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ORIGINAL ARTICLE
Education

Training the Trainers in Microsurgery: A Success Story from Vietnam's Hanoi National Hospital of Odonto-stomatology

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Background: Microsurgery is a highly specialized skill that requires advanced training. This is a recount of the 12-year development of Hanoi National Hospital of Odonto-Stomatology (NHOS) from a basic plastic surgery unit to a high-volume, subspecialized reconstructive center.
Methods: We present a 12-year retrospective account of the development of NHOS with a brief summary of microsurgical reconstructive outcomes.
Results: From 2008 to 2020, NHOS has performed 665 microsurgical flaps for reconstruction of various maxillomandibular defects. In the pioneering stage (2008-2011), without surgical microscopes, all five free flaps failed. After acquiring a microscope and mentoring from Hanoi's 108 Military Hospital, mandibular bone defect reconstruction with free fibula flaps had 85% success rate. In the growth stage (2012-2015), reconstruction advanced toward more complex defects requiring soft tissue, with a 98.7% success rate. The maturation stage (2016-2020) focused on refinement of reconstructive service to provide subspecialized care for malignant head and neck cancer patients with help from Taiwan's E-Da Hospital and Operation Smile's charity program. The charity mission trips were structured to facilitate good quality teaching rather than hit a quantitative goal of the number of surgeries done. And with a success rate of 99.4%, we have begun further education of the plastic surgery community in Vietnam.
Conclusions: Our rapid 12-year maturation into a high-volume, subspecialized microsurgical center is the embodiment of the generous efforts of many international friends who invested their time and expertise. And we highly recommend charity mission trips to adopt the "training the trainers" concept to maximize lasting, local impact. *(Plast Reconstr Surg Glob Open 2021;9:e3637; doi: 10.1097/GOX.0000000000003637; Published online 22 June 2021.)*

INTRODUCTION

By the 1970s, the modern era of microsurgery was in full swing around the world[1] and, standing on the enormous legacy left behind by Operation Smile's cleft projects in the 1980s, Professor Nguyen Huy Phan, the former surgeon general of the Vietnamese Army, sought help from Operation Smile (NGO) again to introduce microsurgery to Vietnam, and over the span of 15 years, 108 Military Central Hospital's microsurgery thrived.[2]

In the early 2000s, Hanoi had a booming population of around 1.7 million. Ameloblastoma, although uncommon globally,[3] is one of the most common oral cancers in Asia, especially in Vietnam.[4,5] Together with osteofibroma,[6] these deforming tumors constitute the bulk of cases at Hanoi National Hospital of Odonto-Stomatology (NHOS). We are a large tertiary level facility, specializing in odonto-stomatology and oral surgery. At the time, our capabilities were limited to simple tumor resections without reconstruction. 108 Military Hospital was the only center with microsurgical capabilities in Hanoi, and although available to the general public, served still predominantly as a military hospital, and was clearly not able to meet the large microsurgical demands. This placed huge pressure

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Received for publication January 20, 2021; accepted April 21, 2021.

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DOI: 10.1097/GOX.0000000000003637

Disclosure: *The authors have no financial interest to declare in relation to the content of this article. This study did not receive any funding.*

on NHOS to develop into a microsurgical service for the general public.

In 2008, NHOS took initiatives to implement microsurgery. Professor Son (senior author) from 108 Military Hospital, who had trained in Taiwan as an advanced microsurgical fellow, introduced us to Operation Smile and Taiwan's E-Da hospital. And we wish to share our growth story as a testimony to the importance of the "train the trainer" framework. A train-the-trainers mission is at heart a charity mission, but it is run like a hands-on, live surgery conference, and should be structured in a way to facilitate good quality subspecialty teaching.

MATERIALS AND METHODS

In this review, we will describe the development of our department and how our charity missions are set up according to the train the trainers framework, and will give a brief report of microsurgical outcomes at NHOS in the period from 2008 to 2020.

