

# Survey-based Study to Assess the Self-perceived Competency in and Knowledge about Reconstructive Microsurgery among Young Plastic Surgeons

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## ABSTRACT

**Objective:** Microvascular free tissue transfer has become a preferred reconstructive technique for managing complex wounds and defects. The aim of this questionnaire-based study was to assess self-perceived competency in and knowledge about reconstructive microsurgery among plastic surgeons who graduated from the Faculty of Medicine Siriraj Hospital, Mahidol University during 2015-2019.

**Materials and Methods:** Questionnaire was sent by email elicited information about the amount of microsurgery performed in practice, types of microsurgeries performed, reconstructive methods, types of flaps used, and respondent's opinion about the microsurgery course attended during residency/fellowship training.

**Results:** The total response rate was 87.5%. Almost all respondents work in a government hospital (90.4%), and responses came from all regions of Thailand. Thirty-eight percent of respondents reported no microsurgery cases, and the majority of those who did perform microsurgery did so less than 20 times/year. Hand reconstruction was the most common type of microsurgical procedure. The factors that negatively influence microsurgery in clinical practice include insufficiency of resources and personnel (29.1%), excessive workload (27.3%), and long operative time (23.6%). Suggestions for improvement of the microsurgical training course include having a good objective method for assessing microsurgical practices (27.7%), increasing the volume of practice on animal model (25.5%), and an appropriate number of microsurgery cases to gain necessary experience (25.5%).

**Conclusion:** Reconstructive microsurgery was found to be a challenging procedure for many junior-level plastic surgeons. A low volume of cases limits a surgeon's ability to develop needed skills. Important improvements in the microsurgery training course were also recommended.

**Keywords:** Microsurgery; surgical education; free flap; plastic surgery training; plastic surgeon (Siriraj Med J 2024; 76: 255-261)

## INTRODUCTION

Microvascular free tissue transfer has become a preferred reconstructive technique for managing complex wounds and defects, such as limb salvage surgery, breast reconstruction, head and neck reconstruction, and lower extremity reconstruction. The development of meticulous microsurgical skills requires good foundational training, clinical experience, and continuous learning. In order

for plastic surgery residents and fellows to be able to competently and confidently perform microsurgical procedures in routine clinical practice after graduation, they must receive sufficient training and have had adequate hands-on experience in the operating room under the guidance of an experienced instructor.<sup>1-5</sup>

At our center, microsurgical skill is an important area of competency that is assessed among our trainees, and

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Received 8 November 2023 Revised 14 February 2024 Accepted 27 February 2024

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<https://doi.org/10.33192/smj.v76i5.266240>



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more than 100 cases of microsurgery are performed in our division annually.<sup>6-9</sup> Our trainees receive reconstructive microsurgery training and experience by both practicing in the microsurgery lab, and by operating on real-life patients in the operating theater for conditions that include replantation, auto-transplantation, revascularization in order to resolve defects arising from tumor ablation, traumatic injuries, and congenital abnormalities.<sup>10-13</sup> However, we have never assessed the views about, attitudes towards, reflections of, and experience in reconstructive microsurgery among our plastic surgery trainees after graduation. Accordingly, the aim of this questionnaire-based study was to assess the self-perceived competency in and knowledge about reconstructive microsurgery among plastic surgeons who graduated from the Faculty of Medicine Siriraj Hospital, Mahidol University during 2015-2019.

## MATERIALS AND METHODS

### Sample selection

All plastic surgeons who graduated from the Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand during 2015 to 2019 were eligible for study enrollment, and all 24 of those surgeons were sent study questionnaires via email. The surgeons that responded were included in the study and the final analysis. The protocol for this study was approved by the Siriraj Institutional Review Board (SIRB) (COA no. 616/2563), and all included subjects provided written informed consent to participate.

### Study design and administration

The survey comprised 44 questions that cover various aspects of microsurgery, including the amount of microsurgery performed per year, the types of microsurgeries performed, the specialists responsible for performing microsurgery, the reconstructive methods used, the types of flaps used, and their opinions about the microsurgery course that they took during their residency/fellowship training. There was no imputation for missing data, such as specific questions for which an answer wasn't given. Data management was performed using Microsoft Excel spreadsheet program (Microsoft Corporation, Redmond, WA, USA).

