

Pectoralis Major Myocutaneous Flap



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KEYWORDS

• Pectoralis major • Myocutaneous • Surgical flaps • Pedicled flaps • Soft tissue reconstruction

KEY POINTS

- The pectoralis major myocutaneous flap is a widely used pedicled flap in oral and maxillofacial reconstruction, both in replacing tissue loss in avulsive trauma-related and ablative tumor-related defects.
- The pectoralis major myocutaneous flap is favored for its ability to graft a large volume of vascularized muscle with minimal risk of necrosis.
- The thoracoacromial artery and its venae comitantes are the major vessels supplying this flap.
- The major complication associated with this pedicled flap is usually the loss of the skin paddle caused by possible shearing of the perforators during surgery.
- Pedicled pectoralis major myocutaneous flaps should continue to be used appropriately in soft tissue reconstruction as a salvage flap after the loss of a free flap or even considered for patients who have severe comorbidities and are not candidates for a free flap.

INTRODUCTION

Despite the advent of vascularized free tissue grafts, the pectoralis major myocutaneous (PMMC) flap remains a widely used pedicled flap for reconstruction of soft tissue defects in the oral and maxillofacial region. PMMC flaps were originally developed in 1947 for the reconstruction of cardiathoracic tissue defects.^{1,2} Ariyan³ reported the first use of the PMMC flaps in head and neck reconstruction in 1979. Before the PMMC flap, surgeons were using deltopectoral flaps and other local flaps near the head and neck, which did not provide a great bulk of muscle or vasculature.⁴ The success of this flap has been recognized, and surgeons began to use the PMMC flap more routinely in head and neck reconstruction. Green and colleagues⁵ later described the use of the PMMC flap for reconstruction of mandible using part of the sternum. Ariyan and Cuono⁶ further utilized a costochondral segment with a PMMC flap

for mandibular segmental reconstructions after ablative defects. The use of double skin paddles for reconstruction of both intraoral and skin defects simultaneously mainly for through and through defects was described thereafter by Ord and Avery.⁷

There has been a gradual shift of the utilization of PMMC pedicled flaps with the current advancements in the successful development of vascularized free flaps. Currently, PMMC flaps are considered a salvage mechanism after failure of a free vascularized flap or used as the reconstructive option for patients who are considered poor candidates for free flaps. In addition, they can be used as chimeric flaps with a free vascularized flap in the reconstruction of gross head and neck defects. This review discusses the PMMC flap for reconstruction of the oral and maxillofacial region, from preoperative considerations and anatomy to surgical technique and possible complications. Advantages and disadvantages for such flaps are also discussed.

The authors have nothing to disclose.

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PREOPERATIVE CONSIDERATIONS

An ideal PMMC flap should include a thorough evaluation of patients and treatment plan, considering aspects that are vital to the success of the flap. These considerations include an ideal treatment sequence, the arc of rotation of the flap, the size of the defect, the color match of the skin donor site to the graft site, and the potential complications of such a procedure.

Treatment Sequence

The source of the original tissue defect should be considered in the sequencing of the PMMC flap. The PMMC is considered a workhouse flap for head and neck reconstruction. Common indications include patients that require salvage head and neck reconstruction after failed microvascular free tissue transfer or in patients that are unwilling or unable because of medical comorbidities to undergo free tissue transfer.

Arc of Rotation of the Flap

The arch of rotation is an important consideration and provides an estimate of the length of the pedicle to be used and also the possible design of the skin paddle. The arc of rotation extends in an oblique fashion from the lateral head of the clavicle to the xiphoid process. The skin paddle, if desired, should be placed in the inferior two-thirds of the incision line to capture the fourth to sixth internal mammary perforators. The arc of rotation can be increased by dissecting off the pectoralis muscle from the humeral head. This humeral head dissection, in turn, increases the effective length of the pedicle. The size of the defect should coincide with the length and width of the skin paddle. The skin color of the chest is not a good match; however, in the realm of salvage surgery or trauma, it is not considered to be much of an issue to patients.

Potential Contraindications

The PMMC flap is the most referenced regional pedicle flap in head and neck reconstructive surgery⁸⁻¹⁰ because of the simple graft technique, reliable vascular supply, adequate arc of rotation, and versatility. With increased utilization of vascularized free flaps, PMMC flaps are used as salvage flaps and, therefore, are opted in a circumstance of limited possibilities. Still, it should be noted that certain patients are contraindicated for such flaps. Morbidly obese patients are contraindicated, as they could have a nonviable skin paddle and too much soft tissue bulk to allow for functional reconstruction.⁹ Other groups of patients

contraindicated for PMMC flaps are those who are congenitally missing the pectoralis muscle, as patients with Poland syndrome. The patients' records should be carefully examined, as patients with previous trauma or surgery to the chest wall could compromise the vasculature to the muscle leading to a poor source of donor tissue. Additionally, patients with vocations requiring full range of motion in their shoulders and arms should be considered with caution, as the PMMC flap harvest could lead to a functional reduction in the movement of the shoulder.

SURGICAL ANATOMY

The pectoralis is a large fan-shaped muscle that covers the anterior chest wall. Its origins are divided into a cephalad (clavicular) portion that attaches to the medial one-third of the clavicle, a central (sternal) portion that arises from the sternum and the first 6 ribs, and a caudal (abdominal) portion that arises from the aponeurosis of the external oblique muscle portion. Each of these divisions has its own vascular and motor supply source. The muscle converges to form a tendon that attaches to the greater tubercle of the humerus and forms the axillary fold.

Laterally, the pectoralis major is closely associated with the medial aspect of the deltoid muscle, forming the deltopectoral groove, which consistently contains the cephalic vein. A layer of deep cervical fascia surrounds the superior surface of the pectoralis major. The inferior surface is separated from the pectoralis minor by the clavipectoral fascia. The clavipectoral fascia extends cephalad to insert into the inferior aspect of the clavicle, splitting just before its insertion to surround the subclavian muscle.

The blood supply to this muscle includes the pectoral branch of the thoracoacromial artery, the lateral thoracic artery, the superior thoracic artery, and the intercostal artery (**Fig. 1**).¹¹ The pectoralis artery supplies the pectoralis major and arises from the thoracoacromial artery, which, in turn, originates from the second portion of the axillary artery. The lateral thoracic artery, although it is not thought to contribute significantly to the blood supply of the muscle, is often sacrificed to improve the arc of rotation of the muscle. Both arteries are accompanied by their respective venae comitantes.

The tendinous insertion of the pectoralis major on the greater tubercle of the humerus is sacrificed completely to improve the arc of rotation and to increase the effective length of the pedicle. The pectoralis major and overlying skin is supplied by the internal mammary perforators, which anastomose with the thoracoacromial artery branches. Thus,

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