SUMMARY OF NHOS DEVELOPMENT

During the last 12 years, we operated on 665 patients in total, with rapid improvement in success rate and complexity of reconstructive techniques. There were three distinct stages in NHOS's development as a microsurgical center:

- Pioneering stage: The initial 4 years from 2008 to 2012 was an initial implementation phase. We encountered many challenges managing our first 39 patients. The very first five operations were done with support from the surgical team from the internationally renowned Mayo Clinic. However, without advanced equipment such as a surgical microscope, all five cases failed. By 2010, we acquired our first surgical microscope, and subsequently successfully completed 33 of 34 cases, giving us a success rate around 85%.
- Growth stage: After achieving initial successes with free fibular flaps for simple bone defects, our patient cases increased exponentially, and in the mid-2010s, our reconstruction expanded to include soft tissue free flaps, including lateral arm flaps and anterolateral thigh flaps on 234 patients. As techniques continued to mature, our success rate was 98.7% over the 2012–2016 period.
- Maturation stage: the increase in head and neck malignancies forced NHOS to mature into a multi-disciplinary service that provided more complex reconstructive options. From 2016 to 2020, E-Da hospital – (a well-developed high-volume center for head and neck cancer reconstruction in Taiwan) has visited annually, one week at a time, running intensive surgical workshops. Under the influence of this charity program, we were able to fine-tune our reconstructive service to manage highly complicated defects after cancer ablation, including double free flap transfers. Of the 392 flaps that were done during this period, only 2 flaps failed, giving a 99.4% success rate.

The mean age of our patients with ameloblastoma and osteofibroma is 42 years (age: 14–69 years). The mean age of patients with cancer is 53 years (age: 23–83 years). Patients with benign tumors are followed up for 1–2 years, and patients with malignancy receive postoperative radiotherapy and are followed up for 1–5 years. Figure 1 is a graphic summary of our free flap cases, according to development phase and broken down to flap types. Fibula osseous and osteocutaneous flaps form the main bulk of our reconstructive work, which increased exponentially. The low rates of flap total loss were visible and had markedly decreased over the years. Likewise, the increased proportion of soft tissue flaps was observed. We had 11 cases of total flap loss over the years, eight attributed to venous thrombosis, and three arterial causes. Failed fibula cases were managed with staged bone grafts, and the failed lateral arm cases all received hyperbaric oxygen therapy, to let the wounds completely re-epithelialized without further surgical intervention.

DISCUSSION: DEVELOPING A SPECIALIZED MICROSURGICAL SERVICE

Installing Software and Hardware

There is an old proverb that says "To do a good job, an artisan needs the best tools." The first step of setting up a subspecialty service is assessing the local resources, both in hardware and software, and installing what is needed.

In the Vietnam healthcare system, both oral surgeons from dental background and plastic surgeons operate on head and neck cases. As of the early 2000s, NHOS had 11 surgeons: nine oral surgeons, all of whom had no microsurgical training, and two plastic surgeons, and only the first author (Nguyen Hong Nhung) could perform microsurgery. With a department of predominantly dental background, we could resect various tumors but were inexperienced in dealing with complex, particularly microscopic reconstructions. The first charity mission from Mayo Clinic was essentially a microsurgical skills demonstration and teaching course, and gave the initial software installment we needed. With poor surgical lighting and very basic microsurgical instruments, not even a microscope, the initial dissections were done under loupe magnification and were understandably less than delicate. The outcomes were expectedly poor. The purchase of a Zeiss surgical microscope in 2010 and additional microsurgical instruments propelled us onto a steep but fast learning curve. Starting with more straightforward osseous only reconstruction, over time, we were able to reconstruct with more osteotomy variations and increasing size of cutaneous components in our flaps.

