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Review Article

Cleft palate: historical treatments and current management

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ABSTRACT

The soft palate is an indispensable anatomical component that serves crucial functions such as airway maintenance, swallowing facilitation, and speech enablement. Significant morbidity results from excisional surgery that disturbs the functional architecture of the soft palate; furthermore, the intrinsic velar musculature cannot be adequately restored with prosthetic or flap reconstructions. When managing oral malignancies that affect the soft palate, achieving oncological control and reducing the incidence of complications and adverse effects are the principal goals. In the contemporary era of microsurgical practice, research groups are not solely focused on achieving successful flap procedures and oncological excision, but also on improving functional outcomes. A suprafascial ALT flap was surgically constructed in this instance to optimize the functionality of the remaining velar muscles and provide additional volume. The method of treatment is determined by the defect's dimensions and the anatomical components that are extracted. It is advisable to perform direct repair for full-thickness injuries. However, nonanatomic reconstruction is employed for full-thickness injuries that are "near-total to total," or exceeding 70%, with the addition of a fascial splint to restrict the velopharynx. A two-layer closure technique, the use of a fascial sling, the positioning of the skin vessel/perforator, the incorporation of the vastus lateralis muscle, the maintenance of a minimal distance between the point of entry into the muscle and the point where the perforator branches off, and the verification of the muscle's vitality prior to finalizing the closure are all recommended approaches for managing velopharyngeal constriction. In summary, the utilization of an anterolateral thigh (ALT) free flap technique in palate reconstruction yields advantageous functional outcomes while minimizing donor site complications.

Keywords: Free flap, Microsurgery, Cleft palate

INTRODUCTION

The soft palate, a naturally movable and intricately complex three-dimensional structure, plays an essential role in several critical physiological functions. It is indispensable for maintaining an open airway, facilitating the act of swallowing, and enabling the articulation of speech. The integrity of the soft palate's functional architecture is paramount; as even mild morbidity can result from excisional procedures that disrupt its delicate structure. Traditional flap reconstructions and prosthetic interventions often fall short in restoring the intrinsic musculature of the soft palate, leaving patients with suboptimal outcomes. Additionally, the potential requirement for further radiation therapy can be particularly debilitating, exacerbating the challenges faced by patients. In the context of managing oral malignancies that involve the soft palate, achieving oncological control while minimizing complications and adverse effects stands as the primary objective for healthcare providers. Post-surgical complications can be numerous and impactful. In the immediate aftermath of surgery, patients may experience issues such as infections and the development of anomalous connections, known as fistulas, between the oropharynx and nasopharynx. These complications can significantly hinder recovery and affect the patient's quality of life. The long-term restoration of pharyngeal functions, particularly those involving speech and ingestion, is crucial for patient satisfaction following reconstruction. Successful rehabilitation of these functions is strongly correlated with the patient's overall contentment and quality of life post-surgery. However, the complexity of late palate repair can introduce additional challenges. Over time, the predictability of speech outcomes may deteriorate, and patients might experience an increase in nasal regurgitation, which can be distressing and uncomfortable. Therefore, the pursuit of optimal treatment strategies is imperative. This includes meticulous surgical techniques, comprehensive rehabilitation programs, and ongoing support to address the multifaceted needs of patients. By focusing on these aspects, healthcare providers can enhance the prospects of achieving satisfactory functional and aesthetic outcomes, ultimately improving the long-term well-being of individuals undergoing soft palate reconstruction.[1-6]

In the contemporary era of microsurgical practice, research groups are not solely focused on achieving successful flap procedures and oncological excision, but also on improving functional outcomes. Consequently, metrics of patient-reported outcomes and assessments of quality of life have been incorporated into the definition of excellence. The scope of surgical success has broadened to encompass not just the immediate technical achievements but also the long-term well-being of patients. This holistic approach recognizes that the ultimate goal of medical interventions is to enhance the overall health and satisfaction of individuals. Modern microsurgical techniques have advanced significantly, allowing for more precise and less invasive procedures. These innovations are crucial in the treatment of complex conditions affecting delicate structures such as the soft palate. However, the impact of surgery extends beyond the operating room. Postoperative recovery, the restoration of functions such as speech and swallowing, and the psychological and social aspects of healing are now considered vital components of successful treatment. Patient-reported outcomes provide valuable insights into how patients perceive their recovery and the effectiveness of their treatment. These metrics help to capture the nuances of individual experiences, which might not be fully reflected in clinical or surgical measures alone. By integrating these perspectives, healthcare providers can tailor their approaches to better meet the needs and expectations of their patients. Quality of life assessments offer a comprehensive view of how medical interventions affect a patient's daily living and overall happiness. These assessments consider physical, emotional, and social dimensions, providing a multidimensional evaluation of health outcomes. By prioritizing quality of life, medical professionals acknowledge the importance of maintaining a balance between treating the disease and preserving the patient's lifestyle and mental well-being. Incorporating patient-reported outcomes and quality of life assessments into the definition of excellence ensures that the standards of care continue to evolve. This patient-centered approach fosters continuous improvement in medical practices, encouraging the development of techniques and treatments that are not only effective but also enhance the lived experiences of patients. Through this holistic perspective, the field of microsurgery aims to achieve the highest possible standards of care, ultimately leading to better health outcomes and greater patient satisfaction.[7-9]