## RESULTS

Twenty-one of 24 (87.5%) junior plastic surgeons returned a questionnaire, and 47.6% (10 of 21 respondents) answered all of the 44 questions. Almost all respondents (90.4%) work in a government academic or non-academic hospital. The remaining 9.6% work in the private sector. Questionnaires were received from all geographical regions of Thailand. Most doctors work in the Central region (11 of 21 (52.4%)), followed by the Southern region (19.0%) and the Eastern region (9.5%) (Table 1).

### Annual volume of microsurgery cases

The volume of microsurgery cases per year was 0 cases in 38.1% (8 of 21) of respondents, 1 to 3 cases in 23.8% (5 of 21), and 11 to 20 cases in 14.3% (3 of 21). For the overall number of microsurgery cases, 95.2% of

**TABLE 1.** Employment and location data of young plastic surgeon respondents.

|                                       | n  | %     |
|---------------------------------------|----|-------|
| <b>Type of hospital</b>               |    |       |
| Ministry of Public Health hospital    | 12 | 57.1% |
| Medical school or university hospital | 7  | 33.3% |
| Private hospital                      | 2  | 9.5%  |
| <b>Region</b>                         |    |       |
| Central                               | 11 | 52.4% |
| South                                 | 4  | 19.0% |
| East                                  | 2  | 9.5%  |
| West                                  | 2  | 9.5%  |
| North                                 | 1  | 4.8%  |
| Northeast                             | 1  | 4.8%  |

respondents performed microsurgical reconstruction less than 20 cases annually (Fig 1).

Regarding the percentage of microsurgery performed at each region of the body, hand reconstruction was the most frequently performed procedure (61.9%, 13 of 21), followed by breast reconstruction in 42.9% (9 of 21) and head and neck reconstruction in 42.9% (9 of 21). Trunk reconstruction was performed least often (14.3%, 3 of 21) (Fig 2).

#### **Responsible surgeons for reconstructive microsurgery at each region of the body**

For the head and neck region, plastic surgeons performed reconstruction in 88.2%, and otolaryngologists performed reconstruction in 11.8%. Breast reconstruction was performed by plastic surgeons in 62.5%, and by general surgeons in 37.5%. Hand reconstruction was performed by plastic surgeons in 78.9%, and by orthopedists in 21.1%. Hand replantation was performed by orthopedists in 55.6%, and by plastic surgeons in 44.4%. Lower extremity reconstruction and trunk reconstruction was performed by plastic surgeons in 95% and 88.2% of cases, respectively. Perineum reconstruction was performed by plastic surgeons in 83.3%, and the remaining cases were performed by urologists, gynecologists, or general surgeons (Fig 3).

#### **Preferred choices of reconstruction for each region of the body**

##### **Head and neck reconstruction (no cases in 23.8% of respondents)**

The loco-regional flap was reported to be the preferred

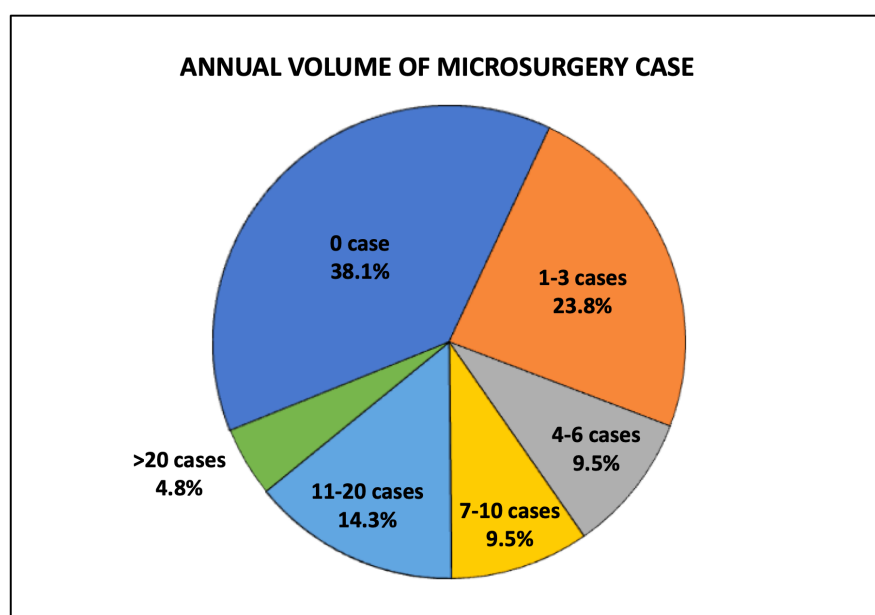
method for managing head and neck defects (66.7%), with the most commonly used flaps being nasolabial flap (40.0%), paramedian forehead flap (30.0%), and pectoralis major myo-cutaneous flap (25.0%). Free flaps were performed in 27.8% of cases, with the anterolateral thigh free flap, fibular free flap, and radial forearm free flap used in 45.5%, 31.8%, and 22.7% of cases, respectively (Supplementary Fig 1).

