



## ORIGINAL RESEARCH PAPER

### CASE STUDY ON USE OF HARVESTED FRESH AMNIOTIC MEMBRANE GRAFT OVER SUPERFICIAL PARTIAL THICKNESS FACIAL BURNS

## General Surgery

**KEY WORDS:** Partial-Thickness Burns, Conventional Dressing, Biological Dressing, Amniotic Membrane, Pluripotent, Immune Privileged, Lund And Browder's Chart, Grades Clinical Score

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#### INTRODUCTION

Burns continue to be a devastating emergency that causes numerous physical and psychological impairments. Its significance for public health is demonstrated by the fact that bacteria are major contributors to nosocomial infections that cause septicemia and death in burn patients.(1) Burn injuries are classified based on a variety of variables, including depth, aetiology and percentage of body surface area injured. The degree of burn injuries is determined by a combination of the classifications listed above. Burns can be classed as "partial-thickness" or "full-thickness".(2) If the damage is restricted to the epidermis and the outer part of the dermis (a superficial partial-thickness burn), with the majority of the appendage structures intact, recovery will be quick (10-14 days) and the risk of scarring is low. If, on the other hand, the burn reaches deeper levels of the dermis, causing more tissue damage, the epithelium will take longer to repair (3-6 weeks) and there is a high risk of hypertrophic scarring.(2) Full-thickness burns cause the destruction of all layers of skin and usually require surgical intervention.(2) In the classic approach, the treatment of burn is via daily washing of the wound, removal of the dead tissue and antibiotic dressing until the formation of granulation tissue and then grafting.(1) The treatment of burn wounds remains one of the most difficult problems in medicine. The fundamentals of burn treatment include early debridement and skin transplantation.(3) Following successful debridement, synthetic or biological dressings are used to cover burn wounds until definitive skin grafting is achieved. To prepare the tissue for definitive coverage with skin grafts, this temporary covering of the wound bed allows the tissue to re-epithelialize in a better way.(3) Amniotic membranes (AMs) are a novel solution to the substandard temporary covering of burn wounds that has been used up to now. The amniotic membrane's biological characteristics could lead to improved scar quality and quicker healing.(3) Several mechanisms have been proposed to explain the unique positive benefits of the amniotic membrane. The main components of the amniotic membrane are the stroma and the spongy layer, which both contain significant regenerative factors and molecules; the basal membrane, which is composed of extracellular matrix proteins like collagen and fibronectin; and the epithelium, which is thought to be a reservoir of biologically active pluripotent stem cells.(3) It has been demonstrated that these elements facilitate the maintenance of the initial epithelial phenotype while inducing the proliferation, migration, and differentiation of epithelial cells.(3) Furthermore, the amniotic membrane has little or no antigenicity. This grants these allografts, an immune privileged status(3)

#### Case Study

A 11-year-old male child presented to New Civil Hospital's emergency department with alleged history of fire cracker burns over right side of face, neck, and dorsum of right hand (Fig 2). On examination there was superficial partial thickness burn wound over right side of face and neck including a total

body surface area of approximately 4% as per Lund and Browder Chart(4)(Fig 1). Patient's vitals were stable on presentation and intravenous fluids were started as per Modified Parkland's formula. Patient's burnt areas were cleaned with chlorhexidine diluted in normal saline and non-adherent dressing materials were applied after application silver sulfadiazine. Patient was shifted to Burns Intensive Care Unit (ICU) thereafter.

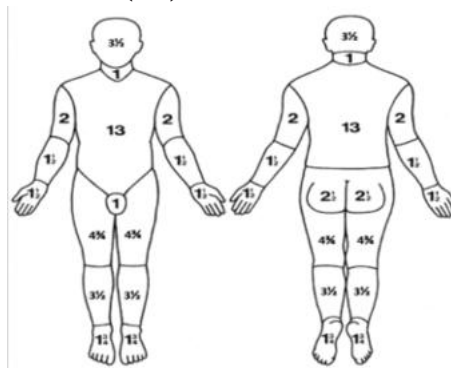


Fig 1. Lund and Browder Chart (4)



Fig 2. Approx. 4% Superficial Partial Thickness Facial Burns (Day 0)

#### MATERIALS AND METHODS

Wound swab from burnt area was sent on day of admission for culture and sensitivity (day 0). The child underwent 2 days of conventional dressing using chlorhexidine and antimicrobial

ointment/ cream (neomycin ointment was used in our study) and covering the areas with sterile Vaseline gauze (Fig 4). Application of fresh amniotic membrane was planned post 2 days of conventional dressing. Another wound swab was sent on day 2 before application of human amniotic membrane (day 2).

