



Free Abdominal Tissue Transfer and Utilization of the Umbilical Stalk for “Tubular” Reconstruction in Ear, Nose, and Throat Defects

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Large head and neck burns and cancer-related defects pose many challenges to the reconstructive surgeon with the ultimate goals being aesthetic, as well as functional restoration, or as the renowned Italian plastic surgeon Gaspare Tagliacozzi espoused to “restore, rebuild, and make whole those parts which nature hath given but which fortune has taken away.” The face, in particular, has inherent structures that are vital to interpersonal relationships, as well as everyday function. Large head and neck burns or cancer defects may require a tracheostomy and stoma creation or reconstruction of the external auditory meatus both posing a significant reconstructive challenge.

Reconstructive options in these large head and neck cases can be limited with the inability to utilize skin grafts, local tissue expansion, or potentially locoregional flaps due to the amount of surrounding scarring, lack of soft tissue, and amount of tissue bulk needed for reconstruction. Therefore, free flap coverage is often needed. Many types of free flaps can be utilized for head and neck reconstruction including the radial forearm or anterolateral thigh (ALT) flap due to their thin and versatile nature; however, abdominal-based free flaps can be uniquely designed to fit the reconstructive purpose of not only wound coverage but also the ability to recreate a vascularized tubed structure. Whether designed as a deep inferior epigastric perforator (DIEP) flap or a free transverse rectus abdominis myocutaneous (TRAM) flap, the abdominal-based free flap is versatile and provides a readily available umbilical opening that functions as a thin, vascularized umbilical stalk that can be utilized for reconstruction of a tubular structure such as the external auditory meatus, nasal passageway, or neck tracheostomy/stoma site. We present four cases in which an abdominal free flap was used to reconstruct large burn and cancer resection defects while providing a channel for tubular reconstruction.

Case Description

Patient 1

Our first patient is a 45-year-old gentleman who presented after an extensive electrical burn injury to his left ear and scalp with the resultant defect showing exposed calvarium, as well as complete loss of the external ear structure. The amount of surrounding skin available was deficient and therefore an abdominal-based free flap was used for reconstruction with the umbilical opening and stalk used for reconstruction of the external auditory meatus. This flap was subsequently debulked to assist with better contour with the final image showing the patient 5-year postoperatively. (► Fig. 1)

Patient 2

The second patient is a 22-year-old female who experienced a significant burn involving her left external ear, scalp, neck, and posterior torso and shoulder. The patient underwent various tissue expansions and scar revisions; however, due to the lack of surrounding skin available for coverage and areas of exposed bone, it was decided to proceed with a free rectus abdominis flap with the umbilical opening and stalk used for the external auditory canal reconstruction. She subsequently underwent two further revision operations and local tissue expansion to assist in excision of areas of alopecia. (► Fig. 2)

Patient 3

The third patient is a 63-year-old gentleman who had a carcinoma of the larynx that was initially treated with chemoradiation. He, unfortunately, developed a recurrence and subsequently required resection and a partial laryngectomy. He developed a further recurrence and had a subsequent wide excision of the tracheostomy stoma, part of his pharynx and esophagus, sternocleidomastoid, and surrounding skin. Due to the large nature of the wound, an abdominal, folded, free

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Fig. 1 Original burn involving scalp and external ear (top left). Flap design with umbilicus as external auditory canal (bottom left). Postoperative from flap (top right). 5 years postop after some debulking of the flap (bottom right).

TRAM flap was used to reconstruct the neck defect. The umbilical stalk was then used as a vascularized tubed structure to reconstruct the tracheal stoma. (–Fig. 3)

Patient 4

The fourth patient is a 58-year-old male who presented with a recurrent chordoma excised from his central face which included resection of his total nose, ethmoids, and surrounding skin. He subsequently had a folded TRAM flap with the umbilical stalk used to create a nasal opening that was subsequently connected to a full thickness skin graft around a tube to reconstruct the deeper nasal lining. He was, unfortunately, lost to follow-up before further revisions of the flap could be performed. (–Fig. 4)

Discussion

Head and neck reconstruction can encompass a variety of anatomical features that must be considered during reconstruction. Reconstruction of tubed structures can be especially difficult as attempted invagination of a surrounding flap or structure can lead to potential stenosis of the opening with eventual contraction and loss of tube patency. Utilizing a naturally formed, well-vascularized, thin-tubed

structure, such as the umbilical stalk, which provides a reconstructive option that can be readily used for tubed reconstruction.

