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**THE PECTORALIS MAJOR FLAP IN HEAD AND NECK  
RECONSTRUCTION - FIRST 500 PATIENTS**

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## SUMMARY

**Aim:** The aim of this study was to evaluate almost twenty years of using the pectoralis major flap in head and neck reconstruction at the Department of Maxillofacial Surgery, Zagreb. **Patients:** In the period from 1981 through 1999 a total of 506 pectoralis major flaps were used for head and neck reconstruction in 500 patients. In all cases the flap was used after surgical resection of an advanced malignant tumour of the head and neck.

**Results:** The tumours were intraoral in 387 cases (77%), pharyngeal in 78 cases (15%) and on the skin in 10 cases (5%). The defect was located in the mucosal lining in 407 (81%), skin in 43 (8%), both intra- and extraoral in 53 (10%) patients. Bone defects took place in 65 patients. In 31 patients (6 %) the pectoralis major flap was used in combination with other flaps (deltopectoral, tongue, trapezius and free flaps).

Complications occurred with 168 flaps (33 %), but total flap necrosis was seen in only 10 patients (2%). Surgical treatment of complications was necessary in 87 patients (17 %). **Conclusion:** Despite the increasing application of microvascular reconstruction, the pectoralis major myocutaneous flap continues to be the most universal flap in head and neck reconstruction.

**Keywords:** pectoralis major flap, reconstruction, complication

## INTRODUCTION

The purpose of this report is to review twenty years of using the pectoralis major myocutaneous flap for one-stage reconstruction of head and neck cancer defects. The first published reports of the use of a pectoralis major myocutaneous flap (PMF) in head and neck reconstruction was that of Ariyan (1979a and b). Baek et al.(1982) was first to present clinical experience in a large series of cases including 133 flaps. Freeman et al. (1981) described the vascular anatomy. In the early eighties PMF seemed to offer a definite advance in reconstructive surgery over previously employed methods. This statement was proven by many authors (Withers et al., 1979; Magee et al., 1980; Biller et al.,1981).

Although free-tissue transfer has emerged as a safe, reliable means of soft tissue and bony reconstruction in the head and neck, PMF should still be considered as a source of vascularized soft tissue.

Up to now the largest reported series of consecutive PMF was that of Liu et al. (2001) having analyzed 244 cases.

## PATIENTS

The pectoralis major flap was used for head and neck reconstruction in 500 patients admitted to the Maxillofacial and Oral Surgery Department from 1981 to 1999. All data concerning the number, types of flaps, site of tumours, types of defects, complications and surgical treatment were retrospectively analyzed and entered into a computer database. A total of 506 pectoralis major flaps were used. The patients were male in 94% (474 patients).

### Highlights of technique used for harvesting the pectoralis major flap

Initial skin incision was along the previously marked pectoral skin island deep through subcutaneous fat to the pectoral fascia all around the marked area. The incision down to the fascia was oblique to include more perforators from the muscle. The skin island was tightened to the muscle with continuing absorbable sutures to protect the skin island during operative handling and postoperative healing. The next skin incision was designed as a lower limb of a deltopectoral flap, from the lateral edge of the pectoralis skin island to the anterior axillary fold (Virag, 1982). The prepectoral skin was elevated in the plane above the pectoral fascia. As

the lateral border of the pectoralis major was identified, finger dissection was done between major and minor pectoral muscle and the neurovascular pedicle (pectoral branch of the thoracoacromial artery) was identified. The thoracoacromial artery divides into four branches: pectoral, acromial, clavicular and deltoid. The pectoralis major muscle derives its blood supply from the pectoral branch of the thoracoacromial artery and lateral thoracic artery. After dissecting the flap off the chest wall, a subcutaneous tunnel was formed under the skin between neck and chest and the flap passed underneath the skin bridge. The flap was placed into the defect and sutured in two layers. The donor defect was closed primarily.

