

A Comparative Analysis of Patient-Reported Outcomes Following Free Tissue Transfer, Partial Foot Amputation, and Below-Knee Amputation in High-Risk Limb Salvage Patients

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Introduction

- In the United States, 2.4 to 4.5 million people suffer from chronic lower extremity (LE) wounds, with 150,000 requiring amputations annually.
- The choice between limb salvage (e.g., free tissue transfer [FTT]) versus amputation (e.g., partial foot amputation [PFA], below-knee amputation [BKA]) depends on factors such as the patient's health, wound healing potential, and patient goals and preferences.
- Patient-reported outcome measures (PROMs) measure patients' own experience of their health such as mobility, mental health, and social function²
- While several studies have assessed postoperative outcomes following FTT, PFA, and BKA for chronic LE wounds, the patient experience after limb salvage remains understudied³⁻⁷

Objective

To compare PROMs related to pain, LE function, psychosocial well-being, and overall QoL in patients who underwent FTT, PFA, or BKA for chronic LE wounds.

Methods

- PROMs were collected all adult chronic LE wound patients who presented to a tertiary wound center between June 2022 and June 2023. A cross-sectional analysis of patients who underwent FTT, PFA, and BKA was conducted.
- Lower Extremity Functional Scale (**LEFS**), PROM Information System Pain Intensity (**PROMIS-3a**), 12-Item Short Survey (**SF-12**), and 20-Item Self-Reporting Questionnaire (**SRQ-20**) were completed at 1-month, 3-months, 6-months, 1-year, 3-years, and 5-years postoperatively
- Patient demographics, comorbidities, preoperative characteristics, and amputation details were collected.

Results

Table 1. Patient Demographics

	Total n=123	PFA n=38	BKA n=52	FTT n=33	<i>P</i>
<i>Patient Demographics</i>					
Age (years); median (IQR)	61.5 (12.9)	63.7 (12.4)	60.4 (11.9)	60.6 (14.6)	0.254
Sex					0.871
Male	95 (77.2)	30 (78.9)	39 (75.0)	26 (78.8)	-
Female	28 (22.8)	8 (21.1)	13 (25.0)	7 (21.2)	-
Race					0.197
White	51 (41.5)	12 (31.6)	19 (36.5)	20 (60.6)	-
Black or AA	57 (46.3)	23 (60.5)	23 (44.2)	11 (33.3)	-
Asian	1 (0.8)	0 (0.0)	0 (0.0)	1 (3.0)	-
Native Hawaiian or Other Pacific Islander	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	-
American Indian or Alaska Native	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	-
Other	13 (10.6)	3 (7.9)	10 (19.2)	1 (3.0)	-
BMI (kg/m ²)	30.3±7.0	31.0±8.1	30.2±6.9	29.9±6.0	0.524
CCI	5.6±3.0	6.8±2.6	5.4±3.0	4.5±3.0	0.001
<i>Comorbidities</i>					
DM	86 (69.9)	32 (84.2)	36 (69.2)	20 (60.6)	0.165
CKD	36 (29.3)	16 (42.1)	16 (30.8)	4 (12.1)	0.084
CHF	17 (13.8)	8 (21.1)	6 (11.5)	3 (9.1)	0.193
PVD	56 (45.5)	18 (47.4)	22 (42.3)	16 (48.5)	0.790
MDD	17 (13.8)	5 (13.2)	7 (13.5)	5 (15.2)	0.646
GAD	14 (11.4)	4 (10.5)	7 (13.5)	3 (9.1)	0.434

Bolded: *p*<0.05; “-”: not applicable; *PFA*: partial foot amputation; *BKA*: below-knee amputation; *FTT*: free tissue transfer; *P*: *p*-value; *IQR*: interquartile range; *AA*: African American; *BMI*: body mass index; *CCI*: Charlson Comorbidity index; *DM*: diabetes mellitus; *CKD*: chronic kidney disease; *CHF*: congestive heart failure; *PVD*: peripheral vascular disease; *MDD*: major depressive disorder; *GAD*: generalized anxiety disorder

