

**ORIGINAL ARTICLE**

**THE EFFECT OF EARLY TANGENTIAL EXCISION AND SPLIT THICKNESS SKIN GRAFT IN REDUCING LENGTH OF STAY IN BURNS PATIENTS IN JAKARTA ISLAMIC HOSPITAL CEMPAKA PUTIH**

Aditya Wardhana<sup>1\*</sup>, Gammaditya Adhibarata Winarno<sup>2</sup>, Sanjaya Faisal Tanjunga<sup>2</sup>, A. S Augiani<sup>2</sup>, & An'umillah Arini Zidna<sup>2</sup>

1. Burn Unit, Division of Plastic Surgery, Dr. Ciptomangunkusumo National Hospital, Faculty of Medicine, Universitas Indonesia, Jakarta, Indonesia.

2. General Practitioner, Jakarta Islamic Hospital Cempaka Putih, Jakarta, Indonesia

**ABSTRACT**

**Introduction:** Early tangential excision (TE) and split-thickness skin graft (STSG) have increased the outcome in burn patients treated at specialized burn centers. This study was conducted to compare the length of stay (LOS) in burn patients undergoing early TE & STSG and delayed TE & STSG.

**Method:** This is a retrospective cross-sectional study including 42 patients with varied burn degrees, and TBSA admitted to Jakarta Islamic Hospital Cempaka Putih (JIHCP) Burn Unit. Patients were assigned to two study groups, the early TE & STSG group including 32 patients and the delayed TE & STSG group including 10 patients. All data were collected from the medical record and compared between two study groups.

**Result:** The mean of LOS in a group with early TE & STSG was shorter (9.81±6.41 days) than LOS in the delayed TE & STSG group (15.80±5.67 days). The data of LOS between these groups were compared using an independent T-test. The LOS in the early TE & STSG group was significantly shorter than the delayed TE & STSG group (p=0.012).

**Conclusion:** In patients with burn injuries, early TE & STSG is associated with a shorter length of stay than the delayed TE & STSG. Our study indicates that early excision within five days after burn injury is optimal to reduce the length of stay in burn patients.

**Keywords:** Burns; Burn injury; Early tangential excision and skin graft; Delayed tangential excision and skin graft; Length of stay

**ABSTRAK**

**Introduksi:** Eksisi tangensial dini (TE) dan cangkok kulit dengan ketebalan terpisah (STSG) telah meningkatkan hasil pada pasien luka bakar yang dirawat di pusat luka bakar khusus. Penelitian ini dilakukan untuk membandingkan lama rawat inap (LOS) pada pasien luka bakar yang menjalani TE & STSG dini dan TE & STSG tertunda.

**Metodologi:** Penelitian ini merupakan penelitian cross-sectional retrospektif terhadap 42 pasien dengan derajat luka bakar bervariasi dan TBSA dirawat di Unit Luka Bakar Rumah Sakit Islam Jakarta Cempaka Putih (JIHCP). Pasien dimasukkan ke dalam dua kelompok studi, kelompok TE & STSG awal termasuk 32 pasien dan kelompok TE & STSG tertunda termasuk 10 pasien. Data semua pasien dikumpulkan dari rekam medis dan dibandingkan antara dua kelompok studi.

**Hasil:** Rerata LOS pada kelompok TE & STSG dini lebih pendek (9,81 ± 6,41 hari) dibandingkan LOS pada kelompok TE & STSG tertunda (15,80 ± 5,67 hari). Data LOS antara kelompok-kelompok ini dibandingkan dengan menggunakan uji-T independen. LOS pada kelompok TE & STSG awal secara signifikan lebih pendek daripada kelompok TE & STSG tertunda (p = 0,012).

**Kesimpulan:** Pada pasien dengan cedera luka bakar, TE & STSG dini dikaitkan dengan lama rawat inap yang lebih pendek dibandingkan dengan TE & STSG yang tertunda. Penelitian kami menunjukkan bahwa eksisi dini dalam 5 hari setelah cedera luka bakar optimal untuk mengurangi lama perawatan pada pasien luka bakar.

