

How to Start and Build Microsurgery Practice—Topics on Success and Sustainability: Global/International

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Summary: Many young microsurgeons begin their careers at established hospitals where microsurgery resources are limited. This article shares the authors' experiences in overcoming challenges and establishing a microsurgery practice in a new hospital. Due to the lack of equipment, limited support from colleagues, absence of discussion partners, fear of failure, and unpredictable situations, many aspiring microsurgeons lose their motivation. The purpose of this article is to guide future microsurgeons by describing the author's actions and suggesting improvements for their first free flap case. Key factors for building a successful, sustainable, and enjoyable microsurgery practice include remembering your training and mentors, acquiring fundamental knowledge of microsurgery, creating a supportive ecosystem, and having fun. (*Plast Reconstr Surg Glob Open* 2024; 12:e5626; doi: [10.1097/GOX.00000000000005626](https://doi.org/10.1097/GOX.00000000000005626); Published online 5 February 2024.)

INTRODUCTION

To become a true microsurgeon, one must lose 100 flaps, as the senior author's mentor, Professor Yoon Kyu Chung, once said.¹ This statement is not meant to justify losing flaps but rather to console surgeons who have experienced such losses. The lesson from this wisdom is that one must learn from failure, agony, success, and ultimately happiness while building a microsurgery practice. Many lessons are learned along the way, and by staying on the path, one day you will become an excellent microsurgeon.

The first part of the journey always starts by stepping out of one's comfort zone. If you are fortunate enough to continue working where you trained, you may not need to worry about building a new practice. However, when faced with an environment lacking microsurgery resources, the challenge begins. This may be especially true in developing countries where proper microsurgery training is less available than in developed countries.²⁻⁶ It is likely that you will establish your microsurgery practice in an established hospital with relatively good resources, such as a microscope, general anesthesia, and fine surgical instruments. Nevertheless, the author's

experience in setting up a new practice can be applied to anyone establishing a microsurgery practice, regardless of location.

In this article, the authors share their experience of overcoming trials and errors while developing a microsurgery practice in an established hospital where microsurgery resources were limited. The key factors that can guide you in building a successful, sustainable, and enjoyable microsurgery practice include remembering your training and mentors, acquiring fundamental knowledge of microsurgery, creating a supportive ecosystem, and having fun.

EPISODE OF THE FIRST FREE FLAP

This account details the first author's trial-and-error experience while performing their first free flap in a new hospital where free flaps had not been previously performed. A 23-year-old male patient was brought to the hospital after a grenade explosion accident. He had an extensive soft tissue defect in the right calf area, including a segmental loss of the Achilles tendon. An orthopedic surgeon reconstructed the Achilles tendon using an allotendon. The authors reconstructed the soft tissue defect with a 34×15cm anterolateral thigh (ALT) free flap and promoted vascularization of the allotendon by wrapping it with the vascularized deep fascia of the ALT free flap (Fig. 1). (See figure, Supplemental Digital Content 1, which displays the follow-up photography of donor site at postoperative 4 months. <http://links.lww.com/PRSGO/D77>.)

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Related Digital Media are available in the full-text version of the article on www.PRSGlobalOpen.com.

WHAT THE AUTHORS DID AND MISSED

1. Preparation of Hardware (Surgical Instruments, Drugs) for Microsurgery

Did: The authors checked the surgical instruments (micro needle holder, curved scissor, straight scissor, dilator, jeweler, and bipolar tip) and tools. All blunt or broken instruments were replaced with better products. The size of the nylon threads, vascular clamps, and vascular clips were checked. Fishhooks, which can deliver consistent traction without the help of an assistant, were prepared (Fig. 2).⁷ Lipo-prostaglandin E1, papaverine, and low-molecular-weight heparin were prepared.

Missed: The function of the vascular clamp was not checked properly, leading to blood leakage from the artery, which blurred the surgical field continuously during arterial anastomosis.

2. Discussion with Other Department Doctors

Did: The authors discussed Achilles tendon reconstruction with the orthopedic surgeon over the phone.

Takeaways

Question: How to start and build a microsurgery practice in a new hospital? Tips for the young microsurgeon who wants to build a microsurgery practice in a new hospital.

Findings: The authors share the experience of going through trials and errors in setting up a microsurgery practice in a new hospital.

