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**Original Article**

# Human Amniotic Membrane Dressing: an Excellent Method for Outpatient Management of Burn Wounds

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**Abstract**

**Background:** Burns are among the most common traumas in developing countries, which consume large amounts of medical resources. It is important to find an appropriate material for dressing of burn wounds that improves healing and is readily available, easily applicable, and economical.

**Methods:** In a single-blind randomized controlled clinical trial from March to October 2006, 211 patients with less than 20% burn were enrolled into two groups. The first group contained 104 patients with average burn of 11.90± 3.80% of total body surface area (TBSA) for whom amnion dressing was used. The second group composed of 107 patients with average burn of 12.30± 4.14% of TBSA treated with routine silver sulfadiazine dressing.

**Results:** Amniotic membrane usage was accompanied by acceleration in wound healing, less need for skin graft, and less pain. The mean healing time in superficial parts of burn wounds in the amnion group was significantly shorter than the control group (9.50±2.13 *v* 14.30±2.60 days; P value < 0.01). The extent of the wound with granulation tissue which needed skin graft was less in the amnion group (2.10 ± 2.21% *v* 4.20±1.44%; P value < 0.01).

**Conclusion:** Widespread use of amniotic membrane dressing is recommended for limited burn wound management.
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**Keywords** ● Amniotic membrane ● burn ● healing ● wound

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## Introduction

Burn injuries represent a major challenge to the use of available medical resources.[1] Almost 90% of burn injuries are minor and most of them happen in people with lower socio-economic class.[2] Therefore, reducing the expenses of burn treatment is an important goal alongside healing as the primary aim.

The main principles in the treatment of minor burns are control of pain, control of infection, promote healing, and decreasing repeated trauma to the burn surface that may injure the damaged epithelium and convert a superficial burn to a deeper tissue injury. All of these goals can be achieved by using amniotic membrane dressing.[2] It effectively relieves pain, protects

from secondary wound infection, promotes healing, adheres well to the wound, is easily applicable and most importantly, is economical.[2] The present study has been conducted to compare the effect of daily dressing with human amniotic membrane with topical antibiotics in outpatient management of limited burns to determine more effective and more economical method.

## Patients and Methods

In a prospective single-blind randomized controlled clinical trial from March 2006 to October 2006, 211 patients with 2nd and 3rd degree and less than 20% of total body surface area (TBSA) burn who were due to be treated as outpatients were divided into two groups regardless of the burn depth. The present clinical trial was approved by Ethical Committee of Shiraz University of Medical Sciences. All patients (or their parents in case of children) signed an informed consent. The patients who could not be followed due to factors including long distance between their homes and the medical center, non-cooperative patients, those referred after 72 hours of burn, or those refused of being included in the study were excluded from the trial.

In group one, the burn wounds were irrigated with normal saline and diluted povidone-iodine without debridement. Then a layer of human amniotic membrane was applied and covered with Vaseline gauze and dry gauze dressing. Dressing was changed every 3-4 days until complete healing of superficial burns or appearance of granulation tissue in deep wounds. The patients in group 2 were managed by irrigation with normal saline, povidone-iodine, and silver sulfadiazine ointment application and daily dressing change until superficial wound healing or granulation appearance of deep burns. For the comparison of pain, a scaled spectrogram (from 0 to 10, which 0 means no pain and 10 is the most severe pain the patient has ever experienced) was used (Box- Wisker plot). The pain was checked in each patient once before the dressing change and once after it.

The patients in both groups received oral analgesics (325mg/5mg Acetaminophen/Codeine or 400 mg ibuprofen tablets in adults, and ibuprofen suspension in children) in case of intolerable pain.

The amniotic membranes were obtained from placenta during elective cesarean sections of mothers without sexually transmitted disease, endometritis, or premature rupture of membranes (PROM) and who had negative VDRL, HIV, HCV, and HBS tests. The placenta should have normal color and smell and should not be contaminated with meconium. The amniotic membrane was delicately separated from chorion and placenta and washed thoroughly with normal saline until a whitish, smooth transparent layer remained. The amniotic membranes were placed in a sterile pot containing normal saline and 80 mg gentamicin and stored in refrigerator at 4° centigrade. A blood sample was drawn from umbilical cord and checked for VDRL, HIV, and HCV and HBS antigen. The amniotic membrane would be used only if all the above tests were negative. All samples stored for more than one week underwent weekly bacteriologic culture prior to their use to rule out bacterial contamination.

