



ORIGINAL ARTICLE

## Comparison of cellular versus acellular amnion in facial burns at burn center of Punjab: Our experience.

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**Article Citation:** Ihsan M, Mujahid A, Fatima M, Khurshid AP. Comparison of cellular versus acellular amnion in facial burns at burn center of Punjab: Our experience. Professional Med J 2024; 31 (09):1307-1312. <https://doi.org/10.29309/TPMJ/2024.31.09.8277>

**ABSTRACT... Objective:** To compare the effectiveness of cellular versus acellular amnion in patients with superficial facial burns at tertiary care hospital burn center of Punjab. **Study Design:** Randomized Control Trial. **Setting:** Department of Burn and Plastic Surgery, Jinnah Burn and Reconstructive Surgery Center, Lahore. **Period:** 1<sup>st</sup> September 2020 to 31<sup>st</sup> December 2021. **Methods:** A total of 60 patients who fulfilled the inclusion criteria were recruited after the informed consent and were randomly divided into two groups with 30 patients in Group A and 30 patients in Group B. Group A patients had acellular amnion application and Group B had cellular amnion application over the superficial facial burns. The data was noted on a predesigned proforma and analyzed by using IBM-SPSS.Version.25 and was compared in terms of outcome measures. **Results:** The mean age in Group A and B was 37.7±9.86 and 38.1±9.37(range20-70 years) respectively and mean pain score was 8.5±0.937 in group A and 8.7±0.897 in group B. Hypersensitivity reaction was seen in 13.33% in group A vs 26.67% patients in Group B, infection rate of 8.33% in Group A vs 25% in Group B, Healing in 31.67% vs 18.33% in Group A and B respectively while in Group A the need for skin graft was noted in 8.33% vs 20% in group B patients and the difference was significant statistically (p=0.045). **Conclusion:** Application of Acellular amnion is better choice than Cellular amnion over facial burns with less hypersensitivity reaction, infection rate, need of skin graft and with improved wound healing.

**Key words:** Acellular Amnion, Cellular Amnion, Biological Dressing, Facial Burn, Skin Graft, Wound Healing.

### INTRODUCTION

The face is a prominent part of the body and helps in identity of individual, expressions, emotions and communication of feelings through different facial gesture. Burn is very common problem across the globe and face being exposed part of the body is more frequently involved. Facial burn can result in disruption of different anatomical structures and hence the function, leading to long term scarring, pain, contractures with disability and deformity. This can cause different physical and psychological effects on individual's life.<sup>1</sup>

Different treatment options are available to treat the facial burns depending upon the extent and severity of the problem and both the surgical and non-surgical approaches can be employed. Non-Surgical options are usually useful for superficial and partial thickness burns and can includes topical ointments, gauze dressing, different

biological dressings, matrix products (cellular and acellular) and human amniotic membrane.<sup>2</sup> These matrices provide different growth factors, cellular material and other key elements to promote re-epithelialization and revascularization of the wound bed and prevent degradation of the extracellular matrix to help in healing.<sup>3</sup>

In 1913, Sabella first reported the use of amnion as a dressing for burn wounds.<sup>4</sup> It has useful properties as a dermal matrix substitute and has been studied well in many burns patients in the past. The advantages of amniotic membrane include easy availability, non-immunogenic, anti-inflammatory and antimicrobial properties, cost effectiveness and suitable alternative to other expensive dressings in resource poor countries like Pakistan for their use in wound healing in burns, chronic wounds and diabetic foot ulcers.<sup>5,1,6,7</sup> Clinical experience with amniotic

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**Article received on:** 20/05/2024

**Accepted for publication:** 25/07/2024

membrane dressing has shown that amnion is a cost-effective biological dressing on superficial burns. In Another study, use of Amniotic membrane with split thickness skin graft has significantly reduced the itching and hypertrophic scar formation that can be greatly distressing to burn patients.<sup>5</sup> Another comparative study for superficial burns (amnion vs conventional dressing) on two hundred and eleven patients has shown an increased rate of wound healing ( $9.50\% \pm 2.13$  vs  $14.30\% \pm 2.60$  days; P value < 0.01), less need of skin graft ( $2.10 \pm 2.21\%$  vs  $4.20 \pm 1.44\%$ ; p value < 0.01) and less pain with amnion dressing than conventional dressing.<sup>8</sup>

Most of the studies for the treatment of superficial facial burns are with use of cellular amnion. However, the comparative studies regarding the efficacy of cellular or acellular amnion are very scarce. Nouri et al. carried out a comparative study by using the dried amnion, acellular human amniotic membrane and Mepitel to cover the donor site of split thickness skin graft and found no difference in healing time, pain sensations, infection rate and formation of scar.<sup>9</sup>

The aim of this study was to compare the effectiveness of cellular versus acellular amnion in patients with superficial facial burns, in terms of terms of pain, hypersensitivity reaction, infection rate, wound healing and need for skin graft. As no national level data is available so results of this study can be used to further determine the effectiveness and formulate a strategy for facial burn management accordingly.

