

# Mayo Clinic Experience with Unfavorable Results After Free Tissue Transfer to Head and Neck



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## KEYWORDS

• Head and neck reconstruction • Microsurgery • Free flap • Salvage

## KEY POINTS

- Successful free tissue transfer should produce optimal functional as well as aesthetic outcomes. Anticipating potential risk factors before reconstruction is key.
- Specific factors negatively affecting head and neck reconstruction include radiation, contamination, and mobility. Of these, radiation with its attendant damage to the capillary bed provides the biggest challenge.
- Poor wound healing due to these factors can lead to wound breakdown and fistula formation, threatening the microvascular anastomoses, the flap, and the great vessels of the neck.
- Maxillo-mandibular reconstruction must respect the occlusal plane for functional dental rehabilitation to be optimized.
- Reconstruction of the pharynx and esophagus following chemoradiotherapy must factor in the ongoing negative effects that can obliterate laryngo-pharyngo-esophageal function.

## INTRODUCTION

The aim of this article is to share our experience with head and neck reconstructive surgery and technical approaches we have learned from untoward results. There are several factors somewhat unique to the head and neck patient population that challenge the reconstructive surgeon.

First, the upper aerodigestive tract contaminates the reconstructed area. Second, mobility of reconstructed tissue is to be expected and can impact healing. Third, radiotherapy (RT) in the upper aerodigestive tract either before or after reconstructive surgery is the norm. The negative tissue side effects created by radiation need to be factored into the technical considerations of

each surgery. Most of the discussion regarding RT references patients who have already undergone radiation because a deficient vascular bed presents unique challenges to healing. Current use of concurrent chemoradiotherapy (CXRT) produces even greater tissue damage than conventional RT.

The last and perhaps one of the most important aspects of head and neck reconstruction relates to how patients meet their world. Appearance that includes functional and aesthetic outcomes is equally or more important following head and neck reconstruction than anywhere else in the body. As we set expectations for our patients, we outline tiers of priority: oncologic success,

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function, and appearance. Although these goals must be prioritized in this order, the importance of function, namely, speech and swallowing, and appearance are essential to successful head and neck reconstruction and cannot be overemphasized.

### SALVAGING FREE FLAPS

Modern reconstructive surgeons can expect a better than 98% success rate with free tissue transfer.<sup>1-3</sup> Improvements in microsurgical training, surgical instruments, and technique; the expansion of potential free tissue donor sites; and a better understanding of free tissue physiology have certainly contributed to the current high rates of success.

As we reviewed our experience of more than 2500 flaps, exclusively in the head and neck, we have seen our failure rates in the last 2 decades plateau at less than 1%. There remain 2% to 3% of cases that have early vascular compromise and require salvage. Most cases of vascular compromise are venous pedicle obstructions, and most of these occur within 72 hours after surgery. A very small number of arterial pedicle problems are discussed later. Our practice is not unique in that careful postoperative monitoring is used for early identification of flap compromise with urgent return to the operating room (OR) when necessary and leech therapy for temporary venous decongestion of the flap while preparing for the OR.

Our protocol for dealing with venous thrombosis is based on lessons learned from untoward results. Failure to trim microstay sutures following anastomosis can result in inadvertent traction on the microvascular anastomoses during even the most gentle clot removal in those patients with hematomas in the neck surrounding the anastomoses. Our technique has not fundamentally changed for 30 years. When all blood clots have been completely removed in the neck and an engorged venous pedicle is identified together with a patent arterial pedicle, the venous pedicle is sectioned at the anastomosis. A mechanical thrombectomy of the venous pedicle is performed, which by itself rarely, if ever, restores flow. The recipient artery is clamped proximal to the arterial anastomosis, and intra-arterial injection of a thrombolytic is administered. This practice has changed over 30 years from streptokinase to urokinase to the tissue plasminogen activator (TPA) currently used. The concentration of thrombolytic can be much greater than a systemic dose as the agent will not enter the systemic circulation because the venous pedicle has been severed. The arterial clamp is removed, and the agent can work its way into the

flap. Retrograde irrigation with the same high concentration of thrombolytic is performed. Sometimes with engorged thrombosed veins within the venous system of the flap, intravenous injections of these veins are also performed with the concentrated thrombolytic. Venous outflow slowly returns, during which time all venous outflow is extracorporeal. While awaiting the return of adequate venous outflow, an alternative recipient vein is prepared. Depending on the patient, this may be the original shortened vein, a new vein, or even a vein graft in exceptional cases. Once full venous outflow has been reestablished and all injected thrombolytic has been flushed from the flap, the venous anastomosis is performed (**Fig. 1**). We do not routinely anticoagulate our free flap patients with anything more than aspirin or ketorolac tromethamine (Toradol). However, in salvage patients, we heparinize the patients for a few days. In the 1980s, we salvaged a dozen or more flaps using this technique and always heparinized the patients following salvage. When we decided to not heparinize one salvaged patient, rethrombosis occurred. Regardless of whether a lesson was learned from untoward results or we responded to an anecdotal experience, we now heparinize our patients after salvaging their flaps.

### RADIOTHERAPY CONSIDERATIONS

The negative impact of RT and CXRT presents the greatest challenge to successful head and neck reconstructive surgery. Radiation produces subintimal fibrosis in the microvasculature of the radiated field and can dramatically decrease or even obliterate the capillary bed. This loss of the capillary bed dramatically decreases the affected tissues' nutrient and oxygen delivery system resulting in predictably compromised healing. Reconstruction in an irradiated bed will have higher rates of orocutaneous or pharyngocutaneous fistulae even when well-vascularized flaps are used. The nonradiated free flap will not heal as well to heavily radiated, poorly vascularized, contaminated, and mobile tissues. Several strategies are used to minimize the risk fistula poses to a free flap. When possible we try to locate the microvascular anastomosis to the contralateral neck, which is far less likely to become contaminated by a fistula. If a fistula seems imminent or does develop, the drainage must be redirected not only away from the carotid artery but also away from the microvascular anastomosis.

If the microvascular anastomosis must be in the ipsilateral neck, it is beneficial to devise ways to ensure that if a patient were to fistulize, the vascular anastomosis would be protected from

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