It should be emphasized, for other centers in the world who want to develop microsurgery from the ground up with virtually no microsurgery experience at all, that at some point the center needs to invest in one or two pioneers to go overseas for full-time advanced fellowship training. The pioneers bear the responsibility of returning to teach the rest of the team (installing software) and serve as mentors during the growth of the department. Professor Son from 108 Military Hospital is essentially our pioneer; his story has already been published in 2007.[2] Professor Son trained in Taiwan for one full year as an

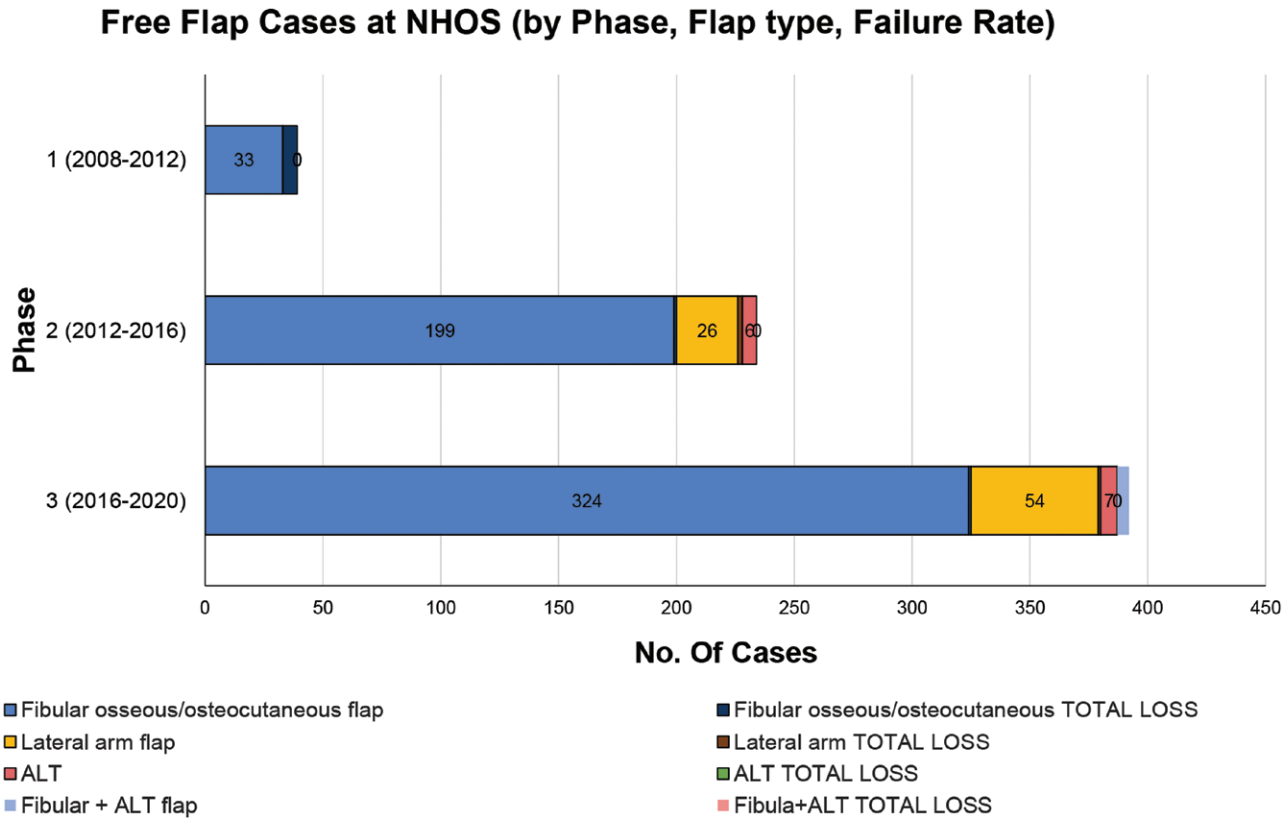

Fig. 1. Display of the number of free flap cases during different phases. The type of flap is denoted by different colors, and darker shades represent cases of total loss.

advanced fellow in microsurgery, and his team from 108 Military Hospital mentored us at NHOS. The importance of teamwork cannot be over-emphasized. Microsurgery is highly intensive work for long, sometimes very awkward hours; it is not a one-man job, and a microsurgical service with a single surgeon is not sustainable long-term.

