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WHAT IS THE BEST WAY TO TRAIN MICROSURGERY? : A SURVEY OF MICROSURGEONS

Surgery

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ABSTRACT

INTRODUCTION: Microsurgery is a fundamental technique in the armamentarium of reconstructive plastic surgery for complex treatments involving free tissue transfer. Its training involves years, and the financial and ethical costs should not be overlooked. The training model is an important tool in teaching surgical techniques, as well as having an important social impact, as the professional will improve techniques and improve the intervention on the human being. **OBJECTIVE:** This study aims to analyze the opinions of microsurgeons about the role of simulation in the training of microsurgical techniques. **METHODS:** An online survey was distributed to microsurgeons working in Brazil, about the role of simulation in the evaluation of microsurgery and in the training of their techniques. **RESULTS:** This study observed that 72% of the interviewees had already taken some practical course in microsurgery. Such a percentile demonstrates the importance that training models have gained, and some institutions have even recommended participation in refresher courses before clinical practice. About 80% of our participants believe that routine training in a simulation lab environment would have improved their skills. In addition, 93% agree that such practice would have been useful during their residency. More than half of the respondents believe that a high-fidelity, non-animal synthetic training model would be very important in their training. **CONCLUSION:** It was observed that the opinions of microsurgeons have changed over time, becoming more favorable to the use of simulation in training microsurgical techniques.

KEYWORDS

Microsurgery, Simulation Training, High Fidelity Simulation Training,

INTRODUCTION

Simulation is an instructional process that replaces real patient encounters with artificial models, live actors, or virtual reality patients.[1] When conducted properly, it creates an ideal educational environment as activities are done in a predictable, consistent, standardized, safe, and reproducible manner.[2]

Simulation scenarios have been widely applied in the field of emergency medicine and in some surgical specialties.[3] However, in the field of microsurgery, the use of this method as a form of training is still far from becoming a concrete reality.[4]

Due to its complexity, microsurgery cannot be acquired by observation or infrequent practice alone. Microsurgeons need to develop highly refined manual dexterity, eye-motor coordination and good criticality.[5]The combination of less time available for training in the workplace and the highly demanding skill of the microsurgical technique, leads to the need to establish simulations as an integral part of microsurgical training.[6]

Some studies have shown that the competence of apprentices improves to a level comparable to that of experts after intensive repetition of anastomoses over a relatively short period of time.[7] This demonstrates a steep learning curve in microsurgery, in which skill acquisition can be extended through focused practice.[7,8]

Currently, the gap in simulation scenarios in microsurgical training has been filled with practice on small animal models and with training courses in the field, although not without drawbacks.[9,10] In addition, portable, reusable, high-fidelity synthetic models have been developed to improve microsurgical technique.[11]

The constant media attention to possible medical and surgical errors, coupled with the intense regulation of residency training, promotes an increased demand to objectively evaluate the skills of practicing surgeons.[12] In this context, the search for standardization in the certification of microsurgical skills is constant and necessary.[6] This study aims to analyze the opinions of microsurgeons about the role of simulation in the training of microsurgical techniques.

METHODS

This study was conducted at Plastic Surgery Department at Paulista School of Medicine – Federal University of São Paulo. The research protocol was approved by the institution's Research Ethics Committee (registration number: 0675/2019), in compliance with the ethical principles of the Declaration of Helsinki and with the requirements of Brazilian National Health Council (Resolutions 466/12 and 510/16).

An online survey was distributed to 100 microsurgeons practicing in Brazil. This survey was anonymous and contained an informed consent form. In all, 63 responses were obtained. This study followed the recommendations of CHERRIES (https:// www. ncbi. nlm. nih. gov/pmc/articles/PMC1550605/). The questionnaire was designed by a microsurgeon with more than five years of experience in teaching microsurgery. A pilot test was first administered to ten fellow microsurgeons in order to assess whether the questions were understandable.

The questions were mostly multiple choice (See appendix). They addressed demographic aspects of the interviewees (age, gender, nationality, and marital status), medical specialty and residence time, as well as information about the microsurgical practice (procedures in the year and types of services). In addition, it was asked whether the participant had ever attended any practical course on microsurgery, including the number of courses held and how long ago was the most recent training.

