The Pectoralis Major Myocutaneous Flap: Applications and Complications in Head and Neck Reconstruction

Winai Wadwongtham MD, MSc*,
Permsarp Isipradit MD*, Siripornchai Supanakorn MD*

** Department of Otolaryngology, Faculty of Medicine, Chulalongkorn University*

Ninety-six pectoralis major myocutaneous flaps were used in the head and neck reconstruction of 93 patients who underwent extirpation of cancer. The utilization of the pectoralis major myocutaneous flap included 50 tongue replacements, 19 hypopharynx and pharyngoesophageal closure, 11 oral mucosal closure and external skin replacement, 7 soft tissue coverage of the reconstruction plate, 3 soft tissue protection of the great vessels at the neck and 6 correction of the wound breakdown from failure of the other flap reconstruction. The major complication, which included total flap loss, partial skin paddle loss, orocutaneous fistula, dehiscence and plate exposure, was 17.7%. The overall complication rate was 54.2% and most of them were healed by conservative management. The pectoralis major myocutaneous flap is feasible and reliable for immediate reconstruction of various defects in the head and neck area. The pectoralis major myocutaneous flap should be the suitable flap for the advanced-staged cancer patient with a limited life expectancy.

Keywords : *Pectoralis major myocutaneous flap, Head and neck reconstruction,*

J Med Assoc Thai 2004; 87 (Suppl 2): S95-9
e-Journal: *http://www.medassocthai.org/journal*

The pectoralis major myocutaneous flap introduced by Ariyan [1] has always been a mainstay of the reconstruction of defects in the oral cavity and oropharyngeal area. Its abundant soft tissue, reliable vascular supply by thoracoacromial artery, feasibility and proximity to the head and neck facilitate the immediate one-staged reconstruction after extirpation of cancer. Previous reports of the complication rate vary from very low to a much higher incidence of problems which cause some effect of selection of the flap for reconstruction between the pectoralis major myocutaneous flap and the free-tissue transfer.

The authors reviewed a series of pectoralis major myocutaneous flaps in our institute within the past ten years to determine the current incidence of complication as well as to indicate in which conditions this flap should have been used.

Patients and Method

Ninety-three head and neck cancer patients, 67 men and 26 women, who underwent reconstruction using a pectoralis major myocutaneous flap following oncologic resection at the Department of Otolaryngology, King Chulalongkorn Memorial Hospital between January 1994 and December 2003 were recruited in this retrospective study. The patients ranged in age from 29 to 84 years old with a mean age of 57.3 years. There were 66 untreated malignant neoplasms and 27 recurrent cancers or salvage surgery after the failure of irradiation therapy. The oral cavity and the oropharynx were the most commonly reconstructed sites and the advanced-stage of squamous cell carcinoma were the most histologic findings (90 squamous cell carcinomas, 2 malignant mixed tumors, 1 rhabdomyosarcoma). The tumor sites and staging are shown in Table 1.

The side of the harvested flap was usually the same side the defect. The size of the skin paddle of the pectoralis major myocutaneous flap was measured

Table 1. Primary site of tumors (N=93)

Tumor site	Stage 1	Stage 2	Stage 3	Stage 4	Total
Tongue		8	2	24	34
Retromolar trigone		1	2	6	9
Floor of mouth		2	2	6	10
Alveolar process		1		10	11
Buccal mucosa		3		6	9
Larynx			3	4	7
Pyriform sinus			1	9	10
Post cricoid				1	1
Parotid				2	2
Total		15	10	68	93

Correspondence to : Wadwongtham W. Department of Otolaryngology, Faculty of Medicine, Chulalongkorn University, Bangkok 10330, Thailand.

after removing the tumor and checking the margin for free of carcinoma tissues with the frozen section. The incision of the pectoralis major myocutaneous flap was below the limb of a deltopectoral flap for preserving the deltopectoral flap if it was needed afterward. In a female patient, the incision coursed lateral and inferior to the breast (inframammary) to minimize cosmetic deformity. Exposure of pectoralis major myocutaneous flap proceeded in a lateral to medial direction so that the entire muscle flap could be harvested to ensure it would reach the defect and the muscle portion of the pedicle would be used to protect the great vessels at the neck area after neck dissection. The arc of rotation of the pectoralis major myocutaneous flap was passed over the clavicle through a subcutaneous tunnel into the neck. Reconstruction of the oral cavity and oropharyngeal defect was accomplished by suture of the pectoralis major myocutaneous flap with the mucosa. The pectoralis major myocutaneous flap was suspended with permanent sutures to the soft tissue near the site of repair in all cases, so that the weight of the flap did not produce significant tension on the suture line. The defected skin at the donor site was undermined and primary closure was performed. When the large skin paddle of the pectoralis major myocutaneous flap was required, the split thickness skin graft was used to cover the donor site.

