

Reconstruction of full-thickness cheek after cancer resection using free radial forearm flap

Tadeusz Witwicki, Edward Towpik, Stanisław Starościak¹, Romuald Krajewski¹

Aim. Reconstruction of full-thickness cheek after cancer resection is a major surgical challenge. This study presents results of full-thickness cheek reconstruction using folded free radial forearm flap.

Material and methods. Folded free radial forearm flap was used in 10 patients after extensive resection of full-thickness cheek, usually with additional resection of surrounding tissues (lip, angle of mouth) and with neck or suprahyoid lymph node dissection. Microsurgical venous anastomoses were performed to the external jugular vein, and arterial – to the facial or superior thyroid artery.

Results. Vascularity of free flaps was good in all cases, although one revision of venous anastomosis was required. The final esthetic and functional result was satisfactory.

Conclusion. Folded free radial forearm flap is a valuable alternative for reconstruction of full-thickness cheek after cancer resection.

Zastosowanie wolnego płata promieniowego z przedramienia w rekonstrukcji pełnej grubości policzka po resekcji

Cel. Rekonstrukcja pełnej grubości policzka po resekcji nowotworu jest trudnym zadaniem. W pracy oceniono możliwości i wyniki odtwarzania policzka wolnym, złożonym płatem promieniowym z przedramienia.

Materiał i metody. Wolny płat promieniowy z przedramienia zastosowano u 10 pacjentów po rozległej resekcji pełnej grubości policzka. Najczęściej dodatkowo resekowano też inne otaczające tkanki (wargę, kąt ust) i usuwano szyjne lub nadgnykowe węzły chłonne. Mikrozespolenia żyłne wykonywano do żyły szyjnej zewnętrznej, a tętnice – do tętnicy twarzowej lub tarzowej górnej.

Wyniki. Unaczynienie wszystkich przeniesionych płatów było dobre; w jednym przypadku wykonano z powodzeniem rewizję niedrożnego zespolenia żylnego. Wyniki estetyczne i czynnościowe były dobre.

Podsumowanie. Rekonstrukcja wolnym złożonym płatem promieniowym z przedramienia jest dobrą metodą odtwarzania pełnej grubości policzka po resekcji nowotworu.

Key words: cheek, reconstruction, microsurgical, radial forearm flap

Słowa kluczowe: policzek, rekonstrukcja, mikrochirurgia, płat promieniowy

Reconstruction after full-thickness cheek resection presents a formidable surgical challenge. It requires replacement of both the external skin and intraoral lining. Moreover, the color match is difficult to obtain, and the immobility of tissues used for reconstruction is clearly visible in the face, thus further deteriorating the final appearance.

Several flaps, or combinations of flaps (folded forehead flap, forehead and deltopectoral flaps etc.) were used in the past [1-5]. With the introduction of myocuta-

neous flaps, pectoralis major became the workhorse in head and neck reconstruction [6]. It was also successfully used for full-thickness cheek reconstruction, either as a double-island, skin-grafted island or in combination with other flaps [5, 7-9]. However, the major disadvantage of a pedicled pectoralis major flap was its excessive bulk.

An alternative approach is to use the free radial forearm flap [10]. This thin and pliable fasciocutaneous flap has already proved its usefulness in various reconstructive procedures in the head and neck region [11-13]. This study presents our initial experience in using this flap for full-thickness cheek restoration after extensive cancer resection.

¹ Department of Head and Neck Cancer and Department of Breast Cancer and Reconstructive Surgery Maria Skłodowska-Curie Memorial Cancer Center and Institute of Oncology, Warsaw, Poland

Material and methods

Surgical technique

Radial flap contains fasciocutaneous island from the ventral aspect of the forearm, supplied by the radial artery. Venous drainage is provided by two venae comitantes that accompany the artery and a variable pattern of subcutaneous forearm veins that drain into the cephalic, basilic and median cubital veins [11].

The radial artery and the superficial subcutaneous veins can be palpated and marked, and the appropriately designed

flap is outlined on the nondominant forearm. The size and shape of the required flap is determined according to the anticipated surgical defect. An Allen test is performed to ensure viability of the hand with radial artery temporarily closed by finger pressure.

