Clinics in Surgery

Editorial
Published: 13 Jul, 2017

Clinics in Podiatric Surgery

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Editorial

Significant changes have occurred in Podiatric Medicine in the past 20 years. Although the profession has been primarily focused on expanding the surgical training to include a uniform PSR 36, there has been a recent need to expand our capabilities in dermatology, lymphedema management, and wound healing. We have also reenergized our interest in biomechanics and greatly expanded our understanding of alternative therapies and nutraceuticals. The colleges, long invested in expanding our surgical abilities, have not kept up with the profession's need to know more and more medicine and each school has had to make significant investment in training facilities in this area. Nowhere is this change more obvious than in the area of wound care. Destined to become the next recognized medical specialty, wound healing has embraced podiatric medicine as an equal to allopathic and osteopathic medicine largely due to our expertise in diabetic foot management to which we owe a great debt to the early pioneers in the field such as Harkless, Armstrong, Lavery, and Frykberg.

Wound management has come a long way from the advent of moist wound healing, driven by the nursing community in the late 80s through the nineties, to multiple therapeutic options from negative pressure to cellular and acellular tissue-based products (CTPs) to enhance the rate and frequency of wound closure. Research investment in podiatric medicine has also expanded greatly from the days when 1 or 2 researchers received the majority of grants to today when Federal, State, and Corporate grants are available to numerous podiatric researchers in the field.

At Temple University we have received grants to study antifungal medications, dermatological preparations, compression dressings, offloading devices, and the effects of CTPs on wound healing. Beginning with porcine small intestinal submucosa in the late 90's the majority of our present works in the wound center has been in the study of placental derived tissues both cellular and acellular. Although significant improvement can be obtained with acellular materials whether porcine, bovine or ovine, cellular materials appear to produce better outcomes with even the most difficult wounds.

Despite advances in dressings the best that standard of care in wound healing has been able to achieve is approximately 49% closure at 12 weeks [1]. Sheehan demonstrated that percent change in wound area after 4 weeks of care was a strong predictor of healing at 12 weeks [2]. In that study the percent change in wound area at 4 weeks in wound healers was 82% (95%CI 70–94), as opposed to 25% (15–35; $P < 0.001$) in those who failed to heal by 12 weeks. Sheehan demonstrated that early intervention with advanced wound care products such as CTPs is recommended when 50% wound closure is not achieved within the first 4 weeks of therapy. Several clinical studies of CTPs have demonstrated various healing rates from 32% to 76.1% to date [3,4].

Continued research on new therapies to improve the healing process of stalled wounds has demonstrated that we need not settle for that [5,6]. Placental membranes have been used to treat wounds for over 100 years. The combination of growth factors, collagen-rich extracellular matrix and in some CTPs live cells provide the clinician to a powerful healing modality. The preservation of mesenchymal stem cells (MSCs), neonatal fibroblasts and epithelial cells in cryopreserved human amnionic membrane provides a significant jump start for non-healing wounds. Multiple growth factors and proteins including anti-scarring proteins (TGF-β3 and growth factor) [7], anti-microbial proteins (neutrophil gelatinase-associated lipocalin and defensins) [8] and angiogenic factors (vascular endothelial growth factor, platelet-derived growth factor [8] and basic fibroblast growth factor) are present in the matrix [8-10]. The addition of live cells and MSCs has made a significant difference in our ability to heal difficult to close chronic wounds. We have also been impressed with both our clinical experience and the results of the studies that show superior healing with cryopreserved human amnion that preserves the MSCs in the tissue over cellular dehydrated versions of the same tissue. A recent study just published by Johnson et al. pointed this out. In this

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Received Date: *26 Apr 2017*
Accepted Date: *07 Jul 2017*
Published Date: *13 Jul 2017*

Citation:
Robinson L, McGuire J. Clinics in Podiatric Surgery. Clin Surg. 2017; 2: 1557.

investigator initiated study of clinical outcomes, the authors compared two nonrandomized statistically equal homogenous patient cohorts totaling 79 patients and 101 wounds. 63% of the patients receiving the cryopreserved human placental membrane achieved complete closure within the study period compared to 18.2% of that receiving dehydrated amnion/chorion membrane. This clinical comparison of two very different versions of the same tissue increased our confidence in what had been demonstrated in controlled randomized studies and what we had suspected from our clinical observation.

The study we have just closed and a new one about to open will be to study this same technology. At the Foot and Ankle Institute of Temple University we are also conducting trials of a cadaver skin allograft, an offloading insert, a topical antifungal, and a competing cellular and acellular tissue product. In the past several years we have looked at fetal bovine tissue, compression systems, several antifungal medications, and DNA microbial assessment of chronic wounds. This is a far cry from the years when the only studies completed were case studies, basic research in the gait lab, and surgical case studies of materials and fixation systems. Wound care, dermatology, biomechanics, and the medical aspects of podiatric medicine are taking center stage again. Recently one of our clinicians was overheard discussing the varied aspects of their practice. After reviewing all their interests and the care they rendered the observer asked "I don't understand. Are you a surgeon, a dermatologist, a biomechanist, a physical therapist, or a wound care specialist? The clinician replied, "I am a podiatrist."

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