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A Qualitative Study of Patients' Lived Experiences of Free Tissue Transfer for Diabetic Foot Disease

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Background: Free tissue transfer (FTT) for reconstruction of diabetic foot disease (DFD) is an emerging field to preserve the lower limb within this patient group. The design of future quantitative research and clinical services in this area must consider the needs, expectations and concerns of patients. This qualitative study explores patient experiences of FTT for reconstruction of DFD.

Methods: Semistructured interviews were conducted to explore patients' lived experiences of FTT for DFD. A purposive sampling strategy identified six patients who underwent FTT for recalcitrant DFD between September 2019 and December 2021 in a single center in the United Kingdom.

Results: Three experiential themes emerged. Theme 1: "negative lived experiences of living with DFD" included frustration with the chronic management of nonhealing ulcers and fear regarding limb amputation. Theme 2: "surgery related concerns" included fears of reconstructive failure and subsequent amputation, as well as foot cosmesis and donor-site morbidity. Theme 3: "positive lived experiences following reconstruction" included the positive impact the reconstruction had on their overall life and diabetic control. All patients would repeat the process to obtain their current results.

Conclusions: This qualitative study provides first-hand insight into the lived experience of FTT for DFD, exploring both the negative and positive experiences and reasons for these. We found that FTT for DFD can be positively life-changing for affected individuals. *(Plast Reconstr Surg Glob Open 2024; 12:e5842; doi: 10.1097/GOX.0000000000005842; Published online 20 May 2024.)*

INTRODUCTION

Diabetic foot disease (DFD) is an extremely common and growing socioeconomic burden, which affects 19%–34% of people with diabetes.[1] It is a devastating sequela of diabetes and associated with a high risk of major amputation, with 21% of patients with DFD requiring major amputation at 5 years.[2] Chronic diabetic foot ulceration (DFU) and major amputation (above the level of the ankle joint) are associated with poor quality of life, loss of independence, and reduced life expectancy (five-year mortality in people with DFU is around 40%–70%).[2,3] Management of DFD is also extremely expensive: the annual direct costs of health care for ulceration and amputation in diabetes in 2014–2015 in the NHS was estimated at £962 million, more than the combined cost of management for breast, prostate, and lung cancers.[4] Strategies to reduce the chronic burden of DFD with particular focus on limb preservation[5] are therefore imperative.

Over recent years, there has been growing interest in using free tissue transfer (FTT) to preserve limbs in DFD.[6–10] Data reporting improvements in wound healing, limb salvage, and overall survival following FTT for DFD have been published from multiple centers worldwide.[6–10] However, this surgery is not routinely available in most healthcare facilities. This may be due to uncertainty regarding long-term outcomes, perceived high risk of complications, and the technical and resource demands

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of major reconstructive surgery on individuals with multiple co-morbidities.

There are limited long-term outcome data comparing FTT with other DFD management strategies. Where there is quantitative evidence of outcome, this may not align with patients' priorities or experiences of surgery and outcome or be contextualized with the information they were provided when they made the decision to undergo major surgery. As FTT for DFD grows in popularity, the design of future quantitative research studies and clinical DFD services must take into consideration the needs, expectations, and concerns of patients who are considered for FTT. This study aimed to explore patients' lived experiences of undergoing FTT for DFD using qualitative methodology.

Takeaways

Question: What are patients' lived experiences of undergoing free tissue transfer (FTT) for diabetic foot ulceration?

Findings: This qualitative study using a semistructured interview design identified three main themes following thematic analysis: 1. Negative lived experiences of living with diabetic foot ulceration; 2. Free flap surgery-related concerns; 3. Positive lived experiences of reconstruction.

Meaning: This qualitative study provides first-hand insight into the lived experience of FTT for DFD, suggesting that FTT for DFD can be positively life-changing for affected individuals.