The raising of the flap and cheek resection (with eventual neck dissection) are performed simultaneously by two separate teams.

Elevation of the flap is relatively straightforward and proceeds under tourniquet control. The flap is raised in a subfascial plane, exposing muscle bellies proximally and tendons distally (Figure 1). Paratenon coverage of the flexor tendons must be

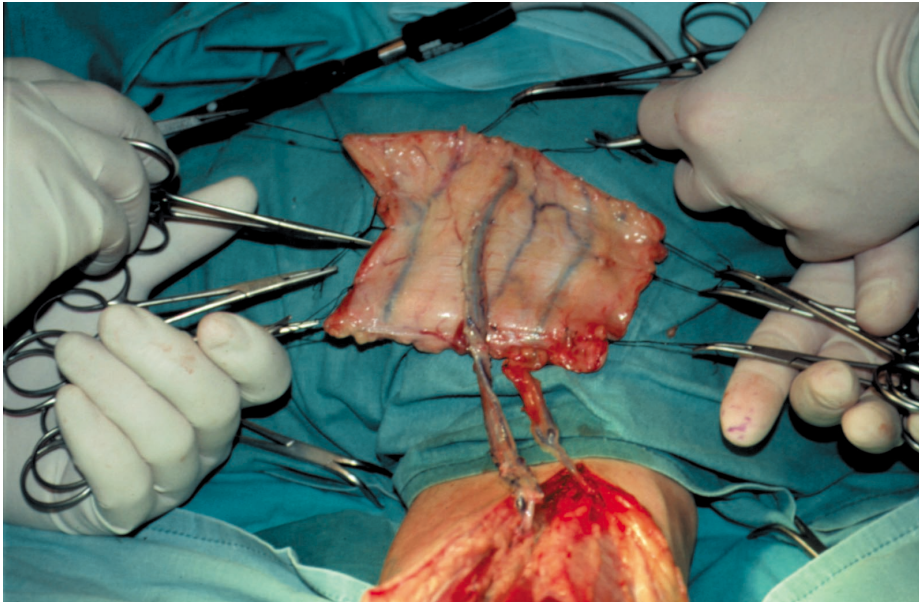


Figure 1. Radial forearm fasciocutaneous flap raised on radial artery and accompanying vein, ready for transfer



Figure 2. Full-thickness cheek and angle of the mouth defect after extensive cancer resection. Modified neck dissection is also performed, and superior thyroid artery (over white plate) is prepared for microsurgical anastomosis with radial artery



Figure 3. Microsurgical reconstruction of full-thickness cheek using free radial forearm flap

preserved to provide suitable surface for subsequent skin-grafting. The plane of dissection on the undersurface of the deep fascia ensures that the radial artery, lying in the lateral intermuscular septum, is included in the flap [11].

After raising the flap, microvascular clamps are placed on both artery and vein, the vessels are severed, the flap is transferred to the cheek, and its vessels are anastomosed to recipient vessels, using operating microscope and 10/0 microsutures. The reconstruction is then completed, using the pliable flap for both external skin coverage and intraoral lining. (Figure 2 and 3). The donor site on the forearm is eventually covered with a skin graft.

Clinical experience

Folded free radial forearm flap was used for immediate reconstruction of full-thickness cheek defects after extensive cancer resection in ten patients (4 females and 6 males, aged 44-64, mean 52).

In 9/10 cases, additional resection of lips, angle of mouth, mandible, maxilla or nose was also performed. Modified radical neck dissection or suprahyoid lymph node dissection were performed in 8/10 cases. In one case a fragment of vascularized radial bone, raised together with the flap, was used to reconstruct a fragment of resected mandible.

External jugular vein was the recipient vein in all cases. Facial or superior thyroid arteries served as recipient arteries. The clinical data is summarized in Table I.

Results

The vascularity of all 10 free radial forearm flaps used for full-thickness cheek reconstruction was good. However, revision of vein anastomosis was required in one case. The healing was uneventful, the functional result was good, and the final appearance was acceptable.