Hurdles to Overcome

During our growth phase, we soon found our skills lacking as the need for soft tissue reconstruction increased. The modernization of Vietnam,[7] especially in large cities like Hanoi, was associated with increased incidence of oral cancers over the last decade due to betel nut and tobacco use. Lack of nation-wide screening programs and lack of awareness in the lower socio-economic status groups resulted in many late presentations with large tumors.[8,9] Adequate wide excision often resulted in complex maxillomandibular defects involving various combinations of orbital floor, mouth floor, partial or total tongue defects, and cheek defects. The reconstruction of these defects requires careful design of both osseous and soft tissue components that provide not only adequate area of coverage but also volume.

Funding for acquisition of appropriate equipment (the hardware) or sending surgeons overseas to train (the software) can sometimes be a hurdle. This is where a supportive administrative team, the help of an NGO, or taking advantage of government healthcare initiatives can be very helpful.

For us, the main challenge we faced in growing our microsurgical service was not only funding, but also limited access to information, which is closely linked to language barrier. The majority of doctors in our department have basic colloquial English, but we were not sufficiently proficient in updating our "software" purely via reading journal articles or via English-based online resources (which were also scarce two decades ago). We were keen to learn but found attending the few international conferences to provide little gain without hands-on experience. Professor Son, the senior author, who previously worked with Professor Pham at Military Hospital 108 in Hanoi, was sent to Taiwan's Chang Gung Memorial Hospital for a 1-year fellowship training in microsurgery. This was a key step for Military Hospital 108. But for NHOS, even though Taiwan was close to Vietnam and had a much lower cost of living compared with Europe or Northern America, we were hesitant in sacrificing valuable manpower for an overseas fellowship, which, in addition to the financial and bureaucratic challenges of going abroad, was seemingly both time-consuming and not cost-effective.

The Role of Operation Smile

The involvement of the charity organization Operation Smile was a game changer for NHOS. Not only did they have a team of experienced translators (which was invaluable especially in the early phases of correspondence), they effectively brought the expertise and training to us, close enough to correspond with basic colloquial English, and covered a large portion of the cost. For a center to truly mature into a self-sufficient microsurgical service,

ongoing input from experts is crucial. For us, the "software upgrades" took the form of high-yield, teaching-centered charity missions. The long-term benefits of a well-run train-the-trainer charity program far outweighs the monetary savings of sending a few surgeons to an overseas conference or a single surgeon on a fellowship program. We realized this is an incredible privilege, not always available to most underserved communities, and would like to credit Operation Smile for funding these charity missions.

Software Upgrades with Train the Trainer Missions

A reconstructive center needs to update its skill set to keep up with the needs of the community it serves. Ideal charity missions not only identify potential areas of weakness, but are able to give the local team an upgrade on existing skills to equip them for future demands.

None of the surgeons at NHOS went overseas for further microsurgical training. We credit our development to the mentorship from 108 Military Hospital and multiple charity missions staffed by international teams over the years, facilitated by Operation Smile. As a result of these charity missions, our reconstructive approach is heavily influenced by Taiwan's E-Da hospital team for whom ALT is the main workhorse flap for head and neck reconstruction.[10–18] In the mid to late 2010s, we started incorporating lateral arm and anterolateral thigh flaps into our reconstructive arsenal for soft tissue defects. With prior experience in microsurgery, and well-structured missions that targeted local team training, we were able to very quickly adopt the ALT with multiple variations for reconstruction of tongue, mouth floor, buccal mucosa, many through-and-through cheek defects and even using combined fibula-ALT double free flaps.