## Results

In the first group after 1-4 sessions of amniotic membrane dressing almost all superficial burns were completely healed. The amniotic membranes peeled 7-10 days after the last application. A well epithelialized surface appeared after the end of treatment. Table 1 shows demographic data and characteristics of the patients. The mean healing time in superficial parts of burn wounds in amnion group was significantly shorter than the control group (9.50±2.13 *v* 14.30 ± 2.60 days; P <0.01).

In deep second and third degrees burns application of amniotic membrane was accompanied by early separation of necrotic tissues in these wounds. The collection of necrotic tissue in this group caused separation of amniotic membrane, which necessitated multiple applications. Moreover, some patients developed fever (about 38-39 °C), although their

**Table 1:** Comparison of the patients' demographic data and characteristics.

| Variable | Amnion group | Control group | P value |
|---|---|---|---|
| Number of patients | 104 | 107 | |
| Male/Female | 61/43 | 62/45 | 0.40 |
| Burned TBSA (%) | 11.90±3.80 | 12.30±4.14 | 0.45 |
| Mean age(years) | 17.30±12.42 | 19.10±11.56 | 0.43 |
| Healing time(day) | 9.50±2.13 | 14.30±2.60 | <0.01 |
| Time ready for graft | 18.50±2.15 | 27.20±67 | <0.01 |
| Needed skin graft (%) | 2.10±2.21 | 4.20±1.44 | <0.01 |

TBSA: Total body surface area

general condition remained satisfactory despite their relatively high fever. We continued amnion dressing in this group every 3 days without antibiotic therapy and achieved good results. Fever was relieved after 2-4 days without any evidence of wound infection or sepsis.

Appearance of granulation tissue was earlier in this group than in the control group (18.5± 2.1 *v* 27.2± 6.0 days; P value<0.01).

The extent of the wound with granulation tissue that needed skin graft was less in the amnion group (2.10 ± 2.21% *v* 4.20 ±1.44%; P value<0.01). Table 2 shows the etiology of burn injuries in the two groups. The pain relief was dramatic in amnion group (table 3). This difference was noticed in both pre- and post-dressing period. Children were back to normal activity soon after amnion application and adults reported significant pain relief. Analgesic use was also lower in this group (7.48 ±3.40 *v* 40.52± 18 doses; P value<0.01).

**Table 2:** Etiology of burn in the study groups.

| | Amnion group (number of patients) | Control group (number of patients) | P value |
|---|---|---|---|
| Scald | 57 | 59 | 0.66 |
| Flame | 34 | 31 | |
| Flash | 10 | 13 | |
| Contact | 3 | 4 | |

**Table 3:** The pain score and need for analgesics.

| Parameter | Amnion group (mean ±SD) | Control group (mean ± SD) | P value |
|---|---|---|---|
| Pain (before dressing) | 2.08±1.51 | 4.43±1.90 | <0.01 |
| Pain (after dressing) | 3.90±2.38 | 7.40±1.85 | <0.01 |
| Analgesic (doses) | 7.48±3.40 | 40.52±18 | <0.01 |

## Discussion

Since John Staige Davis introduced human amniotic membrane as an effective dressing in 1910, several studies have provided evidence showing human amniotic membrane as an ideal dressing.[3,4,5] With advent of synthetic dressings including Opsite, DermaFilm, Duo-Derm, Biobrane, and the concern of infection transmission, the extensive use of amniotic membrane did not become popular in developed countries. On the other hand, availability of amniotic membrane and the very low price of its processing have attracted attention in developing countries to its extensive use.

