Open Access

Original Article

Comparison of Outcome Between Long Posterior Burgess Flap and Skew Flap in Below Knee Amputation in Diabetics

Muhammad Asad Zafar, Imran Ashraf*, Sidra Fatima, Farooq Sultan Minhas, Rashid Zahid, Qaisar Naveed***

Department of General Surgery, Combined Military Hospital, Kharian/National University of Medical Sciences (NUMS) Pakistan, *Department of General Surgery, Combined Military Hospital, Rawalpindi/National University of Medical Sciences (NUMS) Pakistan, **Department of General Surgery, Combined Military Hospital, Chunian/National University of Medical Sciences (NUMS) Pakistan,

ABSTRACT

Objective: To evaluate and compare the results between the long posterior Burgess flap and skew flap surgical approach in below knee amputations among diabetic patients and to determine which approach produces better outcomes in terms of mobility, mortality rate, revision status, hospital stay, follow-up, limb fitted, and wound healing.

Study Design: Quasi-experimental study.

Place and Duration of Study: Department of Surgery, Combined Military Hospital, Kharian, Pakistan, from Jul 2021 to Jul 2023.

Methods: This quasi-experimental study was conducted on 60 patients undergoing below-knee amputation, comparing skew flap and Burgess flap techniques. Outcomes including mobility, wound healing, and hospital stay were analyzed with independent sample t-tests using SPSS v26 where a *p*-value of ≤0.05 was considered as significant.

Results: Mean age of participants was 60.38±5.88 years. Wound exudate was noted in 2(7%) patients in Burgess flap and 6(20%) in skew flap while major flap necrosis was observed in 10(33%) patients with Burgess flap and 17(56%) patients with skew flap, 16(54%) patients with Burgess flap completed follow-up after 6 months while 18(60%) patients in skew flap group did. A further 20 patients died (8 in Burgess flap and 12 in skew flap) during the follow-up period,15 patients were immobile (50%), 8 patients were dependent (26%) and 7 patients were independent (24%). By comparing the two groups' outcomes, there was significant difference noted.

Conclusion: This study suggests that the long posterior Burgess flap technique may be a more favorable choice for below knee amputation among patients with diabetes mellitus.

Keywords: Amputation, Diabetes Mellitus, Surgical Flaps.

How to Cite This Article: *Zafar MA, Ashraf I, Fatima S, Minhas FS, Zahid R, Naveed Q. Comparison of Outcome Between Long Posterior Burgess Flap and Skew Flap in Below Knee Amputation in Diabetics. Pak Armed Forces Med J 2025; 75(5): 983-986. DOI: https://doi.org/10.51253/pafmj.v75i5.11231*

INTRODUCTION

The increasing prevalence of diabetes mellitus has led to a growing number of individuals requiring below the knee lower limb amputations.[1] Two methods, the long posterior Burgess flap and skew flap techniques, have gained attention as distinct approaches to below knee amputations in diabetic patients.[2] The choice between these techniques can have significant implications on wound healing, post-operative complications, functional abilities, and overall patient satisfaction.[3] Two prominent surgical techniques are employed in below knee amputations, called the long posterior Burgess flap and the skew flap.[4] The Burgess procedure involves placing anesthetic marks on the front and back of the lower leg, piercing the subcutaneous layer, fascia, and muscular tissues, and performing amputation with an amputation knife,[5] while the skew flap technique uses a flap with a different orientation to provide adequate tissue coverage and is performed under regional or general anesthesia with precise markings on the skin to indicate the location of the skin flaps,[6,7] and antibiotics are administered for infection prevention,[8] with the patient being able to ambulate autonomously and be discharged within 4 to 5 weeks after operation.[9] While the choice between these two surgical techniques is influenced by various factors, including the surgeon's experience, patient-specific anatomical considerations, the clinical status of the patient is the most important consideration.[10] This research was done to compare the below knee amputation outcomes among patients with diabetes using Burgess flap and skew flap techniques, focusing on wound healing, post-operative complications, ambulation status, and patient satisfaction.

METHODOLOGY

After obtaining approval from hospital Ethics Committee, ref no: 25, a quasi-experimental study was carried out in Combined Medical Hospital (CMH),

Correspondence: Dr Muhammad Asad Zafar, Department of General Surgery, Combined Military Hospital, Kharian Pakistan

Received: 04 Dec 2023; revision received: 22 Jan 2024; accepted: 23 Jan 2024

Kharian, Pakistan, from July 2021 to July 2023. A sample size of 60 patients was calculated using Open Epi calculator with 95% confidence interval and 80% power and non-probability sampling was used to recruit participants.

