Journal of Cranio-Maxillo-Facial Surgery 42 (2014) 79–83

Contents lists available at SciVerse ScienceDirect

Journal of Cranio-Maxillo-Facial Surgery

journal homepage: www.jcmfs.com

Development of the clinical use of distant flaps for head and neck reconstruction

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ARTICLE INFO

Article history:
Paper received 19 November 2012
Accepted 21 February 2013

Keywords:
Head and neck cancer
Plastic and reconstructive surgery
Oral and maxillofacial surgery
Free flaps

ABSTRACT

The reconstruction of hard and soft tissue defects, mainly after ablative oncologic surgery in the head and neck area, is an evolving field. The use of free flaps for reconstruction of the head and neck is considered to be the surgical standard. In our analysis of more than 1000 free flaps we give an overview of the development of the use of different types of free tissue transfer to the head and neck area over the last 25 years. We show that the evolving field of head and neck reconstruction raises new possibilities with new types of flaps, whereas other types of flaps disappear in the everyday clinical use. The spectrum of reconstruction possibilities broadens with the number of different flap types available to the head and neck surgeon.

1. Introduction

The reconstruction of hard and soft tissue defects, mainly after ablative oncologic surgery in the head and neck area, is a strongly evolving field at the moment. Searching for "free flap + head neck" in PubMed, one will find as many as 1979 medical articles in November 2012. This reflects the growing interest in the use of free flaps for head and neck reconstruction.

Nowadays, the reconstruction of large defects in the head and neck area with free autologous tissue transplants and microvascular anastomosis is often described as the gold standard (Wong and Wei, 2010). It enables the surgeon to resect large tumours and to provide at least partly functional and aesthetic reconstruction for the patient. Some authors even find an improved long-term survival in patients with free flap transfers, probably according to larger and more secure safety margins (de Vicente et al., 2012). On the other hand, the effects on the quality of life for patients with large tumour resections in the head and neck area and free flap reconstructions must be considered (Li et al., 2012a,b).

The range of different possibilities for head and neck reconstructive surgery is widening during the last decades, providing a larger variety of different distant flap types. The use of pedicled, regional and distant flaps for head and neck reconstruction has been known for centuries, but it became the standard of care in the late 1950s and 1960s (Ariyan, 1979; Withers et al., 1979). Free flap transfer, either vascularised or not, started to become the surgical standard in the 1980s (Watkinson and Breach, 1991; Shestak et al., 1992). Some commonly used surgical workhorses, like the fibula or radial forearm flap were first described around this time (Taylor et al., 1975; Yang et al., 1997). In the last years, some new microvascular flaps have been introduced for everyday clinical use, such as the antero-lateral thigh flap (ALT) and the iliac crest bone flap using the deep circumflex iliac artery (DCIA) (Park and Miles, 2011; Gerressen et al., 2012).

In this study, we provide a single centre experience with distant flap reconstruction for head and neck defects from 1987 to 2011. We can show the development in the use of different flap types in a group of oncologic patients. The purpose of this study is to show which types of flaps were found to be useful and established in this challenging field of reconstructive plastic surgery, and which flaps are not used anymore.

2. Material and methods

In this single centre study, we analyse retrospectively all distant flaps used in oncologic patients for primary or secondary reconstruction of head and neck defects from 1987 to 2011. Local flaps, full or split thickness skin transplants, free small cartilage transplants or free monocortical bone or free cancellous bone transplants were not included in our study. Only free microvascular flaps, distant pedicled flaps and free avascular full thickness (bicortical bone or full thickness rib) transplants were included in this analysis. Data were obtained using the operating schedule of the Department of Oral and Maxillofacial Surgery of the University

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1010-5182/$ – see front matter
http://dx.doi.org/10.1016/j.jcms.2013.02.006

Hospital Heidelberg and the electronic documentation system (ISH-med 4.72, SAP, Walldorf, Germany). Descriptive statistical analyses were performed using Excel (Microsoft Office XP, Microsoft Corporation, Redmond, Washington, USA).

3. Results

During the 25-year period, 1003 distant flaps were performed at our department and were included in this analysis. We found a large difference in the overall number of distant flaps performed per year. In 1989 only 8 flaps were used and this number has continuously increased to 156 distant flaps used in 2011. The development of the overall number of distant flaps for oncologic patients per year is presented shown in Table 1.

