

Chapter 82

Regional Pedicle Flaps

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Pec. Flap

The use of pedicle flaps has significantly improved the safety and functional outcomes of head and neck surgery. The reliability and ready availability of pedicle flaps make them the most commonly used means of reconstructing defects created in the course of extirpative surgery. Because of the aggressiveness of today's chemotherapy and radiation therapy protocols, the ability to bring oxygenated tissue with a nourishing blood supply to the surgical defect has been critical. Moreover, many of these flaps can be created and transferred without needing to reposition the patient intraoperatively. They do not require microvascular expertise, along with the painstaking time spent under the microscope, nor do they tend to significantly increase the duration of the operative procedure. This chapter presents an overview of the relevant anatomy, steps for technical execution, and common complications of pedicled flaps for the head and neck.

Several excellent general references and atlases have been prepared to assist surgeons contemplating head and neck reconstruction with regional flaps. Three excellent sources are listed at the beginning of the reference section.^{1,3}

PECTORALIS MAJOR FLAP

The pectoralis major flap is the most commonly used muscle or myocutaneous flap worldwide in head and neck surgery and certainly one of the most reliable of all the pedicle flaps.^{4,7} It has a long tradition of use in reconstruction of the oral cavity and oropharynx and can be used with a cutaneous island or as a myofascial flap alone (Fig. 82-1). Its ability to protect the great vessels of the neck is literally a lifesaving attribute.

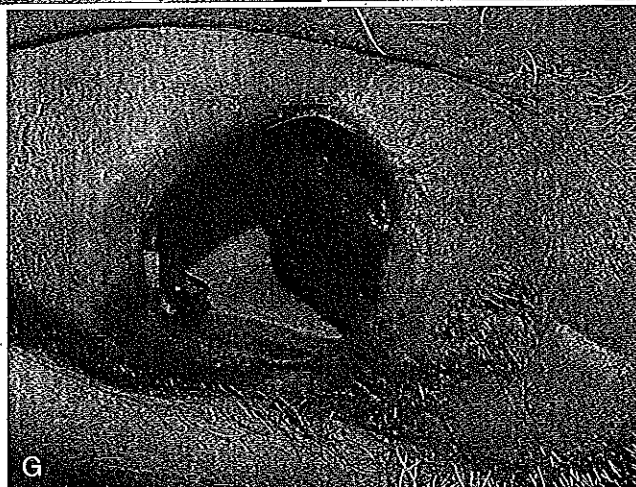
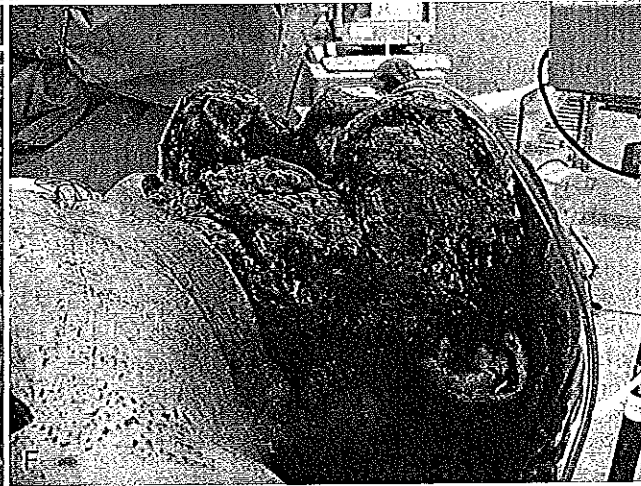
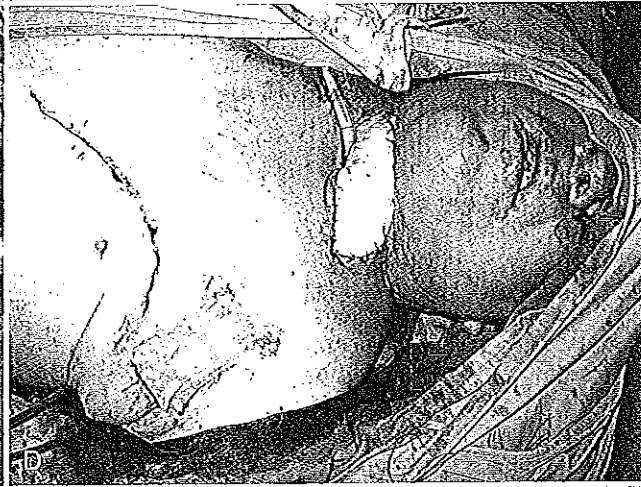
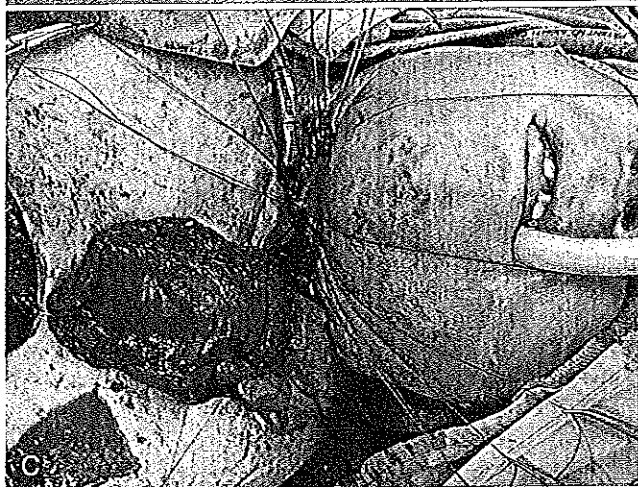
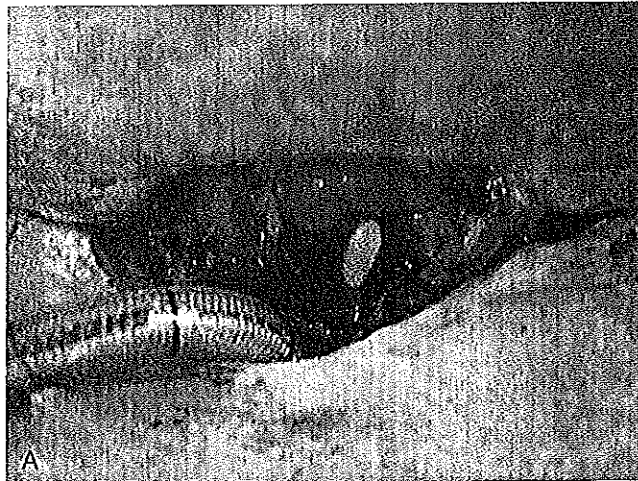
The pectoralis major muscle provides the bulk of the flap and is nourished by the pectoral branches of the thoracoacromial artery. The thoracoacromial artery branches from the subclavian artery deep to the clavicle and enters the underside of the pectoralis major muscle