##### **Breast reconstruction (no cases in 38.1% of respondents)**

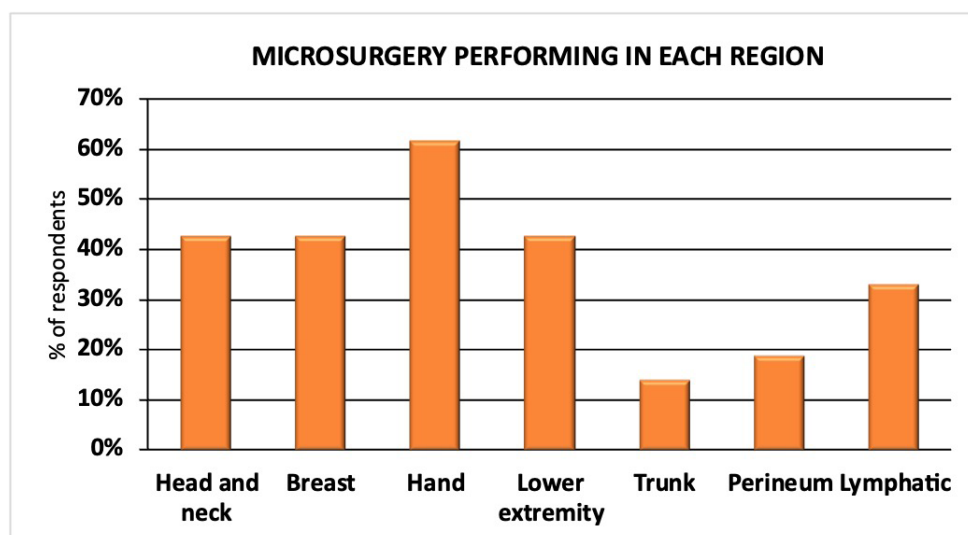
Pedicle transverse rectus abdominis myo-cutaneous (TRAM) flap was the most commonly used flap for coverage of a breast defect (performed by 25.0% of respondents), following by pedicled latissimus dorsi (LD) myo-cutaneous flap with silicone implant (13.6%). Free tissue transfer was seldomly performed, but when it was, free TRAM flap and free deep inferior epigastric perforator (DIEP) flap were the reconstructive flaps of choice (4.5% and 2.3%, respectively). Regarding the timing of reconstruction, nearly one-third of respondents preferred delayed breast reconstruction (28.6%). Other reported types of breast reconstruction that were encountered included implant-based reconstruction (22.7%), mastopexy (18.2%), and lipofilling (13.6%) (Supplementary Fig 2).