RESEARCH DESIGN AND METHODS

Design

This qualitative study used a semistructured interview study design, with an interpretative thematic analysis approach to explore patients' lived experiences of FTT reconstruction for DFD. As we had identified a small preexisting evidence base, we elected to use thematic analysis a priori, to facilitate a detailed exploration of a small number of patients' lived experiences, focusing on the perceptions and understanding of those who have experienced FTT for DFD.[11]

Participants Sampling

We identified all patients who had undergone a microsurgical FTT operation to treat DFD in a single institution from 2019 (when this treatment option was first offered by the senior authors) to November 2022. This identified 12 eligible patients. All operations were undertaken jointly by RS and JC. A purposive sampling strategy was used to select those most likely to be information-rich in relation to the study question.[12] This resulted in exclusion of patients who had their primary operation less than 12 months before the onset of this project. We adopted this strategy to encourage inclusion of patients with longer lived experiences of the phenomenon. Six patients were identified as eligible for inclusion and invited to participate in the study. This small yet focused sample size enables an in-depth analysis of relevant patients' lived experiences.[11,12] The sample comprised both male and female patients, with ages ranging from 31 to 78. Although the index condition and treatment were common amongst all interviewed patients, we included patients of varying ages and socio-healthcare backgrounds who had flaps harvested from different donor sites. This resulted in commonality around disease process and treatment, but individualism based on free flap donor sites and patient demographics. Each participant's demographics, including defect location, free flap donor site and comorbidities are listed in Table 1. Free flap donor site was dictated by factors including the size and configuration of the defect postexcision, suitability of available donor sites (eg, thickness for consideration of footwear), patient, and surgeon preference. Selection of recipient vessels and flap design was further guided by preoperative computed tomography-angiography. Figure 1 provides case examples.

Data Collection

Participant information sheets were given to patients before enrolling. (**See appendix, Supplemental Digital Content 1**, which displays the participant information sheet. **http://links.lww.com/PRSGO/D218**.) The semistructured interviews followed a topic guide devised through discussion amongst the authors, which aimed to focus on individuals' lived experiences during their reconstructive treatment, including specific focus on patients' decision-making for treatment choice and long-term reflections on their reconstructive journey. (**See appendix, Supplemental Digital Content 2**, which demonstrates the semistructured interview guide. **http://links.lww.com/PRSGO/D219**.) The interviewer took an open, narrative approach to questioning to facilitate a reflective and open dialogue between interviewer and participant.[11,12] In-depth semistructured interviews were performed by the same author (RG) between September and November 2022. All interviews were conducted by telephone and audio recorded, with measures taken to ensure the recordings were effectively anonymous by omitting identifiable data. They were then later transcribed verbatim by a professional typist within the healthcare institution where the study was conducted. Interviews lasted between 23 and 46 minutes (mean duration 31 minutes).

Ethical Approval

The project protocol was reviewed by the local research and innovation department and was identified as a service evaluation study. In keeping with national UK research guidance,[13] it was therefore exempt from research ethics committee or Health Research Authority approval. Written patient consent was obtained from all patients for use of medical photography.

Data Analysis

Two authors (R.J.G. and K.L.B.) analyzed each transcript independently in its entirety at least twice. Anonymized transcripts were imported into NVIVO12.[14] RG and KB identified preliminary themes, to which codes

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Table 1. Patient Demographics

Patient	Age	BMI	Comorbidities	Defect Location	Smoker	Free Flap Donor Site for Reconstruction	Recipient Vessels	End–End (E-E) or End–Side
1	38	29	Type 1 diabetes, hypertension, glaucoma, hiatus hernia	Right hallux metatarsal head exposed	Yes	Superficial circumflex iliac perforator	Second metatarsal artery + two superficial veins	EE
2	37	22	Type 1 diabetes, hypertension	Right 2nd–4th metatarsal heads exposed	Yes	Anterolateral thigh	Dorsalis pedis artery + venae comitantes + great saphenous vein	ES
3	57	34	Type 2 diabetes, ischemic heart disease, hypertension	Plantar surface right foot	No	Latissimus dorsi	Dorsalis pedis artery + venae comitantes	ES
4	31	20	Type 1 diabetes	Transmetatarsal amputation left foot	Yes	Superficial circumflex iliac perforator	Dorsalis pedis artery + venae comitantes	EE
5	78	33	Type 2 diabetes, congestive cardiac failure, hypertension, thrombocytopenia, hypercholesterolemia, Right sided below knee amputation, hiatus hernia	Anteromedial left ankle	No	Gracilis	Anterior tibial artery + venae comitantes	ES
6	46	28	Type 2 diabetes, hypertension	Left hallux metatarsal head exposed	No	Medial sural artery perforator	Dorsalis pedis artery + superficial vein	EE

were attributed during a subsequent line-by-line analysis performed in NVIVO12. Themes were clustered, with contributing codes repeatedly reviewed. Whole author group discussion resulted in the identification of super-ordinate experiential themes, each with contributing subthemes determined based on the patterns of codes produced within these themes.

