Int. J. Oral Maxillofac. Surg. 2016; 45: 163–166
http://dx.doi.org/10.1016/j.ijom.2015.09.022, available online at http://www.sciencedirect.com

International Journal of Oral & Maxillofacial Surgery

Clinical Paper
Reconstructive Surgery

The relative survival of composite free flaps in head and neck reconstruction

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M. L. V. Van Genechten, M. D. Batstone: The relative survival of composite free flaps in head and neck reconstruction. Int. J. Oral Maxillofac. Surg. 2016; 45: 163–166.

Abstract. Various composite free flaps are available for reconstruction of bony head and neck defects. The aim of this study was to compare the relative success of four different bony free flaps. One hundred and seventy-three microvascular composite free flap reconstructions for bony defects of the head and neck region, performed over the period April 2008 to April 2015, were reviewed retrospectively. The type of free flap, indication for free flap reconstruction, age at harvesting of the free flap, use of pre- or postoperative radiotherapy, and free flap failure were examined. For the 173 reconstructions performed, 84 fibula free flaps, 43 iliac crest free flaps, 32 scapula free flaps, and 14 osteocutaneous radial forearm free flaps were harvested. The mean age at time of harvesting was 40.7 years for the iliac crest, 57.3 years for the fibula, 64.3 years for the scapula, and 73.9 years for the osteocutaneous radial forearm free flap. No complete free flap failure was documented, nor was there any failure of bony segments. Three fibula flap skin paddles did not survive. No returns to theatre for salvage were required. This study showed no difference in the survival rates of these four types of composite free flap.

Key words: microvascular free flap; osseous free flap; composite free flap; flap survival; flap failure.

Accepted for publication 29 September 2015
Available online 27 October 2015

Over the past three decades, vascularized free tissue transfer has become the technique of choice in head and neck reconstruction after oncological resection, complications of irradiation, trauma, or congenital defects. In order to restore form and function, free flaps are conventionally chosen to fit as closely as possible the soft and hard tissues that are to be reconstructed. Because of technological advancements in magnification and instrumentation, and increasing microsurgical experience, the reliability of microvascular free tissue transfer in general has increased to success rates higher than 95%.[1]

Although reported survival rates in the literature are up to 100% for osseous free flaps, survival of the composite free flap remains challenging.[2,3] Early reports mention a five-fold increase in flap failure rate for bony free flaps compared to flaps containing only soft tissue.[4] Also, relative success rates are reported to differ within the group of osseous free flaps.[2,5,6] Ho et al. illustrated the relative survival difference in composite free flaps in a large series of free flaps for head and neck reconstruction.[5] Analysis demonstrated a higher overall survival for the scapula free flap for head and neck reconstruction compared to the iliac crest free flap. Mücke et al. analysed a series of composite fibula and iliac crest free flaps and reported that the likelihood of flap failure was influenced by flap type, with a higher failure rate for iliac crest free flaps.[2] A statistical analysis by Takushima

et al. on the relative success rates in a series of osseous free flap reconstructions, demonstrated total flap failure rates of up to 17% for the iliac crest free flap and 15% for the fibula free flap.[6]

The aim of this study was to compare the survival rates of a broad range of composite free flaps, all used for head and neck reconstruction for a variety of indications.

Materials and methods

One hundred and seventy-three microvascular composite free flap reconstructions for soft and hard tissue defects of the head and neck region, performed over a 7-year period (April 2008 to April 2015), were reviewed retrospectively. The free flaps used were the iliac crest free flap, the fibula free flap, the scapula free flap, and the osteocutaneous radial forearm free flap. The variables examined for each patient were: (1) demographic details, (2) free flap type, (3) indication, (4) radiotherapy usage pre surgery, (5) flap failure–determined by status at most recent review, (6) need for revision surgery, and (7) reconstruction of the maxilla/mandible.

Data were gathered in a retrospective manner from a prospectively maintained database. A query was done for the variables of interest. Patient records were consulted to complete the data where necessary and to verify the data available in the database. When patient records did not provide sufficient information, archived charts were reviewed.

Postoperative monitoring was performed hourly during the first 48 h postoperative and every 4 h up to 72 h after surgery. Flap viability was assessed by visual inspection and handheld Doppler evaluation. Visual inspection was performed using a wooden tongue depressor and a torch with a high colour rendering index (CRI) LED for optimal evaluation of the colour and the capillary refill of the free flap.[7] A Doppler stitch for localization of the free flap pedicle was done to assist correct evaluation. When flap viability was in doubt, the supervising surgeon was contacted for final evaluation and decision-making. In rare cases, flap scratching was performed. Pharmacological therapy included only the use of 5000 IU heparin every 12 h during hospitalization.

