

Evaluation of Patient Reported Outcomes in Burn Survivors Undergoing Reconstructive Surgery in the Rehabilitation Period

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Abstract:

Background: This study examines reconstructive surgery outcomes in 165 adult Burn Model System participants, focusing on factors influencing surgical interventions and their impact on patient-reported outcomes.

Methods: A retrospective analysis of data gathered from burn survivors within a 24-month post-injury period was conducted. Logistic regression was used to estimate predictors of surgery, and patient-reported outcomes were assessed using the Short Form-12/Veterans RAND 12 questionnaires.

Results: Approximately 24.8% of participants underwent burn-related surgeries, primarily for scar-related issues. The number of surgeries during the index admission, and specific burn locations were associated with surgery likelihood. Patient-reported outcomes varied among surgical and non-surgical cohorts.

Conclusion: Factors influencing reconstructive surgery in burn survivors include age, sex, surgical history, and burn location. Patient-reported outcomes showed differing trends between surgical and non-surgical groups.

Recommendations: Healthcare providers should consider these factors when planning burn rehabilitation and reconstructive surgery. Further research is needed to explore the long-term effects of surgical interventions and improve patient care.

Keywords: Reconstructive Surgery, Burn Survivors, Patient-Reported Outcomes, Predictive Factors.

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Introduction

Burn injuries are among the most traumatic and life-altering experiences an individual can endure. The journey to recovery extends far beyond the initial wound healing, involving a complex interplay of physical, psychological, and social factors. The reconstructive surgery and rehabilitation phase is a critical period in this journey, where the focus shifts from mere survival to improving the quality of life and functional outcomes for burn survivors [1]. A greater understanding of the significance of patient-reported outcomes (PROs) has emerged in recent years in assessing the effectiveness of medical interventions and the overall recovery process in this patient population [2].

Patient-reported outcomes offer a unique perspective, emphasizing the patient's subjective evaluation of their health status, quality of life, and the impact of treatment. This approach is particularly relevant in the context of burn recovery, where the outcomes are not just about scar appearance or physical function, but also about the patient's psychological well-being, social integration, and return to normalcy [3]. By incorporating PROs into the assessment framework, healthcare providers can gain deeper insights into the multifaceted needs of burn survivors, tailoring

interventions to address both the visible and invisible scars left by the injury.

The reconstructive surgery and rehabilitation phase for burn survivors is a time of significant physical and emotional adjustment. Reconstructive surgeries, though aimed at improving function and appearance, can be numerous and demanding, each posing its own set of challenges and expectations for the patient. Rehabilitation, on the other hand, is a prolonged process that not only focuses on physical recovery but also on psychological support and social reintegration [4]. It is during this phase that patients often grapple with issues such as pain management, scar maturation, mobility, self-image, and coping strategies.

Evaluating PROs during this phase involves a range of instruments and methodologies, designed to capture various dimensions of the patient's experience. These may include health-related quality of life measures, pain assessment tools, psychological screening instruments, and functional outcome scales. The choice of these tools must be guided by their validity, reliability, and sensitivity to the changes experienced by burn survivors [5]. Furthermore, the assessment of PROs should be an

ongoing process, reflecting the dynamic nature of recovery and rehabilitation.

The aim of this study is to comprehensively assess and analyze the patient-reported outcomes (PROs) among burn survivors undertaking reconstructive surgery and rehabilitation, with the goal of improving the quality of care and enhancing the overall well-being and satisfaction of this patient population.

Methodology

Study Design: A retrospective cohort study.

Study Setting: The research is conducted at Patna Medical College and Hospital (P.M.C.H.), Patna, Bihar, India, between a duration of 2017 to 2020.

Participants: The study encompasses 165 adult participants who experienced burn injuries.

Inclusion Criteria: The inclusion criteria for this study are as follows: eligible participants must be adults aged 18 years or older. Additionally, they should have experienced burn injuries that meet specific criteria, which vary depending on age and the nature of the burn injury. For individuals aged 18-64 years, the criteria include a burn injury covering 20 percent or more of the total body surface area that required surgical intervention. For individuals aged 65 yrs or older, a burn injury covering 10 percent or more of the total body surface area with surgical intervention is required. Surgical intervention for burn injuries to the face/neck, hands, or feet is included for individuals aged 18 years or older, as well as for high-voltage electrical burn injuries in participants aged 18 years or older. Additionally, participants must have provided responses to the post-discharge burn surgery questionnaire to be eligible for the study.

Exclusion Criteria

Exclusion criteria for the study included patients who do not meet the inclusion criteria and who did not respond to the post-discharge burn surgery questionnaire.

Data Collection: Data were collected prospectively through the Burn Model System database. Information encompasses demographic details, burn characteristics, surgical history, and patient-reported outcomes, assessed through validated questionnaires (SF-12 and VR-12), administered during follow-up visits at hospital discharge and at 6, 12, and 24 months after the injury.

Statistical Analysis: The study employed logistic regression analysis to investigate the determinants of burn-related surgery after discharge. The C statistic was utilised to measure the model's fitness. Propensity score matching is used to pair participants who underwent surgery with those who did not within the same follow-up windows in order to assess the association between post-injury SF-12/VR-12 scores and reconstructive procedures. Every statistical model's significance is assessed at the 0.05 alpha level.

Ethical Considerations: Informed consent for data collection and analysis was secured from participants. Ethical approval for this study was obtained from ethical committee.

