



Do We Still Need Plastic Surgery on the Limb-Preservation Team? Yes, If You Can Find Them

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Wound healing represents a tremendous challenge for patients and providers as well as considerable stress on the health care system. The extent of the impact of a non-healing wound on quality of life is hard to quantify. Yan et al found that the health-related quality of life in patients hospitalized with a chronic wound was poor. Decreased sleep, pain, and wound odor were the biggest factors negatively affecting quality of life.¹ Chronic wounds not only stress the patient but also their support system. Health care providers must juggle the concerns and anxieties of their patients and their patient's caregivers and, in turn, guide them through a system that is clearly overwhelmed.

In the United Kingdom, the National Healthcare Service is estimated to spend \$5 billion on wound care per year.² In the United States, Medicare spending approaches \$32 billion per year on non-healing wounds.³ Chronic wounds cost Australia an estimated AU\$3 billion.⁴ Germany spends almost €10,000 per patient, per wound.⁵

Limb preservation aims to reduce the suffering and alleviate the strain on our fragile systems. Unfortunately, not every limb can be saved, and too often patients with chronic wounds or chronic limb-threatening ischemia (CLTI) undergo major amputation. The perioperative mortality for below-the-knee amputation can be as high as 14% and above-the-knee amputation mortality climbs to 35%.⁶ The 1-year and 5-year mortality rates are worse. For those patients who survive their immediate postoperative course, some may go on to ambulate with a prosthetic, but a considerable number will not.⁷ Successful wound healing not only ends the morbidity of a chronic wound, but also avoids amputation and its associated complications.

The benefits of a multidisciplinary approach to limb salvage are well documented in the literature.⁸⁻¹⁰ A multidisciplinary team can reduce amputations, hospital admissions, emergency

room use, and health care costs while increasing quality-adjusted life-years.^{11,12} These teams can include, but are not limited to, podiatric surgery, vascular surgery, interventional radiology, plastic surgery, orthopedic surgery, general surgery, internal medicine, endocrinology, infectious disease, cardiology, dermatology, rheumatology, pain management, prosthetists, nursing, physical therapy, and occupational therapy, among others. Wound care cuts across the breadth of medical specialties, and plastic surgery consultation has become standard for the most complex wounds in many institutions.

Wound care has always been at the heart of plastic surgery as a specialty. Managing complex war wounds led to the creation of the specialty during World War I, and plastic surgeons have remained at the forefront of complex wounds. In this issue of the *Journal of Critical Limb Ischemia*, Fujihara et al present their study evaluating the current impact of plastic surgeons in managing wounds for patients with CLTI.

The authors present a retrospective review of 1000 CLTI cases and report on the rate of wound healing when patients are managed by plastic surgeons versus other medical specialties. Over the 8 different centers, patients managed by plastic surgeons had a significantly higher rate of healing (52% vs 40% at 4 months) compared with other medical specialties (vascular surgeons, dermatologists, orthopedic surgeons, and interventional cardiologists). The patients managed by plastic surgeons also had lower rates for a major adverse limb event, amputation. The authors conclude that expert wound care is needed in addition to revascularization.¹³

There are often multiple medical specialties capable of addressing a particular disease presentation. Sometimes it arises from differences in training, such as orthopedic and neurosurgery sharing the subspecialty of spine surgery. Sometimes there

is anatomic overlap, as with podiatry and orthopedic foot and ankle surgeons. This article highlights an area in medicine where numerous specialties shoulder the tremendous burden together. Multiple specialties have assumed the care for non-healing wounds, either out of training, interest, or necessity.

The authors have expertly zeroed in on one of the age-old debates in medicine, ie, which specialty is best suited to address this particular problem? These discussions can be quite sensitive, as opinions are not always rooted in fact or evidence. Personal bias plays a key role as well as historical trends, institutional politics, culture, and financial consequences. As clinicians and scientists, we must acknowledge these biases, put them to the side, and use the best available evidence to guide decision-making, protocol development, and patient flow.