Utilization of the pectoralis major myocutaneous flap in this series was:

1. For total tongue or partial tongue replacement [2] (Fig. 1),

2. For closure of hypopharyngeal defect after total laryngopharyngectomy[3] (Fig. 2),

3. For soft tissue coverage of the parotid area and buccal mocosa,

4. For vascularized soft tissue coverage of the reconstruction plate after segmental mandibulectomy [4,5] (Fig. 3),

Table 2. Utilization of pectoralis major myocutaneous flap (N = 96)

Utilization	Number
1. Total tongue (26 cases) or partial tongue replacement (24 cases); [including reconstruction plate]	50 [16]
2. Oral mucosa closure or external skin replacement [including reconstruction plate]	19 [5]
3. Pharyngeal or pharyngoesophageal closure	11
4. Soft tissue coverage of the reconstruction plate	7
5. Protection of the great vessels	3
6. Correction other flap failure	6

5. For vascularized soft tissue coverage of the great vessels after neck dissection and prevention of potential wound breakdown from other treatment failure [6].

Ninety-six pectoralis major myocutaneous flaps were used (50 right sides, 40 left sides and 3 bila-

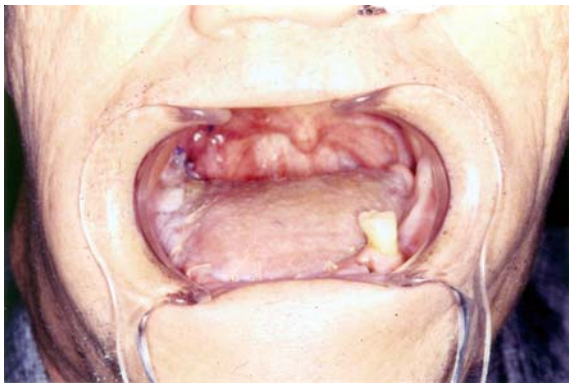

Fig. 1 Total tongue replacement with the pectoralis major myocutaneous flap

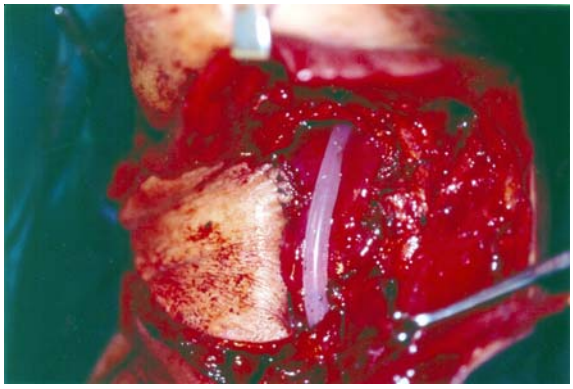

Fig. 2 Pharyngoesophageal reconstruction with patch-on pectoralis major myocutaneous flap

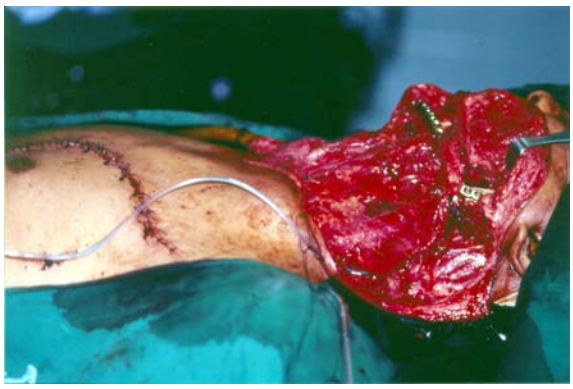

Fig. 3 The pectoralis major myocutaneous flap as the soft tissue coverage of the reconstruction plate

teral sides). Three cases of bilateral flaps were harvested, two were used for secondary stage correction of other flap failure and one was used for great vessel protection.

In most of the cases, radical neck dissection was necessary due to lymphnode metastasis. The modified radical neck dissection, preserving the internal jugular vein and the accessory nerve, was required in the case of no lymphnode metastasis to reduce the vascular tension of the flap at the neck area. Sixty-four cases of the pectoralis major myocutaneous flap were radiated postoperatively. The patient received standard external beam radiation to the flap and surrounding tissue.

The mean follow-up period after tumor ablation and the pectoralis major myocutaneous flap reconstruction was 17 months (ranged from 4 months to 72 months) Patients were evaluated for complications with emphasis on those specifically related to the pectoralis major myocutaneous flap reconstruction. The flap-related complications were characterized as major if the revision of surgery was necessary and minor if conservative wound care alone was required.