RESULTS

Three experiential super-ordinate themes, each with 2–3 supporting subthemes, emerged from the analysis of the data (Table 2). Selected examples of patient quotes coded to each subtheme are included in the tables below, and Supplemental Digital Content 3. (**See appendix, Supplemental Digital Content 3**, which includes further quotes coded to each subtheme. **http://links.lww.com/PRSGO/D220**.)

Theme 1: Negative Lived Experiences of Living with DFU

Each of the six interviews started with open questions about the participants' experiences of living with DFD. All participants spoke with consistent negativity about living with DFD, with a clear subtheme of helplessness and frustration emerging surrounding the chronic, unsuccessful management of their nonhealing DFD. All patients expressed concerns about their treatment preceding FTT, with implications of loss of confidence in their healthcare providers (Table 3).

An additional subtheme identified was the impact of each participants' nonhealing DFD on their general health, life, and relationships, with further negative connotations articulated (Table 4). The overwhelming subtheme, however, that emerged within the super-ordinate theme of negative lived experiences of DFD, was patients' descriptions about their fears of major amputation, with every participant reporting these fears in depth (Table 5).

Theme 2: Surgery-related Concerns

A second main theme identified from the semistructured interviews was surgery-related concerns. This was supported by two underlying subthemes: (a) problems related to the flap or operation itself, and (b) long-term issues of postoperative foot cosmesis and donor site morbidity.

Surgery-related problems described by patients included peri-operative fears of flap failure, the need for unplanned returns to theater, the frustration of postoperative flap monitoring and bed rest, and two patients describing long-term frustrations with delayed wound healing (Table 6).

When asked specifically about the free flap donor site symptoms, diverse responses resulted. Two interviewees had reconstruction with free superficial circumflex iliac artery perforator (SCIP) flaps from the groin, and talked positively about this donor site. Two patients had free muscle flap reconstructions, one with a free gracilis flap from the inner thigh and the other with a free latissimus dorsi flap reconstruction from the back. Both patients described positive experiences of these donor sites. One participant's reconstruction was with a free medial sural