at about the midpoint of the clavicle. One can draw the course of the thoracoacromial artery on the skin of the chest by marking the clavicle at its midpoint. If one draws a line from the xyphoid to the acromion and constructs a perpendicular to this line that meets the midpoint of the clavicle, the artery's course corresponds to the vertical perpendicular and the medial portion of the line from xyphoid to acromion. When elevating the pectoralis major, the artery can be seen running in fat on the underside of the muscle.

Additionally, the lateral thoracic artery enters the lateral portion of the sternal head of the pectoralis major muscle but is routinely sacrificed during harvest to maximize the arc of rotation of the flap. Usually, this will not compromise flap viability, but a wary surgeon is advised to inspect the course of the thoracoacromial first. Some authors have reported that perhaps one in seven patients has a sternal portion of the muscle served predominantly by a branch of the lateral thoracic artery.

The skin overlying the medial aspect of the pectoralis major muscle is nourished by perforators from the internal mammary artery, especially those arising from rib interspaces 2, 3, and 4, with perforators from interspaces 3 and 4 playing particularly prominent roles. These perforators are the arterial input for the classic deltopectoral flap.

The origin of the pectoralis major is divided into three segments: clavicular, sternocostal, and the aponeurosis of the external oblique. The clavicular origin arises from the medial third of the clavicle. The sternocostal origin arises from the sternum and the first six ribs. The third origin arises from the attachment of the inferior edge of the pectoralis muscle to the aponeurosis and the fascia of the external oblique muscle. The insertion of the pectoralis major runs deep to the deltoid and inserts on the greater tubercle of the humerus. The medial edge of the deltoid and the tendinous insertion of the pectoralis major are almost



indistinguishable from one another. The cephalic vein can be used as a guide to differentiate between them. The thoracoacromial artery will run the length of the muscle on its deep surface as described earlier.

The pectoralis muscle mass stretches across the superior anterior aspect of the chest, where it acts to abduct and medially rotate the humerus. Use of the muscle in construction of a flap does not cause significant functional disability. Because of the length available in this flap, the pectoralis major muscle can be used for defects ranging from the lower part of the neck such as a stoma after laryngectomy, the upper part of the neck, the tongue and floor of the mouth, and the lateral head/auricular area.

A skin island is often used to replace mucosa when a pectoralis major myocutaneous flap is positioned in the site of the defect. The skin island is fed by perforators of the thoracoacromial system emerging from the anterior surface of the muscle. If the skin island is extended off the boundaries of the muscle in any direction, the portion of skin extending beyond the muscle will have a random blood supply and can be less reliable. However, the skin island can be placed anywhere on the anterior surface of the muscle that would be usable in filling the defect. This is often approximated during surgery by positioning a towel at the origin of the thoracoacromial artery below the clavicle and extending inferiorly to the inferior edge of the skin island. In this way the arc of rotation and the length of the muscle on its pedicle can be evaluated to ensure adequate advancement.

