OPEN

PRS GLOBAL OPEN

SPECIAL TOPIC

The Left-handed Plastic Surgery Trainee: Perspectives and Recommendations

Ira L. Savetsky, MD*
Michael J. Cammarata, MD*
Rami S. Kantar, MD*
J. Rodrigo Diaz-Siso, MD*
Yash J. Avashia, MD†
Rod J. Rohrich, MD†
Pierre B. Saadeh, MD*

Background: Left-handed surgeons experience difficulty with tools designed for use in the right hand. The purpose of this study was to examine instrument laterality and to survey the experiences of left-handed plastic surgery trainees.
Methods: Count sheets for plastic surgery trays (reconstructive, microsurgery, rhinoplasty, craniofacial) were acquired from Tisch Hospital, NYU Langone Health. Instruments with right-handed laterality were tallied. A survey was also distributed to plastic surgery residents and fellows to determine hand preference for surgical tasks, and those who identified as left-handed described how handedness impacted their training.
Results: Right-handed laterality was seen in 15 (31.3%) of the 48 reconstructive instruments, 17 (22.7%) of the 75 rhinoplasty instruments, and 22 (31.0%) of the 71 craniofacial instruments. One-hundred percent of the 25 microsurgery instruments were ambidextrous. There were 97 survey responses. Trainees (17.5%) were identified as left-handed and were more likely than right-handed trainees to report operating with both hands equally or with the opposite hand (47.1% versus 1.3%; $P < 0.001$). Left-handed trainees were significantly more likely than right-handed trainees to use their nondominant hand with scissors ($P < 0.001$), electrocautery ($P = 0.03$), and needle drivers ($P < 0.001$) and when performing tissue dissection ($P < 0.001$) and microsurgery ($P = 0.008$). There was no difference in use of the nondominant hand between right and left-handed trainees for knot tying ($P = 0.83$) and in use of the scalpel ($P = 0.41$).
Conclusions: Left-handed plastic surgery trainees frequently encounter instruments designed for the nondominant hand, with which they adaptively perform several surgical tasks. Mentoring may help trainees overcome the laterality-related challenges of residency. *(Plast Reconstr Surg Glob Open 2020;8:e2686; doi: 10.1097/GOX.0000000000002686; Published online 21 May 2020.)*

INTRODUCTION

Left-handed individuals represent approximately 11% of the American population.[1,2] One school of thought states that left-handed individuals tend to be more intellectual, musical, and artistic. In addition, some may consider left-handed individuals to be more adaptable due to their upbringing in a right-handed world. However, left-handed individuals have been shown to experience greater difficulty with tools designed for the right hand.[3–5] These difficulties extend to the use of instruments within the operating room, where left-handed surgical residents experience anxiety about laterality[6] and infrequently find mentoring in handedness from senior surgeons.[2,6] Additional disadvantages include greater difficulty learning from right-handed surgeons,[7] lack of access to left-handed instruments,[8] and inconveniences during assisting.[6] Left-handed surgeons often resort to becoming more ambidextrous,[9] or even operating with the right hand, despite the well-established benefits of skills acquisition with the dominant hand.[10] For example, left-handed students learned bone drilling better with tools designed for their dominant hand,[11] and psychomotor skills may be more easily internalized when there is concordance in handedness between trainer and trainee[12]; however, left-handed surgeons rarely experience these benefits during training.

*From the *Hansjörg Wyss Department of Plastic Surgery, New York University Langone Health, New York, N.Y.; and †Dallas Plastic Surgery Institute, Dallas, Tex.*

Received for publication November 22, 2019; accepted January 15, 2020.

DOI: 10.1097/GOX.0000000000002686

Disclosure: *Dr. Rohrich receives instrument royalties from Eriem Surgical, Inc., and book royalties from Thieme Medical Publishing. The other authors have no financial interest to declare.*

Despite the need to increase awareness among surgeons about the technical implications of training as a left-handed surgeon,[13] few teaching materials are available to trainees as they progress through residency, and there are no studies documenting the experience of left-handed trainees within plastic surgery. Although encouraging, only editorials[9] and brief technical reports on the subject have been described within plastic surgery.[10,14,15] Previous surveys of left-handed surgeons have been published; however, they were non–plastic surgery specific, with results that may not be generalizable.[2,7,16,17]

In an effort to improve the visibility of left-handed plastic surgeons and ultimately their approaches to training,[13] we set out to survey left-handed independent and integrated plastic surgery trainees from around the country about their experiences. We also invited the participation of right-handed surgeons to help determine the distribution of laterality for basic surgical tasks. In an effort to determine the frequency with which a left-handed surgeon encounters instruments designed for the nondominant hand, we also examined several plastic surgery trays and investigated how lateralized instruments vary among reconstructive, microsurgery, craniofacial, cosmetic, and hand surgery cases.