Results

There was one complete flap loss in a patient whose the pectoralis major myocutaneous flap was used for reconstruction of the anterior tongue. The cause of this flap loss was due to the occlusion of a thoracoacromial artery. The opposite pectoralis major myocutaneous flap was used to replace the necrotic one. However, it was finally improved. Two patients with base of the tongue and the hypopharyngeal reconstruction had partial necrosis of skin paddle. Temporalis flap and a secondary opposite pectoralis major myocutaneous flap were used to correct the necrotic flaps afterward, respectively.

Eleven orocutaneous fistulas occurred in 6 patients of glossectomy, 3 patients of laryngopharyngectomy and 2 patients of buccal mucosa excision. Four cases of these fistulas were developed from tumor recurrence. Just only seven orocutaneous fistulas were related to the pectoralis major myocutaneous flap reconstruction and there were four cases who needed surgical intervention with local muscle and skin flap.

Two patients who used the pectoralis major myocutaneous flap for total tongue replacement after extirpation of carcinoma at the base of the tongue had dehiscence at the lateral oropharyngeal wall and these dehiscences might be due to the bulkiness and the weight of the flap. The dehiscence needed resuture and suspension with permanent suture. There were four cases of bulkiness of the pectoralis major myocutaneous flap at the oropharynx, which caused poor deglutition initially and required long term nasogastric tube feeding. But there was improvement of the deglutition without any surgical treatment afterward.

There were four cases of saliva pooling after reconstruction of the tongue and hypopharyngeal area due to the swelling and the bulkiness of the pectoralis myocutaneous flap. All of them needed long term nasogastric tube feeding. However, the nasogastric tube could be removed later when the swelling of the flap had subsided. One esophageal stricture from pharyngoesophageal reconstruction was developed. The stricture was not so severe and the patient could tolerate it. In the present series, hair growth was not found at the skin paddle of the flap in the oral cavity.

In case of the mandibular involvement of oral cavity carcinoma, the reconstruction plate with the pectoralis major myocutaneous flap was used after segmental mandibulectomy. The pectoralis major myocutaneous flap was not only used for soft tissue and mucosa replacement but also used the muscle portion of the flap for supporting the reconstruction plate. There were 28 cases of reconstruction plate with the pectoralis major myocutaneous flap. Twenty-six cases were reconstructed after lateral segmental mandibulecotomy and two cases were reconstructed after anterior segmental mandibulectomy. Eight patients had some area of plate exposure. Five of them were healed with local advancement flap and the reconstruction plate had to be removed in one case. The other two cases had recurrence of cancer.

Table 3. Flap-related complications (N=96)

Complications	Overall	Major
Recipient area		
- Total flap loss	1	1
- Partial flap necrosis (skin paddle)	2	2
- Orocutaneous fistula	7	4
- Plate exposure	8	6
- Dehiscence	2	2
- Bulkiness in the oropharynx	4	
- Saliva pooling	4	
- Esophageal stricture	1	
Donor site		
- Wound infection	3	
- Granulation tissue	2	2
Pedicle area		
- Bulkiness of the pedicle	12	
- Tethering of the pedicle	6	
Total	52	17

At the donor site, there were nine patients who needed a large skin paddle to reconstruct the defects after tumor ablation so the split thickness skin grafts were required to cover the donor site defects. Two cases developed granulation tissue which needed additional skin grafts and three of them had minor wound infection at the suture line.

The entire muscle portion of the pectoralis major myocutaneous flap was used to cover and protect the great vessels after the neck dissection. This caused twelve cases of bulging and swelling of their pedicles. There were six cases of tethering of the pedicle due to muscle contracture that caused limitation of neck movement. Both bulkiness and tethering of the pedicle part made poor esthetic appearance. However, the patients accepted these consequences. Even using the pectoralis major myocutaneous flap to protect the great vessels, there were two cases of carotid blowout. These patients had prior irradiation treatment so the carotid blowout could not be counted as a flap-related complication.

The overall flap-related complication in the present series was 54.2% (52/96 flaps). The major complication which needed surgical intervention was 17.7% (17/96 flaps). Two-year survival rate after the pectoralis major myocutaneous flap reconstruction was 43%.

