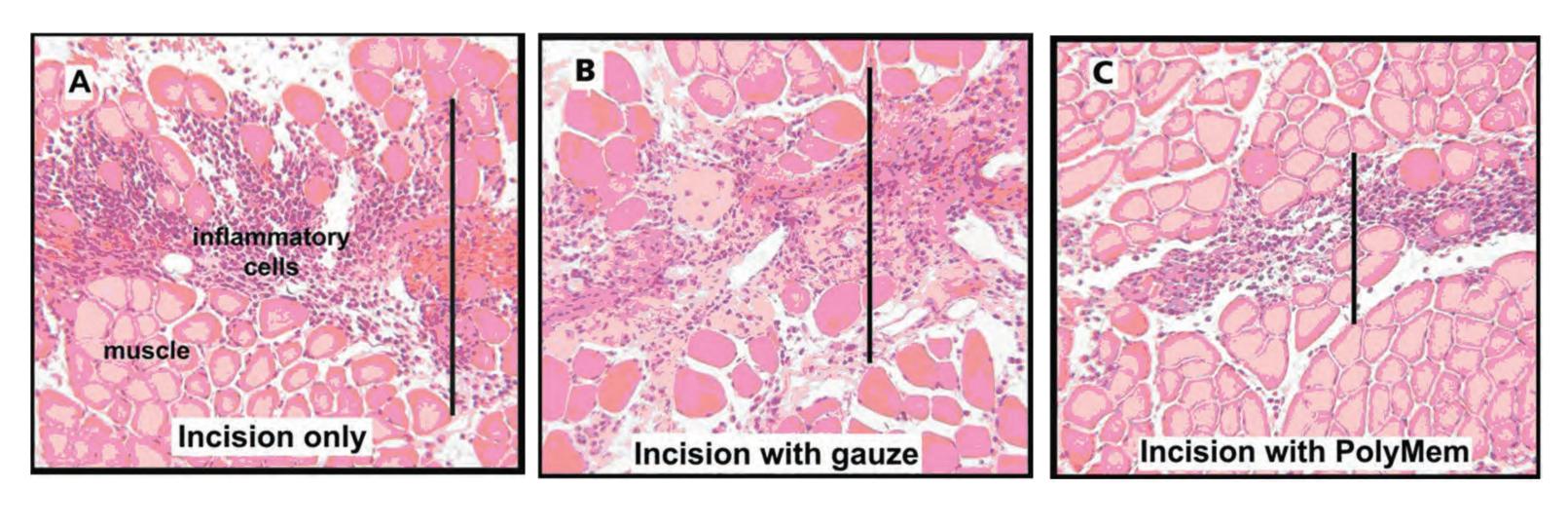


Withdrawal response due to hyperalgesia is the same with or without gauze, but it is much less with PolyMem dressings in place, indicating

* Statistically significantly different (p<0.0001) from PolyMem dressings



PolyMem dressings (Wrap) also reverse the decrease in cage activity, which is caused by wound pain, much more dramatically than covering the wounds with gauze. * Statistically significantly different from rats with no incision



FACILITY-BASED EVALUATIONS

wound dressings over a one year period and concluded: 'PolvMem dressings provide significant ^{*} wound pain relief (or in SCI cases, decreased spasticity)... All of our patients benefit from the quick healing and

pain relief of PolyMem

dressings..."¹⁶

When over 180 USA-based Long-Term-Care facilities compared PolyMem dressings using an evidence-based Skin Tear Protocol to their previous treatment, 71% switched to PolyMem dressings. Statistics showed: . a reduction in both episodes of bruising with injury and

welling in the area of injury. Patients using the PolyMem lressings skin tear protocol also reported decreased pain during dressing changes and decreased pain overall."²³