METHODS

Instrument Tray Counts

Instrument count sheets for various plastic surgery trays were acquired from NYU Tisch Hospital. From the following 5 trays, the number of instruments with right-handed laterality were tallied: reconstructive, microsurgery, craniofacial, rhinoplasty, and hand.

Survey

A web-based, Institutional Review Board–approved survey was distributed to the US Integrated and Independent plastic surgery residents and fellows via an email to residency coordinators. All surveys were administered and stored within the REDCap database. The survey invited responses from both left- and right-handed plastic surgery trainees. Using a survey form adapted from Lieske,[7] all trainees provided demographic information, their overall handedness in surgery, and their hand preference for various surgical tasks. Self-reported ambidexterity was defined as trainees who generally identified as operating with either both hands equally or primarily the nondominant hand. Surgical tasks included use of the scalpel, scissors, electrocautery, and needle driver and the performance of knot tying, tissue dissection, and microsurgery. Options to select from included "only left, mainly left, both equally, mainly right, only right." Within the surgical tasks, use of the nondominant hand was defined as a trainee using both hands equally, mainly the nondominant hand, or only the nondominant hand. Institutional data were not collected in order to protect trainee confidentiality. Trainees who self-identified as left-handed answered several follow-up questions, adapted from Anderson et al,[17] on the use of left-handed instruments, access to mentorship, and the advantages and disadvantages of being a left-handed plastic surgery trainee. Open-ended questions were also included to further elicit the opinions of left-handed trainees.

Statistical Analysis

All responses were collected anonymously, and the results were tabulated using SPSS version 25.0 (IBM Corp, Armonk, N.Y.). Statistical analysis was performed using a χ^2 test, and significance was defined as P value <0.05.

RESULTS

Instrument Tray Counts

In the general reconstructive tray, 15 (31.3%) of the 48 instruments had right-handed laterality, while 33 (68.7%) were ambidextrous. In the microsurgery tray, 100% of the 25 instruments were ambidextrous. In the craniofacial tray, 22 (31.0%) of the 71 instruments had right-handed laterality, while 49 (69.0%) were ambidextrous. In the rhinoplasty tray, 17 (22.7%) of the 75 instruments had right-handed laterality, while 58 (77.3%) were ambidextrous. In the hand tray, 15 (32.6%) of the 46 instruments had right-handed laterality, while 31 (67.4%) were ambidextrous (Table 1).

Survey

Demographics

A total of 97 survey responses were received, with a response rate of 9.8%. Sixty-one (62.9%) respondents were men, and 36 (37.1%) were women. A majority of trainees were in their 30s (58.8%) or 20s (39.2%), and most were in their second post-graduate year (PGY) (Table 2). Eight respondents (8.2%) were from independent plastic surgery programs, while the remaining 89 (91.8%) were from integrated programs.

Ambidexterity and Use of the Nondominant Hand

Eighty (82.4%) respondents were right-handed, and 17 (17.5%) were left-handed. One right-handed trainee reported operating with both hands equally, and all other right-handed individuals primarily operated with the right hand. Seven left-handed trainees reported operating equally with both hands, 9 with primarily the left hand, and 1 with primarily the right hand. Upon χ^2 analysis, left-handed trainees were significantly more likely than right-handed trainees to report operating with both hands equally or with the nondominant hand (47.1 versus 1.3%; $P < 0.001$). When handedness was compared across surgical tasks, left-handed trainees were significantly more likely than right-handed trainees to use their nondominant hand when using scissors (88.2% versus 19.4%; $P < 0.001$), electrocautery (54.5% versus 15.9%; $P = 0.03$), and needle drivers (41.2% versus 0%; $P < 0.001$), as well as when performing tissue dissection (58.8% versus 5.3%; $P < 0.001$) and microsurgery (35.7% versus 8.7%; $P = 0.008$). There was no difference in the use of the nondominant hand between right- and left-handed trainees

