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Original Article

The Use of the Pectoralis Major Muscle As An Island Flap on the Thoracoacromial Artery in Defects of the Head-Neck and Infraclavicular Area

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Keywords: Head and neck reconstruction; infraclavicular defect reconstruction; pectoralis major muscle flap; thoracoacromial artery.

ABSTRACT

Objective: Plastic surgeons frequently reconstruct defects in the head, neck, and infraclavicular area. Pectoralis major muscle flap is a common flap choice for use in these areas. In this study, a modification of this flap is presented that could avoid problems seen with conventional pectoralis major flap.

Methods: Twenty–two patients with a median age of 58.4 years were operated on between 2010 and 2015 for defects located in the head, neck, or infraclavicular area. In 14 patients, defects were in head and neck area, whereas in 8 patients, it was in infraclavicular area.

Results: No partial or total flap loss was encountered during the follow-up period of 13.2 months. In 1 patient with infraclavicular defect, local wound healing problems were observed and treated with conservative methods and did not require additional surgery. In another patient, hematoma located under the flap was observed and surgically drained. In 2 patients operated on for defects located in the head and neck area, local wound healing problems were encountered which healed spontaneously. In all patients, defects were successfully reconstructed with high patient satisfaction rate.

Conclusion: The pectoralis major island flap is a safe option for the reconstruction of head, neck, and infraclavicular defects and has low morbidity rate.

INTRODUCTION

Reconstruction of head and neck region is the main field of occupation of plastic and reconstructive surgery. For the reconstruction of the region many alternatives are available ranging from local to free flaps.[1] Pectoralis major muscle is one of the frequently used muscle in the reconstruction of head and neck region. Major pedicle of the pectoral muscle flap is thoracoacromial artery, while its minor pedicle is lateral thoracic artery.[2] For the reconstruction of the head and neck region it is mostly used over its pedicle as muscle or musculocutaneous flap. It has many advantages for the reconstruction of the region as its nearness to the region, provision of both muscle, and skin for reconstruction Pectoral muscle basically divides into three parts as clavicular part, sternal part, and costal part.[3] In conventional method, without dissecting pedicle of the flap, muscle is rotated around the clavicular part, and transported to the femoral neck. As a conclusion, functions of the shoulder are lost partially, and the main body of the rotated muscle should be dissected away in a second operation. In the method presented, distal half

of the pectoral muscle was prepared as an island flap on thoracoacromial artery with an intention to decrease flap-related morbidity.

MATERIAL AND METHODS

A total of 22 patients with a median age of 58.4 years (age range, 44 and 71) who were operated between the years 2010, and 2015 for prexusting tissue defects localized on head-neck (n=14), and infraclavicular (n=8) regions. Average area of the defects was calculated as 16.1x10.3 cm. Neck contracture due to burn wound was detected in 4, and excision of different types of tumors iin 18 patients (Table 1).

All patients were operated under general anesthesia. After estimation of the defect size, through a standard incision used for the elevation of pectoral muscle flap the surgery was performed. Following determination of the pectoral muscle, and skin island to be transported, sternocostal part of the muscle started to be elevated from the chest wall (Fig. 1). Clavicular part of the muscle was left intact, pectoral branch of the thoracoacromial artery which was the dominant pedicle of the flap was detected at the 3rd intercostal space (Fig. 2). Following dissection of this branch, other attachments of the muscle were liberated, and pectoral island flap was prepared, and transported to the defective area (Fig. 3).

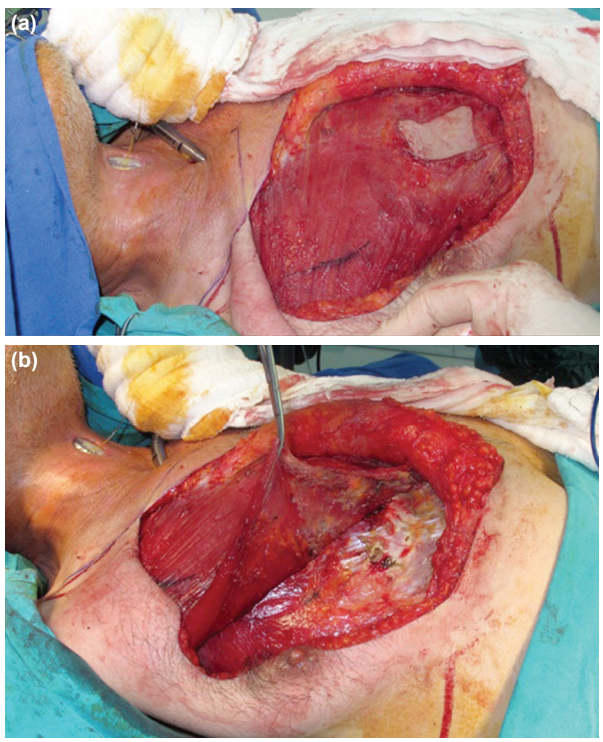

Figure 1. (a) After exposure of the pectoral muscle through an appropriate incision the skin island to be transported is planned. **(b)** Sternocostal part of the pectoral muscle is started to be elevated from the chest wall.

