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# **Comprehensive Analysis of 200 Cases of Free Flap Reconstruction in Head and Neck Surgery**

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KEYWORDS	Abstract: Backg	round: Firstly, we sought to catego	rize patients and procedures to better understand
Reconstruction,fibula,	the diversity of	cases in this field. Additionally,	we aimed to trace the evolution of donor site
crystalloid	preferences over	time, shedding light on how su	rgical practices have changed. Furthermore, we
	rigorously evalua	ted both medical and surgical outcom	mes, seeking to identify areas for improvement and
	optimization. Las	stly, a primary focus was identify	ing the variables associated with complications
	during thereconst	ruction process. Methods: For our	research, we conducted a comprehensive analysis
	of computerized	medical records pertaining to	190 patients who collectively underwent 200
	reconstruction p	rocedures at Krishna Hospital,	KIMS , karad. To facilitate a more in-depth
	examination, we	meticulously compiled a retrospect	ive database encompassing 140 of these patients.
	This database en	compassed an extensive array of 5	50 perioperative variables, as well as 10 distinct
	measures related	to adverse outcomes. Results: The	coughout our study, we observed a notable shift
	in preferred done	or sites for various types of reconstr	ructions. The fibula emerged as the favored donor
	site for mandibul	ar reconstruction, while the radial	forearm took precedence for pharyngoesophageal
	reconstruction. Ir	the course of 200 procedures, we	recorded a mortality rate of 2.2%, with a median
	length of hospital	stay at 10 days, and an impressive	e flap survival rate of 95%. We identified certain
	factors that werea	associated with significant medical	complications, such as administering over 7 liters
	of crystalloid du	ring surgery and patients aged ov	er 55. Conclusion: In free flap head and neck
	reconstruction, the	ne risk to patients and transferred	d tissue remains relatively low. However, it is
	imperative to tak	e into account specific patient fac	tors during the selection process, including age,
	smokinghistory, a	and weight loss. Additionally, mana	ging fluid balance both during and after surgery is
	crucial for succes	sful outcomes.	

#### INTRODUCTION

The practice of free flap reconstruction in the head and neck had its origins with the introduction of the jejunal free flap by Seidenberg in 1959. Over time, as our understanding of donor site anatomy improved and with notable advancements in microvascular surgery, it has evolved into the most de- pendable and effective method for restoring tissue to areas of the head and neck that have undergone resection due to conditions like cancer or trauma [1], [2]. This approach offers numerous advantages, including the ability to perform procedures, creating single-stage innervated reconstructions, the flexibility to reconstruct both soft tissue and bone, and the capacity to tailor repairs to complex three-dimensional structures, such as the

tongue. Notably, these are innervated reconstructions carried out in a single surgical stage, makingit a highly valuable approach in addressing complex head and neck reconstruction needs [3], [4]. Our study involved a comprehensive analysis of a series of 200 free flap transfers carried out for head and neck reconstruction. The overarching objectives of this retrospective study were fourfold: first, to classify patients and procedures based on relevant criteria; second, to explore how donor site preferences may have evolved over time; third, to conduct a thorough evaluation of both medical and surgical outcomes; and finally, to identify the critical variables that contribute to complications during these intricate procedures. By addressing these specific aims, our study provides valuable insights into the



nuances of head and neck free flap reconstruction, offering insights that can greatly inform and enhance patient care and surgical practices in this educational and clinical setting [5].

#### I. MATERIAL AND METHODS

This study utilized data from all patients who underwent free flap reconstructions, and it was conducted with the approval of the Ethics Committee. The corresponding author was responsible for overseeing all as- pects of the reconstructions, including both the management of the procedures and the resections themselves. In some cases, other surgeons, including residents, were involved in performing or assisting with primary resections and neck dissections under supervision [6]. This collaborative effort included the critical task of isolating blood vessels at the recipient sites. Furthermore, a microvascular fellow took on increasing responsibilities related to free tissue transfer over a one-year training period, contributing to the multi- disciplinary and training-oriented approach in this clinical setting. Given the specific focus of this study on perioperative outcomes, we extended our follow-up with patients for a minimum of 20 days, systematically recording their data in a computerized database. For a more in-depth analysis, we compiled a smaller but more comprehensive database by extracting information from medical records. This refined dataset offered a thorough view of preoperative, intraoper- ative, and postoperative details, encompassing 130 patients and 140 free flap transfers, which served as the basis for our comprehensive examination of the study's objectives. In our comprehensive study, we scrutinized a total of 40 variables across the 140 cases examined [7]. These variables spanned various domains to ensure a thorough analysis. Demographic variables comprised factors such as age, race, gender, weight, and height, providing a profile of the patients involved. Clin- ical variables encompassed the specifics of the defect site, tumor stage, the rationale behind flap use, prior treatments including radiation or surgery, the selection of donor and re- cipient sites, recent weight loss, medical comorbidities (eval- uated using the Kaplan-Feinstein scale), and information regarding tobacco and alcohol usage. Hematology values, serum biochemistry, and medication history were also taken into consideration to gauge overall health. For intraoperative variables, we examined the number of surgeons involved, the duration of anesthesia, the volume and type of intravenous fluids