##### **Hand reconstruction (no cases in 38.1% of respondents)**

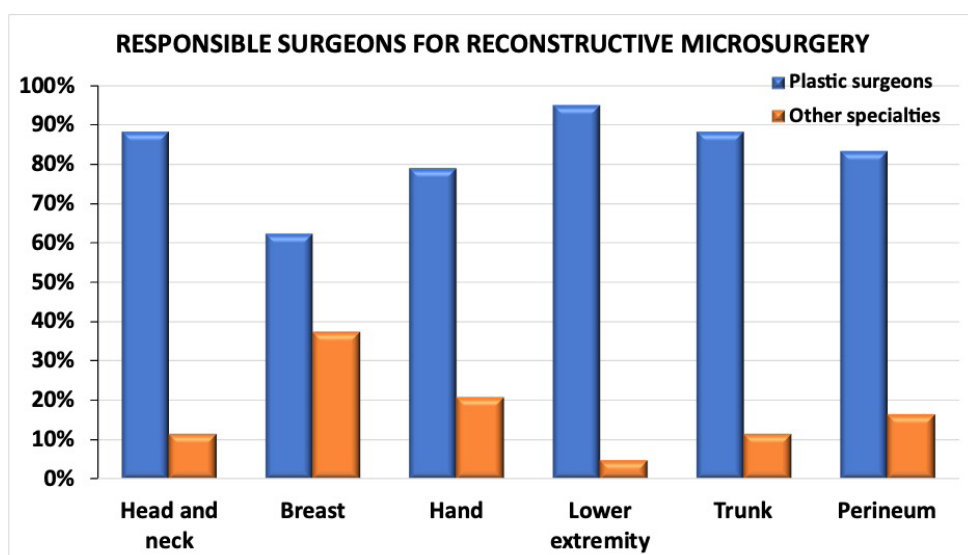
The most frequently used flaps for soft tissue reconstruction were loco-regional flap (43%) (such as reverse radial forearm free flap, and posterior interosseous artery flap), followed by tissue substitute with skin graft (24%), and distant flap (14%). For replantation, single



**Fig 1.** Volume of microsurgery cases per year among our respondent cohort.



**Fig 2.** The percentage of respondents who performed microsurgical procedures compared among different regions of reconstruction.



**Fig 3.** Surgeon responsible for performing microsurgical reconstruction between plastic surgeons and other specialties compared among different regions of reconstruction

axial K-wire was the most commonly used method for bony fixation (78.9%). During the postoperative period, most respondents (89.5%) reported the use of nail plate removal and stab incision at the nail bed if blood-letting was required ([Supplementary Fig 3](#)).

**Lower extremity reconstruction (no cases in 4.8% of respondents)**

For the repair of lower limb defects, the reported methods of choice were loco-regional flap (40%) and skin graft (35%). Free flap surgery was performed in only 10% of cases, and the ALT free flap was used in 53.3%. Perforator/propeller flap was used in 15% of lower extremity cases ([Supplementary Fig 4](#)).

**Trunk reconstruction (no cases in 42.9% of respondents)**

Loco-regional flaps, such as the rectus abdominis myo-cutaneous flap, the omental flap, and the internal oblique muscle flap, were reported to be preferred reconstruction techniques (46.7%), followed by skin grafting (33.3%). Free flap (flap of choice was the ALT free flap) and keystone/propeller flap were both used in 6.7% of cases. About 6.7% of respondents performed laparoscopy-assisted component separation (LACS) for abdominal wall reconstruction ([Supplementary Fig 5](#)).

**Perineum reconstruction (no cases in 42.9% of respondents)**

Most cases were performed by plastic surgeons

(83.3%), and loco-regional flap was the reconstructive method of choice (64.3%), followed by skin grafting (35.7%) ([Supplementary Fig 6](#)).

#### ***Lymphatic reconstruction (no cases in 66.7% of respondents)***

The number of lymphatic reconstruction cases per year among our respondents was 0 cases in 66.7%, 1 to 3 cases in 14.3%, and 7 to 10 cases in 14.3%. The majority of cases (66.7%) were performed using non-microsurgical techniques, such as Charles procedure or liposuction. The methods most commonly used for investigation and diagnosis of lymphedema were of circumferential measurement of the affected limb (44.8%), lymphoscintigraphy (27.6%), and indocyanine green (ICG) lymphography with infrared camera (17.2%) ([Supplementary Fig 7](#)).

#### ***Microsurgical learning experience during the residency/fellowship training program***

During their 3 years learning in our division, about half of trainees participated in more than 30 microsurgical reconstruction cases (31 to 50 cases [28.6%], and more than 50 cases in 23.8%). Regarding the replantation procedure, most trainees had experience with more than 5 cases [6 to 10 cases (38.1%), 11 to 15 cases (19%), and 16 to 20 cases (19%), respectively] ([Supplementary Fig 8](#)).