**Kata Kunci:** Luka bakar; Luka bakar; Eksisi tangensial dini dan cangkok kulit; Eksisi tangensial tertunda dan cangkok kulit; Lama tinggal

**Conflicts of Interest Statement:**

The Author (s) listed in this manuscript declare the absence of any conflict of interest on the subject matter or materials discussed.

Received: 07 10 2020, Revised: 27 11 2020, Accepted: 11 03 2021

Copyright by Winarno, et al (2021). | P-ISSN 2089-6492; E-ISSN 2089-9734 | DOI: 10.14228/jprjournal.v8i1.309

Published by Lingkar Studi Bedah Plastik Foundation. This is an open-access article distributed under the terms of the Creative Commons Attribution-Non-Commercial-No Derivatives License 4.0 (CCBY-NC-ND), where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially without permission from the journal. This article can be viewed at [www.jprjournal.com](http://www.jprjournal.com)

## INTRODUCTION

According to the World Health Organization (WHO), burns are still a global health problem with a mortality rate of 180,000 people per Year. In Indonesia, based on one of the epidemiological studies conducted at Ciptomangunkusumo Hospital, the annual mortality rate for burn patients treated in the Burn Unit reaches an average of 27.6% per year<sup>3</sup>.

Burns has relatively high hospitalization days, morbidity rate, and degree of disability compared to other injuries. The cost required is also high. Generally, the length of stay in burn patients is estimated as one day for every 1% of burns. This number was formulated by a plastic surgeon in 1986 based on a database of burns patients<sup>1</sup>. However, in practice, hospitalization in burn patients varies depending on how complex the burn is and other factors such as the comorbidity, patient demographics, and the presence of inhalation injury.

Tangential excision and skin graft are known to reduce the length of stay, by which remove the necrotic tissue followed by closing the wound by healthy skin donor from the patient. This technique can limit inflammation and also bacterial infection. A high percentage of second-degree and third-degree burns managed conservatively tend to experience delayed healing, leaving a scar. Therefore, the main priority is rapid wound closure.

In a developed country, tangential excision and skin graft have been applied as standard therapy for severe burns. However, in a developing country, burn those procedures rarely treat patients to extend the length of stay and burden the maintenance costs.

In this study, we would like to know the effect of tangential excision (TE) and split-thickness skin graft (STSG) in reducing the length of stay in burn patients in Jakarta Islamic Hospital Cempaka Putih.

## METHOD

This is a retrospective cross-sectional study, collecting data from the medical record. A total sampling of patients admitted to Jakarta Islamic Hospital Cempaka Putih (JIHCP) burn unit

between April 2015 and September 2018. The Inclusion criteria are patients admitted to the JIHCP burn unit between the period, patients who underwent TE and STSG, patients who were readmitted without underwent the procedure, and the readmission period is no longer than three days. Exclusion criteria in patients who underwent treatment in other hospitals ward before admitted to the JIHCP burn unit, patients who referred to the JIHCP burn unit from other hospitals after five days from burn injuries, patients with incomplete medical record data about burn injuries and operation date, patients who discharge forcibly from the hospital. Statistical analysis and tabulation of the data using SPSS 20 for Mac.

## RESULTS

Out of 42 patients admitted to the burn unit and had been done the surgery (tangential excision and split-thickness skin graft) between April 2015 and September 2018, 27 were male, and 15 were female, with a ratio of 1.8:1. The highest incidence in terms of age group is 19-60 years old (24), with a higher number of male 18 (75%) admitted than female 6 (25%), followed by age group 0-18 years old (14), with 9 males and 5 females, as can be seen on chart 2. The average age of patients is 30.73 and median is 32, with the oldest patient treated is 78 years old, and the youngest is 9 months old. These details of the age-gender profile can be seen in **Table 1** and **Figure 1**.

Table 1. Age Category to Gender Profile

Age Category		Gender		Total
		Male	Female	
Children	Adult	9	5	14
	Elder	18	6	24
	Total	0	4	4
	Total	27	15	42

Most of the patients admitted have been diagnosed with burn injury with TBSA <10% grade II and 11-30% grade II, which share the same proportion of 11 patients, followed by 11-30% grade II-III (7). The diagnosis for the most TBSA is <10% (20) and grade II (23), with the

average TBSA being 13.57±9.57%, median of 11%. The least extent is 1%, and the most extent is 40%.