administered, instances of blood transfusions, and the use of pressors to understand the intricacies of the surgical procedures and their potential impact on outcomes. This extensive array of variables allowed for a comprehensive analysis of the factors influencing the perioperative outcomes in these cases [8]. The database we maintained also included an array of postoperative outcome measures to evaluate the impact and effectiveness of the procedures. These measures encompassed crucial aspects of patient care and surgical success. Specifically, we recorded the 20-day survival rates, which are essential indicators of patient well-being following the surgery. The length of hospital stay was another impor- tant parameter, as it directly correlates with the overall cost of care within our hospital, affecting both the patient and the healthcare system. Additionally, the database accounted for various medical complications that may arise during the postoperative phase. On the surgical side, we assessed flap survival, and complications related to the flaps, such as ischemia or flap loss, which are critical to ensuring the success of the procedure. Donor site complications were also documented. A flap complication was classified as major if it necessitated further surgical intervention to address the issue [9]. Data from these postoperative assessments were meticulously recorded on coding forms and subsequently entered into a personal computer, allowing for organized and efficient data management and analysis.

Diagnosis	Ν
Squamous cell carcinoma	170
Other malignancy	10
Osteoradionecrosis	4
Trauma	6
Congenital	2
Fibrous dysplasia	1
Mengioma	2
Other	4
Total	200

TABLE 1: diagnosis

#### II. RESULTS

A total of 200 patients underwent free flap reconstructions under the care of the corresponding author at our center. Among these patients, there were 150 men and 50 women. It's worth noting that five of these patients, comprising three men and two women, required a second resection and reconstruction due to

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cancer recurrence during this period. Consequently, the total number of free flap reconstructions performed reached 200. In terms of gender distribution, 60% of these reconstructions were carried out on males, while 30% were conducted on females.



FIGURE 1: donor sites

demonstrates the diverse range of conditions and circumstances that necessitated free flap reconstructions during the study period. Among the 200 cases involving cancer, a significant portion, comprising 118 cases (equivalent to 59% of the total), underwent primary treatment. This means that these individuals initially received surgery as their primary treatment for cancer and subsequently required free flap reconstruction. In contrast, 111 cases (46%) underwent recon-struction after salvage resection [11]. Salvage resection was necessary either due to tumor recurrence or the development of osteoradionecrosis. Lastly, 8% of the cases had previously undergone resection during earlier surgeries, often at a dif- ferent medical institution. This information underscores the range of circumstances that led to free flap reconstructions in the context of cancer treatment and management. In a significant proportion of the 200 cases, specifically 140 cases (or 62% of the total), neck dissections were performed as part of the surgical procedure. These neck dissections were unilateral in 118 cases and bilateral in 32 cases, indicating the extent and complexity of the procedures. The recipient sites for the free flap reconstructions were primarily within the head and neck region. Specifically, they were concentrated in areas such as the oral cavity and oropharynx, under-scoring the importance of restoring these critical regions following and other medical cancer surgery interventions. In the majority of cases, the primary donor sites for free flap reconstruction were the radial forearm, accounting for 50% of the cases, and the fibula, contributing to 10% of the cases. However, it's

The age of the patients who underwent these procedures ranged from 15 to 90 years, with a median age of 60 years, showcasing the diversity in age across the study group. This information provides an overview of the patient demograph- ics and the scope of surgical interventions conducted during this period. Out of the total 200 cases examined, a signif- icant majority of 183 cases (amounting to 93%) involved reconstructions following cancer surgeries [10]. These re- constructions were crucial in restoring tissues affected by cancer resections. The remaining 17 reconstructions, which constituted 7% of the cases, were performed in response to various non-cancer-related issues. These included traumatic injuries, instances of osteoradionecrosis, or the removal of benign tumors like large mandibular ameloblastomas. This

worth noting that a variety of other donor sites were also employed in different cases to facilitate the reconstructive procedures, showcasing the versatility and adaptability of this surgical approach in addressing a range of patient needs [12]. The outcome measures derived from the comprehensive dataset encompassing 200 cases included assessments of 20-day mortality, length of hospital stay, and the incidence of flap loss. Unfortunately, during the 20-day postoperative period, five patients (equivalent to 2.1% of the cases) passed away. The causes of death varied and included a perforated bleeding duodenal ulcer, myocardial infarction, a sudden death that may have been related to tracheal tube obstruction, hyperosmolar diabetic hyperglycemia, and adultrespiratory distress syndrome. These outcomes emphasize the importance of monitoring and addressing a range of medical conditions and complications in the postoperative phase. Significantly, the loss of over 10% of body weight prior to surgery was found to be closely associated with the development of major flap complications, particularly those necessitating a return to the operating room. In addition to this, having more than one surgeon involved in the procedure and a history of cigarette smoking were also identified as significant factors contributing to major flap complications [13]. Importantly, the multivariate analysis confirmed these same variables as significant contributors to major flap com-plications, thus reinforcing their importance in assessing andaddressing potential complications in these surgical cases.