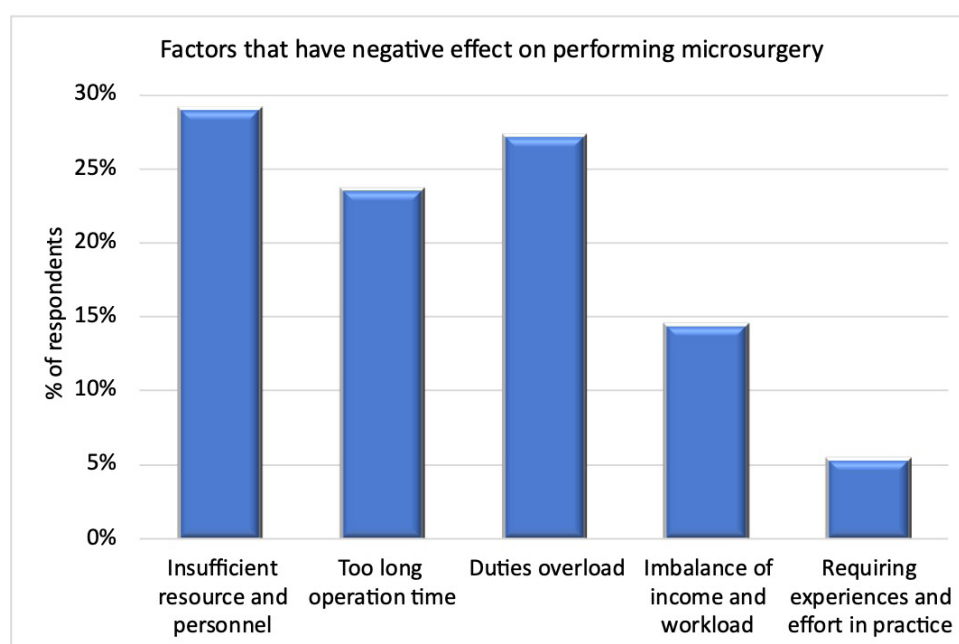
Most respondents reported that the microsurgical reconstruction training and experience that they received at our center positively influenced their real-life practices

and surgical outcomes (moderate positive influence in 57.1%, and marked positive influence in 33.3%). In contrast, the factors that were reported to negatively influence having to perform microsurgery in routine clinical practice included insufficiency of resources and personnel (29.1%), excessive workload (27.3%), and long operative time (23.6%) ([Fig 4](#)).

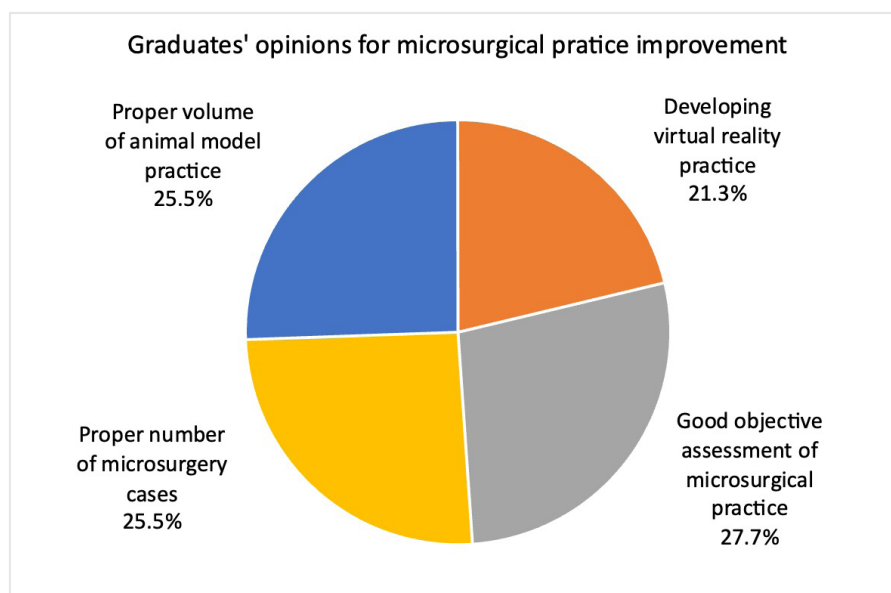
In the final part of the survey, our respondents were given an opportunity to suggest ways that the microsurgical learning experience can be improved in terms of take-aways that can be used improve skills for real-life clinical practice after graduation. Those suggestions included having a good objective method for assessing microsurgical practices (27.7%), increasing the volume of practice on animal model (25.5%), and an appropriate number of microsurgery cases to gain necessary experience (25.5%) ([Fig 5](#)).