Table 2. Characteristic of Burn Injury

	Grade	II			Total
		II	-	III	
		III			
TBSA	< 10%	11	6	3	20
	11-30%	11	8	0	19
	> 30%	1	1	1	3
	Total	23	15	4	42

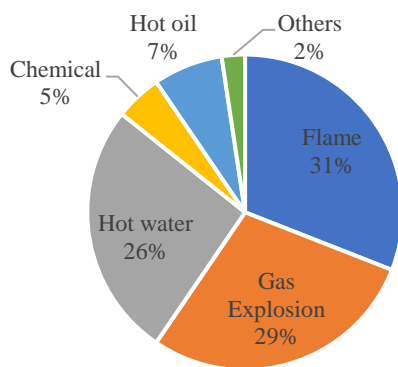


Figure 2. Etiology of Burn Injury

Table 2 summarizes the characteristic of the burn injury profile

The highest incidence of burn injury in this population is caused by flame with 13(31%), followed by gas explosion 12(29%), hot water 11(26%), hot oil 3(7%), chemical 2(5%) and the least is others 1(2%) that caused by contact with hot metal. It can be seen in Figure 2.

Indonesia has had a transition of National Health Insurance between the years, which indirectly affects the selection of hospitals in the referral system. In this study, burn patients admitted to Cempaka Putih Jakarta Islamic Hospital came from hospitals in the Special Region of Jakarta. Ciptomangunksumo hospital has the most significant proportion of referring hospitals, with 14 (33.33%). They were followed by Hermina Kemayoran Hospital, Johar Baru Primary Health Care, and Plastic Surgery Polyclinic in Cempaka Putih Jakarta Islamic Hospital with the same proportion of 3%. Mitra

Keluarga Hospital, Pertamina Jaya Hospital, and Koja Fourth Tier Hospital referred to the least 2%

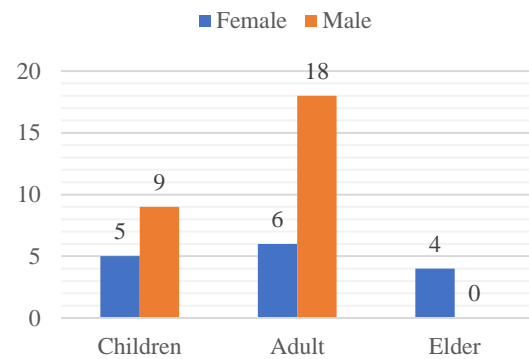


Figure 1. Age and Sex Distribution

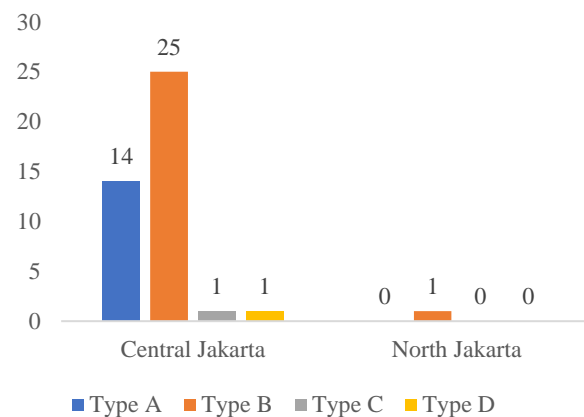


Figure 3. Referring Medical Facilities

of patients. Out of 42 patients in this study, more than half of the patients went straight to the Cempaka Putih Jakarta Islamic Hospital emergency unit with 22 patients (52.38%). The proportion between medical facilities can be seen in Figure 3.

Patients admitted to the Cempaka Putih Jakarta Islamic Hospital burn unit have an average length of stay of 11.24±6.69 days hospitalization (median=11), with the shortest length of stay being a day and the longest time being 26 days, as can be seen in Table 3.

Table 3. Length of Stay Frequency

	Min	Max	Mean	Std. Deviation
LOS	1	26	11.24	6.69

Tangential excision (TE) is a surgical procedure that removes burning skin by maintaining living tissue underneath; meanwhile, split-thickness skin graft (STSG) is the procedure of applying graft that contains epidermis and a variable amount of dermis 2. In this study, tangential excision and STSG were categorized as early if done within 5 days after the event, and categorized as delayed if done after 5 days after the event. Out of 42 samples in this study, 32 (76.19%) underwent an early procedure, and 10 (23.80%) underwent a delayed procedure, as shown in **Figure 4**.

