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Pectoralis Mycocutaneous Flap in Head and Neck Reconstruction- A Review

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ABSTRACT
The pectoralis myocutaneous flap stands as a highly versatile and frequently utilized surgical technique within the realm of reconstructive procedures, particularly gaining prominence in complex head and neck surgeries. This sophisticated method entails the meticulous harvesting of a composite tissue flap from the chest wall, specifically encompassing a segment of skin, the underlying subcutaneous tissue, and the pectoralis major muscle. Its remarkable utility stems from several inherent advantages, chief among them being its exceptionally robust blood supply, which ensures excellent tissue viability post-transplantation. Furthermore, the flap's inherent malleability allows surgeons to meticulously contour and shape it to precisely address intricate and challenging defects. Such defects commonly arise from extensive tumor excisions, a frequent necessity in oncology, or from severe traumatic injuries that result in significant tissue loss.
A crucial benefit of the pectoralis myocutaneous flap is its anatomical proximity to typical head and neck recipient sites. This close proximity facilitates an efficient and often less complex vascular anastomosis, the surgical connection of blood vessels between the flap and the recipient area. Optimal vascular anastomosis is paramount as it directly promotes robust tissue integration and ultimately contributes to the long-term success of the reconstruction. Despite the demonstrated efficacy of the pectoralis myocutaneous flap across a diverse range of clinical scenarios, it is imperative to emphasize that successful outcomes are heavily contingent upon careful patient selection and a high level of surgical skill. The intricate nature of the procedure demands meticulous planning and execution. Moreover, the field of reconstructive surgery is continuously evolving; ongoing advancements in microsurgical techniques and innovative flap design consistently contribute to the refinement and evolution of this reconstructive approach. These continuous improvements not only enhance its applicability to an even wider spectrum of complex cases but also play a vital role in minimizing donor site morbidity, thereby improving the overall patient experience and outcome.

KEYWORDS: Pectoralis major flap, Head and neck reconstruction, Flap complications, Surgical repair, Pedicled flap.

INTRODUCTION

The oral cavity plays an indispensable role in a person's life, being intricately involved in fundamental functions such as speaking, deglutition (swallowing), breathing, and maintaining an individual's appearance. Unfortunately, the incidence of malignancies within the head and neck region is on the rise, largely attributed to factors like tobacco and alcohol usage. A significant challenge in treating these cancers is that the majority of patients present with an advanced stage of the disease, necessitating extensive surgical resection. Such comprehensive resections inevitably lead to postoperative defects that, while crucial for disease eradication, result in considerable functional and cosmetic issues (1). Following rigorous resection, combined defects in the head and neck region often demand the meticulous restoration of multiple tissue layers, including the intraoral lining, osseous (bone) reconstruction of the mandible or maxilla, and adequate soft tissue/skin covering.

While free flaps are currently considered the "gold standard" for reconstructing these complex post-resection deformities (2), pedicled flaps continue to be widely utilized in cancer treatment facilities globally, encompassing both undeveloped and developed nations (3–5). Among these, Pectoralis Myocutaneous Flaps (PMMFs) are recognized as the most dependable and adaptable form of flap in head and neck reconstruction, often referred to as the "workhorse" of the field. This single-stage reconstruction technique offers numerous advantages to head and neck surgeons, including minimal donor site morbidities, satisfactory cosmetic results, and a well-vascularized tissue bulk that effectively fills maxillofacial post-surgical defects. Furthermore, it crucially provides coverage for the neck's vital structures. With its potent vascularity and a relatively minimal learning curve for surgeons, the PMMF remains a reliable option, especially for centers with limited resources and high patient loads (6).