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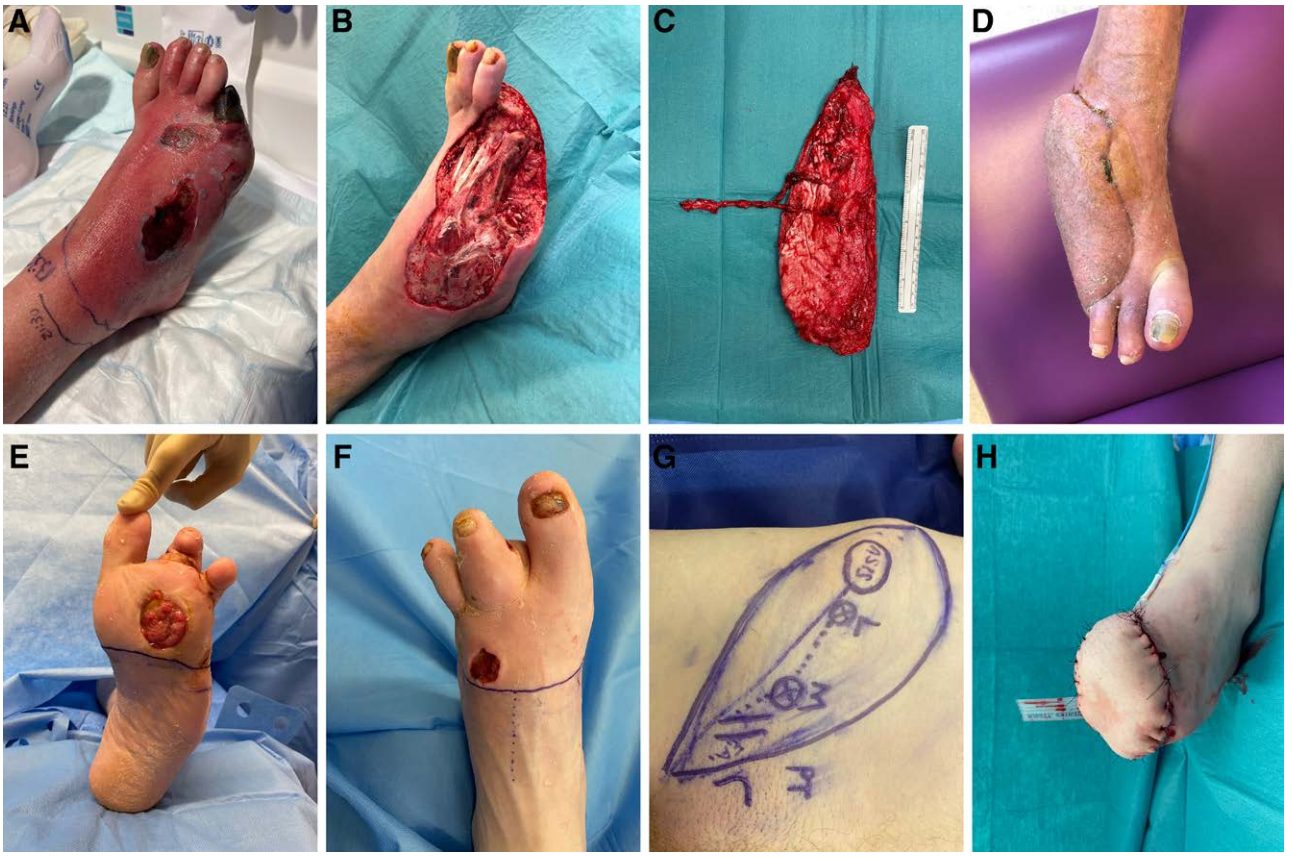


Fig. 1. FTT for DFU. A–D, Demonstration of a free anterolateral thigh flap reconstruction after debridement of an acute diabetic foot attack. E–H, Demonstration of a free superficial circumflex iliac artery perforator flap reconstruction for a nonhealing extensive diabetic foot ulcer.

Table 2. Emergent Themes and Subthemes of Qualitative Analysis

Theme	Negative Lived Experiences of Living with DFD	Surgery-related Concerns	Positive Lived Experiences following Reconstruction
Subtheme	a) Fear of amputation	a) Problems with the surgery	a) Positive reflections and advice for surgeons/ patients
	b) Helplessness and frustration	b) Cosmetic considerations and donor site morbidity	b) Perceived effects of reconstruction on general life, health, and relationships
	c) Effect on general life, health, and relationships		c) Relationship with surgeons

Table 3. Negative Lived Experiences of Living with DFD: Subtheme: Helplessness and Frustration

Theme: Negative Lived Experiences of Living with DFD	
Subtheme: Helplessness and Frustration	
Patient 1:	*"I had been having treatment every week for it and had been on antibiotics for a month and it just wouldn't get better."*
	"I kept being told it is nearly healing and it is doing well, and then the weather would get cold or something would set it off and it would just keep opening up…
	It was just really frustrating because it was going on and on and wouldn't get any better."
Patient 2:	*"What they were doing wasn't working and I was telling the hospital nothing is working. They kept sending a diabetic doctor and he kept saying 'that's fine it's fine'. I said it's not fine and I know something is going wrong…I kept asking for something to be done."*

Table 4. Negative Lived Experiences of Living with DFD: Subtheme: Effect on General Life, Health, and Relationships

Theme: Negative Lived Experiences of Living with DFD	
Subtheme: Effect on General Life, Health, and Relationships	
Patient 1:	*"It was winter, and I couldn't wear shoes because of all my bandaging…I was dizzy, I couldn't walk properly all the time. I couldn't bathe, I couldn't wear shoes, it sort of took over everything really. I mean even financially because going to one or two appointments that are in different towns every week, sometimes it would cost £30 a week just to get to appointments just to have a bandage changed on my foot."*