Table 1. Frequency of Laterality versus Ambidexterity among Instrument Trays

Tray	Right-hand Laterality, No. (%)	Ambidextrous, No. (%)	Total No. Instruments
General reconstructive	15 (31.3)	33 (68.7)	48
Microsurgery	0 (0)	25 (100)	25
Craniofacial	22 (31)	49 (69)	71
Cosmetic/rhinoplasty	17 (22.7)	58 (77.3)	75
Hand	15 (32.6)	31 (67.4)	46

Table 2. Survey Responses by PGY

PGY	No. (%)
PGY-1	18 (18.6)
PGY-2	22 (22.7)
PGY-3	13 (13.4)
PGY-4	16 (16.5)
PGY-5	14 (14.4)
PGY-6	11 (11.3)
Fellow	3 (3.1)
Total	97 (100)

for knot tying (52.9% versus 50.0%; $P = 0.83$) and use of the scalpel (0% versus 3.9%; $P = 0.41$).

Responses from Left-handed Trainees

One (5.9%) left-handed respondent had been offered mentorship for his laterality, while the remaining 16 (94.1%) had not; however, only 6 (35.5%) actually desired mentorship. Over half of respondents (58.8%) believed that there are advantages to being a left-handed trainee, while 52.9% believed that there are disadvantages. Experience with left-handed instruments was seen in 17.6% of trainees; however, a majority of left-handed respondents (52.9%) believed that left-handed trainees should use their left hand with right-handed instruments. No trainee identified a particular plastic surgery procedure made more difficult by left-handedness. A majority of trainees (56.3%) made at least one modification to a procedure to accommodate left-hand dominance, such as switching sides of the operating table (n = 8), modifying the patient positioning (n = 3), and changing the technique in a step of the procedure (n = 2). One trainee considered changing specialties due to laterality. Six left-handed trainees anticipated pursuing a career in academics, 5 in private practice, and 6 were undecided.

DISCUSSION

While one school of thought states that left-handed individuals tend to be more intellectual, musical, and artistic, the use of certain surgical instruments may be fatiguing and unnatural for left-handed surgeons, given that these tools are designed for use in their nondominant hand.[18] Although surgeons have advocated for use of left-handed instruments,[8] they are often expensive and outdated[9]; hence, a majority of left-handed surgeons have no alternative but to adapt to using right-handed tools in their left hand. In an effort to determine the frequency of encountering tools designed for the nondominant hand, we examined various plastic surgery trays for instruments with either right-handed laterality or ambidexterity.

Among the general reconstructive, craniofacial, and hand trays, approximately one third of all instruments (31.3%, 31.0%, and 32.6%, respectively) had right-handed laterality. A majority of these instruments were locking or cutting tools such as scissors, clamps, and needle drivers. The remaining instruments were ambidextrous, such as retractors, forceps, and hooks. Although lateralized instruments represented only a minority of the tools within these trays, they are likely used with much greater frequency given their utility across various surgical tasks essential to plastic surgery, such as suturing and tissue dissection. To overcome these obstacles, plastic surgeons have described various technical modifications, such as the Miller–Meyerson maneuver, which allows left-handed surgeons to more efficiently handle locking instruments.[10] Other surgical sets, such as the rhinoplasty tray, had fewer instruments with right-handed laterality (22.7%) given the prevalence of osteotomes, elevators, and speculums. The microsurgery tray did not have any instruments with right-handed laterality due to the ambidexterity afforded by the Castroviejo design, which replaces the locking mechanism of needle drivers and eliminates the need for finger rings on scissors. Furthermore, the tissues and sutures within microsurgery are small and delicate, rendering them more amenable to cutting, unlike monofilament and braided suture in macrosurgery, which require a very specific motion of the scissor blades. Our analysis did not include instruments such as Watson skin-grafting knives; however, they are known to present a challenge to left-handed surgeons. Cunnane et al[14] described a technical modification to facilitate the use of this right-handed tool in the left hand. Plastic surgeons are known for finding creative solutions to complex problems, and it is therefore no surprise to find reports of technical adaptations of right-handed tools originating from plastic surgeons.[10,14] We encourage plastic surgeons to continue to publish their innovations that help make left-handed surgeons more comfortable in the operating room.