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The PMMC flap has been classified as type 5 according to Mathes and Nahai's categorization system, characterized by a single major pedicle and accessory segmental vascular pedicles. The pectoralis major flap typically possesses a rich vascular supply, featuring a pedicle situated between distinct tissue planes and numerous skin perforators. Research indicates that PMMF complications can range from 17% to 63% (7–9). Although some authors contend that free flaps are less prone to difficulties than PMMFs, complete flap necrosis remains an uncommon consequence when utilizing PMMFs, even with novice surgeons (10). Most PMMF-related problems, such as modest skin flap necrosis, can be effectively managed conservatively and typically resolve successfully. Therefore, in institutions where PMMFs are frequently employed, it is crucial to diligently study their effectiveness and potential consequences (11).

Embryology
Skeletal muscles originate from the mesoderm, one of the three primary germ layers. Between the fourth and eighth weeks of embryonic development, the paraxial mesoderm organizes itself alongside the neural tube into distinct blocks of tissue known as somites. These somites are composed of two primary cell subpopulations: the dorsolateral dermomyotome and the ventromedial sclerotome. The dermomyotome subsequently differentiates to produce the skeletal muscle, while the sclerotome, at this developmental stage, forms the axial skeleton. Specifically, the hypomere cells of the dermatomyotome are responsible for generating the embryo's anterior muscles (12). Congenital pectoral muscle defects are notably associated with Poland syndrome (13). This condition is distinctly characterized by the unilateral absence or underdevelopment of the pectoralis major muscle, which is frequently linked to ipsilateral symbrachydactyly (webbed or short fingers) and other chest wall abnormalities (13).

Blood Supply and Lymphatics
The principal arterial supply for the pectoralis major muscle is provided by the pectoralis artery, which originates as the second branch of the axillary artery, specifically from the thoracic trunk. Venous drainage from the pectoralis major muscle is primarily facilitated by the pectoral vein, which ultimately drains into the subclavian vein (14,15).

Clinical Relevance
Pectoralis injury is a relatively uncommon occurrence; a 2012 meta-analysis documented only 365 reported instances in the literature (16). Tendon tears of the pectoralis major occur almost exclusively in males typically between 20 and 40 years of age. Approximately half of these injuries are sustained during weight-bearing activities, most notably the bench press, particularly when the arm under load is in an extended and externally rotated position (15). A clinical examination of a pectoralis major rupture will typically reveal localized edema, hemorrhage, medialization of the muscle bed, and tenderness along the humeral insertion and in the axilla. It is important to note that these symptoms are not specific to pectoralis injuries and may manifest suddenly or develop gradually over several weeks. The investigation of a suspected pectoral injury primarily focuses on obtaining a thorough clinical history, performing a physical examination, and utilizing radiography. A chest x-ray can effectively rule out any underlying bone damage. Avulsion, where the tendon tears away from the bone, is a less common presentation, occurring in only 2% to 5% of patients.

In 1980, Tietjen established a comprehensive categorization system for pectoralis major injuries, ranging from Grade I to Grade III (17). Grade I injuries are classified as a sprain or contusion. Grade II injuries involve an incomplete tear of the muscle. Grade III injuries signify a complete tear, which can be further subcategorized based on the tear's location: (a) sternoclavicular origin, (b) muscular belly, (c) muscle-tendinous junction, and (d) insertion.

The majority of these tears are managed conservatively, involving a regimen of analgesics, ice application, and sling immobilization in an adducted and internally rotated posture. Patients typically show progressive improvement in mobility between two and six weeks. Light resistance exercises can then be gradually introduced between six and eight weeks, with a complete return to resistance activities generally conceivable after three to five months (15). However, in instances of complete tears or in younger, athletic individuals, surgical repair is the recommended course of action and should ideally be performed within six weeks of the injury [1].

Surgical Implications
The pectoralis major muscle has been extensively utilized in flap repairs during neck surgeries due to its substantial size, favorable anatomical position, and robust blood supply. Its rich vascularization, primarily via the thoracoacromial artery, significantly reduces the risk of necrosis during flap advancement (18,19). While the use of pectoralis major myocutaneous flaps (PMMC) is seeing a decline with the increasing prevalence of vascularized free flaps, it remains a viable and reliable alternative for soft tissue repair in the neck and face following trauma or tumor surgery. PMMC flaps can effectively seal a wide range of head and neck defects and are crucial for covering exposed vital vasculature in areas like the oropharynx, pharynx, and skull base. Furthermore, the flap can contribute essential bulk to severe neck dissections, aiding in contour restoration.