Discussion

The pectoralis major myocutaneous flap is a reliable regional soft tissue for reconstruction of mucosa and soft tissue defect following oncologic resection. The previous reports of clinical application are mainly soft tissue replacement such as, the tongue replacement [2], the hypopharyngeal and esophageal reconstruction [3], the buccal mucosal lining, skin coverage of the cheek, the carotid artery coverage and neck resurfacing [6], and the coverage of a mandibular reconstruction plate in addition to soft tissue replacement [4,5]. The other application is using the sternum or the fifth rib with the pectoralis major muscle as a vascularized osteomyocutaneous flap to reconstruct the mandibular defect after mandibulectomy. However, this mandibular reconstruction gives unsatisfactory results [7]. The major problem is the resorption of the bone. Considering the poor results of the pectoralis osteomyocutaneous flap, the free vascularized bone transfer is preferred for a large mandibular defect or an anterior mandibular defect in our institute.

In the present series, the major complications that required surgical intervention included one total flap loss, two partial skin paddle losses, four orocutaneous fistulas, two dehiscences, six plate exposures and two granulation tissues at the donor sites. The rate of major complication was 17.7% (17/96 flaps) and the overall rate of complication was 54.2% (52/96 flaps). This flap-related complication rate is comparable to the previous reports. Flap-related complications have been reported to occur generally in 35% to 63%[8-11]. Additional surgical procedures are required in 26-36%. Patients with advanced-staged carcinoma are frequently malnourished and generally not ideal surgical conditions. The defects are frequently large and expose to saliva and bacterial contamination so these unfavorable factors usually cause a high rate of complications. The major complications like a flap loss and an orocutaneous fistula are developed from the severe stretching of the flap, the tension at suture line due to gravity, and the bulkiness of the flap. These could be found in the oral cavity and oropharyngeal reconstruction. To prevent these kinds of complications, the length of the flap has to be suitably measured and some more tissue added for contraction of the muscle. The muscle portion of the pectoralis major myocutaneous flap should be suspended to the nearby thick fascia or bone.

The saliva pooling and aspiration, which are related to the bulkiness of the flap in the oropharynx and hypopharynx, will be improved when the swelling of the flap has subsided. To reduce the bulkiness in the fat patients, only a pectoralis myofascial flap without the skin and subcutaneous tissue can be used. The nearby mucosa in the oral cavity will grow to cover it finally without any problem [12,13].

Even though the bulkiness of the pectoralis major myocutaneous causes many problems, for total tongue replacement and reconstruction of the base of the tongue, the bulkiness of the pectoralis major myocutaneous flap is useful and necessary for the improvement of deglutition.

The bulkiness of the flap at the neck was due to harvesting the entire muscle portion of the flap to cover and protect the carotid artery. However, there were two cases of carotid blowout in patients with prior irradiation treatment. The other drawback of using the entire muscle to cover the neck is that it could obscure the recurrence of tumor and lymphnode metastasis [14,15]. There were two cases of carcinoma recurrence at the neck area. Most recurrent cancers occur at the primary site. To avoid using the entire muscle portion in a muscular patient whose thick muscle pedicle can cause poor cosmetic appearance, some surgeons favor the modified pectoralis major myocutaneous flap [16]. However, the authers prefer an entire muscle pedicle in

cases where radical neck dissection had to be performed.

The unwanted development of complications such as wound dehiscence, flap-edge necrosis and fistula formation are not specific occurrence when using the pectoralis major myocutaneous flap. They could happen in other modalities of reconstruction like revascularized free-tissue transfer [17]. Even though the complication rate is higher in the group of pectoralis major myocutaneous flap reconstruction, most complications are minor and require only conservative management to correct them. Compared to the revascularized free-tissue reconstruction, which needs microsurgical expertise and microsurgical equipments, the pectoralis major myocutaneous flap should be the suitable flap for reconstruction in head and neck cancer patients with limited life expectancy.