## RESULTS

### Types of flaps (Table 1.)

A great majority of flaps used were **MYOCUTANEOUS** flaps with an island of skin over the muscle (467). Mostly these flaps were used in reconstructing simple defects. When it was a through - and - through defect, meaning that two epithelial surfaces were resected, the flap had been used with two islands of skin (22). This type of flap, the **JANUS FLAP** was first described by Dennis and Kashima (1981). Reconstruction of the mandible has always been another problem. When the location of

tumour required segmental resection of the mandible, in four instances the pectoralis major has been raised with part of rib bone as a **OSTEOMYOCUTANEOUS FLAP**. In 18 cases in whom the mandible was resected segmentally, a reconstructive plate was used in combination with a pectoralis major flap. In three patients only **MUSCLE** tissue was used for coverage of neck structures left uncovered after neck dissection.

#### Combination with other flaps (Table 2.)

In 31 patients (6%) pectoralis major flap was used in combination with other flaps, mostly when a defect remained both intra- and extraorally. The combination used most often (16 patients) was with a deltopectoral flap (Bakamjian, 1965). Then the pectoralis flap was used for intraoral and deltopectoral flap for extraoral coverage. McGregor (1981) was first to describe raising both flaps at the same time not compromising vascularity of each other. Other combinations were with a tongue flap (always used intraorally) in 7 patients, trapezius flap in 2 patients and with free flaps (mostly radial forearm flaps) in 6 patients.

#### Sites of primary tumour (Table 3.)

In all cases there had been resection of an advanced malignant tumours of the head and neck. They were located intraorally in 387 (77%) cases and pharyngeally in 78 (15 %) cases. Salivary gland tumours occurred in

27 patients and the skin tumours in 10 (2 %) cases.

#### Types of defects (Table 4.)

The defects were divided into three groups. In 407 (81%) patients there was a mucosal lining defect, in 43 (8%) a skin defect and in 53 (10%) patients the defect was both intra- and extraorally. In 22 cases these defects were reconstructed by a Janus flaps and in 31 cases PMF was used in combination with other flaps (deltopectoral, tongue, trapezius and radial forearm flap).

#### Complications (Table 5.)

Only flap related complications were analyzed. Any aberration from primary healing was noted and placed into one of the category of complications. If a patient had more than one complication, the clinically most dominant one was chosen. Primary healing took place in 338 flaps used (67%) and complications occurred in 168 (33%) flaps. Total flap necrosis occurred in only 10 (2%) patients. Other complications were more commonly seen. Flap skin necrosis was categorized as total skin necrosis or partial skin necrosis. Total skin necrosis occurred in 19 flaps (4%) while partial skin necrosis occurred in 33 flaps (6.5%). Orocutaneous



fistulae occurred in 28 cases (5.5%). Dehiscences occurred intraorally in 31 flaps (6%) and in the neck in 22 patients (4%). Due to fistula formation or plate exposure, plate removal was necessary in 7 patients, 39% of patients in whom reconstruction plates were used. Donor side complications such as dehiscence, haematoma, seroma were infrequent. The incidence of donor side complication were 4% (18 cases).

#### Management of flap complications (Table 6.)

In 81 out of those 168 cases (16% of all cases) complications were managed conservatively with local wound care, allowing healing by secondary intention. Surgical intervention was necessary in 87 patients (17%); in 22 patients (4%) debridement was required, in 19 (4%) reconstruction with surrounding soft tissue and in 10 patients (2 %) a new flap was used. As mentioned before, reconstruction plate had to be taken out in 7 patients. Other surgical treatments (seroma evacuation, abscess drainage) were done in 27 (5%) patients.