Table 2. Lower Extremity Functional Scale (LEFS)

Procedure	2 Weeks	1 Month	3 Months	6 Months	1 Year	2 Years	5 Years	Overall	<i>P</i>
<i>PFA</i>									
Raw	25.0±18.6	33.3±14.1	63.0±2.8	32.8±18.8	34.6±13.1	31.5±23.0	45.8±27.1	45.8±27.1	0.457
% Max	31.3±23.2	41.6±17.7	78.8±3.5	41.0±23.5	43.2±16.3	39.4±28.8	57.2±33.9	57.2±33.9	0.457
<i>BKA</i>									
Raw	35.0±29.7	40.0±13.2	37.5±18.6	46.2±23.4	29.7±20.4	40.5±16.8	45.0±5.3	45.0±5.3	-
% Max	43.8±37.1	50.0±16.5	46.9±23.2	57.8±29.2	37.1±25.5	50.7±21.0	56.3±6.6	56.3±6.6	-
<i>FTT</i>									
Raw	37.8±8.9	44.3±19.1	33.8±21.0	31.4±17.5	45.0±0.0	42.1±12.8	46.8±23.4	46.8±23.4	-
% Max	47.2±11.1	55.4±23.9	42.2±26.3	39.3±21.9	56.3±0.0	52.6±16.1	58.4±29.2	58.4±29.2	-

Bolded: *p*<0.05; “-”: not applicable; *PFA*: partial foot amputation; *BKA*: below-knee amputation; *FTT*: free tissue transfer; *P*: *p*-value

Table 3. 12-Item Short Form Survey (SF-12)

Procedure	2 Weeks	1 Month	3 Months	6 Months	1 Year	2 Years	5 Years	Overall	<i>P</i>
<i>PFA</i>									
Raw	29.3±1.2	30.0±2.1	34.0±0.0	27.8±6.1	28.0±1.4	31.0±0.0	29.5±0.7	29.5±2.9	0.298
<i>BKA</i>									
Raw	27.0±2.1	29.5±3.4	32.0±1.9	27.0±3.5	-	27.2±5.4	-	29.0±4.0	-
<i>FTT</i>									
Raw	30.0±7.2	28.0±2.1	32.5±0.7	-	32.0±0.0	29.0±4.4	-	29.6±4.1	-

Bolded: *p*<0.05; “-”: not applicable; *PFA*: partial foot amputation; *BKA*: below-knee amputation; *FTT*: free tissue transfer; *P*: *p*-value

Discussion

- This cohort exhibited satisfactory functioning, with average LEFS of approximately 46.8% of maximal function: “**limited community ambulator**”
- A surgical focus on **functional outcomes** includes 1) BKA techniques with tenodesis, tibia-fibular fusion, and TMR; 2) PFA with tendon rebalancing procedures to prevent recurrences; 3) FTT techniques that prioritize the longevity of soft tissue, bone, and blood flow.
- Multidisciplinary care models** that emphasize optimizing overall health, including diabetic blood sugar management, smoking cessation, weight loss, access to primary care, and regular foot and skin checks, are crucial for achieving highly functional patient outcomes
- This study has several **limitations**: 1) the lack of preoperative PROMs limits the study's ability to establish a clear cause-and-effect relationship between the surgical interventions and the reported outcomes, 2) single institution, and 3) did not assess objective clinical measures.

Conclusion

This study demonstrates an increase in LEFS scores over time in patients completing PROMs. Patient-centered surgical management, which includes interdisciplinary care, preoperative medical optimization, and proper patient selection, contributes to better long-term outcomes and enhanced patient satisfaction. Collecting PROMs over time with larger sample sizes is critical for enhancing our understanding of patient experiences in the face of limb loss.

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