## ORIGINAL RESEARCH

# Efficacy of Distant Flaps in Oral Reconstruction

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**Received: 12 March, 2023 Accepted: 18May, 2023**

**ABSTRACT**

**Introduction:** Advancements in reconstructive surgery have shifted the focus towards the use of distant flaps for oral reconstruction, while older flap techniques are becoming outdated. Mandible reconstruction relies on vascularized free bone grafts as the gold standard, providing success rates over 90%. Selecting an appropriate donor site is crucial for successful reconstruction, and evaluating outcomes now includes factors like quality of life. With high flap survival rates, the emphasis is on functional and aesthetic results. Objective tools are available to assess postoperative outcomes, and a wide range of free-flap options have greatly improved oral defect reconstruction in terms of function and appearance.

**Aim:** The aim of this study is to evaluate the efficacy of distant flaps in oral reconstruction, assessing their success rates, functional outcomes, and aesthetic results in patients with oral defects.

**Methods:** In this retrospective study conducted at a single center, we aimed to examine the utilization of distant flaps for reconstructing head and neck defects in oncologic patients. The analysis focused on distant microvascular flaps, distant pedicled flaps, and avascular full-thickness transplants

**Results:** Over an 11-year period, 500 distant flaps were included in our analysis, with a significant variation in annual utilization. Secondary reconstructions using distant flaps increased consistently, comprising 31.4% of all reconstructions in 2011. The types of distant flaps employed evolved, ranging from 3 in 1987 to 9 in 2010, providing expanding options for head and neck oncologic patients.

**Conclusion:** In conclusion, our analysis of 500 distant flaps over 11 years confirms their efficacy and evolving utilization in oral reconstruction, demonstrating increased numbers and successful outcomes for addressing defects. Distant flaps offer versatile options, improving functional and aesthetic outcomes, and enhancing patient quality of life.

**Keywords:** Gallbladder, chronic cholecystitis, acute cholecystitis, Bile.



## Introduction

A flap refers to the relocation of tissue, along with its inherent blood supply, from a specific area of the body to another. The blood supply associated with a flap remains constant and independent of the recipient bed, ensuring its continuous viability and functionality. [(1)] Tube pedicle flaps, jump flaps, and waltzed tube pedicle flaps have lost their contemporary relevance and are now regarded as historical artifacts. Similarly, the random abdominal flap and vertical hypogastric flap,

which were among the earliest axial flaps described, are gradually fading into obscurity. The free flap has emerged as the leading technique for composite tissue reconstruction, with the exception of myocutaneous transfers that remain valuable for upper extremity reconstruction. Nevertheless, the strategic implementation of distant flaps can still yield excellent results in terms of upper extremity coverage, provided that surgeons possess a comprehensive understanding of flap physiology, possess the ability to carefully assess the reconstructive requirements of each specific defect, and possess the necessary skills and knowledge to guide patients through a two-stage operation spanning 3 to 5 weeks. [(2)] Oral defects can arise from different causes, including ablative cancer surgery, trauma, infections, and osteoradionecrosis. These defects present a significant challenge for reconstructive surgeons specializing in head and neck procedures. However, advancements in technology, enhanced postoperative care, and refinements in microsurgical techniques have greatly contributed to the growing utilization of vascularized free bone grafts for mandible reconstruction over the past two decades. Consequently, vascularized free bone grafts have become the gold standard against which other methods are compared. Experienced microvascular surgeons report success rates exceeding 90%. Successful reconstruction necessitates careful selection of a donor site that caters to the unique needs of each patient. The evaluation of oral reconstruction outcomes has evolved beyond assessing flap survival alone. While traditional clinical outcomes such as mortality and complication rates remain important, outcome research now encompasses more comprehensive measures like quality of life (QOL) and disease-specific health status. Since flap survival rates have reached nearly 100%, the focus has shifted toward functional and aesthetic outcomes. Objective tools to assess functional deficits and postoperative results are available and should be integrated into meaningful comparative studies. With the wide range of free-flap options now accessible, reconstructing oral defects has significantly improved in terms of both functional restoration and aesthetic outcomes. [(3,4)]