Amniotic membrane adheres to the wound immediately. Several studies have shown that it is accompanied by rapid re-epithelialization and promotion of wound healing.[2,6,7,8] Amnion does not vascularize, however it stimulates angiogenesis through an unknown mechanism.[6] It has also been suggested that the mechanism responsible for the rapid healing and developing granulation tissue is inhibition of the protease activity, thus reducing the infiltration of polymorphonuclear leukocytes.[9] These mechanisms explain the more rapid wound healing in the amnion group.

Shallow burns will heal in 3 weeks and do not need skin graft. On the other hand, the difference in depth between a shallow burn that heals in 3 weeks, a deep partial-thickness burn that heals after several weeks with hypertrophic scar, and a full-thickness burn that would not heal, may represent a few tenths of millimeter. A burn undergoes a dynamic process in the first few days; a burn appearing shallow on day 1 may appear considerably deeper by day 3. Furthermore, the kind of topical care used can dramatically change the appearance of the burn. Every time that antibiotic and gauze dressing is changed, it traumatizes the fragile surface of the wound. Dressing repeats twice a day for several days which can eventually deepen the wound even for a few tenths of millimeter and change a shallow wound that does not need skin graft to a deeper wound. Amniotic membrane dressing needs less frequent dressing change (every 3-4 days) and does not traumatize the wound because amniotic membrane completely adheres to wound and does not need to be removed before a new amniotic membrane will be applied over it. This prevention of repeated traumatization and deepening of the wound seems to be the cause of decreasing the need for skin graft in amnion group.

Amnion dressing was accompanied by much less pain in burn patients. One reason is less frequent dressing change because patients experience more intensive pain after dressing change. Another cause is less inflammatory response to amniotic membrane. Human amniotic epithelial cells do not express HLA-A, B, C and DR or beta2 microglobulin on their surface.[10] This could contribute to the lower inflammatory responses and less inflammatory mediators in the burn area and less pain sensation.

In the previous studies, amniotic membrane dressing has been recommended only for superficial burns and there is no report in deep burns. In the present study, we had no case selection and all patients were recruited regardless of burn depth. We observed that superficial parts of burn wounds were epithelialized faster in patients with amnion dressing, which was consistent with previous studies. However, the unique and more interesting result was early separation of necrotic tissues

and burn scars in deep parts of wounds and appearance of granulation tissue.

Accordingly, we suggest widespread use of amniotic membrane as a safe, cheap and easy method of dressing in all burns in outpatient settings.

**Conflict of Interest:** None declared

## References


1 Onuba O, Udoidiok E. The problems and prevention of burn in developing countries. *Burns Incl Therm Inj* 1987; 13: 382-5.

2 Ravishanker R, Bath AS, Roy R. Amnion Bank- the use of long term glycerol preserved amniotic membranes in the management of superficial and superficial partial thickness burns. *Burns* 2003; 29: 369-74.

3 Robson MC, KrizekTJ, Koss N, Samburg JL. Amniotic membrane as a temporary wound dressing. *Surg Gynaccol Obstet* 1973; 136: 904-6.

4 Bose B. Burn wound dressing with human amniotic membrane. *Ann R Coll Surg Engl* 1979; 61: 444-7.

5 Colocho G, Graham WP 3rd, Greene AE, et al. Human amniotic membrane as a physiologic wound dressing. *Arch Surg* 1974; 109: 370-3.

6 Moerman E, Middelkoop E, Mackie D, Groenevelt F. The temporary use of allograft for complicated wounds in plastic surgery. *Burns* 2002; 28: S13-5.

7 Atanassov W, Mazgalova J, Todorov R, et al. Use of amniotic membranes as biological dressings in contemporary treatment of burns. *Ann Medit Burns Club* 1994; 7: 202-5.

8 Sawhney CP. Amniotic membrane as a biological dressing in the management of burns. *Burns* 1989; 15: 339-42.

9 Ghalambor AA, Pipelzadeh Mh, Khodadadi A. The Amniotic Membrane: A Suitable Biological Dressing to Prevent Infection in Thermal Burns. *Medical Journal of Islamic Academy of Sciences* 2000; 13: 113-8.

10 Akle CA, Adinolfi M, Welsh KL, et al. Immunogenicity of human amniotic epithelial cells after transplantation to volunteers. *Lancet* 1981; 2: 1003-5.