Of the 97 total survey responses received in our study, n = 17 (17.5%) respondents identified as left handed. Although the proportion of left-handed trainees was greater than expected given the national average, this increase in prevalence was most likely accounted for by sampling bias, as left-handed individuals tend to gravitate toward topics of left-handedness. Furthermore, we specifically sought out the responses of left-handed trainees to ensure a large enough sample size. The survey data demonstrated that left-handed trainees had significantly higher rates of self-reported ambidexterity (47.1 versus 1.3%; $P < 0.001$), illustrating a perceived ambidexterity and general comfort with operating with the right hand.

When preference for handedness was examined across specific surgical tasks, left-handed trainees were significantly more likely than right-handed trainees to use the nondominant hand when handling scissors, electrocautery, and needle drivers, as well as when performing tissue dissection and microsurgery. Interestingly, there was no difference between groups for use of the scalpel and knot tying. Neither right-handed nor left-handed trainees felt comfortable using the scalpel in the nondominant hand, illustrating that the scalpel requires the utmost precision. Approximately 50% of both right- and left-handed trainees used the nondominant hand for knot tying; hence, there was no significant difference between groups. Right-handed trainees used the nondominant hand most when knot tying (50%) and when using scissors (19.4%). Experimental studies would be required to determine if left-handed trainees are truly ambidextrous and therefore display equal use of the right and left hands; however, our results support the notion of significantly greater use of the nondominant hand by left-handed trainees and illustrate how they adapt to right-handed environments.

Survey responses of left-handed trainees were consistent with previous reports in surgery, demonstrating a lack of available mentoring and little to no access to left-handed instruments.[2,6,13,18] Previous authors have called for early laterality-related mentoring,[6,13,19] which may help junior residents progress more comfortably as senior surgeons help them navigate the hurdles they have already overcome. Trainees were divided on the particular advantages and disadvantages of being left handed. Ten trainees cited advantages, such as the development of right-handed skills, a versatility that allows them to operate in one position without frequent position changes, and an ability to work more comfortably in difficult to reach spaces. Nine residents cited disadvantages, especially pertaining to their relationships with faculty. For example, right-handed faculty may have difficulty teaching and assessing left-handed trainees, may insist on operating with a right-handed assistant, and may unfairly criticize left-handed trainees for looking "awkward" or "doing things backwards." The bilateral nature of certain plastic surgery procedures allows for right- and left-handed surgeons to stand on their preferred side of the table, such as during an abdominoplasty, when each surgeon can use his or her dominant hand for tissue undermining. However, opposite handedness between the primary and assistant surgeons during microsurgery will be noncomplimentary, such that what is difficult for the primary surgeon is often also difficult for the assistant. Given the "head-to-toe" nature of plastic surgery, there is no consistent approach analogous to the median sternotomy in cardiothoracic surgery,[20] and it is therefore difficult to make specific recommendations on how to set up and operate as a left-handed plastic surgeon. Robotic surgery may help eliminate issues of handedness in intra-abdominal cases,[21,22] but the open nature of most plastic surgery cases makes it more resistant to such changes. Regardless, trainees may find that they must make some kind of accommodation to patient positioning or steps in a procedure to facilitate their handedness. Having a more senior resident or faculty mentor work through these challenges with left-handed trainees would be ideal.

Our study was primarily limited by the survey design and small sample size. To protect confidentiality, institutional data were not collected, and it is therefore not possible to determine how many different programs were represented. It would have been preferable to elicit greater numbers of survey responses from senior residents, given that these residents have accumulated more hours of plastic surgery–specific training. However, our survey responses were primarily from PGY-1 and PGY-2 residents (18.6% and 22.7%, respectively) who spend a substantial amount of time on other services for rotations such as general, vascular, and transplant surgery, and their opinions may not be representative of experiences solely based in plastic surgery or representative of senior resident responses. However, integrated programs are dedicating increasingly longer periods of time to plastic surgery rotations, even during PGY-1.[23]

CONCLUSIONS

This study demonstrates that left-handed trainees frequently encounter tools designed for the nondominant hand, with which they adaptively perform several surgical tasks. Left-handed trainees also had greater self-reported ambidexterity but rarely have access to mentoring or left-handed instruments. We hope this study will improve the training of left-handed plastic surgeons by giving rise to additional research and resources describing technical modifications for left-handed approaches. In the meantime, we will continue to promote a positive learning environment for left-handed trainees and encourage all trainees to not only be affable, available, and able but also ambidextrous.

