ORIGINAL REPORTS

Resident Involvement in Microsurgery: An American College of Surgeons National Surgical Quality Improvement Program Analysis

Kevin T. Jubbal, MD,[*] Daniel Chang, MD,[†] Shayan A. Izaddoost, MD, PhD,[†] William Pederson, MD,[‡] Dmitry Zavlin, MD,[§] and Anthony Echo, MD[§]

[*]Department of Plastic Surgery, Loma Linda University Medical Center, Loma Linda, California; [†]Division of Plastic Surgery, Baylor College of Medicine, Houston, Texas; [‡]Division of Plastic Surgery, Baylor College of Medicine, Houston, Texas; and [§]Institute for Reconstructive Surgery, Houston Methodist Hospital, Weill Cornell Medicine, Texas, Houston, Texas

OBJECTIVE: In the current healthcare climate, there is increased focus on medical errors, patient outcomes, and the influence of resident participation on these metrics. Other studies have examined the influence of resident involvement on surgical outcomes, but the arena of microsurgery, with added complexity and learning curve, has yet to be investigated.

DESIGN: A retrospective analysis of the American College of Surgeons National Surgical Quality Improvement Program database was performed to find patients undergoing procedures with free tissue transfer by screening for Current Procedural Terminology codes. Primary outcomes measured include flap failure, wound, infectious, and major and minor complications.

SETTING: This study was conducted at the Methodist Hospital, an academic hospital located in Houston, Texas.

PARTICIPANTS: Patients in the National Surgical Quality Improvement Program database between the years 2005 and 2012 undergoing microsurgical procedures were included in this analysis.

RESULTS: A total of 1466 patients met inclusion criteria. There was a statistically significant association of major complications with age, peripheral vascular disease, American Society of Anesthesiologists (ASA) classification of 3 or greater, total operative time, and year of operation. Multivariate analysis on minor complications demonstrated significant association with ASA class of 3 or 4. Resident involvement was not a significant factor among any outcome measures including major complications, minor complications, flap failure, wound complications, infectious complications, bleeding requiring transfusion, and unexpected reoperation rates within 30 days.

CONCLUSIONS: This study provides further evidence in support of the claim that resident involvement in microsurgery is safe and effective, with similar rates of major complications, minor complications, flap failure, and unexpected reoperation. High ASA classification and history of peripheral vascular disease were strong predictors of major complications and should be optimized preoperatively before free tissue transfer. Later years were associated with decreased major complication rates, which may be reflective of enhanced supervision standards. (J Surg Ed ▮:▮▮▮-▮▮▮. © 2017 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

KEY WORDS: microsurgery, clinical aspect of plastic microsurgery, clinical outcomes research, resident training

COMPETENCY: Practice-Based Learning and Improvement

INTRODUCTION

The field of modern microvascular surgery has evolved into a valuable tool for surgeons in multiple specialties including plastic and reconstructive surgery, orthopedic surgery, neurosurgery, cardiovascular surgery, general surgery, and urology.[1,2] Microsurgery is an indispensable technique for complex reconstructions, and is therefore an essential component in training plastic and reconstructive surgeons.[3,4]

Correspondence: Inquiries to Kevin T. Jubbal, MD, Department of Plastic Surgery, Loma Linda University Medical Center, 11234 Anderson St, Loma Linda, CA 92354; e-mail: kjubbal@gmail.com

  1931-7204/$30.00 http://dx.doi.org/10.1016/j.jsurg.2017.05.017

With advances to the field, residents are exposed to microsurgery earlier in their training.[5] Complex microsurgical cases necessitate a skilled surgical assistant or second surgeon. In the academic setting where many of such procedures take place, a resident or fellow is therefore frequently involved. With increased focus on medical errors, adverse events, and patient outcomes,[6] the influence of resident participation on these metrics is an area currently being investigated. The involvement of trainees in patient care has raised concerns about their experience and abilities, leading some patients to request that house staff not participate in their care.[7]

Specifically to microsurgery, there is a steep learning curve and demand for highly refined manual dexterity, hand-eye coordination, and good judgement in a clinical setting which requires considerable time in practice.[8,9] It has been demonstrated that the surgeon variable is a major determinant of success or failure in microsurgery, with studies demonstrating a significant learning curve before achieving high success rate.[10]

Prior research exploring resident involvement correlated to patient outcomes among different subspecialties and procedure types has produced mixed results. Although some of these studies resulted in poorer outcomes with resident involvement,[11-19] others reported no significant detriment in outcomes with resident involvement.[5,20-24] The effect of resident involvement in plastic surgery on a large scale has been studied demonstrating safety;[20] however, the arena of microsurgery, with added complexity and learning curve, has limited data in the literature. Given this learning curve and operator dependence unique to the field of microsurgery, outcomes in cases with resident involvement should be examined.[25] The purpose of this study was to examine the influence of resident involvement in microsurgical outcomes.

MATERIALS AND METHODS

Data Source

Participant Use Data Files for 2005 to 2014 were downloaded from the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) website (http://www.acsnsqip.org/). This database is comprised of data regarding preoperative comorbidities, intraoperative variables, and 30-day postoperative mortality and morbidity outcomes in surgeries performed at participating institutions. The details for data collection methods are available through the program.[26] Data for years 2013 and 2014 were excluded given changes in data collection of key variables including flap failure[27,28] and discontinuation of variables which allowed for determination of resident involvement in cases. This study was conducted in accordance with the principles outlined in the Declaration of Helsinki.

Patient Selection

We performed a retrospective analysis of the database to obtain data on all patients undergoing procedures with microvascular anastomoses between 2005 and 2012. The following American Medical Association Current Procedural Terminology codes were screened as both primary and secondary operations to identify patients undergoing microsurgical procedures: 15756 to 15758, 15842, 19364, 20955 to 20957, 20962, 20969 to 20973, 26551, 26553, 26554, 26556, 43496, and 49906 (Table 1).

TABLE 1. CPT Codes

CPT Code	Procedure
15756	Free muscle flap with or without skin graft with microvascular anastomosis
15757	Free skin flap with microvascular anastomosis
15758	Free fascial flap with microvascular anastomosis
15842	Flap for face nerve palsy
19364	Breast reconstruction
20955	Bone graft with microvascular anastomosis
20956	Bone graft with microvascular anastomosis; iliac crest
20957	Bone graft with microvascular anastomosis; metatarsal
20962	Bone graft other than fibula, iliac crest, or metatarsal
20969	Free osteocutaneous flap with microvascular anastomosis, other than iliac crest, rib, metatarsal, or great toe
20970	Free osteocutaneous flap with microvascular anastomosis; iliac crest
20971	Free osteocutaneous flap with microvascular anastomosis
20972	Free osteocutaneous flap with microvascular anastomosis; metatarsal
20973	Free osteocutaneous flap with microvascular anastomosis; great toe
26551	Toe-to-hand transfer with microvascular anastomosis; great toe "wrap-around" with bone graft
26553	Other than great toe, single
26554	Other than great toe, double
26556	Free toe joint transfer with microvascular anastomosis
43496	Free jejunum transfer with microvascular anastomosis
49906	Free omental flap with microvascular anastomosis

CPT, Current Procedural Terminology.