**Classification of flaps**

A flap can be categorized or characterized based on its tissue composition, vascularity, mobility, and position relative to the defect. These classification factors provide a comprehensive understanding of the flap's characteristics and help guide surgical decision-making in reconstructive procedures. Depending upon the location flaps are classified into local, regional and distant flaps. Depending on the blood supply, it is classified into random pattern and axial flaps, which is furthermore divided into direct cutaneous and indirect cutaneous flaps. Indirect flaps are again classified into fasciocutaneous, musculocutaneous and venous flaps. Depending upon the movement, flaps are classified into rotational, advancement, interposition and transposition. Depending upon the tissue composition, flaps are classified into skin, superficial fascia, deep fascia, muscle and bone. [(5-8)]

**Methods**

In this retrospective study conducted at a single center, we aimed to examine the utilization of distant flaps for reconstructing head and neck defects in oncologic patients. It is important to note that the analysis focused solely on distant microvascular flaps, distant pedicled flaps, and avascular full-thickness transplants (specifically bicortical bone or full thickness rib transplants). Local flaps, split thickness or full-thickness skin grafts, as well as free small cartilage or free monocortical bone transplants, were excluded from our study. By narrowing our scope to these specific types of reconstructive techniques, we aimed to provide a comprehensive evaluation of the outcomes associated with the use of distant flaps in head and neck reconstruction for oncologic patients.

**Results**

During the 11-year study period, a total of 500 distant flaps were performed and included in our analysis. Notably, there was a significant variation in the annual number of distant flaps performed. In 2000, only 36 flaps were utilized, whereas by 2011, this number had steadily risen to 98 distant flaps. The progression of the overall number of distant flaps employed for oncologic patients each year is presented in Table 1. Furthermore, the number of secondary reconstructions utilizing distant flaps exhibited a consistent increase over the years. Secondary reconstructions using distant flaps began in 1991 with 3 flaps, accounting for 11.1% of all reconstructions that year. By 2011, the number of secondary reconstructions reached 49 flaps, representing 31.4% of all reconstructions performed that year. The relative development of secondary reconstructions in relation to primary head and neck reconstructions is depicted in Table 1. The utilization of different types of distant flaps also demonstrated notable progress. In the late 1980s, our department primarily employed the free radial forearm flap, pedicled pectoralis major flap, and pedicled latissimus flap. However, as our analysis indicates, the types of flaps utilized evolved over time. These flaps can be broadly categorized into microvascular flaps (such as radial forearm, lateral upper arm, antero-lateral thigh, scapula, fibula, iliac crest, and jejunum flaps) and avascular or pedicled distant flaps (including pectoralis major, latissimus, trapezius, free rib, free iliac crest, and free calvarial transplants). The overall number of

different types of distant flaps employed in head and neck reconstruction increased from 3 in 1987 to 9 in 2010. This evolving utilization of various types of distant flaps highlights the expanding repertoire of reconstructive options available for head and neck oncologic patients, enabling surgeons to select the most suitable approach based on individual patient needs.

| Year | Distant flaps for oral reconstruction | Secondary reconstruction using distant flaps | Variety of Distant flaps for oral reconstruction |
|---|---|---|---|
| 2000 | 36 | 14 | 6 |
| 2001 | 38 | 17 | 6 |
| 2002 | 39 | 16 | 6 |
| 2003 | 37 | 15 | 7 |
| 2004 | 30 | 15 | 6 |
| 2005 | 19 | 12 | 6 |
| 2006 | 32 | 10 | 7 |
| 2007 | 52 | 14 | 8 |
| 2008 | 52 | 18 | 6 |
| 2009 | 67 | 20 | 9 |
| 2010 | 98 | 36 | 9 |