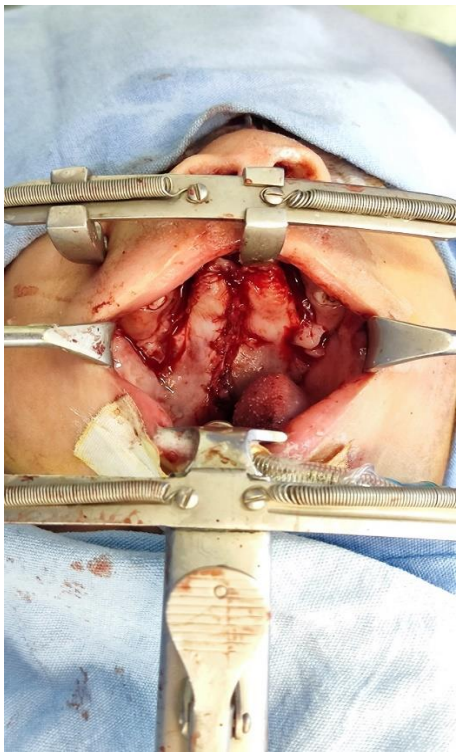

Figure 1: Pushback technique.

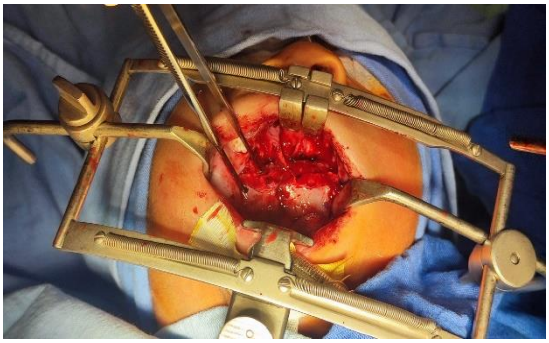

Figure 2: Pushback technique.

SURGICAL TECHNIQUE

A suprafascial ALT membrane was surgically constructed to provide additional volume, with or without the vastus lateralis muscle. A free flap was implemented through the utilization of a modified port method. In order to optimize the functional benefit of the remaining velar muscles and facilitate the closure of the oronasopharyngeal opening, thereby enabling the implantation of a nasogastric tube, a free flap was employed to cover the vacant space. The treatment approach is specified below and is applicable to both the defect's dimensions and the anatomical components that were extracted. When muscle is incorporated into the membrane, a "combined" technique is implemented. The process entails conventionally elevating the anterolateral thigh (ALT) above the fascia. This muscle segment is supplied by the distal discharge of the descending branch of the lateral circumflex femoral arteries. This facilitates an increased degree of adaptability in the placement of the muscle segment in order to eradicate vacant space.[4] Deficits of the soft palate, which may be accompanied by abnormalities of the hard palate, that are distinct or unrelated to other structures.[10]

Direct restoration is advised for injuries to the entire thickness that are equal to or smaller than 25% in magnitude. Initial attempts were made to reduce the diameter of the velopharynx by 25–70% by employing a full-thickness technique. A two-layer technique was employed to sew the musculature of the soft palate and the posterior mucosal layer together. A cutaneous ALT (anterolateral thigh) graft was utilized to replace the outermost layer of tissue (oral lining) on the soft palate and possibly the hard palate. This graft did not contain the deep fascia. It was extracted from the thigh. Complete thickness, "near-total to total," in excess of 70%: The cutaneous anterolateral thigh (ALT) flap was partially pleated to prevent exposure of the pedicle to the airway during a nonanatomic reconstruction. A fascial splint was incorporated and employed to apply pressure to the velopharynx; it was positioned at a 90-degree angle with the long axis of the skin flap. When cutaneous ALT was necessary to address abnormalities, a thin flap was produced strategically in patients with thick quadriceps by either distally constructing the skin paddle or physically thinning it.[11]

Soft palate defects, in addition to deficiencies in the maxillectomy and/or marginal mandibulectomy regions.