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Table 5. Negative Lived Experiences of Living with DFD: Subtheme: Fear of Amputation

Theme: Negative Lived Experiences of Living with DFD	
Subtheme: Fear of Amputation	
Patient 3:	*"They were talking in front of me, and I was absolutely petrified. They said they will have to send me to another hospital and cut it off. I asked them to talk to me rather than talking to each other because I had no idea what they were talking about. They said, well it's like this, you have got gas gangrene in your foot, and it is going up your leg and he said we are going to have to cut it off. I said I couldn't believe it; this has gone pear shaped. I was absolutely petrified. I have driven all my life, I have played sports, I have done loads of things and to suddenly not have your own leg it was like I do not believe this, everything has all gone wrong."*
Patient 2:	*"Worst case scenario should've been really losing my fourth toe, not my whole foot. I got treated by a lot of doctors and a lot of nurses and people like that and what I got to understand is the NHS just see it easier to amputate rather than doing what they done for me. I had been to my darkest places thinking I am going to have no leg."*

Table 6. Surgery-related Concerns: Subtheme: Problems with the Surgery

Theme: Surgery-related Concerns	
Subtheme: Problems with the Surgery	
Patient 1:	*"It was frustrating not being able to move as I wasn't allowed to do anything, my leg had to be up all the time."*
Patient 4:	*"Social life, I am trying to keep contact with my friends but because I have to rest my foot I am stuck indoors and basically, I am just waiting for it to heal so I can go back to work."*

Table 7. Surgery-related Concerns: Subtheme: Cosmetic Considerations and Donor Site Morbidity

Theme: Surgery-related Concerns	
Subtheme: Cosmetic Considerations and Donor Site Morbidity	
Patient 1 (SCIP):	*"Yes, it is from your hip down the inside of your groin. Even when I haven't got underwear on, you cannot really see it as it does really go right into the crease."*
Patient 5 (gracilis):	*"Where the tissue was taken has healed beautifully."*
Patient 3 (latissimus dorsi):	*"I never had any pain from it. It has never affected me carrying anything or it has never affected me lifting my arm or thinking 'Jesus I can't move that arm properly now', it is just normal."*
Patient 6 (MSAP):	*"I don't want to sound, and may come across as sexist, but I am sure if a woman was given a choice, she would rather have it in a place that is more hidden."*

Table 8. Positive Lived Experiences of FTT Reconstruction: Subtheme: Positive Reflections and Advice for Surgeons/Patients

Theme: Positive Lived Experiences of FTT Reconstruction	
Subtheme: Positive Reflections and Advice for Surgeons/Patients	
Patient 1:	*"It was worth the risk because if it did work, it meant that I could have a normal life again and still walk. I just think everything is worth the risk and for a surgeon to do it."*
Patient 4:	*"If they are concerned about the complications, then I would say well what would be the alternative choice then?"*
Patient 3:	*"I have heard people say what a waste of time and things like that. I said to them people if you think it is a waste of time, you go in and somebody tell you that they are going to cut your leg off, see how you feel, see what difference it makes to you and your life because it has made a difference to my life."*
Patient 2:	*"I would say (to the surgeons), at the end of the day, you've got nothing to lose, I know it is a big thing to take on… but if you think you have got some sort of chance of doing it, then go for it as you have got nothing to lose at the end of the day, whereas the patient has got something to lose, if you are not willing to do it then they have got to lose their leg."*

artery perforator flap from the calf. They described no functional concerns with the donor site, however, expressed some minor cosmetic discontent with the scar (Table 7).

Theme 3: Positive Lived Experiences of FTT Reconstruction

The theme of positive lived experiences following FTT consistently dominated the interviews. The first emergent subtheme here was patients' positive reflections on the journey and their recommendations for future surgeons and patients. All patients articulated that they would go through the process again to obtain their current results, and encouraged surgeons to embark upon these complex reconstructions for limb salvage strategies for affected patients (Table 8).