All head and neck reconstructions were performed by the same head and neck surgeon with an assisting fellow or specialist registrar.

Results

One hundred and seventy-three head and neck reconstructions were performed in a total of 169 patients, of whom 67% were male (mean age 57.1 years) and 33% were female (mean age 52.1 years). The mean age of the total population was 55.5 years (range 12–92 years).

In 54% of the total population, the indication for free flap reconstruction was primary resection of an oral malignancy. Other indications included osteoradionecrosis (ORN) (21%), locally aggressive benign disease (17%), and secondary reconstruction (8%) for a variety of indications (cleft, trauma, etc.). The mandible was reconstructed in 86% of cases and the maxilla in 14%. In the case of 50 free flaps, the patient had undergone radiotherapy before surgery; no radiotherapy was performed prior to surgery in the cases of the remaining 123 flaps. Eighty-four fibula free flaps, 43 iliac crest free flaps, 32 scapula free flaps, and 14 osteocutaneous radial forearm free flaps were harvested.

The iliac crest free flap was most frequently used for reconstruction of locally benign aggressive disease (80%). The fibula free flap was most frequently used in primary reconstruction in malignant disease (56%), in ORN (65%), and in cases that required secondary reconstruction (62%). The indication for the scapula free flap was set based on the presence of peripheral vascular disease or the need for an extensive soft tissue component in the free flap. This flap was distributed more evenly over the range of indications (primary resection malignancy 50%, ORN 28%, benign disease 16%, secondary reconstruction 6%). The osteocutaneous radial forearm free flap was used for primary reconstruction after malignancy resection in 92% of cases. This flap was used primarily in elderly patients for early mobilization (Fig. 1).

The mean age at the time of harvesting an iliac crest free flap was 40.7 years. The mean age at harvesting of the fibula, scapula, and osteocutaneous radial forearm free flaps was 57.3 years, 64.3 years, and 73.9 years, respectively (Fig. 2).

Within the age group of 12–39 years, the iliac crest free flap was the most frequently used for reconstruction (76%). However, in patients aged 40–69 years, the fibula free flap was the primary flap used for reconstruction (59%). In the age group 70–79 years, the fibula free flap, scapula free flap, and osteocutaneous radial forearm free flap were equal in distribution (Fig. 3).

The flap success rate was 100%. Skin paddle failure was reported in three fibula free flaps, of which two were harvested in

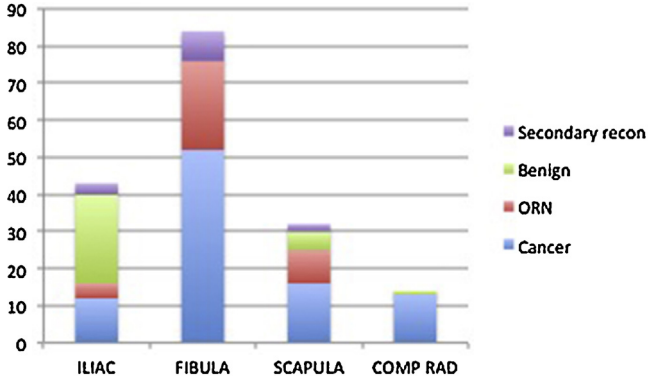

Fig. 1. Indications for flap use.

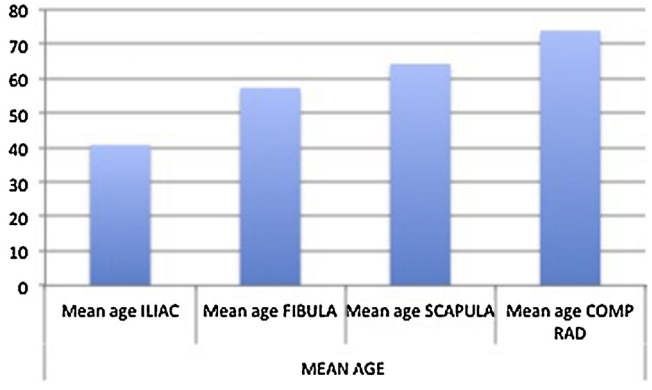

Fig. 2. Mean age flap harvesting.