Skin tears are painful, partial-thickness wounds that are a result of fragile dermal and epidermal attachment. An estimated 1.5 million skin tears occur annually in the institutionalized elderly in the United States. In a single urban long-term care facility, Malone and colleagues reported an annual incidence of 0.92 tears per patient with approximately 80% occurring in the upper extremity. In addition to advanced age, trauma, sensory and cognitive impairment, poor nutrition, immobility, and previous skin tears, are often cited as risk factors. Based on the category of tear, treatment can vary from surgical tape and nonadherent dressings to absorbent dressings such as hydrogel, foam, and nylon-impregnated gauze. Experts recommend the use of nonadherent dressings to minimize tissue trauma and pain when the dressing is removed. In this randomized study we report initial results on the use of a transparent semi-permeable, occlusive, microbial cellulose dressing derived from *Acetobacter xylinum* in the treatment of skin tears in a frail elderly population.

**Materials and Methods**

Fifty-one consecutive residents, who presented with skin tears during the trial period from a single nursing home, were randomly assigned to one of two treatment groups. The study was approved by the Institutional Review Board, and either the patient or a relative gave informed consent. To insure
consistency in wound management, the nursing home staff were briefed on the skin tear treatment protocol and were given instruction on how to use the microbial cellulose dressing prior to the inception of the study. Upon identification of a new skin tear and assessment of the wound area, the wound was cleansed thoroughly with sterile saline and randomly assigned to either receive treatment with either microbial cellulose or a standard dressing, which consisted of Xeroform™ gauze (Covidien, Mansfield, MA) secured with a layer of Tegaderm™ (3M, St. Paul, MN) as a secondary dressing. The protocol was the standard of care in the facility. Standard dressings were changed every 3 days until fully epithelized. Microbial cellulose dressings were applied and covered with a protective stockinet. In most cases, only one application was required since the cellulose membrane adheres to the wound and biodegrades with epithelization. Wounds were inspected daily for loosening and drainage. The primary outcome was the time to complete wound closure. Pain management was evaluated using a numeric pain rating scale (VAS) where 0 represents “no pain” and 10 “worst possible pain.”

At the conclusion of the study, comparative data on ease of use and nursing satisfaction were assessed using a structured questionnaire. Statistical parameters included Student’s *t*-test with Levene’s test for normal distribution with ANOVA (SPSS, Chicago, IL).

**Results**

In this study of frail, elderly nursing home residents presenting with new skin tears, the mean age of both control (24 residents) and the microbial cellulose treated group (27 residents) was 87 years. Women represented more than 75% in both groups and the upper extremities, mainly forearms were affected in 14 (58%) patients in the control group and 14 (51%) of the residents treated with a microbial cellulose dressing. Whereas the average wound size was larger in the microbial cellulose treated group, the difference was not significant (control, 4.38 cm² ± 3.60; microbial cellulose, 6.82 cm² ± 11.06; *P* > .3).

Most of the skin tears were characterized by either partial or complete tissue loss (Payne-Martin category II and III). Healing time in both control and microbial cellulose treated residents was 24 days ± 19 and 21 days ± 12, respectively—an insignificant difference (*P* > .05). Using VAS, pain was experienced by 11 (40%) residents treated with microbial cellulose and was effectively controlled in 8 (73%). In the standard treatment group, 7 (30%) patients complained of pain; by comparison pain was only moderately controlled frequently requiring pain medication and worsened with dressing changes. As many as a third of the residents in both groups experienced various degrees of dementia precluding precise pain assessment. The majority of the participating nurs-
ing staff found the microbial cellulose membrane easy to apply without the need for a secondary dressings or dressing changes. In one patient the membrane fell off during bathing and had to be replaced. With respect to patient satisfaction, 100% of patients rated pain reduction with the cellulose membrane as “good” to “very good” with little or no skin irritation. By contrast, only 17 (70%) patients believed that the application of the standard dressings was “easy” or “very easy” to use but required multiple dressing changes that were associated with pain. Only 2 (10%) respondents using the standard dressing thought that pain reduction was “good” or “very good.”

A single application of a microbial cellulose membrane in a category III skin tear resulted in hemostasis, pain control, and healing in 14 days (Figure 1).

Discussion
Recently, we have reported a significant reduction in healing time in chronic nonhealing lower extremity ulcers following the application of the microbial cellulose wound dressing. In the present study, the application of a microbial cellulose dressing to skin tears in the frail elderly resulted in prompt epithelization of the wounds equivalent to standard care. In addition, significant pain reduction was achieved with minimal resources and thorough caregiver and patient satisfaction. The need for only a single application probably adds to the attributes of the membrane. Overall, 85% of the nursing staff was “very” or “extremely satisfied” with the microbial cellulose dressing.

Microbial cellulose is a biosynthetic microfibrillar cellulose membrane produced from a non-pathogenic bacteria, Acetobacter xylinum and is identical to plant cellulose, however it is free of lignin, pectin, and hemicellulose. In the wet state characterized by the area in contact with the wound, the wound dressing exhibits greater crystallinity, absorptive capacity, and mechanical strength, which enhances the capacity of the membrane as a temporary skin substitute. Since microbial cellulose also has autolytic debridement properties, biodegrades following wound closure, and requires only a single application without secondary dressings, resources are minimized.

Conclusion
A microbial cellulose wound dressing is effective in the management of skin tears in a frail elderly nursing home population.

References