We believe the true value of the charity missions should lie in developing autonomous microsurgery capabilities of the local team. The concept of training has changed dramatically as the world modernized over the last century,[19,20] and the field of plastic surgery is also changing rapidly. The nature of charity mission trips must change with the times. Although they are, at the core, filled with good intentions, without training local surgical teams, no charity organization however well-funded and staffed, will be able to meet the massive, changing, local demand and deliver timely, culturally appropriate health care services. Harboring dependence on overseas resources would be counter productive.

A train-the-trainers mission is at heart a charity mission, but it is run like a hands-on, live surgery conference, and should be structured in a way to facilitate good quality subspecialty teaching, rather than focus on numbers of operations done.

Beginning months before the actual mission, the preparatory phase is crucial in communicating available local resources (both hardware and software) and selecting potential patient candidates for demonstrative purposes. This would provide the visiting team some information as to what they need to bring. Over the years, with each mission, increased familiarity and building of friendship, this preparatory phase would get easier as the unknown and the unpredictable dramatically decreased. We really cannot thank the seasoned staff at Operation Smile enough for facilitating the international communication and the administrative side of the missions.

In our case, we benefited mostly from intensive, step-by-step teaching, promptly followed by hands-on experience, and then receiving immediate constructive critique and feedback. The operating tables are always filled with both visiting international doctors and our local surgeons, surrounded by a small observing crowd of other local staff. This local-visitor mix extended to the scrub and the circulating nurses in the theatre, as they too had to train to become good assistants to our surgeons. Each subsequent visit was both a performance review and also an opportunity of continuous learning.

Each mission trip with E-Da Hospital is only 1 week, and can realistically accommodate around 10 operations. This is by no means a big enough number in comparison with the needs of the Hanoi population. However, after a week of rapid cycle of teaching and hands-on experience, most members of our team were comfortable tackling cases when the E-Da team left. We feel this was a crucial difference between traditional medical missions that focused on hitting a certain quantitative goal, and a teaching orientated mission which is targeted to enable the local team to operate independently after the charity program has finished. The effective teaching and enormous patient load in Hanoi meant we did not need to organize additional training, such as cadaver dissection courses. As NHOS learn from the Mayo Clinic (United States) and E-da hospital (Taiwan), and having 108 Military Hospital close by for assistance, our ability to formulate and execute increasingly complicated reconstruction while keeping very low total flap loss rates over the last decade is a sign of maturation as a subspecialist service. We are now at a better position to further Hanoi and Vietnam's microsurgical capabilities, and have begun our own microsurgical residency training program. This is training the trainer.

From our experience, the basic ingredients to "grow your own microsurgical department" are as follows:

- A motivated local clinical team willing to invest time and man-power into training;
- A reliable source of funding (eg, from government, NGO);
- Knowledgeable experts who are willing to teach;
- A supportive administration who can coordinate between all of the above.

And the steps are:

- Acquire appropriate hardware (lights, microscope, instruments etc);
- Installation of software: send pioneer(s) to the experts to learn and come back to teach the rest of the team;
- Regular upgrades: have annual, high-yield training from experts to refine and update techniques, preferably in the local team environment (eg train-the-trainer based charity missions).

CONCLUSIONS

This is our story at NHOS in Hanoi, Vietnam. Multiple population and economic factors have forced NHOS to mature quickly as a subspecialty center for management of both benign and malignant head and neck tumors: from an initial five total flap failures, to complicated bone and soft tissue microsurgery for head and neck cancer with 99.4% success rate. This is largely the result of charity mission trips adopting the train the trainer model. We hope this is both helpful for medical missions who want to leave long lasting impacts to the places they visit, and also inspirational to young departments who want to develop microsurgery capabilities.

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ACKNOWLEDGMENTS

The authors acknowledge the generous financial support of Operation Smile Vietnam to facilitate the charity programs, and acknowledge the time volunteered by the many surgeons, anesthesiologists, nurses, who have made each of these microsurgical missions possible. The authors also gratefully acknowledge the Vietnamese Government, the Vietnamese Ministry of Health, and the directors and surgical leaders of the Mayo clinic from USA, Military Hospital 108, Vietnam and E-da hospital from Taiwan.

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