An additional subtheme that emerged within the overall theme of positive lived experiences of FTT for DFD was the positive impact the reconstruction had on both patients' general health and their diabetic control (Table 9).

The final subtheme that emerged within this superordinate theme of positive lived experiences was patients' positive relationships that they developed with their operating surgeons, and the clear impact that these relationships had on their journey (Table 10).

DISCUSSION

This qualitative study provides first-hand insight into the lived experience of FTT for DFD, confirming that living with DFD can be near all-consuming for affected

Table 9. Positive Lived Experiences of FTT Reconstruction: Subtheme: Perceived Effects of Reconstruction on General Life, Health, and Relationships

Theme: Positive Lived Experiences of FTT Reconstruction	
Subtheme: Perceived Effects of Reconstruction on General Life, Health, and Relationships	
Patient 1:	*"Now that the infection has actually gone, there is nothing underlying, and all my sugars have fallen into place."*
	"I can wear normal shoes now, I can walk. I wear normal socks; normal footwear and I can put my whole foot in the bath and bathe normally… I have had no infections, it is healed, and it looks good, so I am happy that it did work out well."
Patient 6:	*"In terms of work, I am 100% mobile, to be honest there is zero difference to before. I am still able to do whatever I was before. I couldn't have been happier with how it went."*
Patient 2:	*"It made me change my way of looking at life as well, it made me appreciate life. I'm not going to lie, I was probably one of the worst diabetics you could ever meet and that is not an exaggeration. I never checked my blood sugars, I never took my insulin…now I am not 100% brilliant but compared with what I was it has 100% changed."*

Table 10. Positive Lived Experiences of FTT Reconstruction: Subtheme: Relationship with Surgeons

Theme: Positive Lived Experiences of FTT Reconstruction	
Subtheme: Relationship with Surgeons	
Patient 3:	*"Surgeon A and Surgeon B are absolutely brilliant. I cannot praise them enough. My love for Surgeon A and appreciation for Surgeon B far outweighs anything that I have gone through because of those two. What they do and what they are teaching other people to do is beyond me."*
	"Thank you so much, you have no idea what a difference this has made to me and we cherish everything you do."
Patient 2:	*"Surgeon A and Surgeon B made me feel like one of their family. They took me in like one of their own and I think if they hadn't have treated me the way they did, it would have been a lot more harder to deal with."*
	"He went out of his way on his day off to even come and see me and you don't get that, I'm getting emotional about it now. You can't ask for any more than what them two have done for me. They have literally changed my life. They have got my life on track and I will be forever in their debt, I know it's what they do for living and stuff, but this is very personal to me, we have a personal connection that's how I look at it."

patients, who can find existing treatment pathways often confusing, disheartening and ineffective. Our study suggests that FTT for DFD can be life-changing for affected individuals, with all interviewees reflecting positively on their reconstructive journey.

These findings can help inform the consultation and consent process for future patients considering this treatment. In our practice, we now routinely offer clinical photographs from previous patients (who have consented to this) to prepare them for postoperative foot cosmesis. We are also in the process of developing a patient community that enables new patients to contact those who have been through a similar journey as part of the shared decision-making process.

All participants in this study recounted their detailed, individual fears about imminent amputation before embarking upon their FTT reconstructive journey, with clear understanding that in the absence of FTT as a limb salvage strategy, major amputation was likely. The fear of amputation appeared to be a key determinant in patients' decision-making to proceed with FTT reconstruction. All participants reported that they would go through the process of FTT again, including the postoperative sequelae, to save their limb and to achieve the results they achieved. Furthermore, they each expressed their recommendations for future patients to undertake similar reconstructions, describing the positive impacts that their reconstructions had on their general life. Patients expanded upon this further, by recommending to surgeons that wherever possible, they should offer these reconstructions to affected patients as a limb salvage strategy. Fear of amputation amongst individuals with DFD is well reported, with previous evidence demonstrating that patients with DFD fear major lower extremity amputation more than death.[15]