Discussion

Reconstruction after full-thickness cheek resection requires thin pliable tissue, which can match the thickness of an original cheek, and, simultaneously, provide a substitute for both the external cover and intraoral lining. Free fasciocutaneous radial forearm flap appears to be an excellent choice for this purpose [14-18].

The radial forearm flap was popularized by D.S. Soutar [10] and introduced in Poland by K. Kobus and P. Wójcicki [19-20]. It has relatively big vessels for microanastomoses and a long vascular pedicle. It may be reinnervated by performing nerve microanastomoses. Additionally, it may include bone – thus facilitating mandible reconstruction – or palmaris longus tendon [21-22].

On the other side – it depletes the forearm from one of its two major arteries, and the split-skin grafted donor site may produce a considerable cosmetic defect. This, however, seems to be a relatively small prize for obtaining an excellent material for major reconstruction, without an awkward local pedicle and too much bulk (as i.e. in pectoralis major island flap). Additionally, raising the flap from the forearm causes no additional visible defect in the head and neck area. Other free flaps proposed for full-thickness cheek, i.e. latissimus dorsi, serratus anterior or prefabricated flaps [23-26], are used rather occasionally.

The flap can, as in some of our patients, serve to reconstruct additional surrounding tissue (lip, angle of mouth, chin). The operating time is not long, particularly, when the resection and raising the flap are performed simultaneously. The success rate of vascular microanastomoses may be very high (100% in our series) when

Table I. Clinical data of free radial forearm flap reconstruction after full-thickness cheek resection

Patient	Defect	Addit. surgery	Recip. vessels	Flap survival
1.	Cheek, lower lip, chin	Suprahyoid l. n. dissection	Facial artery Ext. jugular vein	+
2.	Cheek, upper lip, angle of mouth	–	Facial artery Ext. jugular vein	+
3.	Cheek, lower lip	Neck dissection	Sup. thyroid artery Ext. jugular vein	+
4.	Cheek, angle of mouth	–	Facial artery Ext. jugular vein	+
5.	Cheek, angle of mouth	Suprahyoid l.n. dissection	Facial artery Ext. jugular vein	+
6.	Cheek, angle of mouth	Neck dissection	Sup. thyroid artery Ext. jugular vein	+
7.	Cheek	Neck dissection	Sup. thyroid vein Ext. jugular vein	+
8.	Cheek, upper lip, maxilla, nose	Suprahyoid l.n. dissection	Sup. thyroid vein Ext. jugular vein	+
9.	Cheek, lower lip, part. of mandible	Neck dissection	Facial artery Ext. jugular vein	+(vein revision)
10.	Cheek, part. of mandible	Neck dissection	Facial artery Ext. jugular vein	+

they are performed by an experienced microsurgeon. In our experience, free radial forearm flap appears to be the treatment of choice in full-thickness cheek reconstruction.

Edward Towpik M.D., Ph.D.

Department of Breast Cancer and Reconstructive Surgery
Maria Skłodowska-Curie Memorial
Cancer Center and Institute of Oncology
Roentgena 5, 02-781 Warsaw
Poland

23. Harii K, Ono J, Ebihara S. Closure of total cheek defects with two combined myocutaneous free flaps. *Arch Otolaryngol* 1982; 108: 303-308.
24. Igawa HH, Minakawa HM, Sugihara T et al. Cheek reconstruction with an expanded prefabricated musculocutaneous free flap: case report. *Br J Plast Surg* 1995; 48: 569-571.
25. Safak T, Akyurek M. Primary one-stage reconstruction of cheek defect after a shotgun blast to the face: use of the latissimus dorsi musculocutaneous free flap for soft-tissue repair and facial reanimation. *Ann Plast Surg* 2001; 47: 438-441.
26. Huang WC, Chen HC, Jain V et al. Reconstruction of through and through cheek defects involving the oral commissure, using chimeric flaps from the thigh lateral femoral circumflex system. *Plast Reconstr Surg* 2002; 109: 433-441.