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DISCUSSION

Despite the widespread adoption of free flaps over the past decade (20,21), the role of PMMC flap repair remains undeniably significant, unlike Ariyan's earlier descriptions (22). This enduring relevance is largely attributed to the simplicity of harvesting the flap and the abundant supply of both skin and soft tissue it provides for the repair of substantial defects in the oral cavity (23,24). Moreover, due to its close proximity to the primary tumor site and its well-defined vascular pedicle, the PMMC flap serves as a classic pedicled flap for head and neck cancers. Its inherent bulkiness can be particularly advantageous in advanced oral malignancies where greater tissue transfer is necessary to reconstruct the lesion. As demonstrated in current work, the PMMC flap has been successfully employed to repair mandibular defects in advanced oral cavity malignancies. In cases involving cortical bone, patients often undergo segmental/hemimandibulectomy, with the PMMC flap playing a crucial role in achieving satisfactory functional and aesthetic outcomes. Although osseocutaneous free flaps are generally considered a superior alternative for reconstructing mandibular abnormalities, their utility is often limited in older patients with significant comorbidities, who may have lower graft uptake rates (25).

While free flaps offer distinct advantages over pedicled flaps, including superior aesthetic outcomes, reduced bulk, and improved rehabilitation, a study by Anehosur et al. found that the PMMC flap can also serve as a salvage technique following free flap failure. In their research, 11 patients (7.33%) underwent salvage treatment due to free flap failure. PMMC flaps prove highly effective in situations where vascularized free flaps are not feasible, such as in individuals with aberrant vasculature, those at extreme ages, or patients with multiple medical co-morbidities (1). Schneider et al. (26) reported that PMMC flaps were utilized as a salvage technique in 38% of their case series, while Saito et al. (27) observed that 75% of PMMC flaps were exclusively used for salvage purposes.

Sharma et al. (28) reported a 63% complication rate with PMMC flaps, including dehiscence (27%), infection (23%), and partial flap necrosis (3%). In 1982, Baek et al. (29) documented a 1.5% incidence of complete flap necrosis. To ensure effective repair, meticulous handling of the pedicle, the use of vasodilators, minimizing kinking of the vascular pedicle, and thorough preoperative planning are crucial. El-Marakby (30) attributed the high rate of dehiscence and orocutaneous fistulas in their case collection to abnormalities in the oral cavity and pharyngeal-oesophageal junction. The MacFee incision in Schobinger's trifurcation region can create a weak zone for the implantation of a large PMMC flap. To prevent wound dehiscence, it is essential to avoid over-closing the wound, which can restrict blood flow. Regular dressing of sutured margins after surgery is vital for preventing and treating wound dehiscence in the neck area. Costal osteomyelitis is a rare but documented complication associated with PMMC flaps. The study by Anehosur et al. reported no serious donor site complications, apart from five minor dehiscence cases that were managed conservatively without further surgical intervention. PMMC flaps are capable of repairing through-and-through defects without the complexity often associated with free flaps (1). A bilobed flap, which divides the skin into two pieces for extraoral and intraoral lining, has been noted in the literature to potentially cause unattractive results in women due to distortion and asymmetry after reconstruction. However, in the authors' study, all patients, both male and female, were extensively counseled on the paramount importance of aggressive disease treatment and disease-free survival, leading to no complaints regarding the postoperative scar over the chest.

Ultimately, PMMC flaps are highly versatile and possess an excellent blood supply, offering numerous benefits. They can effectively close large skin defects at the donor site alongside the primary reconstruction. The pectoralis major myocutaneous flap, renowned for its versatility, local availability, ease of harvesting, superior blood supply, reliable pedicle, extensive reach to all corners of the oral cavity, and low morbidity, continues to be a highly reliable option for reconstructing defects within the oral cavity.