RESULTS

At the end of a median 13.2 months of the follow-up period (range, 7–24 months) in 22 patients operated using the presented method, partial or complete flap loss was not detected. In one patient following the repair of the infraclavicular region local wound healing problem was detected, however wound healing was achieved with conservative methods without the need for surgery. In another patient hematoma formation was detected underneath the flap, and drained using surgical methods. In 2 patients for whom pectoral island flap was used to repair neck defect, no complication other than local healing problems which did not require additional surgery, was

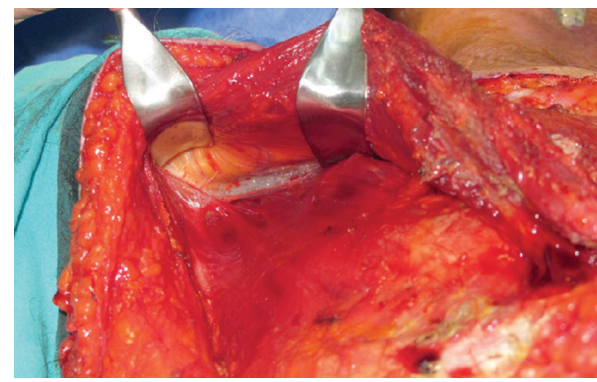

Figure 2. Clavicular part of the muscle is left intact, and at the level of 3rd intercostal space dominant pedicle thoracoacromial artery, and its pectoral branch are seen.

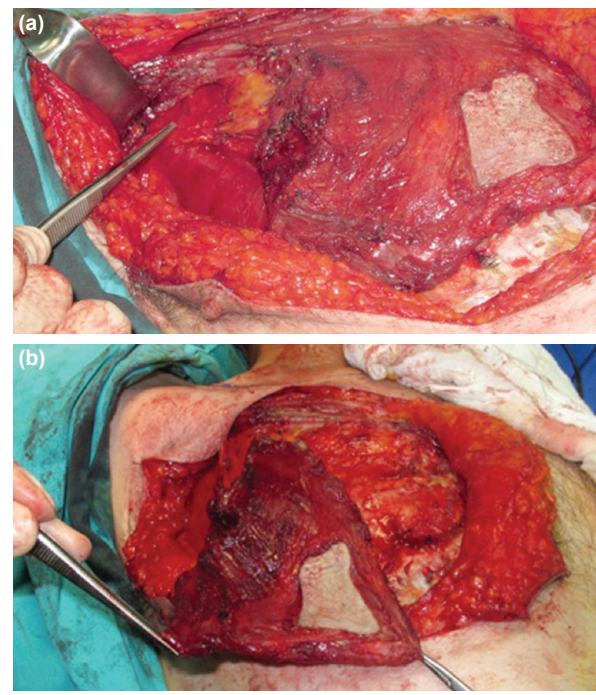

Figure 3. (a) Pectoral branch of the thoracoacromial artery is dissected and island flap was prepared. **(b)** The flap is freed, and transported to the defective area on the pedicle.

Table 1. Sociodemographic, and clinical characteristics of 22 patients

Patient No.	Agte	Sex	Location of the defect	Cause of the defect	Area of the defect (cm)	Follow-up period (mos)	Complications
1	66	Male	Head and neck region	Resection of dermatofibrosarcoma	14x6	18	–
2	58	Male	Head and neck region	Resection of squamous cell sarcoma	12x8	16	Problematic local wound healing
3	57	Male	Infraclavicular region	Resection of squamous cell sarcoma	13x11	15	–
4	44	Male	Head and neck region	Resection of metastatic maalignanat melanoma	24x14	9	–
5	69	Male	Head and neck region	Resection of squamous cell sarcoma	18x9	12	–
6	54	Female	Infraclavicular region	Resection of dermatofibrosarcoma	21x12	21	Hematoma beneath the flap
7	59	Male	Head and neck region	Resection of malignaant fibrous histiocytoma	14x14	13	–
8	63	Male	Head and neck region	Burn scar contracture of the neck	9x8	24	–
9	46	Female	Infraclavicular region	Burn scar contracture of the neck	10x10	19	–
10	62	Male	Head and neck region	Resection of squamous cell sarcoma	16x12	18	Problematic local wound healing
11	49	Male	Infraclavicular region	Resection of dermatofibrosarcoma	15x9	14	–
12	71	Female	Head and neck region	Resection of metastatic breast cancer	21x9	9	–
13	49	Male	Infraclavicular region	Resection of squamous cell sarcoma	18x10	13	–
14	57	Male	Head and neck region	Resection of malignaant fibrous histiocytoma	22x11	12	–
15	49	Male	Head and neck region	Resection of recurrent maligtnant melanoma	15x11	10	–
16	66	Male	Infraclavicular region	Resection of dermatofibrosarcoma	17x9	12	–
17	61	Male	Infraclavicular region	Resection of malignaant fibrous histiocytoma	16x10	8	Problematic local wound healing
18	60	Female	Head and neck region	Resection of squamous cell sarcoma	18x12	11	–
19	52	Female	Infraclavicular region	Burn scar contracture of the neck	16x8	10	–
20	65	Male	Head and neck region	Resection of malignaant fibrous histiocytoma	12x12	8	–
21	64	Male	Head and neck region	Burn scar contracture of the neck	19x12	7	–
22	63	Female	Head and neck region	Resection of squamous cell sarcoma	14x9	11	–