Given the difficulty in managing complex wounds after revascularization, plastic surgeons should always be a part of the multidisciplinary limb-salvage team. The authors have demonstrated the substantial benefit plastic surgeons provide. These wounds are often composite defects and sometimes require composite reconstruction with local, regional, or distant flap rather than inducing granulation and then subsequent epithelialization or skin grafting. While many surgeons may be comfortable with raising flaps, Hoyt et al demonstrated that both institutional experience and plastic surgeon involvement in flap-based reconstruction increased flap survival rate and decreased complications.¹⁴

Plastic surgeons provide access to a wide range of surgical and non-surgical wound-healing modalities. This broad area of expertise has been well schematized in the concepts of the reconstructive ladder, and later, the reconstructive elevator.¹⁵ The more recent iterations of the reconstructive ladder include negative-pressure wound therapy and dermal matrices.¹⁶ New technologies can be quickly adopted by plastic surgeons so that the overall treatment can be optimized. Speed is of the essence when dealing with limb preservation. It is indeed a race against time—a race to heal the wound before infection, need for repeat vascular intervention, or worse, limb loss due to overwhelming infection or untreatable ischemia.

With all the wound-care modalities available, plastic surgeons can not only select the most appropriate initial therapy, but can also quickly shift gears if needed, should the wound regress or dramatically improve. Most importantly, nothing is more effective in healing a wound in what may be a relatively ischemic extremity than vascularized tissue. Vascularized tissue eliminates the need for the wound base to support healing and provides an avenue for systemic antimicrobial therapy to be locally effective at the wound site.¹⁷

Many specialties are capable, competent, and expert in the management of chronic wounds. It would be naive to deny the contributions of general surgery, podiatry, infectious disease, and vascular surgery, among others, to the field of limb salvage. Patients need thoughtful, compassionate, and expert clinicians,

regardless of specialty. The reality is that not every patient needs a flap and not every patient needs a plastic surgeon. It is, however, difficult to know which patients would benefit from plastic surgery consultation at their initial presentation. Other patients may benefit from consultation in the middle of their course.

Plastic surgery consultation, however, may not always be available. Unfortunately, plastic surgeons may not be available geographically or may not be interested in limb preservation clinically. The geographic distribution of plastic surgeons in the United States favors locations where the population is young, female, and urban. There are 25 million Americans who have no plastic surgeon within their health service area.¹⁸ Interestingly, amputation rates are higher in the southern United States as well as in urban areas when the patient has lower socioeconomic status.^{19,20} The “typical” aesthetic plastic surgery patient is nearly the polar opposite of a limb-salvage patient. There is no straightforward way to address or correct this reality.

It is fair to say that plastic surgeons have a strong interest in breast reconstruction, but even breast cancer patients do not always have access to the full scope of reconstructive techniques. A quarter of breast surgeons in the United States do not have a plastic surgery office located within 10 miles and 10% of breast surgeons have no plastic surgeon within 20 miles.²¹

Limb preservation, unfortunately, does not receive the attention that breast reconstruction does. If breast cancer patients have a month of dedicated breast cancer awareness and do not have full access to breast reconstruction, chronic wound patients surely face an uphill battle.

Despite limited access to plastic surgery, the COVID-19 pandemic has pushed us to develop telemedicine infrastructure and increased the usage of remote consultations. Furthermore, telemedicine is likely to increase moving forward. Continuing to build out telemedicine would help increase access to plastic surgeons and help identify patients who would benefit from subsequent in-person consultation. This would be a cost-effective way to increase access to plastic surgeons and hopefully increase healing rates and decrease the morbidity of non-healing wounds and limb loss.

Because delayed wound healing can result in infection, repeat vascular intervention, limb loss, significant morbidity, mortality, and extensive health care expenditures, it is paramount that every effort be made to decrease time to healing. The authors present the significant impact plastic surgeons can have in this effort. Unfortunately, access to plastic surgery is not always readily available, and with the increasing trends toward specialization and subspecialization, the availability of plastic surgeons interested in limb salvage may decrease in the future.²² Now is the time to use the momentum of the COVID-19 pandemic to continue to expand systems to be sure that plastic surgeons are always a part of the multidisciplinary limb-preservation team.

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