## OBJECTIVE

To compare the effectiveness of cellular versus acellular amnion in patients with superficial facial burns at tertiary care hospital burn center of Punjab, in terms of terms of pain, hypersensitivity reaction, infection rate, wound healing and need of skin graft.

## METHODS

This study was conducted at Burn and Plastic Surgery Department, Jinnah Burn and Reconstructive Surgery Center, Lahore from 1<sup>st</sup> September 2020 to 31<sup>st</sup> December 2021. The

sample size of 60 patients was calculated by keeping the power of study equal to 90%, 5 % margin of error and level of significance equal to 5%. Patients with either gender, >20 years of age and patients with superficial facial burns were included in the study while the patients with burns other than face, Age <20 years, not willing for use of amnion and bleeding diathesis or other comorbidities were excluded. Patients were randomly divided into two groups through non-probability consecutive sampling followed by randomization using computer generated random numbers with 30 patients in each group. After the approval from institutional ethical review board (1132/ED/JB & RSC), written informed consent was obtained from all the patients and confidentiality was maintained. Group A patients had acellular amnion application (To make the amnion Acellular, it was first preserved in glycerol then washed with normal saline and was spread over dried slides, then trypsin was applied over it for 20 minutes, after that epithelial layer was removed by gentle scraping to detach the epithelial layer. This Acellular amnion was washed with saline again and preserved in glycerol at -80C)<sup>10</sup> and Group B had cellular amnion (Amnion was first washed with saline and then was preserved in glycerol at 3C) application over the superficial facial burns.

The data was noted on a predesigned proforma and analyzed by using IBM-SPSS.Version.25 and was compared in terms of outcome measures. Mean  $\pm$  SD were calculated for numeric variables i.e., age, pain score and total burn surface. Frequency and percentages were computed for categorical variables i.e., gender, hypersensitivity reaction, infection and healing. Independent t test was used to compare the mean age, total burn surface area and pain score between both groups. Chi square test was applied to compare the distribution of gender, need of skin graft, hypersensitivity reaction, infection and healing between both groups. A p- value  $\leq 0.05$  was considered statistically significant.

## RESULTS

Total 60 patients were included in this study. The mean age (in years), total burn surface area and pain score at baseline in Group A

was  $37.7 \pm 9.86$  (range 20-70),  $4.73 \pm 2.58$  and  $8.5 \pm 0.937$  respectively, whereas in Group B it was  $38.1 \pm 9.37$ ,  $4.33 \pm 2.31$  and  $8.7 \pm 0.897$ , respectively. Comparison of both groups was done in terms of age, total burn surface area and pain scores at baseline and at 48 hours using independent T-test and it was found that no statistically significant difference was present between the groups ( $p > 0.05$ ) (Table-I). Group A had 16.67% males and group B 15%, whereas Group A has 33.3% females and group B 35% females. Comparison of both groups in terms

of gender revealed no significant difference ( $p = 0.781$ ). In group A, hypersensitivity reaction was seen in 13.33% patients and in group B it was seen in 26.67% patients ( $p = 0.035$ ). In group A, infection was present in 8.33% patients and in group B it was present in 25% patients ( $p = 0.006$ ). Healing was seen in 31.67% patients in group A (Figure-1) and 18.33% patients in group B (Figure-2) ( $p = 0.039$ ). The need for skin graft was seen in 8.33% cases in group A and 20% cases in group B and the difference was significant statistically ( $p = 0.045$ ) (Table-II).

Group n = 60	Age (in Years)	Total Burn Surface Area (%)	Pain Score (at Baseline)	Pain Score (at 48 Hours)
A n = 30	$37.7 \pm 9.86$	$4.73 \pm 2.58$	$8.5 \pm 0.937$	$4.73 \pm 1.17$
B n = 30	$38.1 \pm 9.37$	$4.33 \pm 2.31$	$8.7 \pm 0.897$	$5.3 \pm 1.29$
P value	0.529	0.344	0.402	0.544