The incision for liberating the pectoralis major muscle from the overlying skin and the underlying chest wall can be varied, depending on the concerns of the patient and the needs of the reconstructive procedure. Typically, the skin island is positioned near the end of the flap, close to the caudal portion of the muscle origin. It is often possible to dissect out the muscle through an incision in the inframammary fold. If a skin flap is needed, the skin and subcutaneous tissue can be incised to expose the pectoralis muscle, which can then be raised through these incisions around the skin island. The skin island is fed by perforators from the thoracoacromial artery running through the muscle, and thus care must be taken to not undercut or shear the skin island from the muscle. Several stay sutures tacking the skin island to the muscle are helpful toward this end, and the inferior sutures may be left long to help bring the flap up into its final position. The use of long stay sutures wrapped around the surgeon's finger provides traction and flexibility as the surgeon pulls the flap below the neck skin overlying the

clavicle. The crucial technical detail to be observed in flap advancement is making the tunnel under the clavicular skin large enough to easily accommodate the bulk of the muscle. Sometimes it will be necessary to incise this skin and place a skin graft over the muscle.

Any area of the skin island directly over the muscle should have a good blood supply. Portions of the skin that extend beyond the pectoralis will be random, and their survivability is less reliable. Flaps may be harvested with one skin island, two as in the case of a bilobed flap, or no skin island at all. Inclusion of rib has been used when osseous reconstruction is needed, although this is much less commonly done today now that experience with osteocutaneous free flaps is so extensive. If the fifth rib is harvested along with the flap, care must be taken to not separate the muscle from the fifth rib because the rib derives its blood supply from perforators running through the muscle to the periosteum over the surface of the rib.

In a female patient, a curvilinear incision inferior to the breast, in the breast crease, can avoid the more obvious scarring that can still be seen with low neck lines when the incision runs on the anterior chest wall. In addition, the fibrofatty breast tissue can easily be elevated away off the muscle as a complete unit when making an incision in the inframammary fold.

As the pectoralis muscle is lifted off the chest wall, it must be divided at its medial origin and lateral insertion. The connection of the muscle to the proximal end of the humerus will ultimately need to be released to allow enough mobility for the flap to fill a defect in the head and neck region. These muscle divisions are best accomplished with electrocautery. Care must be taken to avoid disruption of the feeder vessels on the undersurface of the pectoralis major. The nerve supply to the pectoralis major muscle arises from the lateral (C5 to C7) and medial (C8, T1) pectoral nerves. These nerves are often cut when raising this flap to provide an adequate arc of rotation. This causes some long-term atrophy of the muscle, which is often advantageous in head and neck reconstruction.

The muscle may be released medially from the sternum and laterally at the anterior axillary line near its insertion. It may then be brought over the clavicle, under the supraclavicular skin, and into the defect. Alternatively, the muscle may be divided on either side of the thoracoacromial vascular bundle down to the distal end of the flap, which may be larger and even include a cutaneous portion. This flap is like a lollipop and creates less of a deformity in the neck. However, it does not have the expanse of tissue to cover deep neck structures, including the great vessels, that the wider pectoralis major flap does.

When positioning this flap the operator must be careful to not overly twist, kink, or crimp the vascular pedicle. If the operator's hand can be comfortably placed below the skin of the inferior portion of the neck and supraclavicular area from the neck incision into the chest incision, there is little danger the vascular pedicle will be compromised. Similarly, experimenting with the most natural pattern for the flap to fill the defect can

Figure 82-1. Pectoralis myocutaneous flap. A, Defect for a pectoralis myocutaneous flap. B, Incision for flap elevation. C, Pectoralis flap ready for coverage of the defect. D, Pectoralis myocutaneous flap in place. E, Pectoralis flap for closure of the oral cavity. F, Flap in place. G, Pectoralis myocutaneous flap lining the oral cavity in another patient.

avoid excessive rotation and reduction of the blood supply.

Complications are fortunately relatively infrequent with this flap, and hence it is used frequently in head and neck reconstruction. Full necrosis of the flap is uncommon. Partial necrosis is not uncommon, however, although local wound care is typically sufficient to resolve problems encountered with healing. On occasion, a split-thickness skin graft will need to be used for coverage of a donor site defect. This is preferable to having the chest wound break down later because of a closure that is too tight. The operator must be wary of tension on the donor site closure when a large skin island has been harvested. A skin graft whose appearance bothers the patient can probably be removed later with the technique of serial excision.

Using at least two suction drains helps avoid but cannot absolutely prevent a postoperative hematoma. Particularly if the patient's blood pressure is elevated or if an episode of excessive coughing occurs, a sudden bulge in the donor area may herald a subcutaneous hematoma. Of course, careful hemostasis must be obtained as the flap is harvested to help avoid this complication.