CONCLUSION

Tietjen's 1980 classification system for pectoralis major injuries, ranging from Grade I (sprain/contusion) to Grade III (complete tear with specific anatomical subcategories), guides their management. While most tears are treated conservatively with rest, immobilization, and gradual rehabilitation, surgical repair is recommended for complete tears, especially in young and athletic individuals, ideally within six weeks of the injury. The pectoralis major muscle's substantial size, strategic position, and rich blood supply, notably from the thoracoacromial artery, make it an invaluable resource for flap repairs in neck surgeries, despite the growing prevalence of vascularized free flaps. The PMMC flap remains a viable and crucial option for soft tissue repair in the neck and face following trauma or tumor surgery, capable of sealing defects, covering exposed vasculature, and adding necessary bulk. Its continued relevance stems from its ease of harvesting, abundant tissue availability, proximity to the tumor site, and its utility as a salvage technique when free flaps fail. While complications can occur, careful surgical technique and adherence to post-operative instructions are key to ensuring successful outcomes. The PMMC flap, with its versatility and reliable characteristics, continues to be a dependable choice for reconstructing oral cavity defects..

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REFERENCES

1. Anehosur V, Dikhit PS, Nagraj N, Jayade B, Kumar N. PMMC Flap Revisited and its Clinical Outcome in 150 Patients. J Maxillofac Oral Surg. 2020 Mar;19(1):26–31.
2. Pinto FR, Malena CR, Vanni CMRS, Capelli F de A, Matos LL de, Kanda JL. Pectoralis major myocutaneous flaps for head and neck reconstruction: factors influencing occurrences of complications and the final outcome. Sao Paulo Med J. 2010 Dec;128(6):336–41.
3. Vartanian JG, Carvalho AL, Carvalho SMT, Mizobe L, Magrin J, Kowalski LP. Pectoralis major and other myofascial/myocutaneous flaps in head and neck cancer reconstruction: experience with 437 cases at a single institution. Head Neck. 2004 Dec;26(12):1018–23.
4. Andrews BT, McCulloch TM, Funk GF, Graham SM, Hoffman HT. Deltopectoral flap revisited in the microvascular era: a single-institution 10-year experience. Ann Otol Rhinol Laryngol. 2006 Jan;115(1):35–40.
5. Uğurlu K, Ozçelik D, Hüthüt I, Yildiz K, Kilinç L, Baş L. Extended vertical trapezius myocutaneous flap in head and neck reconstruction as a salvage procedure. Plast Reconstr Surg. 2004 Aug;114(2):339–50.
6. Tripathi M, Parshad S, Karwasra RK, Singh V. Pectoralis major myocutaneous flap in head and neck reconstruction: An experience in 100 consecutive cases. Natl J Maxillofac Surg. 2015 Jan-Jun;6(1):37–41.
7. Milenović A, Virag M, Uglesić V, Aljinović-Ratković N. The pectoralis major flap in head and neck reconstruction: first 500 patients. J Craniomaxillofac Surg. 2006 Sep;34(6):340–3.
8. Liu R, Gullane P, Brown D, Irish J. Pectoralis major myocutaneous pedicled flap in head and neck reconstruction: retrospective review of indications and results in 244 consecutive cases at the Toronto General Hospital. J Otolaryngol. 2001 Feb;30(1):34–40.
9. Wadwongtham W, Isipradit P, Supanakorn S. The pectoralis major myocutaneous flap: applications and complications in head and neck reconstruction. J Med Assoc Thai. 2004 Sep;87 Suppl 2:S95–9.