The approach utilized for soft palatal access was indistinguishable from the one previously delineated. In this instance, however, a segment of the vastus lateralis muscle supplied by the distal discharge of the descending branch of the lateral circumflex femoral artery was coupled with the ALT flap. In order to prevent the restriction of the newly formed soft palate or to restore the vertical dimension of the mandible subsequent to marginal mandibulectomy, the muscle fragment was employed to completely eradicate the maxillary sinus. Similar to how the cutaneous portion of the membrane was purposefully rendered thin, it was designed to be more malleable. This was accomplished by generating it at the thigh's extremity and reducing its thickness as necessary. In the event that a fully open sinus could not be achieved following low maxillectomy, the thicker and more contiguous segment of the ALT flap was employed to seal the maxillary aperture in lieu of the muscle. When the patient had a substantial thigh, the skin implement was constructed in a manner that was closer to the body or left unaltered in these situations. In most cases, the requirement for a membrane containing mixed or chimeric muscles would be predicted beforehand. Nevertheless, in situations where doubt arose, the branch that supplied nourishment to the muscle was identified and safeguarded throughout the dissection of the flap. This enabled the determination of whether to incorporate the muscle be delayed until the surgical outcome was determined, taking into consideration variables such as the dimensions of the void or the severity of the defect caused by the marginal mandibulectomy,[12-14]

TIPS

In order to treat velopharyngeal constriction, a two-layer closure technique is implemented. This requires mattress sutures to be used to suture the posterior lamina, followed by sutures to the soft palate musculature.[15]

The sling of fascia: a) in order to achieve adequate constriction, the fascial ligature is decreased by 25% in length relative to the breadth of the palatal defect, b) the utilization of vascularized fascia is recommended. The flap has been meticulously designed with pre-inset and pre-division. Alternatively, one may incorporate a wider segment of fascia at the extreme end of the flap and subsequently trim away the surplus while repositioning the flap.[16,17]

Vein or perforator of the skin: a) positioned in an off-center manner, b) it is imperative to position an adequate quantity of skin paddle in close proximity to the body in order to effectively safeguard the skin vessels and impede their exposure to the airways.[18,19]

The vastus lateralis muscle derives from the descending branch's distal discharge. Suppress the underlying fascia in order to augment stability. It is crucial to ensure that there

is a minimum distance of 5 cm between the point of perforator insertion into the muscle and the point of branching off in order to avoid any hindrance or restriction throughout the insertion procedure. Confirm the muscle's vitality before finalizing the closure.[20,21]

Prevention of fistulas: it is critical to ensure that the suture captures both sides of the flap at its maximum depth when suturing the flap skin to the firm palate. A full-layer capture indicates the inclusion of the periosteum, the tissue that envelopes the bone, on the palatal side; avoid cutting or severing needles. However, if forced to make a decision, it is recommended to opt for reverse trimming; c) thickness or weight should never be added to the cover. By doing so, the risk of suture line tearing and subsequent airway obstruction is mitigated. Conform to the intended degree of refinement and tidiness.[22-25]

CONCLUSION

By utilizing an anterolateral thigh (ALT) free flap, a method of palate reconstruction is accomplished that significantly enhances the functionality of the remaining velar muscles while preserving the structure of the associated tissues at the donor site. This innovative approach leverages the robust vascular supply and ample tissue volume of the ALT flap, making it an ideal choice for reconstructing the soft palate. The ALT free flap method yields several advantages. Firstly, it improves the functionality of the velar muscles, which are crucial for activities such as speaking and swallowing. By using the patient's own tissue, the reconstruction achieves a more natural and effective integration with the existing musculature, facilitating better movement and control. This method also preserves the intricate structure of the tissues at the donor site on the thigh, minimizing potential complications and ensuring that the donor area heals well with minimal morbidity.

Furthermore, the ALT free flap technique is associated with favorable functional outcomes. Patients typically experience a restoration of essential soft palate functions, leading to improved speech clarity and swallowing ability. The use of the ALT flap reduces the risk of complications such as fistula formation and infection, which are common concerns in other reconstructive approaches. Minimal complications are a hallmark of the ALT free flap method. The careful harvesting and precise placement of the flap contribute to a lower incidence of adverse effects, promoting a smoother and faster recovery process. Additionally, the robustness of the ALT flap ensures a reliable and durable reconstruction, enhancing the long-term success and satisfaction of patients. In summary, the anterolateral thigh free flap offers a highly effective solution for soft palate reconstruction. By improving the functionality of the remaining velar muscles and preserving the integrity of the donor site, this technique achieves excellent functional outcomes with minimal complications, making it a preferred choice in modern microsurgical practice.

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