

Adeem Moustafa Nachabe

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LSU Health Sciences Center, New Orleans, LA

Mark Stalder, MD

LSUHSC Department of Surgery, Division of Plastic and Reconstructive Surgery

“Maximizing the Potential of the Free Fibula Flap: Multiple Reconstructive Options from a Single Donor Site”

The fibula free flap is the gold standard for vascularized bony reconstruction of the facial skeleton and extremities due to its reliability, versatility, and excellent functional outcomes. While the anatomy of the donor site and flap have been extensively detailed, there remains potential for making better use of the unique anatomic characteristics of the available tissue and vascular pedicle to maximize the flap’s potential in patients that may have limited donor sites, vessel-depleted recipient sites, or multiple simultaneous anatomic defects.

There are three main concepts we have come to use regularly that have advanced our ability to make more efficient use of the fibular donor site to facilitate more creative and sophisticated surgical solutions for complex bony reconstruction. These include the following: (1) the peroneal vascular pedicle allows for creation of a flow-through flap construct, not only from end-to-end, but also using perforating vessels along its course. This becomes of vital importance in the vessel-depleted neck, and also when a second flap has a short pedicle. (2) The fibula should be thought of as a single long bony donor site that may be reliably partitioned into more than one vascularized bone flap based on the linear flow-through anatomy of the peroneal pedicle. This permits simultaneous reconstruction of multiple bony defects from a single donor site. And finally, (3) the fibula donor site provides opportunity for multiple perforator-based fasciocutaneous flaps that may be used simultaneously when soft tissue is required, and a pedicled skin paddle is not the optimal configuration.

Virtual Surgical Planning (VSP), while not a new concept, has proven indispensable in its ability to facilitate simultaneous usage of these concepts in complex cases, and for allowing more creative solutions to come to fruition. Implementation of these surgical strategies, in conjunction with VSP, can permit simultaneous complex maxillary and mandibular bony and soft tissue reconstruction in ballistic injury, or bilateral mandibular defects using only a single donor site. These injuries and pathologies are often coupled with a vessel-depleted neck and/or significant additional soft tissue loss, and in these instances, the ability of the peroneal vascular pedicle to be used in a flow-through configuration is essential. Taken together, these concepts make the fibula donor site an even more powerful resource in complex cases, and have become routine in our practice.