Figure 4. (a) A 44-year-old male patient presenting with a massive metastatic malignant melanoma filling left side of the neck, and parotid loge. **(b)** Appearance at postoperative 2nd month.

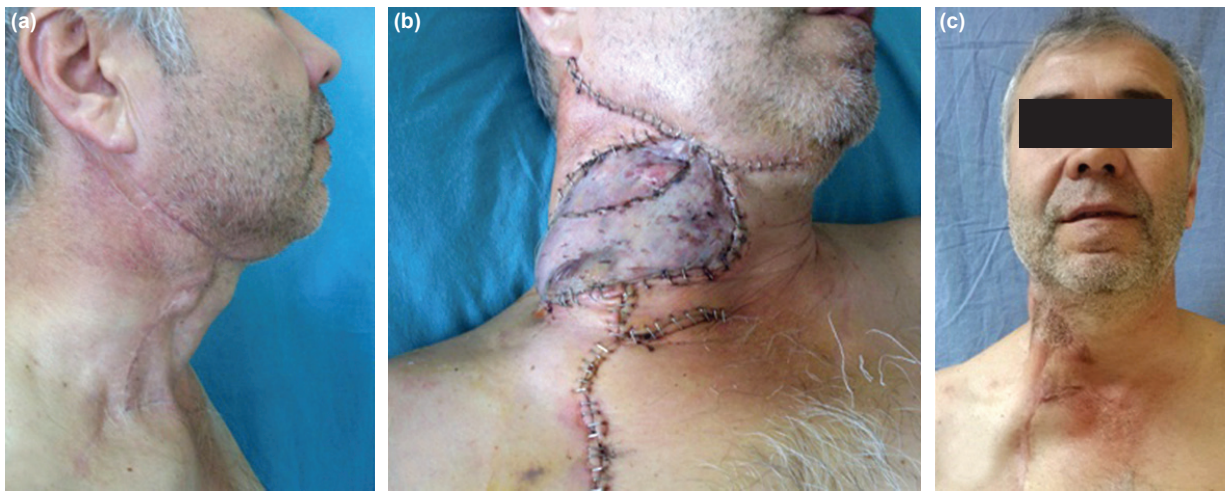

Figure 5. (a) A 49-year-old male patient; a recurrent malignant melanoma invading the skin of the neck. **(b)** Its appearance at postoperative 1st month. Healed skin graft on pectoral island flap is seen **(c)** Its appearance at postoperative 2nd month.

encountered (Table 1). At the end of a follow-up period of 13.2 months, the patients were highly satisfied with this technique in addition to it being successful defect repair (Figs. 4, 5).

DISCUSSION

Due to its dimensions and position, pectoral muscle is a frequently used locoregional flap alternative in the repair of defects of the chest wall and the head and neck region.[4,5] Because of the possibility of adding skin island to the flap, and its large rotation arch, it is preferred in the reconstructive surgery for the repair of the defects of the head and neck region especially in cases where the alternative of free flap is not contemplated.[6] In this study we are presenting a case series in which we transported pectoralis major muscle to the head, and neck region using a technique different from conventional method.

Basically pectoral muscle is divided into three parts, namely, clavicular, sternal, and costal parts.[4] In conventional method, clavicular part of the pectoralis major muscle is preserved so as to maintain the nutrition of the muscle, and the flap is rotated around this muscle part and transported to the head and neck region.[7,8] However all attachments of the muscle which are essential for functioning of the muscle at the shoulder junction are loosened. Clavicular part is the most important part among them which assumes roles in flexion, internal rotation, and adduction of the humerus.[9] In the presented method sternocostal end of the pectoral muscle is elevated as an island flap over thoracoacromial vessels which is the dominant pedicle, and the attachments of the clavicular part which enable functioning of the clavicular part at the shoulder region are left intact. Thanks to this method pectoral muscle flap which is planned as an axial pattern island flap possesses a perfect blood supply, and also relative to conventional methods its adverse effects on the functions of the shoulder are decreased.

