ORIGINAL RESEARCH

Loupes vs microscopes in microsurgical reconstructions: A retrospective review of patient records from 2 large tertiary hospitals in Lagos, Nigeria

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Abstract

Background
Microvascular reconstruction is increasingly performed in many developing countries. Recently, some surgeons have begun to exclusively use loupes due to their perceived ease of use to aid visualization in microsurgery. This study compared loupe-based vs operating microscope–based microsurgical reconstruction in a resource-constrained setting.

Methods
A retrospective chart review was conducted at 2 tertiary centres in Lagos, Nigeria, offering reconstructive microsurgery—1 using loupes and the other using microscopes. Data on demographics, flap type, defect site, reconstruction indication, surgery duration, flap survival rates, and hospital stay duration were recorded.

Results
Over a 5-year period, 61 microsurgical reconstructions were performed. The mean patient age was 43.5±4.6 years, with trauma as the underlying pathogenetic mechanism in 62.9% of cases, while oncologic resections accounted for the remainder. The anterolateral thigh (42.6%) and rectus femoris flaps (31.1%) were the most commonly transferred. No significant differences were observed between the loupes and microscope groups in terms of take-back rates, flap loss rates, or hospitalization duration. The overall flap loss rate was 12%. A significantly shorter mean operative time was noted in the loupe group (P<0.001).

Conclusions
This study highlighted the challenges of reexploring failing flaps in low-resource settings. Loupe microsurgery may offer a cost-effective and quicker alternative for many microsurgical reconstructions when a microscope is unavailable.

Keywords: microsurgery, reconstructive surgery, surgical flaps, surgical equipment, operating microscopes, surgical loupes, resource-limited settings, comparative study, Nigeria

Introduction

Microvascular reconstruction has evolved from its inception in the 1960s into a highly refined art form, boasting success rates above 95% in most centres worldwide.[1] This advancement has led to its widespread application across various surgical specialties. The range of vessels and nerves managed varies from <1 mm for fingertip and paediatric replants to up to 3 mm for the DIEP (deep inferior epigastric perforator) flaps in breast reconstructions.[2],[3]

Modern magnification-assisted procedures span diverse fields, from middle ear surgery in otorhinolaryngology to varicocelectomy and vasectomy reversals in urology, as well as endodontics in dentistry.[4],[5] General surgeons and gynaecologists have often integrated some form of magnification, typically loupe magnification, into their operations, while surgeons practising specialties like neurosurgery generally prefer the operating microscope.[6],[7]

Over 60 years since Jacobson and Suarez's pioneering work, the operating microscope has remained the gold

Table 1. Patient demographics and flap characteristics according to technique

Variable	Loupes	Operating microscope	*P* value
Mean age	41	45	0.17
Male:female ratio	3:1	2:1	
Defect location			
Head and neck	–	18	
Upper limb	2	8	
Lower limb	21	8	
Trunk	2	2	
Flap			
Radial forearm	2	5	
Fibula	3	4	
Rectus femoris	19	–	
Anterolateral thigh	1	26	
Groin	–	1	
Arterial anastomosis, EE/ES	25/0	36/5	
Mean duration of surgery, min ± SD	302±71	377±110	<0.001
Mean hospital stay, days	35	21	0.25
Flab take-back	1	3	0.16
Flap loss	5	6	0.9

All values are frequencies unless otherwise indicated.
All venous anastomoses were end to end.
EE, end-to-end anastomosis; ES, end-to-side anastomosis; SD, standard deviation

standard for magnification, serving as the benchmark for all other magnifying devices. However, recently, many surgeons have increasingly performed microvascular anastomoses using loupe magnification.[8],[9] Serletti et al.[10] demonstrated a 99% success rate in 200 consecutive free flaps on vessels larger than 1.5 mm in adults. Similarly, Shenaq et al.[11] reported a 97.8% success rate in loupe-only microsurgery within a comparable cohort. Despite these findings, many surgeons still consider loupe microsurgery to be suboptimal.

This study assessed loupe-based vs operating microscope–based microsurgical reconstructions in a developing country context, highlighting the potential implications for similar resource-constrained settings.

Methods

Following approval from the institutional review board, the charts of all free flap procedures performed at the 2 largest tertiary hospitals in Lagos State, Nigeria, were reviewed for the period from 2016 through 2020. At the National Orthopaedic Hospital, Igbobi, Lagos, all microvascular anastomoses were executed by A.O.A. using ×6 magnification loupes, while pedicle dissections were performed with ×3.5 loupes. Conversely, at Lagos University Teaching Hospital, Idi-Araba, B.O.M. carried out anastomoses using an operating microscope (OPMI series, Carl Zeiss Meditec, Jena, Germany) at magnifications ranging from ×10 to ×20, following pedicle dissection with ×4.5 loupes. Both surgeons are fellowship-trained microsurgeons with comparable levels of experience.

Data on basic demographics, operative details, surgery duration, flap types, anastomosis techniques, take-back rates, and flap success rates were collected. Statistical analysis was conducted using the unpaired t-test to compare means, while the chi-square test was used to assess the significance of differences between groups, with a 95% confidence level.