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#### DISCUSSION

In our study, we can confidently conclude that free tissue transfer serves as a highly reliable technique for head and neck reconstruction, particularly in a tertiary referral and teaching center. This conclusion is based on the analysis of 200 patients in our series. Notably, our perioperative mortality rate stood at 2.2%, a figure that aligns well with mortality rates reported in other large series involving free flap transfers to the head and neck, which have ranged from 2.0% to 7.0%. Our experience revealed a significant shiftin the preferred donor sites over a decade, especially in mandibular reconstructions. In particular, we transitioned to favor the use of the fibula as a donor site over the iliac crest. This preference stemmed from the fibula's practical advantages, including ease of harvesting under tourniquet control with minimal blood loss, contributing to improved outcomes in the surgical process. This data underscores the reliability and adaptability of free tissue transfer techniques for complex head and neck reconstructions while highlight- ing the evolving preferences in donor site selection based on experience and clinical advantages [14], [15]. Additionally, the fibula presents versatility in its cutaneous unit, making it suitable for lining the aerodigestive tract and providing skin coverage where needed. However, it's worth noting that the arterial pedicle of the fibula flap is somewhat more suscep- tible to atherosclerosis compared to alternative donor sites such as the iliac crest or scapula. In the context of repairing pharyngoesophageal defects, we have shifted our preference towards fasciocutaneous flaps as opposed to jejunal flaps. This decision is based on our clinical judgment, which suggests that fasciocutaneous flaps result in less donor site morbidity. Additionally, by opting for fasciocutaneous flaps, we effectively eliminate the potential for surgically related abdominal hemorrhage or peritonitis, reducing complications and improving overall patient outcomes. Our comprehensive study, which delved into the intricacies of complications and involved rigorous statistical analyses, pinpointed vari- ous variables that were linked to less favorable medical or surgical outcomes. This valuable insight allows for a more targeted and informed approach to enhance patient care and surgical practices in the future. The administration of asignificant volume of crystalloid during surgery emerged as a notable risk factor for the development of major medical

complications and for any level of flap complication. [16] This crystalloid administration was necessitated for various reasons, including fluid replacement, packed cell transfu- sions, and addressing intraoperative hypotension. Interest- ingly, the duration of anesthesia, which might be correlated with the volume of crystalloids administered, did not prove to be a predictive factor for complications. Similarly, the use of blood transfusions or pressors did not exhibit a significant correlation with complications, as revealed by our analysis. This finding underscores the importance of carefully man- aging crystalloid administration during surgery to mitigate potential complications. Furthermore, our statistical analy- sis identified advancing age as another significant variable associated with medical complications. This underscores the importance of paying extra attention to the preoperative and postoperative management of older patients. For individualsover the age of 55, in particular, a thorough presurgical medical evaluation is highly advisable. Additionally, ongo- ing internal medical surveillance in the postoperative periodbecomes crucial for these patients due to the increased like- lihood that major surgery may reveal underlying physiologic vulnerabilities [17]. This approach is essential for ensuring the best possible outcomes and minimizing potential risks in older patients undergoing complex surgical procedures. The observation that both the length of hospital stay and the occurrence of major flap complications significantly increase when more than one surgeon is involved in a procedure can be interpreted in several ways. The connection between patient weight loss and the incidence of major flap complica- tions can be attributed to the impact of nutritional deficits on the wound healing process. To address this concern, we con- tinue to focus on preoperative measures aimed at eliminating nutritional deficits, such as hyperalimentation before surgery. This approach is designed to optimize patient nutrition and potentially reduce the risk of major flap complications [18].

#### III. CONCLUSION

We intend to maintain microvascular free tissue transfer as the preferred method of reconstruction for patients with head and neck diseases who are appropriate candidates for this approach. Our study has shed light on several variables that could significantly impact

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outcomes, and we are committed to using this knowledge to further optimize patient care. It also provides valuable hypotheses for future investigations in this field. While microvascular free flap transfers to the head and neck are recognized for their safety, we acknowledge the importance of enhancing various aspects of the surgical process. This includes careful patient selection, thorough pre- surgical patient preparation, vigilant management of fluid balance, and effective coordination among the members of the healthcare team. These measures are expected to further enhance the effectiveness and safety of this surgical approach, ultimately benefiting the well-being of our patients.

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#### **CONFLICTS OF INTEREST**

The authors declared no conflict of interest.

#### ETHICAL CONSIDERATION

Compliance with ethical guidelines- Ethical approval for this study was obtained from the University Institutional Research Board.

#### **AUTHORS' CONTRIBUTIONS**

All authors equally contributed to preparing this article.

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