References

1. Ariyan S. The pectoralis major myocutaneous flap: a versatile flap for reconstruction in the head and neck. Plast Reconstr Surg 1979;63:73-81.
2. Abemayor E, Blackwell KE. Reconstruction of soft tissue defects in the oral cavity and oropharynx. Arch Ototolaryngol Head Neck Surg 2000;126:909-12.
3. Lam KH, Ho CM, Lau WF, Wei Wl, Wong J. Immediate reconstruction of pharyngoesophageal defects. Arch Otolaryngol Head Neck Surg 1989;115:608-12.
4. Shockley WW, Weissler MC, Pillsbury HC. Immediate mandibular replacement using reconstruction plates. Arch Otolaryngol Head Neck Surg 1991;117:745-9.
5. Kiyokawa L, Tai Y, Inoue Y, Yangaga H. Reliable minimally invassive oromandibular reconstruction using metal plate rolled with pectoralis major myocutaneous flap: clinical applications in head and neck reconstruction; Am J Otolaryngol 1998;19:96-101.
6. Price JC, Davis RK, Koltrai PJ. The pectoralis myocutaneous flap for salvage of necrotic wounds. Laryngoscope 1985;95:146-50.
7. Ord RA. The pectoralis major myocutaneous flap in oral and maxillofacial reconstruction: a retrospective analysis of 50 cases. J Oral Maxillofac Surg 1996;54: 1292-5.
8. Kroll SS, Goepfert H, Jones M, Guillamondegui O, Schusterman M. Analysis of complications in 168 pectoralis major myocutaneus flaps used for head and neck reconstruction. Ann Plast Surg 1990;25:93-7.
9. Ijsselstein CB, Hovius SE. Ten Have BL, Wijthoff SJ. Sonneveld GJ, Meeuwis CA. Is the pectoralis myocutaneous flap in intraoral and oropharyngeal reconstruction outdated? Am J Surg 1996;172:259-62.
10. Shah JP. Haribhakti, Loree TR, Sutaria P. Complications of the pectoralis major myocutaneous flap in head and neck reconstruction. Am J Surg 1990;160:352-5.
11. Liu R, Gulane P, Brown D, Irish J. Pectoralis major myocutaneous pedicle flap in head and neck reconstruction; retrospective review of indication and results in 244 consecutive cases at the Toronto General Hospital. J Otolaryngol 2001;30:34-40.
12. Righi PD, Weisberger EC, Slakes SR, Wilson JL, Kesler KA, Yaw PB. The pectoralis major myofascial flap: clinical applications in head and neck reconstruction. Am J Otolaryngol 1998;19:96-101.
13. Shindo ML, Costantino PD, Friedman CD, Pelzer HJ, Sisson GA, Bressler FJ. The pectoralis major myofascial flap for intraoral and pharyngeal reconstruction. Arch Otolaryngol Head Neck Surg 1992;118:707-11.
14. Schuller DE. Limitations of the pectoralis major myocutaneous flap in head and neck cancer reconstruction. Arch Otolaryngol Head Neck Surg 1980; 106:709-14.
15. Ossoff RH, Wurster CF, Berktold RE, Krespi YP, Sisson GA. Complications after pectoralis major myocutaneous flap reconstruction of head and neck defects. Arch Otolaryngol Head Neck Surg 1983;109:812-4.
16. Kasler M, Banhidy FG, Trizna Z. Experience with the modified pectoralis major myocutaneous flap. Arch Otolaryngol Head Neck Surg 1992;118:931-2.
17. Chepeha DB, Annich G, Pynnonen MA, Beck J, Wolf GT, Teknos TN. Pectoralis major myocutaneous flap vs revascularized free tissue transfer. Arch Otolaryngol Head Neck Surg 2004;130:181-6.

เพ็คเตอราลลิส เมเจอร์ไมโอคิวเทอเนียส แฟลป: การใช้ประโยชน์และผลแทรกซ้อนในการซ่อมแซมบริเวณศีรษะและลำคอ

วินัย แวดวงธรรม, เพิ่มทรัพย์ อิสีประดิฐ, ศิริพรชัย ศุภนคร

ผู้ป่วยมะเร็งบริเวณศีรษะและลำคอ จำนวน 93 คน ได้รับการซ่อมแซมพยาธิสภาพภายหลังจากการผ่าตัดเอามะเร็งออกด้วยเพ็คเตอราลลิส เมเจอร์ ไมโอคิวเทอเนียส แฟลป จำนวน 96 แฟลป ซึ่งแฟลปดังกล่าวได้นำไปใช้ทดแทนลิ้นจำนวน 50 ราย ซ่อมเนื้อเยื่อบริเวณคอหอยและหลอดอาหาร จำนวน 19 ราย ซ่อมแซมผิวหนังและเยื่อบุภายในช่องปาก จำนวน 11 ราย ใช้ปกคลุมเหล็กดามกระดูกขากรรไกร จำนวน 7 ราย ใช้ปกคลุมเส้นเลือดใหญ่บริเวณลำคอ จำนวน 3 ราย และใช้แก้ไขแผล แยกจากการรักษาด้วยวิธีการอื่น จำนวน 6 ราย

ภาวะแทรกซ้อนสำคัญที่จำเป็นต้องแก้ไขด้วยการผ่าตัดมี 17.7% จากภาวะแทรกซ้อนทั้งหมด 54.2% เพ็คเตอราลลิส เมเจอร์ไมโอคิวเทอเนียส แฟลป นับเป็นแฟลปที่มีประโยชน์ในการนำไปใช้ซ่อมแซมเนื้อเยื่อภายหลังการผ่าตัดเอามะเร็ง บริเวณศีรษะและลำคอออก