Ear burn reconstruction may be complex and varied. Burns involving the ear have been described as being present in 90% of cervicofacial burns and can be varied in their presentation from small, cutaneous burns that may be treated with local wound care, to extensive burns which can completely destroy the overall ear structure and framework, as well as the surrounding scalp.^{1–3} Various classifications of ear burns exist with our above patients falling within group IV according to Bhandari (no local tissue or fascia available for reconstruction) and type 3 according to K'ung et al (severe burn with little to minor remnant structures and normal or stenosed external auditory meatus).^{1,3} For these extensive defects with near total or total loss of the ear, Bhandari and other authors have described the usage of either unilateral or contralateral temporoparietal flaps or radial forearm flaps to cover an auricular framework or implant.^{1,4–7}

Not only is the abdominal-based free flap useful for coverage of burn defects involving the ear and reconstruction of the external auditory meatus, it is also useful for reconstruction of other tubed structures, such as external nasal and stoma openings, after neck cancer resection. Various



Fig. 2 Flap design with umbilical stalk for external auditory canal (top). Original burn scar area with loss of external ear (bottom left). Postoperative after flap inset (bottom right).

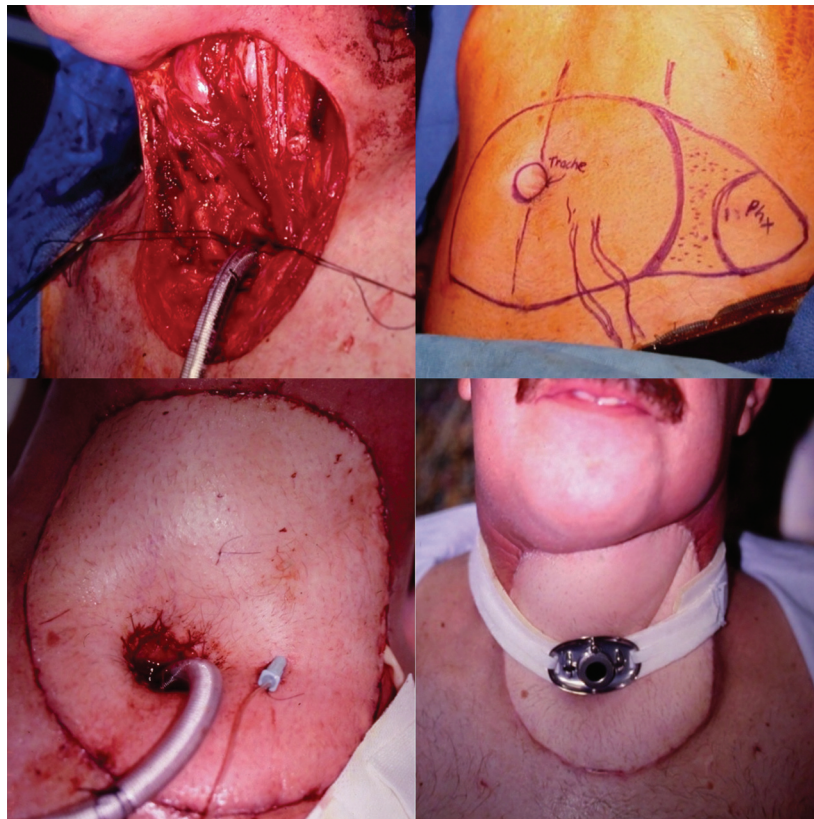


Fig. 3 Original wound after cancer excision with ET tube in place (top left). Flap design incorporating the umbilicus for the external auditory meatus and extent of abdominal flap which was used for the folded laryngeal reconstruction (top right). Postoperative flap inset (bottom left). Postoperative flap with tracheal stoma in place (bottom right).



Fig. 4 Original Facial cancer profile (top left). Planned flap with folded design and umbilicus for neck stoma opening (middle left). Inner-tubed skin graft reconstruction (bottom left). Midface defect postresection (top right). Final flap inset with external nasal opening (bottom right).

flaps including the supraclavicular, ALT, and pectoralis major flaps, skin grafts, and other reconstructive options have been described for anterior neck skin reconstruction; however, as noted by Emerick et al and others, complicating factors, such as overlying skin contraction and history of previous radiation, and fistulas cannot only distort the external stoma and voice restoration but also lead to stomal stenosis which was reported by Chan et al to be around 47.4% and potentially even higher when associated with a local fistula.⁸⁻¹⁰ These previously described reconstructive options are often used; however, they can be difficult to readvance and reconstruct the stomal opening, especially in cases of recurrence and potential further stomal resection. Abdominal free tissue transfer may provide a rather bulky first reconstructive option; however, because of the size of the flap, it can be used in a folded fashion to reconstruct deeper structures as was employed in our anterior neck defect. If desired, the abdominal flap may be thinned via liposuction or surgically debulked later for better contour. This abdominal-based flap even provides a useful reconstructive option in obese patients as the umbilical stalk is stretched and further elongated, providing a long, thin-tubular channel. The abdominal donor site can be subsequently closed as if you were utilizing these tissues in breast reconstruction, as is often the

case, and the decision to perform a neumbilicoplasty is at the patient's discretion.

Conclusion

Tubular structures are difficult to reconstruct especially in the setting of significant burns or cancer resections requiring extensive reconstruction. Free flaps are often needed in these complex defects. We present a novel reconstructive option for extensive head and neck defects with the utilization of abdominal free tissue transfer and reconstruction of tubular structures with the naturally occurring, thin, vascularized, and inherently tubular umbilical stalk.

Conflict of Interest

None declared.

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