Another disadvantage of transporting the flap prepared using a conventional method is the requirement for a second-look surgery. If the flaps are are rotated over clavicular part to transport them to the head and neck region, this connecting piece remains on the neck region as a disturbing bridge. With time it causes a curved neck, difficulty in movements of the neck, and bad cosmetic appearance.[10,11] Therefore most of the time, clavicular part of the muscle is dissected in a second operation to relieve neck region.[12] However when the flap is prepared as an island flap, then this problem is resolved. In none of the patients in the series, a second-look surgery was required because of dehiscence of the flap pedicle or for unwanted cosmetic appearance or dysfunction of the neck.

The presented method is more advantageous thanks to its characteristics when compared with conventional pectoral muscle or musculocutaneous flap method. At the same time at the end of a follow-up period of 13.2 months partial or total flap loss was not experienced which indicates that the technique is a safe, and reliable method with lower morbidity rates.

Minor disadvantage of the method is that since only sternocostal half of the muscle can be used, the size of the harvested flap is smaller than that obtained with conventional method. In our study population, mean area of the defects closed using pectoral muscle island flap was calculated as 16.6x10.4 cm. Still among them a defect was measured as 24x14 cm. When prepared using a correct dissection method it is possible to elevate a flap with a size similar to the flap elevated using a conventional method.

In conclusion, the pectoral muscle island flap technique presented in this article can be used safely in the repair of head-neck and infraventricular region defects. The necessity of a second-look surgery for shoulder girdle dysfunction and dehiscence of the flap pedicle of conventional pectoral flap technique is eliminated with this technique.

Ethics Committee Approval

Approval has been obtained from the Kartal Dr. Lütfi Kırdar Traning and Research Hospital Ethics Committee.

Informed Consent

Approval was obtained from the patients.

Peer-review

Internally peer-reviewed.

Authorship Contributions

Concept: H.Ş.; Design: H.Ş., G.T.; Data collection &/or processing: A.A., A.C.A.; Analysis and/or interpretation: H.Ş.; Literature search: H.Ş., G.T.; Writing: H.Ş.; Critical review: N.Y., G.T.F., M.B.

Conflict of Interest

None declared.

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Baş-Boyun ve Klavikula Altı Yerleşimli Defektlerde Pektoralis Majör Kasının Torakoakromiyal Arter Tabanlı Ada Flebi Olarak Kullanımı

Amaç: Baş boyun ve infraklaviküler bölgedeki defektlerin onarımı plastik cerrahların sıklıkla uğraştığı bir konudur. Burada sıklıkla kullanılan fleplerden biri pektoral kas flebidir. Çalışmamızda konvansiyonel yöntemle baş-boyun bölgesine taşınan pektoral kas flebinde görülen sorunların engellenmesi için kullanılan bir pektoral flep modifikasyonu sunuldu.

Gereç ve Yöntem: Bu çalışmaya, 2010–2015 yılları arasında, baş-boyun ve infraklaviküler bölgede mevcut doku defektleri nedeniyle ameliyat edilen, ortalama yaşları 58.4 olan 22 hasta alındı. Hastaların 14'ünde doku defekti boyun bölgesindeyken, sekizinde infraklaviküler bölgedeydi.

Bulgular: 13.2 aylık ortalama takip süresinin sonunda 22 hastada, kısmi veya tam flep kaybı görülmedi. İnfraklaviküler bölgenin onarımı için ameliyat edilen hastaların birinde lokal yara iyileşme problemleri vardı. Konservatif yöntemlerle cerrahi gerekmeden tedavi edildi, bir diğerinde ise flep altında hematom saptandı, hematom cerrahi olarak boşaltıldı. Boyun bölgesinin onarımı için pektoral ada flebi kullanan hastalarda ise iki olguda saptanan lokal iyileşme problemleri dışında bir komplikasyon görülmedi, ek cerrahi girişim gerekliliği oluşmadı. Hastaların tümünde yüksek memnuniyet oranı ile başarılı defekt onarımı sağlandı.

Sonuç: Pektoral kas ada flebi tekniği, baş-boyun ve infraklaviküler bölge defektlerinin onarımında güvenle ve düşük morbidite avantajıyla kullanılabilecek bir flep seçeneğidir.

Anahtar Sözcükler: Baş boyun rekonstrüksiyonu; infraklaviküler bölge onarımı; pektoralis majör kas flebi; torakoakromial arter.