Results

Over a 5-year period, the charts of 61 patients were reviewed. The mean patient age was 43.5 years among 36 men and 25 women. The indications for free flap procedures were trauma in 38 cases and oncologic resection in 23 cases. The most commonly transferred flaps were the anterolateral thigh flap (42.6%) and the rectus femoris flap (31.1%), with an overall flap success rate of 88% (Table 1). Loupes were

Table 2. Flap complications

#	Flap	Group	Hours before vascular crisis detected	Pathogenesis	Cause	Intervention	Outcome
1	Anterolateral thigh	Loupe	50	Arterial insufficiency	Unknown	Conservative	Total loss
2	Fibular	Microscope	55	Venous	Haematoma	Reexplored (venous thrombectomy, heparin flush)	Total loss
3	Groin	Microscope	72	Marginal necrosis	Unknown	Conservative	Total loss
4	Anterolateral thigh	Microscope	39	Venous congestion	Venous occlusion	Conservative	Total loss
5	Rectus femoris	Loupe	36	Venous congestion	Venous occlusion	Conservative	Total loss
6	Radial forearm	Microscope	24	Venous congestion	Venous occlusion	Multiple punctures with heparin flush	Partial necrosis
7	Anterolateral thigh	Microscope	45	Venous congestion	Venous occlusion	Conservative	Total loss
8	Anterolateral thigh	Microscope	40	Venous congestion	Venous occlusion	Conservative	Total loss
9	Anterolateral thigh	Microscope	42	Venous congestion	Venous occlusion	Reexplored	Total loss
10	Rectus femoris	Loupe	40	Venous congestion	Venous occlusion	Reexplored	Total loss
11	Rectus femoris	Loupe	38	Venous congestion	Venous occlusion	Multiple punctures with heparin flush	Total loss
12	Rectus femoris	Loupe	48	Venous congestion	Venous occlusion	Conservative	Total loss
13	Anterolateral thigh	Microscope	28	Arterial insufficiency	Tight sutures	Reexplored (suture release, lignocaine pedicle irrigation)	Partial necrosis

predominantly used in lower extremity reconstructions (87.5%), while oncologic reconstructions constituted 61.1% of the microscope group's cases. Nearly half of the recipient sites were lower extremities (n=29 of 61, 34.4%). The anterolateral thigh flap was the most frequently performed flap (44.3%), followed by the rectus femoris flap (31.1%). There was 1 death in our series: a 71-year-old man who underwent anterolateral thigh flap transfer following radical excision of a maxillary antrum carcinoma; he succumbed to heart failure on the seventh postoperative day. Eleven flaps were completely lost, and 2 underwent partial necrosis but healed following skin grafting. Of the 4 failing flaps that were reexplored, 1 survived completely. Notably, there was significant difficulty in reexploring most of the failing flaps due to logistical challenges (Table 2).

Discussion

The benefits of higher magnification for enhancing the precision of small vessel repair are well established.[12] There has been a growing trend towards the exclusive use of loupes in microsurgery, with some surgeons advocating for their safety in free flap procedures and endorsing them as a viable alternative to the operating microscope.[13]-[16]

Commercially available loupes offer magnification ranging from 2 to 8 times relative to visibility achieved with the naked eye. They are known for their cost-effectiveness (with lower initial investment and maintenance expenses), their user-friendly manoeuvrability, and their facilitation of close-range manipulation within the surgical field.[17] While various alternatives to the microscope exist—such as varioscopes, exoscopes, and even suggestions of using Android smartphones[18]-[20]—loupes remain the most universally employed.

Microsurgical reconstruction is increasingly performed in resource-constrained settings [21]-[23]; however, these environments continue to face challenges related to operating theatre space, instruments, sutures, training, and the availability of microscopic setups.

Table 3. Mean operating times according to flap type

Flap	Mean duration of transfer, min ± SD
Anterolateral thigh	318±89
Rectus femoris	263±56
Radial forearm flap	177±45
Osteocutaneous fibular	406±98
Groin	264±67

SD, standard deviation

The operating microscope remains a cornerstone of microreconstruction. However, in low-income countries, hospitals often lack this equipment due to numerous competing priorities. When available, maintenance and technical issues can hinder their long-term routine use. Loupes, being lightweight and user-friendly, may be more accessible and have been reported to yield results comparable to those of microscopes in association with procedures involving vessels >2.5 mm in diameter when used by experienced microsurgeons.[17]

Our findings, which showed no significant differences in flap loss rates, take-back rates, or lengths of hospital stay between loupes and microscopes, corroborate previous reports on the safety of loupe microsurgery for various microsurgical reconstructions.[24]-[26] While the use of an operating microscope is advised for procedures involving vessels <1.5 mm in diameter and for procedures on children,[10] we noted some difficulty in refocusing after diverting attention from the surgical field when using high-powered ×6 loupes. Additionally, trainees and assistants, for example, may not see exactly what the lead surgeon sees unless these other team members are using the same magnification. It has been suggested that proficiency with loupes should follow the attainment of technical skill and experience with the operating microscope; thus, we advocate for a preliminary training period with the operating microscope for novice microsurgeons, where possible.[8],[27]

Our study also determined a statistically significant reduction in operating times associated with loupe microsurgery, supporting the observation that a significant reduction in setup time often goes unrecorded in operating time measurements.[28],[16]

In our environment, take-backs are challenging due to difficulties in obtaining emergency access to operating theatre space, resulting in few flaps being salvageable at take-back (Table 3). Our findings align with those of Nangole et al.,[13] who identified the inability to reexplore failing flaps as the primary challenge to routine reconstructive microsurgery in resource-limited settings.

This study was limited by its small sample size, heterogeneous case mix, retrospective design, and the absence of replantation operations.

Given the context of our study and its findings, we encourage practitioners in similar environments to use high-powered loupes for microreconstruction, with which they should anticipate reasonable outcomes. However, we advise caution and suggest that some flaps be limited to procedures involving larger-calibre vessels. Loupes may offer the benefits of reduced operating times and lower startup costs in environments where microscopes are unavailable. We recommend that all foundational microsurgery courses incorporate a component of loupe microsurgery training.

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