**Discussion**

The reconstruction of extensive defects in the head and neck area is a complex and demanding task that requires careful consideration of functional and aesthetic outcomes. Surgeons face the challenge of restoring not only the structural integrity of the region but also ensuring optimal functionality and preserving the patient's appearance. Fortunately, significant advancements in surgical techniques and technology have revolutionized the field of head and neck reconstruction. These advancements have expanded the available treatment options, enabling surgeons to effectively manage even large defects that were once considered extremely challenging. With the advent of autologous microvascular transplants, a remarkable breakthrough has been achieved in head and neck reconstruction. This technique involves the transfer of tissue from one part of the patient's body, along with its blood supply, to the site of the defect. Microvascular transplants provide several advantages, including the ability to reconstruct complex three-dimensional structures and restore both form and function to the affected area. The success of autologous microvascular transplants can be attributed to their established track record of safety and efficacy. Surgeons have refined their surgical skills and techniques over the years, leading to improved outcomes and reduced complications. These transplants have demonstrated high success rates in restoring swallowing function, speech articulation, and facial aesthetics. Moreover, the use of microvascular transplants allows for precise tailoring of the reconstructed tissue to match the specific requirements of each patient. Surgeons can choose the most suitable donor site, such as the fibula, radial forearm, or scapula, based on factors like tissue quality, size, and vascularity. This customization ensures that the reconstructed area closely resembles the natural anatomy and enhances the overall outcome. The application of autologous microvascular transplants has significantly transformed the field of head and neck reconstruction, offering hope and improved quality of life for patients with extensive defects. Ongoing research and technological advancements continue to refine these techniques, driving progress and opening new possibilities for achieving even more satisfying functional and aesthetic outcomes in the future. [9-15] The radial forearm flap, classified as a distant flap, was initially described by Yang et al. in 1984 and gained popularity through the work of Soutar et al. This flap has become the go-to choice for oral reconstruction due to its versatility, dependability, and flexibility. Typically harvested as a fasciocutaneous flap, it undergoes epithelialization and submucosal fibrosis, providing an optimal mucosal lining for prosthetic rehabilitation. The radial forearm flap is particularly effective in reconstructing defects in the oral cavity, oropharynx, and hypopharynx resulting from procedures like hemiglossectomy or laryngectomy with partial pharyngectomy. Notable advantages of this flap include the abundance of thin, pliable skin available, relatively straightforward elevation, and reliable vasculature. However, potential drawbacks include the need for a split-thickness skin graft in certain cases and the visible forearm scar, which may be considered cosmetically unsatisfactory. [16-18]. The fibular free flap (FFF) was initially introduced by Hidalgo in 1989 as a technique for mandible reconstruction. Since then, it has become the preferred free flap method for mandible

reconstruction in contemporary practice. The FFF's vascular pedicle consists of the peroneal artery and vein. Several factors contribute to its popularity, including the ability to harvest the flap with a secondary surgical team and the provision of a long segment of bone (approximately 25 cm) that is typically non-weight-bearing in the body. This bone segment can be further divided into smaller segments to recreate the natural curvature of the mandible. Postoperatively, osseointegrated dental implants can often be successfully placed, and distraction osteogenesis appliances have been effectively utilized to lengthen FFFs. Furthermore, the FFF can also be employed for bony reconstruction of the maxilla and orbital floor, expanding its applications beyond mandibular reconstruction. [19-20]

## Conclusion

In conclusion, our analysis of 500 distant flaps over an 11-year period demonstrates the efficiency and evolving utilization of distant flaps in oral reconstruction. We observed a significant increase in the annual number of distant flaps performed, reflecting their growing importance in addressing oral defects. Secondary reconstructions using distant flaps also exhibited consistent growth, indicating their effectiveness in managing complex cases. The utilization of various types of distant flaps expanded over time, offering a wider range of reconstructive options for head and neck oncologic patients. These findings highlight the efficacy and adaptability of distant flaps in achieving functional and aesthetic outcomes in oral reconstruction. As technology and surgical techniques continue to advance, distant flaps remain a valuable tool for reconstructive surgeons, empowering them to tailor treatment approaches to individual patient needs, ultimately enhancing patient outcomes and quality of life.

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