Patients' quotes provide an insight into the familiar feelings of helplessness associated with chronic illness.[16] Their descriptions of feeling dismissed by clinicians and not listened to, in the context of their ongoing frustration resulting from no improvements in wound healing, are in keeping with previous evidence describing individuals with diabetes not feeling adequately supported by their healthcare professionals either medically, educationally, or emotionally in the care of their feet.[17] Patients in this study had felt a relative reluctance of healthcare professionals in performing reconstructive surgery for DFD. This reluctance may be based on the high-risk nature of FTT reconstruction in individuals who often have multiple co-morbidities, including peripheral vascular disease and compromised healing potential. Free flap survival in such cases has been reported at around 90% compared with over 95% in other elective FTT reconstructions in relatively healthy individuals, for example, breast reconstruction.[7]

Consideration of FTT for limb preservation in DFD requires investment from numerous stakeholders. Firstly, reconstructive microsurgeons performing the operation should recognize and accept the increased likelihood of postoperative complications, including the higher risk of partial or complete flap loss, and possible need for further revisional surgery when compared with other types of free flap reconstruction such as breast reconstruction. Our data suggest that patients hold significant value to their relationship with their surgeons, and surgeons should recognize the importance of this doctor–patient relationship. The active involvement of the surgeon in the pre- and postoperative care is critical, not least to encourage compliance to management plans and to optimize the probability of success for these relatively high-risk reconstructions.

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Secondly, diabetic foot multidisciplinary teams (MDTs) should recognize FTT as a potential treatment option for individuals who traditionally may have been considered for either conservative management or below knee transtibial amputation only. This requires education, culture change and, usually, the involvement of a plastic surgeon within the diabetic foot MDT.

Thirdly, policy makers and hospital management must also be engaged in FTT as a treatment strategy, as these procedures demand greater short-term investment in resources including operative time, perioperative management, and rehabilitation. Patients in our study voiced their concerns about the unwillingness of policymakers to pay for these operations. Unfortunately, lack of data from long-term robust cost-utility analyses exist to support arguments in favor of FTT for DFD to help guide policy decisions at present. Despite this, there is emerging short-medium term quantitative data supporting the role of FTT in achieving successful wound healing and subsequent limb salvage in selected patients with DFD.[6–10] Improvements in 5-year survival following FTT for DFD have also been described.[7] In our study, patients described their ability to return to work and thus contribute to society, with apparently less demand on outpatient foot care services than before their reconstruction. Formal analyses of quality-of-life changes following FTT for DFU using validated patient reported outcome measures are lacking, and should be a focus of future work.

FTT has been adopted as a gold standard, widely accepted management strategy for breast reconstruction following mastectomy for breast cancer. Hospitals, services, and plastic surgery departments worldwide have adapted to accommodate pathways to facilitate FTT reconstruction following breast cancer treatment. Culture change to accommodate FTT as a limb preserving (and potentially life extending) strategy for individuals with DFD should be considered with the same rigor as it was for FTT reconstruction following oncological resection of breast cancer, which remains primarily a cosmetic reconstruction. This qualitative analysis adds to the existing quantitative evidence base supporting a potential role for FTT in DFD, by providing patient-centered insights into the potential benefits these reconstructions can have on affected individuals' general health, life and contributions to society, and should provoke further quantitative analysis assessing its impact on quality of life and cost-effectiveness.

Limitations

Several limitations should be considered when interpreting the results of this analysis. Firstly, all participants interviewed were operated on in a single institution by the same operating surgeons. Generalizability of these results is therefore limited and may not apply to other populations. Secondly, the retrospective nature of patient accounts raises the possibility of recall bias. Thirdly, interviews were performed over the telephone rather than face to face, which has several associated possible strengths and limitations. We felt that the downsides of telephone interviews, which include possible difficulties in establishing a rapport with interviewees and responding to visual cues, were offset in our study by the relative strengths of this strategy, notably the ability to convenience interviewees with greater flexibility and enhanced access to geographical dispersion.[18]

CONCLUSIONS

FTT for salvage reconstruction in DFD can be life-changing for affected individuals. Living with DFD is associated with negative experiences. Patients experience surgery-related concerns and positive experiences following reconstruction. These findings will be useful to inform future quantitative research investigating the effects on quality of life and cost-effectiveness for people with DFD.

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DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

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