Inclusion Criteria: Patients of either gender, with age ranging from 50 to 70 years, who had undergone below knee amputation were included.

Exclusion Criteria: Patients with incomplete medical records, cognitive impairment, traumatic injury, kidney disease and prior surgery of limb were excluded. After taking informed consent, information regarding Mobility status, Mortality Rate, Revision status, Hospital stay, Follow-up, Limb Fitted, and status of wound healing was collected. Also, the questions were close-ended to prevent any statistical errors. All collected data were entered in Statistical Package for the Social Sciences version 26 and analyzed through this software. Quantitative data was represented using mean ± standard deviation and qualitative data was represented by using percentage and frequency. The independent Sample t test Chi square test were applied and p-value of ≤ 0.05 was considered as statistically significant.

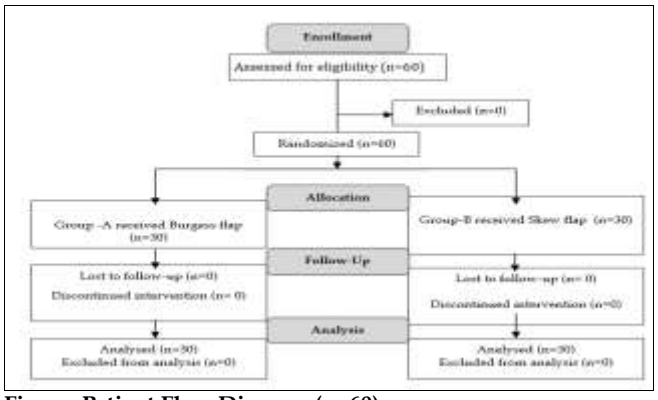

Figure: Patient Flow Diagram (n=60)

RESULTS

In current study, the two groups had 30 participants in the Burgess flap (Group A) and 30 participants in skew flap (Group B) with mean age of participants being 60.38±5.88 years. As shown in Table-I, which lists all demographic and clinical details regarding hospital stay of enrolled participants. The average length of postoperative stay in the surgical wards was 30.46±1.19 days after Burgess flap while after skew flap, average stay was 37.33±1.12 days. By comparing the two groups regarding the whole outcome, as shown in Table-II, there was significant difference between both groups with statistical analysis indicating that the long posterior Burgess flap technique is associated with superior outcomes in terms of mobility status, Mortality Rate, Revision status, Hospital stay, Follow-up, Limb Fitted and status of wound healing compared to the skew flap technique.

Table-I: Participant Characteristics of Hospital Stay (n=60)

Characteristics		n (%)
Mobility status	Immobile	25(41.7)
	Dependent	13(21.7)
	Independent	22(36.7%)
Mortality rate	Dead	20(33.3)
	Alive	40(66.7)
Revision status	Revision at same level	20(33.3)
	No revision	40(66.7)
Hospital stay	> 2 weeks	17(28.3)
	> 3 weeks	4(6.7)
	> 4 weeks	17(28.3)
	> 5 weeks	22(36.7)
Patients follow up after 6 months	Dead	20(33.3)
	Yes	34(56.7)
	No	6(10)
Limb fitted at 6 months	Yes	28(46.7)
	No	32(53.3)
Healing status	Primary healing	16(26.7)
	Wound exudate	7(11.7)
	Minor wound edge necrosis	10(16.7)
	Major flap necrosis	27(45)

Table-II: Groups Comparison in Terms of Mortality, Morbidity and Hospital-related Factors (n=60)