In order to further explore the courses taken, it was asked what activities were performed for skills training, such as using live animal models, dissecting cadavers, using synthetic models, or even observing other microsurgeons.

Opinions about the role of simulation in assessing microsurgery and training its techniques, a key point of this study, was assessed by means of the survey.

RESULTS

Sixty-three responses were obtained, of these, two were excluded from the analysis because the participants had never undergone microsurgery.

The demographic aspects evaluated showed that 27.9% of the interviewees were up to 35 years old, 42.6% between 36 and 45 years, 18% between 46 and 55 years and 11.5% with 56 years or more. About 84% were male, and 97% were of Brazilian nationality. Most were married (79%).

Regarding medical specialty, 60.7% were plastic surgeons, 34.4% orthopedic surgeons, and 4.9% head and neck surgeons. About 26% had completed their residency 5 years or less ago, 28% 6 to 10 years, 16% 11 to 15 years, and 30% 16 years or more ago.

The questions that asked about microsurgery showed that 37.7% of the participants perform up to 10 microsurgical procedures per year, 31.1% between 11 and 25, and the rest (31.1%) perform more than 25 procedures per year.

Table 1: Percentage of microsurgery care by type of service.

Types of service	Never	Seldom	Occasionally	Often	Very often
Private health service	19,7%	31,1%	36,1%	8,2%	4,9%
Health insurance	29,5%	19,7%	31,1%	13,1%	6,6%
Public health service	14,8%	8,2%	29,5%	27,9%	19,7%

As for taking practical courses in microsurgery, 72.1% of the interviewees had already taken some type of course. Of these, 81.1% had taken 1 to 2 courses, 11.4% 3 to 5, and 6.8% 10 or more courses. Regarding the time that has passed since the last training carried out, we obtained:

Table 2: how long has it been since the last microsurgery training.

Last training	Percentage (%)
1 year ago or less	16,6%
2-3 years ago	18,3%
4 - 6 years ago	21,6%
7 - 9 years ago	16,6%
for over 10 years	26,6%

The figure below specifies the activities performed to improve microsurgical skills, with each respondent marking all applicable options.

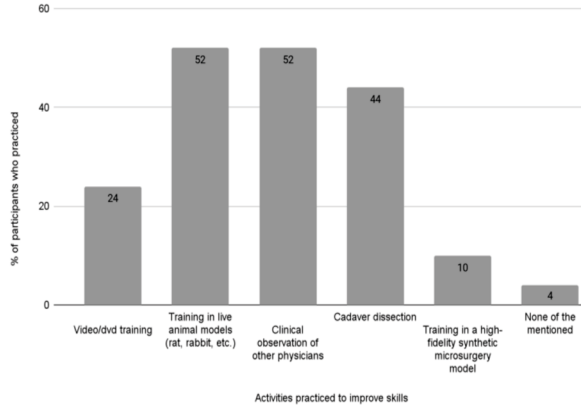

Figure 1: List of microsurgery practices that were performed by the interviewees to improve the learning curve

About 56% of the respondents answered that a high-fidelity synthetic training model in microsurgery, without the use of animals, would be very important in microsurgery training. Thirty-six percent responded that this role would be moderate and 6.6% that it would be somewhat important. In addition, 80.4% agreed that their skills in microsurgery would have improved through a formal training routine in a simulation laboratory environment. Only 4.9% of the participants disagreed with this statement and 14.8% neither agreed nor disagreed.

Considering medical residency, 93.5% of respondents agreed with the sentence, "Access to a microsurgery lab simulation would have been helpful to me during residency." Only 1.6% disagreed and 4.9% neither agreed nor disagreed.

The last question asked participants if they would be willing to purchase a high-fidelity synthetic model in microsurgery training and, if so, how much they would pay. Only 19.7% said they would not buy. In the portion willing to buy (80.3%), about 61% would pay up to two hundred dollars, 34.6% between two to four hundred dollars, and 4% between four to six hundred dollars.