Meaning: The key factors that can guide you in building a successful, sustainable, and fun microsurgery practice are (1) remember your training and mentors, (2) acquire the fundamental knowledge of microsurgery, and (3) create an ecosystem of hardware and software and have fun.

Missed: The first author did not have an in-depth discussion with the orthopedic surgeon before surgery. Upon joining the surgery, the reconstructed Achilles tendon was outside the author's expectation, as the orthopedic surgeon used a lengthy allotendon to suture into the proximal gastrocnemius muscle. As the author planned to use a flap to cover only the calcaneus and the repaired Achilles

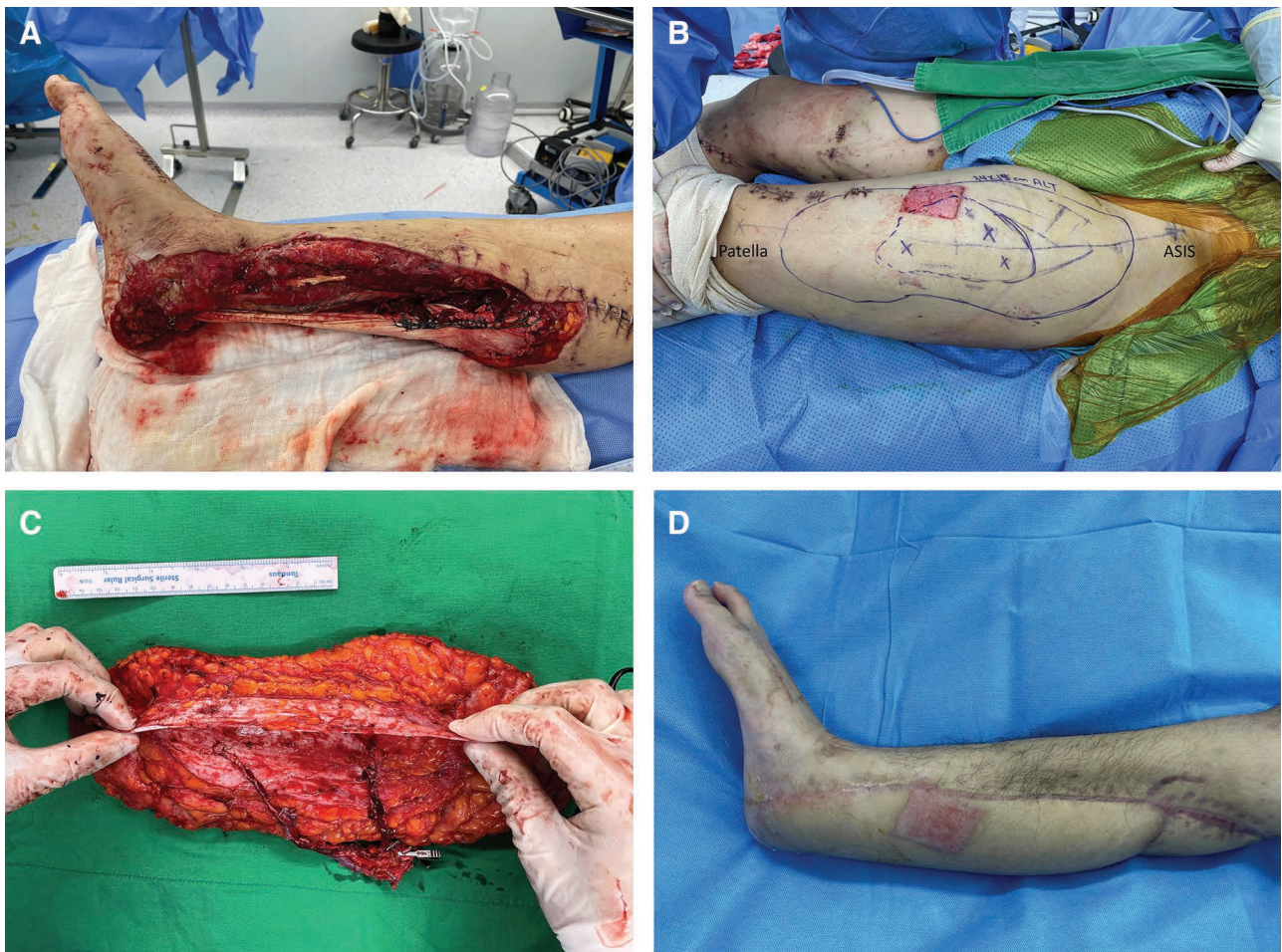


Fig. 1. A 23-year-old male patient with a grenade explosion injury. A, Soft tissue defect after Achilles tendon reconstruction using allotendon. B, Design of 34 × 15 cm ALT free flap. C, Harvested ALT free flap based on three perforators. D, Follow-up photograph at postoperative 4 months.