The placenta in fresh form was provided by Department of Obstetrics and Gynaecology in an elective caesarean section (Fig 5). The mother had been already tested negative for HIV, HbsAg, HCV, TORCH infections during her antenatal period. Amniotic membrane was separated under sterile conditions and washed thoroughly using broad spectrum antimicrobial solutions (Fig 6). The membrane was then transferred to the burns department immediately for application over the burnt areas (Fig 7). The burnt areas were covered with sterile paraffin gauze pieces for the amniotic membrane to retain moisture.

The dressing was kept in place for the next 48 hours and opened thereafter to evaluate the results compared to the initial 48 hours of conventional dressing. The evaluation was done in terms of pain score, healing, and signs of inflammation/ infection. Pain assessment was done on scale of 1-10 where denoted the lowest level of pain and 10 denoted highest level of pain. The clinical assessment of healing and inflammation/ infection was done based on GRADES Clinical Scale for skin regeneration assessment (Fig 3). The following clinical aspects are assessed: wound appearance, amount, and type of exudate, necrotic or detached tissue, granulation tissue, oedema, perilesional skin, and wound margins. The score assigned ranges from 1 to 4, depending on the presentation. The total sum of points represents the clinical status of the wound. This total score, indicates whether the wound is clinically improving or worsening. A decrease in the score relative to the baseline suggests clinical improvement, while an increase in the score indicates clinical worsening, which could be associated with infections, adverse reactions to treatment, rejection responses, underlying problems specific to the patient, or procedural errors during wound generation or follow-up(5). Patient was also observed for systemic signs of sepsis like fever, tachycardia, tachypnoea, or elevated leucocytes counts. Another (3<sup>rd</sup>) swab specimen from the burn area was sent for culture and sensitivity (day 4).

| SCORE |                         | 1        | 2        | 3                                                                                          | 4                                                                                            |                                                                                              |
|-------|-------------------------|----------|----------|--------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| G     | Granulation tissue      | 75-100%  | 50-75%   | 25-50%                                                                                     | <25%                                                                                         |                                                                                              |
| R     | Redness/Edema           | Absent   | Slight + | Moderate ++                                                                                | Abundant +++                                                                                 |                                                                                              |
| A     | Appearance of the wound | Erythema | Flushed  | Pale yellow                                                                                | Necrotic                                                                                     |                                                                                              |
| D     | Devitalized tissue      | Absent   | <25%     | 25-50%                                                                                     | 50%>                                                                                         |                                                                                              |
| E     | Exudate                 | Amount   | Absent   | Slight  | Moderate  | Abundant  |
|       |                         | Type     | Absent   | Serous  | Cloudy    | Purulent  |
| S     | Surrounding             | Skin     | Healthy  | Peeling                                                                                    | Erythematous                                                                                 | Macerated                                                                                    |
|       |                         | Edge     | Attached | Raised                                                                                     | Rolled                                                                                       | Necrotic                                                                                     |

Fig 3. GRADES Clinical Score for Assessment of Skin Regeneration



Fig 4. Day 2 (After 2 Consecutive Days of Conventional Dressing)

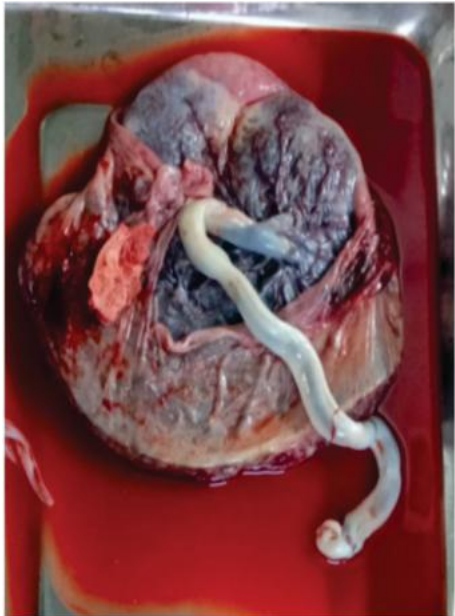


Fig 5. Placenta Obtained From Department of Obstetrics



Fig 6. Amniotic Membrane Separated in Sterile Manner and Thoroughly Washed with Broad Spectrum Antibiotic Solutions



**Fig 7. Fresh Harvested Amniotic Membrane Applied Over BurnWound**

### RESULTS

The pain status on day 1, 2, and 4 along with status of healing and infection are shown in the table given below (Table 1)

Day 1 – 24 hours after 1<sup>st</sup> conventional dressing  
 Day 2 – 24 hours after 2<sup>nd</sup> conventional dressing  
 Day 4 – 48 hours after 1<sup>st</sup> amniotic membrane dressing

On examination, the pain score was found to be 8 on day 1, ranged from 7-8 on day 2 and ranged from 3-4 on day 4 and was discharged with advice of topical antibacterial cream and coconut oil application. GRADES Clinical Score for Skin Regeneration has baseline value of 20 on admission which dropped to 18 on day 1 and subsequently on 14 on day 2 of conventional dressing. The score dropped to 8 on day 4 (i.e., 48 hours after amniotic membrane dressing) (Fig 8). There was no purulent discharge from burn wound or any signs of local or systemic sepsis during entire course of study. All swab culture reports sent on day 0, 2, and 4 were found to be negative for growth of any organisms.