Parameters		Study Groups		*p*-value
		Group A (n=30)	Group B (n=30)	
Age	Range (50-70) years	60.40±6.43	60.36±5.39	
Gender	Male	18(60%)	17(49%)	0.005
	Female	12(40%)	13(43%)	
Mortality Rate	Dead	8(26.7%)	12(40%)	0.003
	Alive	22(73.7%)	18(60%)	
Mobility status	Immobile	10(33.3%)	15(50%)	0.001
	Dependent	5(16.7%)	8(26.7%)	
	Independent	15(50%)	7(23.3%)	
Revision status	Revision	7(23.3%)	13(43.3%)	
	No Revision	23(76.7%)	17(56.7%)	0.001
Hospital stay	more than 2 weeks	13(43.3%)	4(13.3%)	
	more than 3 weeks		4(13.3%)	0.004
	more than 4 weeks	17(56.7%)		
	more than 5 weeks		22(73.3%)	
Follow-up	Dead	8(26.7%)	12(40%)	0.004
	Yes	16(53.3%)	18(16%)	
	No	6(20.0%)		
Limb Fitted	Yes	19(63.3%)	9(30%)	
	No	11(36.7%)	21(70%)	
Healing Status	Primary healing	11(36.3%)	5(16.7%)	0.002
	Wound exudate	1(3.3%)	6(20.0%)	
	Minor wound edge necrosis	8(26.7%)	2(6.7%)	
	Major flap necrosis	10(33.3%)	17(56.7%)	

DISCUSSION

Our results suggest that the Long Posterior Burgess flap may result in better wound healing outcomes compared to the skew flap in diabetic patients undergoing below knee amputation, which is consistent with previous research,[11] as data analysis revealed a statistically significant difference in wound healing scores between the two surgical techniques where patients who received the Long Posterior Burgess flap had a higher mean wound healing score (8.2±1.2) compared to those who underwent the Skew Flap (7.0±1.4) and similar results were reported by another study with wound healing rates being significantly higher in the long posterior Burgess flap group compared to the skew flap group,[12] while long posterior Burgess flap patients also experienced fewer post-operative complications compared to skew flap patients. Another study also reported that patient satisfaction scores were significantly higher in the long posterior Burgess flap group,[13] which aligns with the established principles of surgical flap design. One study also indicated that the long posterior Burgess Flap technique resulted in a higher wound healing rate compared to the skew flap,[4] which aligns with previous research suggesting the advantages of the long posterior Burgess flap in promoting wound healing.[14] In our study, patients who underwent the long posterior Burgess flap exhibited better ambulation status along with patient satisfaction being significantly higher in this group, indicating the impact of the surgical technique on patients' overall well-being,[15] supporting superior outcomes overall.[16] One author reported that the long posterior Burgess flap technique demonstrated better wound healing, fewer complications, improved ambulation, and increased patient satisfaction compared to the skew flap,[17] with long posterior Burgess flap being a favorable choice, as it offers superior outcomes and improved patient satisfaction.[18] The superior wound healing associated with the Long Posterior Burgess flap suggests that it may be a preferred option for patients having diabetes mellitus as improved wound healing is not only essential for reducing the risk of post-operative infections but also for enhancing overall patient well-being where patients with better wound healing are more likely to regain function and mobility sooner.

LIMITATIONS OF STUDY

This study has several key limitations as its quasi-experimental design and use of non-probability purposive sampling introduced a high risk of selection bias, as patients were not randomly assigned, making the groups potentially unequal at baseline. The small sample size of 60 patients is further weakened by a high attrition rate, with 20 deaths during follow-up, which can significantly skew the outcomes and reduce the statistical power and reliability of the results. Furthermore, the single-center setting limits the generalizability of the findings to other populations or surgical contexts.

CONCLUSION

In conclusion, our research suggests that the Long Posterior Burgess flap technique may result in superior wound healing outcomes in diabetic patients undergoing below knee amputation when compared to the Skew Flap technique.

Conflict of Interest: None.

Funding Source: None.

Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

MAZ & IA: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

SF & FSM: Conception, data analysis, drafting the manuscript, approval of the final version to be published.

RZ & QN: Data acquisition, critical review, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