Paper received: 22 March 2002

Accepted: 20 April 2002

References

1. Becker DW. A cervicopectoral rotation flap for cheek coverage. *Plast Reconstr Surg* 1978; 61: 868-871.
2. McGregor IA, Reid WH. Simultaneous temporal and deltopectoral flaps for full-thickness defects of the cheek. *Plast Reconstr Surg* 1970; 45: 326-331.
3. Shah JP. Folded forehead flap for reconstruction of full-thickness defects of the cheek. *Head Neck Surg* 1980; 2: 248-252.
4. Bunkis J, Mulliken JB, Upton J, Murray JE. The evolution of techniques for reconstruction of full-thickness cheek defects. *Plast Reconstr Surg* 1982; 70: 319-324.
5. Kulakowski A, Towpik E. Reconstruction of full-thickness cheek defects after cancer surgery. *Eur J Surg Oncol* 1987; 13: 57-62.
6. Ariyan S. The pectoralis major myocutaneous flap: a versatile flap for reconstruction in the head and neck. *Plast Reconstr Surg* 1979; 63: 73-79.
7. Weaver AW, Vandenberg HJ, Atkinson DP et al. Modified bilobular ("gemini") pectoralis major myocutaneous flap. *Am J Surg* 1982; 144: 482-486.
8. Towpik E, Meyza J. The „double faced” pectoralis major island flap. A valuable alternative in full-thickness cheek reconstruction. *J Cranio-Maxillo-Fac Surg* 1990; 18: 85-87.
9. Towpik E, Meyza J. Odmiany płata skórno-mięśniowego z mięśnia piersiowego większego w zabiegach odtwórczych w obrębie głowy i szyi. *Nowotwory* 1990; 40: 54-58.
10. Soutar DS, Scheker LR, Tanner NSB, McGregor IA. The radial forearm flap: a versatile method for intraoral reconstruction. *Br J Plast Surg* 1983; 36: 1-8.
11. Soutar DS, McGregor IA. Radial forearm free flap in intraoral reconstruction. In: Strauch B, Vasconez LO, Hall-Findlay EJ (Eds). *Grabb's Encyclopedia of Flaps*. Vol. I-III, Boston, Toronto, London: 1990, Little, Brown and Company, 566-573.
12. Schusterman MA, Kroll SS, Weber RS et al. Intraoral soft tissue reconstruction after cancer ablation: a comparison of the pectoralis major flap and the free radial forearm flap. *Am J Surg* 1991; 162: 397-399.
13. Cordeiro PG, Mastorakos DP, Shaka AP. The radial forearm fasciocutaneous free-tissue transfer for tracheostomy reconstruction. *Plast Reconstr Surg* 1996; 98: 354-357.
14. Boorman JG, Green MF. A split Chinese forearm flap for simultaneous oral lining and skin cover. *Br J Plast Surg* 1986; 39: 179-182.
15. Freedman AM, Hidalgo DA. Full-thickness cheek and lip reconstruction with the radial forearm free flap. *Ann Plast Surg* 1990; 25: 287-294.
16. Niranjana NS, Watson DP. Reconstruction of the cheek using a „suspended” radial forearm free flap. *Br J Plast Surg* 1990; 43: 365-366.
17. Savant DN, Patel SG, Deshmukh SP et al. Folded free radial forearm flap for reconstruction of full-thickness defects of the cheek. *Head Neck* 1995; 17: 293-296.
18. Kataou F, Shirai N, Kamakura S et al. Full-thickness reconstruction of cheek defect involving oral commissure with forearm tendinocutaneous flap. *Br J Oral Maxillofac Surg* 1996; 26: 34-37.
19. Kobus K, Wójcicki P. Płat przedramienny wolny i wyspowy. *Pol Przegl Chir* 1998; 70: 168-178.
20. Wójcicki P. Płat skórno-powięziowy z przedramienia. *Pol Przegl Chir* 1991; 63: 840-848.
21. Furuta S, Sakaguchi Y, Iwasawa M et al. Reconstruction of the lips, oral commissure and full-thickness cheek with a composite radial forearm palmaris longus free flap. *Ann Plast Surg* 1994; 33: 544-547.
22. Thoma A, Allen M, Tadeson BH et al. The fate of osteotomized free radial forearm osteocutaneous flap in mandible reconstruction. *J Reconstr Microsurg* 1995; 11: 215-218.