Table-I. Mean Comparison of age, TBSA and Pain Score among groups

Variable n = 60	Group		Total	P-Value	
	A	B			
Gender	Male	10 (16.7%)	9 (15%)	19 (31.7%)	0.781
	Female	20 (33.3%)	21 (35%)		
Hypersensitivity Reaction	Yes	8 (13.3%)	16 (26.7%)	24 (40%)	.035
	No	22 (36.7%)	14 (23.3%)	36 (60%)	
Infection	5 (8.3%)	15 (25%)	20 (33.3%)		.006
	25 (41.7%)	15 (25%)	40 (66.7%)		
Healing	Yes	19 (31.7%)	11 (18.3%)	30 (50%)	.039
	No	11 (18.3%)	19 (31.7%)	30 (50%)	
Need of Skin Graft	Yes	5 (8.3%)	12 (20%)	30 (28.3%)	.045
	No	25 (41.7%)	18 (30%)	30 (71.3%)	

Table-II. Comparison of independent variables among groups



Figure-1. (A) - Before Acellular Amnion application, (B) - After Acellular Amnion application, (C) - After Wound Healing



Figure-2. (A)-Before Cellular Amnion application, (B)-After Cellular Amnion application, (C) - After Wound Healing

## DISCUSSION

Human amnion is a source of both cellular and acellular biologic scaffolds. Allografts having dehydrated human amnion can be used to protect the wound and improve healing process by promoting the angiogenesis of vessels.<sup>6</sup> Similar to that acellular amnion has anti-microbial and anti-fibrotic properties with favorable immunological profile that helps to decrease the frequency of dressing changes. It acts as a reservoir of cytokines and different growth factors that play a significant role in modulation of inflammation and speeds up the healing process. These features of amniotic membrane has revolutionized the use of different products derived from amniotic membrane for the treatment of burns.

Different studies have revealed the effectiveness of using acellular amniotic membrane in superficial burns. Nouri et al. in his study compared the use of dried cellular, acellular human amniotic membrane with Mepitel to cover the donor site of split thickness skin graft and found no difference between the three groups in terms of healing time, sensation of pain, formation of scar and rate of infection.<sup>9</sup> This study findings are different from our study in which acellular amnion was found to be more effective than cellular amnion in terms of hypersensitivity reaction, infection, healing time and need of skin grafting.

Raza et al. in his study compared the use of amnion with topical ointment for facial burns in

sixty two patients and found less healing time, pain score and infection rate in a group treated with amnion.<sup>11</sup> Mohammadi et al compared the effect of amniotic membrane over the skin grafts on the extremities with burns and resulted in an increased rate of wound healing (9% versus 14%), less need of skin graft (2% vs 4%) and less pain compared to conventional mode of fixing the skin graft with staples.<sup>12</sup> Our study results are comparable with both of these studies with use of acellular amnion having better results than cellular amnion.

Amnion's epithelium consists of a single layer of epithelial cells and the mesenchyme of the membrane contains fibroblasts and mesenchymal stem cells. The question about the use of cellular or acellular amnion for ex-vivo or in-vivo applications is still under debate. Few studies have shown that cytokines and growth factors released from epithelium play a role in proliferation of cells and healing of wounds. Contrary to that, some studies have reported that acellular amnion is a better choice for healing of skin wound because it can support growth and adhesion of cells compared to cellular amnion. Furthermore, acellular amnion have less thickness of amnion and decreases its mechanical property their by increasing the rate of degradation and safety. In seven days' time period, acellular amnion usually undergo complete degradation with lysozyme solution, while cellular amnion shows <80% degradation by that time.<sup>13</sup> These findings are supported by



the results of current study which revealed that acellular amnion is better choice than cellular amnion for facial burns with higher rates of healing and less rates of infection. However the limitation of our study is that sample size not larger and it is only single center study, necessitating the future trials to be conducted on larger sample sizes in order to validate the findings of current study.

## CONCLUSION

Application of Acellular amnion is better choice than Cellular amnion over facial burns with less hypersensitivity reaction, infection rate, need of skin graft and improved wound healing. Acellular amnion can yield promising results in patients with facial burns decreasing the morbidity and improving patients' satisfaction.

## CONFLICT OF INTEREST

The authors declare no conflict of interest.

## SOURCE OF FUNDING




This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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**AUTHORSHIP AND CONTRIBUTION DECLARATION**

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1	Mehwish Ihsan	Principal contributor, Conceptualization and design of research work, Data collection.	
2	Abdul Malik Mujahid	Drafting, Review of Literature, Review of results and final approval.	
3	Mehreen Fatima	Writing of manuscript, Statistical analysis, Interpretation of data, Results analysis.	
4	Almeotan Pasha Khurshid	Literature search, Statistical analysis revision of manuscript.	