The number of secondary reconstructions using distant flaps also increased nearly constantly each year, but only started in 1991 with 3 flaps (11.1% of all reconstructions that year) until 2011 with 49 flaps for secondary reconstruction (31.4% of all reconstructions that year). The relative development of secondary to primary head and neck reconstructions in our department is shown in Table 2. The number of different types of distant flaps in use also showed a remarkable development. In the late 1980s only the free radial forearm flap and the pedicled pectoralis major and latissimus flaps were in clinical use in our department. The types of flaps in use in this analysis can be roughly divided into microvascular flaps (i.e. radial forearm, lateral upper arm, antero-lateral thigh, scapula, fibula, iliac crest and jejunum flap) and avascular and pedicled distant flaps (i.e. pectoralis major, latissimus, trapezius, free rib, free iliac crest and free calvarial transplants). The overall number of different types of distant flaps used in head and neck reconstruction increased from 3 in 1987 to 9 in 2010 (see Table 3). Additionally, one could see a clear development to more microvascular flaps in clinical use than pedicled or avascular flaps. While pedicled flaps were more commonly used in the 1980s and the start of the 1990s, in recent years there was a clear predominance of microvascular flaps over avascular transplants (as shown in Table 4). This predominance of microvascular reconstruction in overall numbers becomes more significant if looked at from a percentage viewpoint. The proportion of microvascular to pedicled and avascular reconstruction went up to more than 90% microvascular flaps in 2011, but during the 1990s it was already close to 60% and close to 80% in 1996 (shown in Table 5).

Starting with only 3 different flap types in use in 1987, this number increased up to 9 different types in 2010, but some flaps were used more often than others and some are not used at all anymore (see Table 6). In the last years, soft tissue reconstruction was performed mainly using the free radial forearm flap and the ALT. Bony reconstruction was mainly dominated by the fibula and

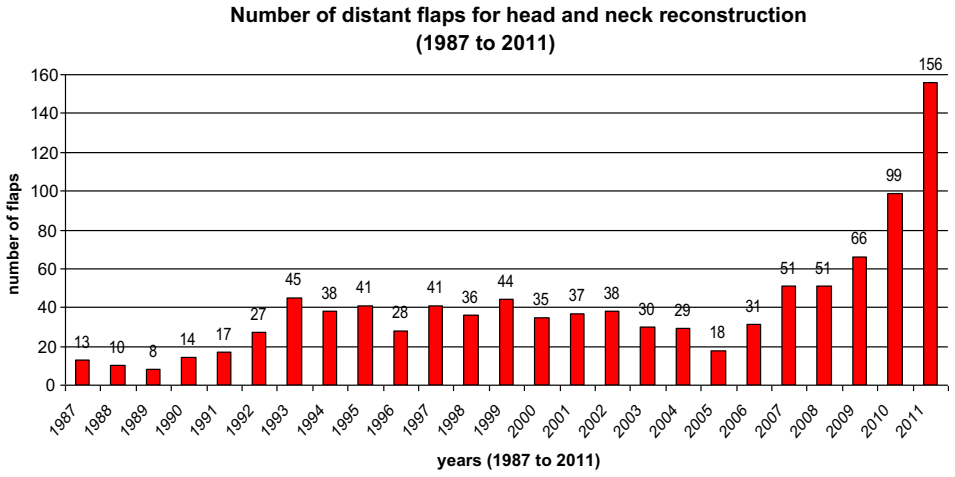

Table 1. Overall number of all distant flaps used in reconstruction of head and neck oncologic patients from 1987 to 2011.

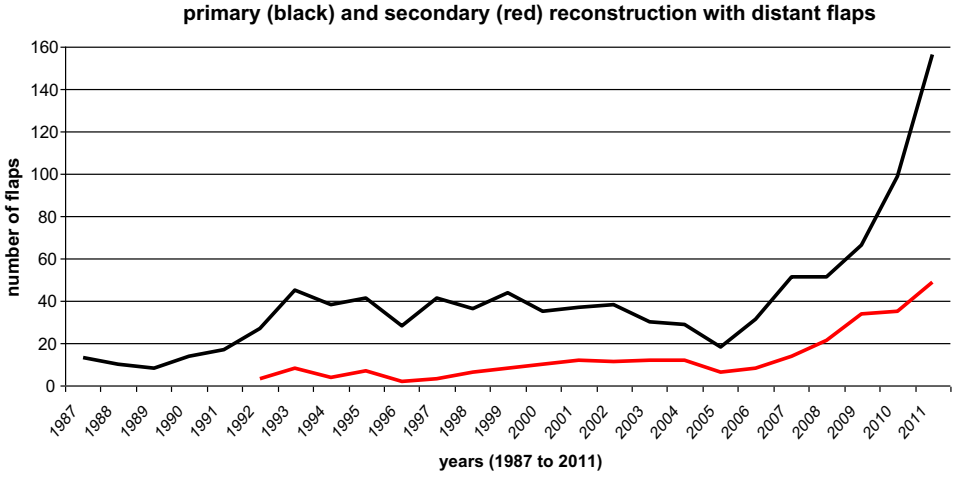

Table 2. Development of primary and secondary head and neck reconstruction from 1987 to 2011 using distant free flaps.