DISCUSSION

Mastery of microsurgical skills cannot be achieved by observation alone but requires regular practice.[5] Many training courses have been developed around the world.[7,10] These courses promote the practice of microsurgical techniques, varying in complexity, cost, length and methodology.[13] This study observed that 72% of the respondents have taken some practical microsurgery course. Such a percentile demonstrates the importance that training models have gained, inclusively, some institutions have recommended the participation in improvement courses before clinical practice.[14]

There are many models described in the literature for microsurgical simulation. High fidelity models such as live animal or cadaver dissection are currently considered the gold standard.[6] There are, however, ethical aspects, costs, and resource implications associated with such models. In this study, about 28% of the participants underwent training on a live animal model and 24% via cadaver dissection. Only 5.4% used a high-fidelity synthetic model.[6]

Non-biological simulation models increasingly play a key role in microsurgical training, and some of them have even been considered high-fidelity.[11,15,16] Several advantages have been demonstrated for synthetic models, such as: availability, ease of setup and maintenance, flexibility in accommodating different training and assessments, low cost, no risk of exposure to biological agents, no policy required for use, potential for repeated use, no animals, and easy storage.[15] As an example, students trained on synthetic models were able to complete a carotid artery anastomosis in rats in the same amount of time as those who trained on animal models only.[17] In this context, our survey pointed out that more than half of the respondents believe that a high-fidelity, non-animal synthetic training model would be very important in their training.

A 2016 study of faculty members of the American Society of Reconstructive Microsurgery showed that only 24% of the microsurgeons surveyed believed that simulation is a useful measure for performance enhancement.[18] Our study noted that this scenario has been changing in recent years. About 80% of our participants believe that routine training in a simulation lab environment would have improved their skills. In addition, 93% agree that this practice would have been useful during their residency.

Another important finding to highlight is that most of our participants had their last training more than 7 years ago, contradicting the current literature that is in favor of routine practice. Recent evidence supports the benefit of repetition in the acquisition of microsurgical skills.[19] It has been shown in several trials that routine training leads to better skill retention than a course done in a concentrated manner.[19,20] Added to this, a randomized clinical trial has pointed out that self-directed practice on a high-fidelity simulator improves microsurgical performance compared to expert-guided practice alone.[21]

While we know that participation in intensive microsurgical training courses results in improved skill acquisition, the associated costs are considerable.[10] Thus, it is important that they are effective in learning. As discussed earlier, synthetic models promote regular practice of skills, and are a long-term investment. When respondents were asked if they would be willing to purchase a high-fidelity synthetic training model, 80% said yes.

The limitations of our study include those associated with methodology. The population surveyed, may not fully represent all microsurgeons, and is therefore a sample bias. Besides our questionnaire response rate was 63%, not corresponding to the totality of respondents. In addition, a certain level of misunderstanding of the questions must be assumed. For example, only 85% of respondents indicated that they participated in clinical observation to learn microsurgery. However, it is difficult to imagine learning microsurgery without observing or assisting a clinical case.

CONCLUSION

There is little doubt about the importance of hands-on microsurgery training prior to surgical practice on patients. It was observed that most microsurgeons in Brazil consider training with simulators important.

Attachment 1 - Questionnaire applied to the participants

1. Age
2. Gender
3. Nationality
4. Marital status
5. Medical specialty
6. How many years ago did you finish medical residency?
7. How often do you perform Microsurgery?
8. How often do you perform microsurgery in the following services?

- Private service
- Health Insurance
- Public service

9. Have you ever taken a practical course in microsurgery?
10. If yes, how many microsurgical skills courses have you completed?
11. When was your most recent microsurgical training?
12. Which of the following activities have you participated in to improve your microsurgical skills? (Please check all that apply):

- Video/dvd training
- Live animal model training (mouse, rabbit, etc)
- Clinical observation of other doctors
- Cadaver dissection
- High-fidelity microsurgery synthetic model training
- None of the above

13. In your opinion, would a high fidelity synthetic non-animal high fidelity microsurgery training model be important in microsurgery training?
14. Do you think your skills in microsurgery would have been improved by a formal training routine in a simulation laboratory environment?
15. Share with us whether you agree or disagree with this statement, "Access to a microsurgery lab simulation would have been helpful to me during residency."
16. If a high fidelity synthetic model for microsurgery training was available on the market, would you be willing to purchase it? If yes, how much would you be willing to pay?

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