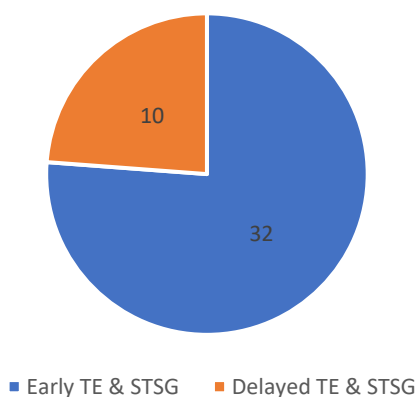


Figure 4. TE & STSG Frequency

**Bivariate Analysis**

The descriptive analysis between LOS and TE & STSG categorized as early and delayed shows that the average length of stay in a population with early TE & STSG is 9.81±6.41 days of hospitalization, with a minimum of 1 day. The maximum is 25 days, which means shorter than LOS in population with delayed TE & STSG with 15.80±5.67 days on average, 8 days in minimum treatment, and 26 days in maximum treatment. The details of this analysis can be seen in **Table 4**.

Table 4. Descriptive Analysis

	Length of Stay (LOS)				
	Mean	Med.	Max	Min	S. D
Early TE & STSG	9.81	8.00	25.00	1.00	6.41

Delayed					
TE & STSG					
	15.80	14.00	26.00	8.00	5.67

Shapiro-Wilk test is performed, we found that the data is normally distributed (p>0.05). After that, we can perform the Independent T-test. The result shows that the variances among the data are homogenous, and there is a significant difference between LOS in the early TE & STSG and delayed TE & STSG population (p<0.05), as can be seen in **Table 5**.

Table 5. Result of Independent T-test

LOS	Mean (SD)	p-Value	CI 95%
Early TE&STSG	9.81 (6.41)	0.012	-5.98(-10.57-(-1.40))
Delayed TE&STSG	15.80 (5.67)		

**DISCUSSION**

Tangential excision and Split-thickness skin graft are not popular before 1970. Janzekovic, who popularized tangential excision techniques in burns that produce satisfactory results<sup>3</sup>; meanwhile, Cope et al. pioneered the concept of early excision and grafting in burns cases in 1942. Excision and graft can be categorized as early and delayed. Early excision and graft are when the procedure is performed within 5 days of burn injury, meanwhile delayed excision and graft were when the procedure failed to perform within 5 days of burn injury<sup>5</sup>. Early tangential excision has several advantages, including a faster healing process, shorter length of stay, and reduced possibility of hypertrophic scar.

Burke et al. said that there is a reduction in mortality rates in third-degree burn patients who received early tangential excision<sup>6</sup>. Engrav et al., in their study comparing the outcome in burn patients with non-operative therapy versus early excision and graft, resulted in an average shorter hospitalization, lower cost, and less time away from work than patients treated non-operatively<sup>7</sup>. Subrahmanyam also had the same

statement in his research comparing patients treated by early excision and honey dressing conventionally, showing that early excision and skin grafting were superior to topical honey dressing<sup>8</sup>.

Tangential excision is a surgical procedure that removes the necrotic burnt tissue to preserve as much of the viable underlying tissue as possible, indicated by capillary bleeding<sup>3,4</sup>. The goal of this technique is to render the wound suitable for skin grafting<sup>4</sup>.

Early excision performed on burn patients can eliminate the effect of various inflammatory mediators produced by burn scar to prevent the occurrence of Systemic Inflammatory Response Syndrome (SIRS) and Multiple Organ System Failure (MOSF). Also, early tangential excision can prevent local and systemic infections by removing necrotic tissue, which is a good place for bacterial colonization. Early excision can also prevent massive bleeding during the surgical procedure because neovascularization has not occurred yet in the first five days of burn injury<sup>3,9</sup>. Based on these benefit, excision and grafting is now the standard surgical management of deep burns<sup>4</sup>. In Jakarta Islamic Hospital, Cempaka Putih tangential excision and skin graft are indicated to perform second-degree and third-degree burns.