REFERENCES

1. Adams CT, Lakra A. Below-Knee Amputation. In: StatPearls: StatPearls Publishing; 2023. Available from: http://www.ncbi.nlm.nih.gov/books/NBK534773/
2. Alfawaz A, Kotha VS, Nigam M, Bekeny JC, Black CK, Tefera E, et al. Popliteal artery patency is an indicator of ambulation and healing after below-knee amputation in vasculopaths. Vascular 2022; 30(4): 708-714. https://doi.org/10.1177/17085381211016735
3. Andersen JC, Gabel JA, Mannoia KA, Kiang SC, Patel ST, Teruya TH, et al. 5-Item Modified Frailty Index Predicts Outcomes After Below-Knee Amputation in the Vascular Quality Initiative Amputation Registry. Am Surg 2020; 86(10): 1225-1229. https://doi.org/10.1177/0003134820942184
4. Jesani L, Gwilym B, Germain S, Jesani H, Stimpson A, Lennon A, et al. Early and Long Term Outcomes Following Long Posterior Flap vs. Skew Flap for Below Knee Amputations. Eur J Vasc Endovasc Surg 2020; 60(2): 301-308. https://doi.org/10.1016/j.ejvs.2020.04.034
5. Barcel DA, Odum S, Rowe T, Sabatini JB, Ford SE, Davis WH, et al. Mortality and Conversion Rates to Below-Knee or Above-Knee Amputation After Transmetatarsal Amputation. J Am Acad Orthop Surg 2022; 30(16): 767-779. https://doi.org/10.5435/JAAOS-D-21-00961
6. Tang A, Massey I, Bosanquet D. Gastrocnemius suture myodesis for skew flap amputations. Ann R Coll Surg Engl 2021; 103(3): 230-231. https://doi.org/10.1308/rcsann.2020.7053

7. Chang BL, Hill AL, Mondshine J, Harbour PW, Episalla NC, Attinger CE, et al. Primary targeted muscle reinnervation in above-knee amputations in patients with unsalvageable limbs from limb-threatening ischemia or infection. J Reconstr Microsurg 2023; 40(2): 109-117. https://doi.org/10.1055/s-0043-1768936
8. Crane H, Boam G, Carradice D, Vanicek N, Twiddy M, Smith GE. Through-knee versus above-knee amputation for vascular and non-vascular major lower limb amputations. Cochrane Database Syst Rev 2021; 12(12): CD013839. https://doi.org/10.1002/14651858.CD013839.pub2
9. Devkota S, Thapa Y. Ultrasound-guided femoral and sciatic nerve block as an option for below-knee amputation in an elderly patient: A case report. J Clin Case Rep 2023; 11(3): e7111.
10. Dinoto E, Pecoraro F, Mirabella D, Ferlito F, Farina A, Lo Biundo N, et al. A Single-Center Experience on Below-The-Knee Endovascular Treatment in Diabetic Patients. J Transl Med 2020; 21: 21-23.
11. Chandrikaa SA. A Randomized Control Trial to Compare the Efficacy of Long Posterior Myocutaneous Flap Versus Skew Flap in Transtibial Amputation in a Tertiary Care Hospital: Madras Medical College, Chennai; 2022.
12. Bascone CM, Sulkar RS, McGraw JR, Levin LS, Kovach SJ. Bringing the Below-Knee amputation out of the Civil War era: Utilization of the neurovascularized lateral compartment flap, TMR, and RPNI. Orthop Surg 2023; 13: 10-16.
13. Egeler SA, De Jong T, Luijsterburg AJ, Mureau MA. Long-term patient-reported outcomes following free flap lower extremity reconstruction for traumatic injuries. Plast Reconstr Surg 2018; 141(3): 773-783. https://doi.org/10.1097/PRS.0000000000004115
14. Huh JW, Kim MW, Noh YM, Seo HE, Lee DH. Effectiveness of ultrasound-guided dual nerve block in the below-knee amputation. BMC Surg 2023; 23(1): 227. https://doi.org/10.1186/s12893-023-02130-3
15. Kennedy G, McGarry K, Bradley G, Harkin DW. All-Cause Mortality Amongst Patients Undergoing Above and Below Knee Amputation in a Regional Vascular Centre within 2014-2015. Ulst Med J 2019; 88(1): 30-35.
16. Hançerli C, Doğan N. Comparison of below-knee and above-knee amputations with demographic, comorbidity, and haematological parameters in patients who died. J Foot Ankle Res 2023; 16(1): 36. https://doi.org/10.1186/s13047-023-00633-z
17. Huffman SS, Berger LE, Huo H, Hill AL, Yamamoto RK, True K, et al. Postoperative Glycemic Response in High-Risk Type II Diabetics Receiving Below-Knee Amputation: Does Intraoperative Dexamethasone Make an Impact? J Foot Ankle Surg 2024; 63(1): 107-113.https://doi.org/10.1053/j.jfas.2023.08.011
18. Fukuba M, Dogo K, Saito K, Ishida T, Yamaoka H, Okochi M, et al. A Case of Fibula Regeneration after Below-the-knee Amputation in an Adult. Plast Reconstr Surg Glob Open 2023; 11(5): e4968. https://doi.org/10.1097/GOX.0000000000004968