Pierre B. Saadeh, MD
Hansjörg Wyss Department of Plastic Surgery
NYU Langone Health
305 E 33rd St
New York, NY 10016
E-mail: pierre.saadeh@nyumc.org

REFERENCES

1. Blomquist PH. Left-handed residents. *J Cataract Refract Surg.* 2010;36:186.
2. Adusumilli PS, Kell C, Chang JH, et al. Left-handed surgeons: are they left out? *Curr Surg.* 2004;61:587–591.
3. Flatt AE. Is being left-handed a handicap? The short and useless answer is "yes and no." *Proc (Bayl Univ Med Cent).* 2008;21:304–307.
4. Graham CJ, Cleveland E. Left-handedness as an injury risk factor in adolescents. *J Adolesc Health.* 1995;16:50–52.
5. Graham CJ, Dick R, Rickert VI, et al. Left-handedness as a risk factor for unintentional injury in children. *Pediatrics.* 1993;92:823–826.
6. Tchantchaleishvili V, Myers PO. Left-handedness—a handicap for training in surgery? *J Surg Educ.* 2010;67:233–236.
7. Lieske B. The left handed surgical trainee. *BMJ.* 2008;337:a2883.
8. Burdett C, Theakston M, Dunning J, et al. Left-handed surgical instruments—a guide for cardiac surgeons. *J Cardiothorac Surg.* 2016;11:135.
9. Rohrich RJ. Left-handedness in plastic surgery: asset or liability? *Plast Reconstr Surg.* 2001;107:845–846.

10. Genova R, Meyerson J, Miller MJ. Miller-Meyerson maneuver for left-handed surgeons. *Plast Reconstr Surg.* 2018;142:104e–105e.
11. Torgerson CS, Brydges R, Chen JM, et al. Drilling simulated temporal bones with left-handed tools: a left-hander's right? *Ann Otol Rhinol Laryngol.* 2007;116:819–826.
12. Lee JY, Mucksavage P, McDougall EM. Surgical skills acquisition among left-handed trainees-true inferiority or unfair assessment: a preliminary study. *J Surg Educ.* 2013;70:237–242.
13. Prasad NK, Kvasnovsky C, Wise ES, et al. The right way to teach left-handed residents: strategies for training by right handers. *J Surg Educ.* 2018;75:271–277.
14. Cunnane M, Thomas R, Creasy H, et al. A left handed surgeon's handicap: technical note on the ambidextrous use of a Watson knife in burns surgery. *Burns.* 2017;43:1356–1357.
15. Khansa I, Khansa L, Westvik T, et al. Work-related musculoskeletal injuries in plastic surgeons in the United States, Canada and Norway. *Plast Reconstr Surg.* 2018;141:165e–175e.
16. Beehler B, Kochanski RB, Byrne R, et al. Prevalence and impact of left-handedness in neurosurgery. *World Neurosurg.* 2018;114:e323–e328.
17. Anderson M, Carballo E, Hughes D, et al. Challenges training left-handed surgeons. *Am J Surg.* 2017;214:554–557.
18. Bernstein G. Needle holders—an instrument especially for the left-handed surgeon. *J Dermatol Surg Oncol.* 1988;14:505–506.
19. Alnassar S, Alrashoudi AN, Alaqeel M, et al. Clinical psychomotor skills among left and right handed medical students: are the left-handed medical students left out? *BMC Med Educ.* 2016;16:97.
20. Burdett C, Dunning J, Goodwin A, et al. Left-handed cardiac surgery: tips from set up to closure for trainees and their trainers. *J Cardiothorac Surg.* 2016;11:139.
21. Badalato GM, Shapiro E, Rothberg MB, et al. The da Vinci robot system eliminates multispecialty surgical trainees' hand dominance in open and robotic surgical settings. *JSLS.* 2014;18:e2014.00399
22. Mucksavage P, Kerbl DC, Lee JY. The da Vinci Surgical System overcomes innate hand dominance. *J Endourol.* 2011;25:1385–1388.
23. Rifkin WJ, Cammarata MJ, Kantar RS, et al. From "Coordinated" to "Integrated" residency training: evaluating changes and the current state of plastic surgery programs. *Plast Reconstr Surg.* 2018;143:644e–654e.