Result: Within 24 months following their injury, 41 individuals (24.8%) out of the 165 adult Burn Model System participants required at least one burn-related surgical treatment. These individuals had an average of 2.14 ± 1.40 operations, the most prevalent being scar-related procedures, followed by contracture and wound-related surgeries. While 19% underwent a combination of scar and contracture operations, the majority (52%) underwent only one type of operation.

Table 1: Participants demographics and clinical characteristics

Variable	Surgery (%)	No Surgery (%)	p-value
Male	74.2	68.0	0.619
Mean Age \pm SD, yr	40.7 \pm 16.2	44.5 \pm 15.8	0.589
Burn size (%TBSA)			
- \leq 10	27.3	45.3	
- 11-20	15.1	20.5	0.697
- 21-30	18.3	16.8	0.427
- 31-40	14.9	7.7	0.179
- 41-50	6.7	5.1	0.186
- 51-60	9.6	1.9	0.035
- 61-70	5.2	1.4	0.588
- 71-80	2.8	0.7	0.899
- 81-90	1.1	0.4	0.441
- >90	1.7	0.9	0.619
Mean no. of trips to the operating room	4.7 \pm 4.8	2.5 \pm 2.7	<0.001
Cause			
- Flame	69.4	58.3	

- Scald	15.2	26.5	0.826
- Other	15.4	15.2	0.544
Body site			
- Hand burn	83.8	68.4	0.004
- Head/neck burn	68.3	48.8	0.188
- Burn perineum	26.8	14.6	0.062
DC range of motion	77.1	53.7	<0.001

There was a positive correlation between the no. of trips to the operating room during the index admission and the number of future operations (OR, 1.13; $p < 0.001$). The probability of surgery was higher for burns involving the hand (OR, 1.76; $p = 0.002$) or perineum (OR, 1.41; $p = 0.035$) than for burns of any other size or origin. Surgery was more likely to occur in those who had restricted range of motion upon discharge (OR, 2.05).

Following discharge, Short Form-12/Veterans RAND 12 physical component summary scores generally improved over 24 months for most participants. However, those who had wound-related operations experienced a 3.8-point decline ($p = 0.040$). Mental health summary scores showed improvement in non-surgical participants but remained stagnant or declined in the surgical cohort. Propensity score matching ensured balanced comparisons.

Discussion

In the current study involving 165 adult Burn Model System participants, 24.8% underwent burn-related surgical procedures within 24 months of injury, averaging approximately 2.14 ± 1.40 operations, primarily involving scar-related procedures followed by contracture and wound-related surgeries. Notably, the number of surgical procedures during the index admission was associated with a higher likelihood of subsequent operations. Surprisingly, burn size and cause did not predict surgery, but burns involving the hand or perineum increased the likelihood, as did documented range-of-motion limitations at discharge. Patient-reported outcomes demonstrated that most participants experienced improved physical component summary scores over 24 months, except for those with wound-related surgeries who saw a decline, while mental health summary scores improved in non-surgical participants but remained stagnant or declined in the surgical cohort. Propensity score matching ensured reliable comparisons.

Recent studies have shed light on various aspects of burn-related surgical procedures and their impact on burn survivors. A systematic review highlighted the prevalence and impact of hypertrophic scarring, a common consequence of burn injuries that often necessitates surgical intervention [6]. Another study documented the lived experiences of adult burn survivors with post-burn contractures, emphasizing

the life changes and challenges they face, including the need for surgical correction [7]. Research on self-reported health measures in burn survivors undergoing surgery post-hospitalization revealed that these individuals often report worse health indicators, underscoring the importance of patient-reported outcomes in this context [8]. Long-term outcomes of surgical treatments for joint burn scar contractures were evaluated in a 10-year single-center study, providing valuable insights into the effectiveness of these procedures [9]. Innovations in reducing surgical procedures for pediatric burn patients were explored through the use of autologous cell harvesting and processing devices, showing promise in expediting healing and reducing the number of surgeries required [10]. The factors contributing to burn injury-related amputations were analyzed in a referral burn center, highlighting the severity of such interventions [11]. Furthermore, the effects of burn-related factors on the quality of life of pediatric burn survivors were reviewed, emphasizing the impact of these factors on their well-being [12]. Lastly, a study investigating the relationship between out-of-pocket expenses and health-related quality of life in burn survivors revealed that financial burdens could negatively impact their recovery, especially following surgical interventions [13].

Conclusion

The study of 165 adult Burn Model System participants revealed that approximately 24.8% underwent burn-related surgical procedures within 24 months of injury, with scar-related procedures being the most common. The number of surgeries during the index admission correlated with subsequent operations. Burn size and cause were not significant predictors, but hand or perineal burns and documented range-of-motion limitations at discharge increased the likelihood of surgery. Patient-reported outcomes varied, with physical component summary scores generally improving over time, except for those with wound-related surgeries, while mental health summary scores improved in non-surgical participants but remained stagnant or declined in the surgical cohort. These findings provide insights into reconstructive surgery and its impact on burn survivors, highlighting areas for further research and potential care improvements.

Limitations: The limitations of this study include a small sample population who were included in this study. The findings of this study cannot be generalized for a larger sample population. Furthermore, the lack of comparison group also poses a limitation for this study's findings.

Recommendations: Healthcare providers should consider these factors when planning burn rehabilitation and reconstructive surgery. Further research is needed to explore the long-term effects of surgical interventions and improve patient care.

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