10. Nagral S, Sankhe M, Patel CV. Experience with the pectoralis major myocutaneous flap for head and neck reconstruction in a general surgical unit. J Postgrad Med. 1992 Jul-Sep;38(3):119–23.
11. Castelli ML, Pecorari G, Succo G, Bena A, Andreis M, Sartoris A. Pectoralis major myocutaneous flap: analysis of complications in difficult patients. Eur Arch Otorhinolaryngol. 2001 Dec;258(10):542–5.
12. Solari F, Burns B. Anatomy, Thorax, Pectoralis Major Major. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2023.
13. Yiyit N, Işıtmangil T, Öksüz S. Clinical analysis of 113 patients with Poland syndrome. Ann Thorac Surg. 2015 Mar;99(3):999–1004.
14. Sanchez ER, Sanchez R, Moliver C. Anatomic relationship of the pectoralis major and minor muscles: a cadaveric study. Aesthet Surg J. 2014 Feb;34(2):258–63.
15. Haley CA, Zacchilli MA. Pectoralis major injuries: evaluation and treatment. Clin Sports Med. 2014 Oct;33(4):739–56.
16. ElMaraghy AW, Devereaux MW. A systematic review and comprehensive classification of pectoralis major tears. J Shoulder Elbow Surg. 2012 Mar;21(3):412–22.
17. Tietjen R. Closed injuries of the pectoralis major muscle. J Trauma. 1980 Mar;20(3):262–4.
18. Patel K, Lyu DJH, Kademani D. Pectoralis major myocutaneous flap. Oral Maxillofac Surg Clin North Am. 2014 Aug;26(3):421–6.
19. Bussu F, Gallus R, Navach V, Bruschini R, Tagliabue M, Almadori G, et al. Contemporary role of pectoralis major regional flaps in head and neck surgery. Acta Otorhinolaryngol Ital. 2014 Oct;34(5):327–41.
20. Pompei S, Caravelli G, Vigili MG, Ducci M, Marzetti F. Free radial forearm flap and myocutaneous flaps in oncological reconstructive surgery of the oral cavity, Comparison of functional results. Minerva Chir. 1998 Mar;53(3):183–92.
21. Chu PY, Chang SY. Reconstruction of circumferential pharyngoesophageal defects with laryngotracheal flap and pectoralis major myocutaneous flap. Head Neck. 2002 Oct;24(10):933–9.
22. Ariyan S. The pectoralis major myocutaneous flap. A versatile flap for reconstruction in the head and neck. Plast Reconstr Surg. 1979 Jan;63(1):73–81.
23. Colman MF, Zemplenyi J. Design of incisions for pectoralis myocutaneous flaps in women. Laryngoscope. 1986 Jun;96(6):695–6.
24. Ord RA, Avery BS. Side-by-side double paddle pectoralis major flap for cheek defects. Br J Oral Maxillofac Surg. 1989 Jun;27(3):177–85.
25. Pradhan P, Samal S, Preetam C, Samal DK, Parida PK. Pectoralis Major Myocutaneous Flap Reconstruction for the Mandibular Defects in Advanced Oral Cavity Malignancies: A Retrospective Study of 30 Cases. Indian J Otolaryngol Head Neck Surg. 2018 Sep;70(3):415–20.
26. Schneider DS, Wu V, Wax MK. Indications for pedicled pectoralis major flap in a free tissue transfer practice. Head Neck. 2012 Aug;34(8):1106–10.
27. Saito A, Minakawa H, Saito N, Nagahashi T. Indications and outcomes for pedicled pectoralis major myocutaneous flaps at a primary microvascular head and neck reconstructive center. Mod Plast Surg. 2012;02(04):103–7.

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28. Sharma S, Murty PS, Hazarika P, Nayak DR, Sharma S. The indications and complications of pectoralis major myocutaneous flap reconstruction in head and neck surgery-our experience. Indian J Otolaryngol Head Neck Surg. 1998 Oct;50(4):362–7.
29. Baek SM, Lawson W, Biller HF. An analysis of 133 pectoralis major myocutaneous flaps. Plast Reconstr Surg. 1982 Mar;69(3):460–9.
30. El-Marakby HH. The reliability of pectoralis major myocutaneous flap in head and neck reconstruction. J Egypt Natl Canc Inst. 2006 Mar;18(1):41–50.