In this study, we compared the outcome of early excision and skin graft versus delayed excision and skin graft in burn patients using the length of stay as the indicator. Out of 42 patients who underwent a surgical procedure, we found a significant difference ( $p < 0.05$ ) in the length of stay between the early and delayed excision and skin graft.

Our study was in coherence with the study by Ayaz et al. In their study, 53 patients who underwent early excision and graft and delayed excision and graft were evaluated. The result showed that the graft success rate was significantly higher in early excision and graft than in the delayed group ( $p < 0.05$ )<sup>9</sup>. Wu et al. also support the previous study, stating that delay in excision was associated with more extended hospital stay and delayed wound closure, and a higher incidence of significant wound contamination ( $p < 0.05$ )<sup>10</sup>.

This research collects data through medical records retrospectively; it might be helpful to

conduct a further study that is done with the cohort so that that information collection can be more comprehensive and complete. This research has a small sample.

## CONCLUSION

Early excision and skin graft have a significantly shorter length of stay than delayed excision and skin graft. Our study indicates that early excision within 5 days after burn injury is optimal to reduce the length of stay in burn patients.

### Correspondence regarding this article should be addressed to:

dr. Aditya Wardhana, SpBP-RE(K), Division of Plastic Surgery, Dr. Ciptomangunkusumo National Hospital, Faculty of Medicine Universitas Indonesia, Jakarta, Indonesia.  
E-mail: aditya\_wrdn@yahoo.com

## REFERENCES

1. WHO Media Center Fact Sheets: Burns [Internet]. Available from: <http://www.who.int/mediacentre/factsheets/fs365/en/>.
2. Winarno, G., Wardhana, A. (2019). Epidemiology and Mortality of Burn Injury in Ciptomangunkusumo Hospital, Jakarta: A 5 Year Retrospective Study. *Jurnal Plastik Rekonstruksi*. 2019; 1:234-242.
3. Taylor, S., Sen, S., Greenhalgh, D., Lawless, M., Curri, T. and Palmieri, T. (2017). Not all patients meet the 1 day per percent burn rule: A simple method for predicting hospital length of stay in patients with burn. *Burns*, 43(2), pp.282-289.
4. Thornton, J. F. (2004). *Skin Graft and Skin Substitutes and Principles of Flaps*. Selected Readings in Plastic Surgery, 10 (1).
5. Ong Y, Samuel M, Song C. Meta-analysis of early excision of burns. *Burns*. 2006;32(2):145-150.
6. Saadiq M. Early Excision and Grafting Versus Delayed Excision and Grafting of Deep Thermal Burns Up To 40% Total Body Surface Area: A Comparison of Outcome. *Annals of Burns and Fire Disasters*. 2012; Xxv (3):143-147.
7. Puri V, Khare N, Chandramouli M, Shende N, Bharadwaj S. Comparative Analysis of

- Early Excision and Grafting vs Delayed Grafting in Burn Patients in a Developing Country. *Journal of Burn Care & Research*. 2016;37(5):278-282.
8. Pietsch JB, Netscher DT, Nagaraj HS, Groff DB. Early excision of major burns in children: effect on morbidity and mortality. *J Pediatr Surg* 1985;20(4):754-7.
  9. Engrav LH, Heimbach DM, Reus JL, Harnar TJ, Marvin JA. Early excision and grafting vs. non-operative treatment of burns of indeterminate depth: a randomized prospective study. *J Trauma* 1983;23(11):1001-4.
  10. Subrahmanyam M. Early tangential excision and skin grafting of moderate burns is superior to honey dressing: a prospective randomised trial. *Burns*. 1999;25(8):729-731.
  11. Ayaz M, Bahadoran H, Arasteh P, Keshavarzi A. Early Excision and Grafting versus Delayed Skin Grafting in Burns Covering Less than 15% of Total Body Surface Area; A Non- Randomized Clinical Trial. *Bull Emerg Trauma*. 2014;2(4):141-145.
  12. Xiao-Wu W. Effects of Delayed Wound Excision and Grafting in Severely Burned Children. *Archives of Surgery*. 2002;137(9):1049.