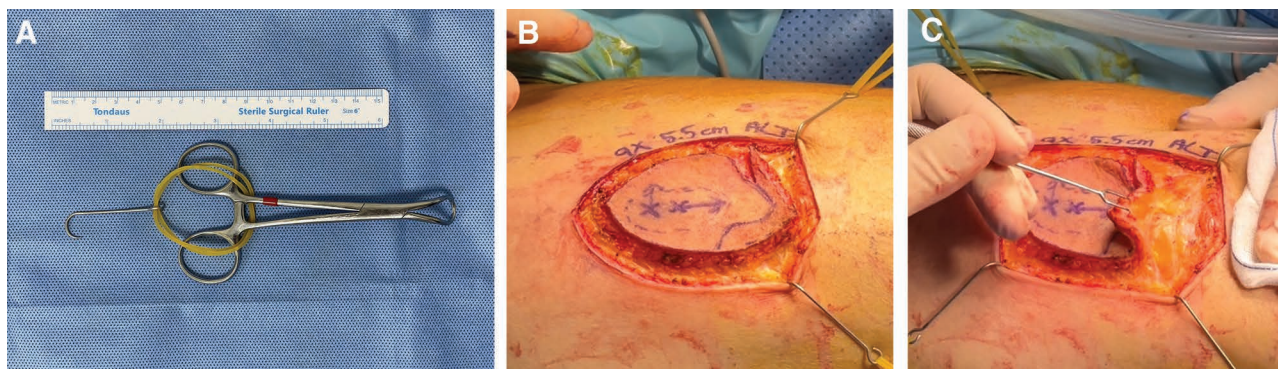


Fig. 2. Self retractor that helps overcome the lack of surgical assistant. A, Fishhook is a useful tool for maintaining static and constant counter-traction. B, C, Flap elevation with stable counter-traction using fishhook without assistant's help.

tendon region and a split-thickness skin graft to cover the calf muscle area, the initial plan was completely changed. Additionally, the anesthesiologist, who was not familiar with flap surgery, used an alpha agonist to increase blood pressure, causing vasospasm, which delayed the operation for 1–2 hours.

3. Preoperative Planning

Did: Computed tomography (CT) angiography and ultrasonography were performed to evaluate the location and function of recipient vessels and ALT perforators. Four perforators were found, and the most suitable perforator was identified. The possibility of deep vein thrombosis was also evaluated through a CT venogram. Before surgery, the authors had a detailed discussion regarding the operation plan with their mentor (senior author) over the phone. This phone call helped organize the author's thoughts and provided confidence in their ability to perform the surgery.

Missed: In the hospital where the authors trained, case conferences played a vital role in formulating plans A, B, and even C. However, as there was no one to discuss the patient within the new hospital, brainstorming was not performed, and plans B or C were not prepared. This lack of alternative strategies made the surgeon very stressed when confronting unexpected situations.

4. Belief in Author's Training

Did: The first author reviewed previous cases performed during their residency training period. In particular, the author reviewed revision cases and the solutions involved. A number of imaginary surgeries and mental rehearsals were performed to organize the steps of the procedure.⁸

Missed: The first author cut the posterior tibial vein for vein anastomosis and noted a thrombosis. The author was puzzled by the thrombus, as the CT venogram showed no DVT and determined it to be localized. Thus, the anastomosis was performed after removing the thrombus using a Fogarty catheter. The author failed to follow their training to avoid injured veins and look for an alternative superficial vein. In the end, after wasting

a lot of time, the author performed the anastomosis on the superficial vein.