When advanced, the flap can be wrapped around bone or reconstruction plates (or both). A cutaneous paddle can be intraoral, extraoral, or both if a bridge of skin between the paddles is de-epithelialized and buried. The surgeon soon learns that myocutaneous flaps to the head and neck must be suspended adequately to obtain the best results. External cutaneous paddles in particular will invariably settle and appear to hang with time, and patients should be advised of this possibility. Later corrective surgery is frequently possible to achieve a significant measure of improvement.

LATISSIMUS DORSI FLAP

The latissimus dorsi flap remains the most generally dependable and versatile flap in the reconstructive surgery armamentarium.⁸⁻¹⁰ It is a broad flat muscle of

considerable length. It originates from an aponeurosis that joins the posterior layer of the thoracolumbar fascia from about the sixth thoracic vertebra to the posterior iliac crest. The muscle inserts into the intertubercular groove of the humerus. Its considerable length allows it to easily reach the head and neck area as a pedicled flap (Fig. 82-2). For this purpose it may be tunneled subcutaneously over the pectoralis major, under the pectoralis major insertion fibers and over the lateral aspect of the clavicle, or under the clavicle itself. In the head and neck area the latissimus dorsi flap may be used for surface reconstruction, and it may also be advanced into the oral cavity and even used for esophageal reconstructions. If a skin paddle is required, it is best to base it on the middle of the muscle because the most distal portion at the origin is not reliably well perfused.

The muscle is approached with the patient bumped up to expose the back or in a decubitus position. A transverse incision high in the axilla is extended along the posterior axillary fold to expose the lateral border of the muscle. The dissection separates the overlying back skin and subcutaneous tissue from the posterior aspect of the muscle, except where a cutaneous portion may be required. Electrocautery is used to release the muscle from its origin. The anterior dissection should respect the long thoracic artery to the serratus muscle, where it lies just a centimeter or so behind and under the anterior border of the latissimus muscle. The thoracodorsal artery serves the latissimus muscle. The thoracodorsal neurovascular bundle is relatively large and may easily be traced to its origin from the subscapular artery. For transposition to the region of the head and neck, painstaking vascular dissection is required so that the muscle can be mobilized on its vascular leash and advanced to above the ear, the maxilla, or across the base of the neck as needed.

As for reconstructions with the pectoralis major muscle, it is essential that the latissimus be supported with multiple sutures so that it does not descend and thereby dehiscence the wound or create a sagging flap that

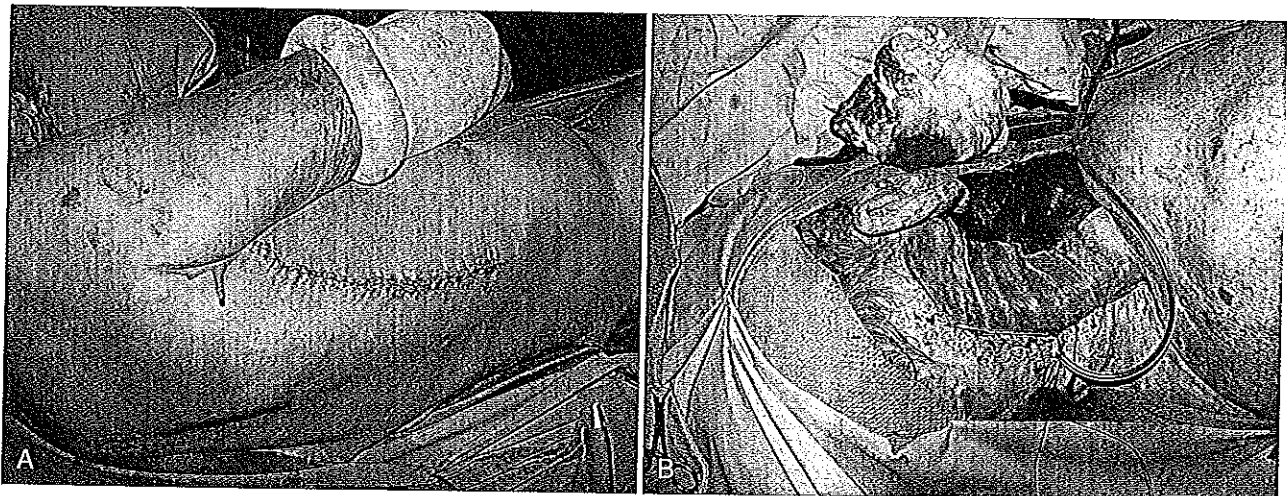


Figure 82-2. Latissimus dorsi flap. A, Latissimus dorsi donor site incision. B, Latissimus flap in place with a skin graft.