**Table 1**

| DAY/ WOUND CHARACTER | Pain | GRADES Clinical Score for Skin Regeneration                                                              | Systemic signs of sepsis |
|----------------------|------|----------------------------------------------------------------------------------------------------------|--------------------------|
| Day 0                | 8    | 20<br>G – 4<br>R – 3<br>A – 2<br>D – 2<br>E – Amount – 3<br>E – Type – 2<br>S – Skin – 3<br>S – Edge – 1 | Absent                   |
| Day 1                | 8    | 18<br>G – 4<br>R – 3<br>A – 2<br>D – 2<br>E – Amount – 2<br>E – Type – 2<br>S – Skin – 2<br>S – Edge – 1 | Absent                   |

|       |     |                                                                                                          |        |
|-------|-----|----------------------------------------------------------------------------------------------------------|--------|
| Day 2 | 7   | 14<br>G – 4<br>R – 2<br>A – 1<br>D – 1<br>E – Amount – 2<br>E – Type – 2<br>S – Skin – 1<br>S – Edge – 1 | Absent |
| Day 4 | 3-4 | 8<br>G – 1<br>R – 1<br>A – 1<br>D – 1<br>E – Amount – 1<br>E – Type – 1<br>S – Skin – 1<br>S – Edge – 1  | Absent |



**Fig 8. Burn Wound After 48 Hours of Application of Amniotic Membrane Application (Day 4)**

### DISCUSSION

Biological dressings were presented as the gold standard for temporary wound coverage. All biologic dressings, except for the amniotic membrane, are susceptible to early response.(6) The use of amniotic membranes in burn therapy dates to 1912. Since then, various studies have been conducted to investigate the favourable effects of employing amniotic membranes as burn wound dressings, which result in an acceleration of the healing process and a reduction in bacterial colonisation of these important wounds.(3) The summative evidence on the beneficial effects of treating burns with amniotic membranes is extensive, including lower rates of infection, a significant reduction in pain before and after dressing changes, a reduction in hypertrophic scar formation, a shorter duration of skin graft take, a reduction in burn wound healing time, a reduction in the number of dressing changes required, a reduction in itching experienced, and, most importantly, a low immunogenicity. In terms of therapeutic use, its ease of handling, light weight, and elasticity make it perfect for usage even in complicated anatomical locations.(3)

One of the key advantages of wound coverage with amniotic membrane is that it does not appear to impede re-epithelization, lowers fluid, protein, heat and energy loss, promotes mobility and most important this may be the best

wound cover next to the patient's own skin.(7) Studies demonstrated that use of amnion in burn wounds can lead to reduction of pain intensity and prevent water and electrolyte disturbances and can help for early preparation of the wound bed for grafting.(6,7)

The preparation of amniotic membrane by our proposed method with simplicity and efficacy lead to decrease in all variables of our study including pain score and all parameters of GRADES Clinical Score for Skin Regeneration. Amnion protects the wound from irritation, evaporation, and dryness, as well as nerve ending stimuli on the wound surface, which are not present in standard conventional dressings. The amnion used in the first few days adheres strongly to the wound surface and has a positive modulation on the wound healing process, either in quality or speed. As a result, in this circumstance, potential wound healing complications such as colour change or hypertrophic scar formation can be reduced. The use of other dermal substitutes including commercially available wet collagen sheets, dried/dehydrated antibiotic coated amniotic and many other can also be used for similar purpose but are not cost effective. Fresh harvested amniotic membrane can therefore be an excellent alternative for people with low SES class as well. In the current study, we found no significant wound infection after dressing with amnion. The use of amniotic membrane can prevent bacterial infiltration of the wound's site. Various other studies reached similar outcomes.(1) The main possible adverse effects are the transfer of infectious diseases such as human immunodeficiency virus, hepatitis C virus, and hepatitis B virus.(8,9) There have been no reports of disease transmissions up until now, considering the thorough screening processes used when harvesting the amniotic membranes.(3)

Due to the ease of preparation and use of amniotic membrane, as well as the lack of adverse effects of its application, and cost effectiveness, it is recommended to use amniotic membrane in the burn patients, particularly those with a high percentage of burn lesions, for pain reduction, improvement of patient wound healing, and improved cosmetic result as without fear of infection.

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