5. Intraoperative Consultation with a Mentor

Did: The accumulated stress reached its peak while performing the arterial anastomosis. As the anterior tibial artery and peroneal artery were damaged by the injury, end-to-side anastomosis to the only remaining PTA was performed. Confusion and anxiety mounted as the veins were not adequate and the broken clamp was constantly leaking. The fear of failure clouded the author's judgment. After completing the arterial anastomosis, the first author reached out to their mentor, the senior author, at 2 AM. The mentor helped assess the current situation, calming the surgeon and organizing their thoughts. This powerful moment provided the surgeon with a renewed boost of confidence.

As the flap stabilized after a couple of hours and the author began to inset the flap, the surgeon received a call from their mentor. The mentor asked about the vein and shared that one vein was left as a lifeboat. The exhaustion left the author with no will to anastomose the remaining vein, but the call from the mentor, encouraging them to aim for perfection, motivated and nudged the author to anastomose the remaining vein.

Outcome after the First Flap

During the first year (June 2022–May 2023) of building up the microsurgery unit at a general hospital where microsurgery was not readily available, eight free flaps were performed. For safety, ALT flaps based on more than two perforators were initially chosen.⁹ One superficial circumflex iliac artery perforator flap was performed, as the defect was long and narrow. Postoperative monitoring was performed every 2 hours for initial 5 days and every 4 hours until day 14. With sufficient hydration, lipo-prostaglandin E1 was administered for initial 5 days. Wheelchair ambulation was begun from postoperative day 5, and low molecular weight heparin was continued until that day (Table 1).¹⁰ Early compression therapy targeting 30–35 mm Hg was started from postoperative day 5.¹¹ There were no revision cases, and all flaps survived

Table 1. Postoperative Monitoring and Management Protocols

	Period	Methods
Flap monitoring	Initial 5 d	Photography notification every 2 h
	6–14 d	Photography notification every 4 h
Lipo-prostaglandin E1	Initial 5 d	20 mL/h (mixed in 500 mL normal saline)
Volulyte	Initial 5 d	20 mL/h
Normal saline	Initial 5 d	60 mL/h
Low-dose aspirin	Initial 30 d	100 mg/d per oral
Low-molecular-weight heparin	Until wheelchair ambulation	20 mg/d subcutaneous injection
Ambulation	From postoperative day 6	Wheelchair

Table 2. Characteristics of Free Flap and Outcome

	Flap	Flap Dimension	Perforator	Defect Location	Injury Type	Anastomosis	Complication
1	ALT	34×15 cm	3 ea	Heel, calf	Explosion	1A 1V (+venous charging)	None
2	ALT	15×9 cm	2 ea	Forearm	COM	1A 1V	None
3	ALT	9×5.5 cm	2 ea	Big toe	Crushing injury	1A 1V	None
4	ALT	23×14 cm	2 ea	Heel	Explosion	1A 1V	None
5	ALT	18×9 cm	2 ea	Pretibia	Explosion	1A 1V	None
6	SCIP	17×7 cm	1 ea	Ankle dorsum	Explosion	1A 1V	None
7	ALT	25×10 cm	2 ea	Foot dorsum	Diabetic foot	1A 1V	None
8	ALT	30×10 cm	3 ea	Pretibia	Degloving injury	1A 1V (+ATA flow through reconstruction)	None

SCIP, superficial circumflex iliac artery perforator free flap; COM, chronic osteomyelitis; A, arterial anastomosis; V, venous anastomosis; ATA, anterior tibial artery.

without any partial necrosis. Two patients underwent deulking for contouring (Table 2).

DISCUSSION

1. Remember Your Training and Mentors

Find Good Mentors

Microsurgery is a long path filled with numerous trials and errors. Therefore, it is quite beneficial to seek guidance from a mentor who has already traveled down that path. Try to find domestic or international mentors. During international conferences such as the World Society of Reconstructive Microsurgery or the American Society of Reconstructive Microsurgery, young microsurgeons can have an opportunity to meet various mentors from all around the world. For example, there are various sessions such as “speed date sessions” that match young microsurgeons to the giants of microsurgery.^{12,13} If you have met a mentor, visit their center and learn everything in-depth for several weeks to months and keep the friendship everlasting.