Mechanical Hyperalgesia Following Bilateral Incisions

REFERENCES

- 1. Clay CS, Chen, WYJ. Wound pain: the need for a more understanding approach. Journal of Wound Care. 2005;14:4,181-184.
- 2. Middleton C. Understanding the physiological effects of unrelieved pain. Nursing Times.
- September 16, 2003; 99(37):28-31. 3. Dvivedi S, Tiwari SM, Sharma A. Effect of ibuprofen and diclofenac sodium on experimental wound healing. Indian Journal of Experimental Biology, November 1997; 35:1243-1245
- 4. Proper SA, Fenske NA, Burnett SM, Luria LW. Compromised wound repair caused by perioperative use of ibuprofen. Journal of the American Academy of Dermatology. 1988; 18:1173-1179.
- 5. Brooks G, Yu X-M, Wang Y, Crabbe MJC, Shattock MJ, Harper JV. Non-steroidal antiinflammatory drugs (NSAIDS) inhibit vascular smooth cell proliferation via differential effects on the cell cycle. Journal of Pharmacy and Pharmacology, 2003: 55:519-526.
- 6. Salcido R. et al. Do anti-inflammatories have a role in wound healing? Adv Skin Wound Care. 2005 Mar;18(2):65-61. Session 301 Clinical Symposium on Advances in Skin and Wound Care, Oct. 23 – 26, 2005.
- 7. Jones MK, Wang H, Peskar BM, Levin E, Sarfeh IJ, Tarnawski AS. Inhibition of angiogenesis by nonsteroidal antiinflammatory drugs: insight into mechanisms and implications for cancer growth and ulcer healing. Nat Med. 1999 Dec;5(12):1418-23
- 8. Tarnawski AS, Jones MK. Inhibition of angiogenesis by NSAIDs: molecular mechanisms and clinical implications. J Mol Med, 2003; 81(10): p. 627-36.
- 9. Powell DM, Rodeheaver GT, Foresman PA, Hankins CL, Bellian KT, Zimmer CA, Becker DG, Edlich RF. Damage to tissue defenses by EMLA[®] cream. Journal of Emergency Medicine, 1999;9:205-209.
- 10. European Wound Management Association (EWMA). Position Document: Pain at wound
- dressing changes. London: MEP Ltd, 2002. 11. Kim Y, Lee S, Hong S, Lee H, Kim E. The effects of polymem on the wound healing. J Korean Soc Plast Reconstr Surg 1999;109:1165-1172.
- 12. Sessions RC. Severe road rash abrasions resulting in edema, inflammation, and pain in track race cycling athlete. National Athletic Trainers Association (NATA) 58th Annual Meeting & Clinical Symposia, June 26 – 30, 2007. Anaheim, CA USA.
- 13. Tamir J. Polymeric foam dressing for skin grafts donor sites: 3 years experience on 800 cases. 23rd Clinical Symposium on Advances in Skin and Wound Care. Poster #49, Oct 27 - 30, 2008. Las Vegas, NV, USA.

Medical Center in Israel switched to PolyMem dressings for all skin graft donor sites. They reported on over 800 cases: ...the use of pain medication in the ward was significantly reduced after PolyMem dressings were introduced. An additiona benefit was faster mobilization of our patients...The dramatic reduction in pain impressed us the

Plastic surgeons at Sheba

14. Sessions RC. Full-thickness chin wound healed in 14 days using only polymeric membrane dressings. WOCN Society 39th Annual Conference. Poster #1277, June 10 – 13, 2007. Salt Lake City, UT USA.

- 15. Hubbard M. Pain relief and healing using polymeric membrane dressings under compression for venous hypertension ulcers. 20th Annual Symposium on Advanced Wound Care (SAWC). Poster #160, Apr 28 – May 1, 2007. Tampa, FL USA.
- 16. Stenius M. Fast healing of pressure ulcers in spinal cord injured (SCI) people through the use of PolyMem[®] dressings. 10th anniversary EPUAP open meeting. Poster #21, August 30 – September 1, 2007. Oxford, England.
- 17. Fleck, CA. Managing wound pain: today and in the future. Advances in Skin and Wound Care 2007;20:3,138-145.
- 8. Benskin L. Dramatic pain relief through the use of polymeric membrane dressings (with and without silver) on a deep axillary wound. WOCN Society 38th Annual Conference. Poster #167/Abstract #1686, June 24 – 28, 2006. Minneapolis, MN USA.
- 19. Kahn AR. A Superficial Cutaneous Dressing Inhibits Pain, Inflammation and Swelling In Deep Tissues. World Pain Conference, July 15-21, 2000. Pain Medicine 2000 June;1(2):187.
- 20. Hayden JK, Cole BJ. The effectiveness of a pain wrap compared to a standard dressing on the reduction of postoperative morbidity following routine knee arthroscopy: a prospective randomized single-blind study. Orthopedics. 2003 Jan; 26(1):59-63.
- 21. Beitz A, Kahn A. Ferris PolyMem Plus™ dressing (REF 0548) Initial Study Summary: University of Minnesota. April 23, 2001. Unpublished.
- 22. Beitz AJ, Newman A, Kahn AR, Ruggles T, Eikmeier L. A polymeric membrane dressing with antinociceptive properties: analysis with a rodent model of stab wound secondary hyperalgesia. J Pain. 2004 Feb;5(1):38-47.
- 23. Benskin L, Bolhuis J. Evidence-based skin tear protocol yields phenomenal results. WOCN Society 40th Annual Conference. Poster # /Abstract #2403, June 21-25, 2008. Orlando, FL, USA.
- 24. Wilson D. Skin tear healing improved through the use of polymeric membrane dressings 21st Clinical Symposium on Advances in Skin & Wound Care. Poster #341. 2006;373,

This research analysis was funded by Ferris Mfg. Corp.

PolyMem[®] dressings are made by Ferris Mfg. Corp., Burr Ridge, IL 60527 USA • 800/POLYMEM