### DISCUSSION

An analysis of these approximately 500 cases shows that the pectoralis major flap is reliable and versatile reconstruction in the head and neck

area. The results presented show a low overall incidence of complications (33%) compared to other series: Shah et al.(1990) found complication in 63%, Ijsselstein et al. (1996) 53 %, Kroll et al. (1990) 63% and Liu et al. (2001) in 35%. This may be explained by the retrospective design of this study which may have omitted minor complications not mentioned in the medical records. But there may also be a difference in the defining a complication. In the published reports by Shah et al. (1990) and Kroll et al. (1990) total flap necrosis occurred extremely seldom (3% and 2.4% respectively vs. 2% in this series). That is of great importance as total flap necrosis is the only complication that requires another flap and in fact another surgical procedure. Total and partial skin flap necrosis were more frequent (10%). Its incidence in this series was less than in series of Shah et al. (1990) who reported 29% of partial flap necrosis and Mehta et al. (1996) with 25% of partial flap necrosis. Fistula and dehiscence incidence were as frequent as in the above mentioned papers. Incidence of donor region complication was 4 % in this series. The fact that the donor sites were always closed primarily may lower the incidence of donor site complications than in previously published data. Biller et al. (1981) reported 7% , Baek et al. (1982) 5% and Ossoff et al. (1983) 8% of donor site complications.

There are some facts that, should be pointed out concerning the surgical technique. The lateral skin incision should extend from the skin island

toward the anterior axillary fold, in order to spare skin for keeping open the option for a deltopectoral flap if this seems necessary later. The motor nerve in the neurovascular pedicle should be identified and cut to prevent muscle contraction and shearing off the skin island after the flap was sutured. Another step for preventing shearing off the skin were drill holes in bone (zygomatic bone or maxilla) for muscle suspension. It can also be suspended over the zygomatic arch.

There are many advantages of this flap. This is a one stage reconstruction, there is no need to change the patient's position, the cutaneous island is large enough to cover practically any defect and it can be used for defects of two epithelial surfaces. The flap with its tissue bulk corrects the neck and face contour and also, with its muscular part, covers neck structures protecting the carotid artery, especially in previously irradiated patients.

Like every other flap it has few disadvantages. Follow-up in the neck area is more complicated because the flap can hide neck recurrences. In women there is breast asymmetry and often the flap might include also breast tissue. In males hairy chest skin is placed intraorally. When the flap is used as osteomyocutaneous flap, the rib is usually not sufficient for adequate reconstruction of lower jaw and its vascularisation is questionable. Therefore, in cases of mandible resection free flaps are better.

## CONCLUSION

The pectoralis major myocutaneous flap is still an acceptable method.

Despite the increasing application of microvascular reconstruction, it still has many advantages. It is fast, reliable, provides safe repair and is indicated especially where bulk is needed. It continues to be one of the most universal flaps in head and neck reconstruction.

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## TABLES

Table 1. Type of flap used

Types of flap	No of flaps
myocutaneous	467
bilobed	10
janus	22
osteomyocutaneous	4
myofascial	3
In addition with reconstruction plate	18

Table 2. Flaps used in combination with pectoralis major flap.

Additional flap used	No
deltpectoral	16
tongue	7
trapezius	2
free flap	6
total	31/506 (6%)

Table 3. Site of primary tumour

Site of tumour	No of flaps	%
intraoral	387	77%
oropharynx	78	15%
salivary gland	27	5%
skin	10	2%
sinus	5	1%
other	3	<1%

Table 4.

Site of defect	No of flaps	%
intraoral / pharyngeal mucosa	407	81%
skin	43	8%
mucosa & skin	53	10%
other	3	<1%

Table 5. Flap related complications.

COMPLICATION	No of flaps	%
total flap necrosis	10	1.9%
skin flap necrosis (total)	19	3.7%
skin flap necrosis (partial)	33	6.5%
orocutaneous fistula	28	5.5%
intraoral dehiscence	31	6.1%
neck dehiscence	22	4.3%
reconstruction plate exposure	7	1.4%
donor region complication	18	3.6%
TOTAL	168	33.2%
NO COMPLICATION	338	66.8%

Table 6. Management of flap complications

Treatment	No
surgical	87
necrectomy	22
fistula closure	19
new flap	10
plate removal	7
other	27
Conservative	81
Total	168