If it is not possible to visit in person, contact mentors through various media on the internet. The simplest method is email, and social media such as International Microsurgery Club, Facebook, Instagram, and YouTube are also good windows.^{14–16} Try to contact multiple mentors simultaneously and follow the mentor who replied to your request. Do not be afraid of not receiving an answer or being rejected.

Start with the Mentor’s Protocol

There will be microsurgery protocols that mentors have established through their experience or research. Follow the mentor’s protocols. Try to fully understand the meaning of each process and find the evidence. If it

does not fit your style or the evidence does not fit, you can gradually develop it and establish your own personalized protocol that suits you.¹⁷ Through this process, you can bypass the trial and error that the mentor already went through for several years.

Continue to Communicate with Your Mentor Even after You Leave

If you have started reconstructive surgery alone in a new hospital, no matter how well prepared, unexpected situations will likely occur. You can continue to face these challenges alone, but you may easily become physically exhausted and emotionally weakened due to the fear of failure. Through the process of constantly consulting with a mentor, you can gain not only knowledge but also inner peace, courage, and confidence.

Perform Preoperative Mapping Using Appropriate Equipment

Since prolonged operation time can lead to various complications, it is very helpful to map the location and pathway of perforators and recipient vessels. CT angiography, ultrasonography, and smartphone thermal imaging can be used.^{18–21} It may not be easy to purchase every piece of equipment, but CT and ultrasonography are relatively available in most hospitals. Utilize the equipment that is already available in the hospital. If possible, do not hesitate to introduce new equipment and actively try it.

Do Not Rush and Proceed Step by Step as You Learn in Training

If you perform a lengthy surgery alone, you may be tempted to rush the procedure. This impatient mindset makes it very difficult to carry out an ideal surgery.⁸ Surgeons who hurry tend to have rough hands, and as they do not spend the time to think, they may make the mistake of skipping routine steps.²² Do not be afraid of ischemic time. A flap resists ischemic time better than you

might think. Surgeons must take action step-by-step, think actively, and think continuously.

2. Acquire the Fundamental Knowledge of Microsurgery

Start by Asking Questions to Learn Essential and Practical Knowledge

Appropriate microsurgical skills begin with a thorough understanding of basic knowledge. To raise a flap, for example, a surgeon should understand not only the basic anatomy of perforators but also the in-depth anatomy of the linking vessel network. Accurate atraumatic vascular manipulation can be achieved by understanding the physiology of vascular spasms.

This essential knowledge can be learned through various textbooks or articles, but it is recommended to ask a mentor. Although the depth of information contained in written materials is limited, you can obtain the wisdom accumulated through years of experience if you discuss it with your mentor. Through these conversations, you will naturally be able to quickly acquire the most practical and fundamental knowledge.

Acquire the Perfect Technique and be Comfortable with Microsurgery

If you absorb essential knowledge, microstructures will feel like macro-structures. To learn microsurgical skills, visiting a mentor's hospital and participating in surgery is the best approach. If this is difficult, learning through videos is another way.¹⁶ You can find high-quality videos through videos shared at conferences or videos attached to recent papers. Recently, there have been opportunities to learn microsurgical skills from giants in congresses such as the World Society of Reconstructive Microsurgery and American Society of Reconstructive Microsurgery.

If you have learned the correct technique, you should undergo enough experience with artificial blood vessels, chickens, and rats to be proficient in it.²³ Through these exercises, not only will you be able to perform anastomosis techniques stably, but you will also gain confidence in these techniques. If microanastomosis has become automatic and you think that the easiest part of the surgery is performing microanastomosis, then you are ready.

3. Create an Ecosystem of Hardware and Software and Have Fun

Brainstorm with a Team and Prepare Plan B and Plan C

It is challenging to generate various creative ideas when working alone in a hospital. There is a limit to the scenarios that can be predicted by thinking alone. Therefore, it is necessary to consult freely with doctors and nurses about surgery and brainstorm. In these open discussions, various ideas are obtained, which can be refined into Plan B or Plan C.

Be Sure to Prepare Appropriate Surgical Instruments

Microstructures are vulnerable to damage, so safe microsurgical instruments are necessary. Basic surgical instruments such as micro needle holders, curved scissors, straight scissors, dilators, jewelers, and vascular clamps, nylon threads, surgical loupes with appropriate

magnification, and a microscope are required. The tips of these instruments must be well stored to prevent damage. If there is an existing device in the hospital, it is necessary to check the condition of the device before surgery.