## **DISCUSSION**

Thailand has approximately ten medical schools that train and graduate about 25 plastic surgeons each year. Our center is Thailand's largest medical school, and we normally graduate 5 plastic surgeons each year or about one-quarter of all plastic surgeons that graduate each year in Thailand. Data from our questionnaire revealed that more than ninety percent of our graduates that completed their plastic surgery training during the study period work in academic or non-academic government hospitals. The questionnaire response rate in this study was a high 87.5%, and nearly half of those (47.6%) answered all of the questions. So, the outcomes of this study might



**Fig 4.** Factors that negatively influence having to perform microsurgery in routine clinical practice



**Fig 5.** Suggested ways to improve the microsurgical learning experience during the plastic surgery training program

be thought to reflect the current situation relative to reconstructive surgery and reconstructive microsurgery among junior plastic surgeons in Thailand.

Our results showed that approximately 82.7% of all kinds of surgical reconstructions were performed by plastic surgeons, and that the 3 most frequent regions requiring reconstruction were lower extremity region (95.0%), head and neck region (88.2%), and trunk region (88.2%) (Fig 3). This data might guide us in how we can improve training so that our graduates will be better prepared for the real-life requirements that Thai plastic surgeons most often need after graduation from training.

The questionnaire data also revealed insufficient resources and personnel (29.1%), excessive workload (27.3%), and long operative time (23.6%) as the factors that most negatively influence having to perform microsurgical reconstruction. Moreover, 38% of our respondents reported having no microsurgery cases, and 95.2% of those who did perform microsurgery did so less than 20 times per year. The finding of our respondents having to perform no or minimal microsurgical procedures adversely influences the development of experience that is needed to obtain a high level of competence in microsurgical reconstruction.

About 90% of respondents reported that the experience gained in reconstructive microsurgery during residency/fellowship training had a substantial positive impact on their real-life practices and surgical outcomes. Our respondents also suggested the following ways that we might improve the microsurgery training: having a good objective method for assessing microsurgical practices (27.7%), increasing the volume of practice on animal model

(25.5%), and participating in an appropriate number of microsurgery cases to gain necessary experience (25.5%). Even though our survey may have some limitations, such as recall bias and the generalizability of the data, we believe this data provides a foundation from which we can begin a process of improvement in microsurgical reconstruction training for plastic surgery residents and fellows at our center. Moreover, knowing the regions of the body most operated upon may guide us in providing more specific training for high prevalence procedures. Importantly, these data also provide some insights into other types of challenges that plastic surgeons face after they enter clinical practice in the Thai public healthcare system. Lastly, in addition to this data benefiting the Division of Plastic Surgery, Department of Surgery, Faculty of Medicine Siriraj Hospital, Mahidol University, this data may also be of some benefit to the Society of Plastic and Reconstructive Surgery of Thailand and the Thailand Ministry of Public Health relative to the challenges that junior plastic surgeons encounter during the early period of their career path.

## CONCLUSION

Reconstructive microsurgery was found to be a challenging procedure for many junior-level plastic surgeons that graduated from our center. No microsurgery cases or a low volume of cases limits a surgeon's ability to develop needed skills. Important improvements in the microsurgery training course were also recommended. Enhancements in the microsurgery training course taken by residents and fellows may improve surgeon confidence, skill, and experience for performing microsurgical reconstruction.

## ACKNOWLEDGEMENTS

The authors gratefully acknowledge the physician respondents that participated in this study.

## Conflict of interest declaration

The authors declare no personal or professional conflicts of interest relating to any aspect of this study.

## Funding disclosure

This was an unfunded study.

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