In flap surgery, identifying the proper dissection plane is crucial, and traction and counter-traction are key to achieving this. Therefore, the absence or inexperience of counter-traction can make dissection dangerous. Fishhooks are useful tools that can maintain static and constant counter-traction. With the help of these tools, flap elevation can be performed more safely.⁷

Medications should also be prepared. Not only drugs such as papaverine and heparin used in the operating room, but also lipo-prostaglandin E1 and low-molecular-weight heparin should be checked in advance.

For the Team within the Department: Repetitive Training and Trust

Successful reconstruction requires not only a capable surgeon but also the synergy of the entire team.²⁴ To improve the capacity of the team, repeated education and trust are needed. This education should address in-depth content. For example, try to make team members understand that the meaning of flap monitoring is not just to see the color of the flap, but to assess the balance and imbalance between the inflow and outflow of the flap. In this way, team members will happily participate in high-quality treatment as they think actively. Even though errors and mistakes may occur during this training, the surgeon should lead the entire team in a positive direction rather than weakening the morale of the team with scolding. All team members will participate responsibly when their relationships with one another are founded on faith and trust. The efforts made to build the team will not only be a great strength in difficult moments but also make the surgery enjoyable and comfortable.

Create a Multidisciplinary Team through Collaboration with Other Departments

Since a multidisciplinary approach is often required, collaboration with other departments must be well established. Many patients who require microsurgery are referred from other departments. In addition, the success of reconstruction cannot be guaranteed by the success of microsurgery alone. Even if the flap surgery is successful, if the bone is not well managed, osteomyelitis may eventually occur, and if diabetes is not controlled, wound healing will not occur.²⁵ Therefore, the level of treatment in other departments must also improve.²⁶ Periodic weekly or monthly meetings are a great help in building teamwork. When each department shares various opinions about a patient, not only does the level of treatment improve, but also mutual trust builds up.

Clarify the Purpose of Reconstruction: Patient

Surgeons must acknowledge that they can become exhausted and make poor judgments. Keep in mind that you can rationalize your actions when you are exhausted, and be careful not to compromise at the moment of judgment. Recognize that you are the patient's last hope. The most powerful drive for microsurgical reconstruction is

Table 3. Key Factors to Build a Successful, Sustainable, and Fun Microsurgery Practice

Key Factors
Remember Your Training and Mentors
-Find good mentors
-Start with the mentor's protocol
-Continue to communicate with your mentor even after you leave
-Do not rush and proceed step by step as you learn in training
Acquire the Fundamental Knowledge of Microsurgery
-Start by asking questions to learn essential and practical knowledge
-Perform preoperative mapping using appropriate equipment
-Acquire the perfect technique and be comfortable with microsurgery
Create an Ecosystem of Hardware and Software and Have Fun
-Brainstorm with team and prepare plan B and plan C
-Be sure to prepare appropriate surgical instruments
-For the team within the department: repetitive training, trust
-Create a multidisciplinary team through collaboration with other departments
-Clarify the purpose of reconstruction: patient
-Always be curious, think, ponder, and challenge

the patient's hope and the surgeon's earnestness that does not let go of that hope. In a state of extreme physical burnout and mental panic, a clear reason and conviction for surgery will arouse strong will and passion.

Always be Curious, Think, Ponder, and Challenge

Gradually, as you gain experience in surgery, the burden you feel for each operation will decrease. You must use this remaining energy to think about the progression. Above all, if you do not make this effort, you will soon lose interest in microsurgery. To enjoy your work, you have to go further and think about it with curiosity. In this process, innovative ideas will emerge. Try to develop your own story. Make a challenge and analyze the results. When you come up with new results, share them with others by publishing papers. If you keep going your own way, new beginners will find you as a mentor, as you did before. Move forward by sharing the knowledge you have received and the wisdom you have accumulated.

CONCLUSIONS

Although the path to establishing microsurgery in a new hospital is not an easy one, it is certainly possible. Remember your training and mentors. Acquire the fundamental knowledge of microsurgery. Create an ecosystem of hardware and software. Most importantly, have fun along the way (Table 3).

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DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

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