Tongue Flaps

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KEYWORDS

• Tongue flap • Flap reconstruction • Oral and maxillofacial surgery

KEY POINTS

- Although limited to anatomic defects located within a short arc of rotation, the dorsal or lateral tongue flap, when indicated, is a safe, reliable, and low-morbidity reconstructive option.
- The dorsal or lateral tongue flap is particularly useful for defects in the palate, floor of mouth, pharynx, and buccal mucosa.
- Complications are rare and usually minor. It is imperative, however, that a well thought out strategy for airway management is planned, especially for the second-stage procedure.

INTRODUCTION AND HISTORY

Historically, intraoral flap reconstruction in oral and maxillofacial surgery (OMS) primarily involved simple buccal or palatal sliding flaps to cover oral-antral fistulas or an occasional intraoral small bone graft. Over the past decade, however, the specialty of OMS has evolved and expanded the wide range of procedures and diseases that are treated on a daily basis that necessitate soft tissue coverage. The ever-increasing use and sophistication of dental implants require equally sophisticated local soft tissue management, and the greater involvement of the OMS in the extirpation and reconstruction of cancer has led down the path of distant flap transfer and microvascular free tissue flaps. At the same time, new or newly recognized conditions, such as osteoradionecrosis and bisphosphonate-related osteonecrosis of the jaws, have created a new population of patients needing complex tissue coverage.

As the number of procedures needed has increased, so have the variety and complexity of possible flap designs. An ideal flap would be simple to perform in an office or as an outpatient procedure, have little down time for patients, have minimal complications, and provide ample and supple tissue to any area of the mouth or face as needed. Although no perfect flap exists to date, the tongue flap meets many of these criteria and has, over time, proved a utilitarian, reliable flap that can be used in many common defects. In addition, unlike many of the distant and microvascular flaps that require additional subspecialized or fellowship training, the tongue flap is well within the scope of practice and training of just about any practicing oral and maxillofacial surgeon, not only related to the procedure itself but also the management of its few potential complications.

Although the tongue flap seemingly is currently having resurgence in popularity, it is not a new procedure. The procedure was first described more than 100 years ago, initially by Eiselsberg for intraoral defects and soon after by Lexer, who described its use for defects of the retromolar trigone and tonsillar areas.[1,2] Technical difficulties precluded its widespread use until several articles in the 1950s and 1960s described technical advancements that made this flap a useful and viable tool to manage closure of palatal defects and oral-antral fistulas.[3] Since that time, there have been many articles describing the use of this flap in its various formats (lateral, dorsal, anterior based, posterior based, and so forth) for transposition into a variety of defects.

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APPLIED SURGICAL ANATOMY

The tongue is a muscular hydrostat (functional muscular tissue without skeletal support) formed by a mass of skeletal muscle covered with keratinized stratified squamous epithelium. On average, the tongue is 12 to 14 cm in length.[4] Embryologically, the tongue is formed from components of the first 4 pharyngeal arches. The anterior two-thirds of the tongue lie in the oral cavity and are derived from the first pharyngeal arch, whereas the posterior third is contained in the oropharynx and hypopharynx and is derived from the third pharyngeal arch.[5] The tongue functions in deglutition (swallowing), mastication (chewing), gustation (tasting), and phonation (vocalization).

The tongue is divided into right and left halves by a median fibrous septum. The muscles of the tongue are attached to the hyoid bone, mandible, styloid process, palate, and pharynx. The tongue musculature is divided into 4 intrinsic and 4 extrinsic muscles. All the tongue muscles are innervated by the hypoglossal nerve (cranial nerve XII), except for the palatoglossus muscle, which is innervated by the pharyngeal plexus of the vagus nerve (cranial nerve X). The intrinsic muscles of the tongue are used to change the shape of the tongue and do not attach to bone or aid in movement. The intrinsic tongue muscles include the superior longitudinalis, the inferior longitudinalis, the transversus, and the verticalis muscles. The extrinsic muscles of the tongue all originate from bone and function to allow tongue movement. The extrinsic tongue muscles include the genioglossus, the hyoglossus, the styloglossus, and the palatoglossus muscles.[5,6]

The anterior and posterior parts of tongue are separated by the V-shaped sulcus terminalis. The foramen cecum is located in the midline, approximately 2.5 cm anterior to the tongue base, at the junction of the 2 arms of the sulcus terminalis. Neurologically, the general somatic afferent innervation to the anterior two-thirds of the tongue is via the lingual branch of the third division of the trigeminal nerve (cranial nerve V), and taste sensation is via the chorda tympani, which is a branch of the facial nerve (cranial nerve VII) traveling with the lingual nerve. The general visceral afferent innervation and taste sensation to the posterior third of the tongue are supplied via the glossopharyngeal nerve (cranial nerve IX).[5,6]

The blood supply of the tongue is supplied via the lingual artery, the tonsillar branch of the facial artery, and the ascending pharyngeal artery. The vast majority of the blood supply of the tongue is via the lingual artery, which is the third direct branch of the external carotid artery. The lingual artery arises from the anterior surface of the external carotid artery at the level of the greater horn of the hyoid bone in the Pirogoff triangle (formed by the intermediate tendon of the digastric muscle, the posterior border of the mylohyoid muscle, and the hypoglossal nerve). The anatomic location of the lingual artery has also be described using the Lesser triangle (formed by the hypoglossal nerve and the anterior and posterior bellies of the digastric muscle), with the artery lying within the triangle deep to the hyoglossus muscle. Access to the Pirogoff and Lesser triangles is clinically important because they allow for ligation of the most proximal trunk of the lingual artery. The lingual artery passes deep to the hyoglossus muscle and lies on the middle pharyngeal constrictor as it advances into the posterior lateral tongue. The lingual artery gives rise to the suprahyoid artery, the dorsal lingual artery, the sublingual artery, and the deep lingual artery. The suprahyoid artery travels along the superior border of the hyoid bone and supplies the suprahyoid musculature. The dorsal lingual artery arises caudal to the hyoglossus muscle and supplies the dorsum of the tongue, the vallecula, tonsils, glossopalatine arch, and the adjacent soft palate. In the tip of the tongue, the ranine branch anastomoses the bilateral dorsal lingual arteries into a rich plexus. The sublingual artery arises at the anterior border of the hyoglossus muscle and travels along the genioglossus muscle and sublingual gland toward the midline where it anastomosis with the opposite side. The sublingual artery supplies the mylohyoid muscle, the sublingual gland, the floor of the mouth, and the lingual mandibular alveolus and gingiva. It also has a branch that pierces the mylohyoid muscle and anastomoses with the ipsilateral facial artery. The deep lingual artery is the terminal branch of the lingual artery, which travels a torturous course along the ventral surface of the tongue lying on the inferior side of the inferior longitudinalis muscle, the lateral surface of the genioglossus muscle, and just deep to the ventral mucosa toward the tip of the tongue. After traversing the hyoglossus muscle, the deep lingual artery travels with the lingual nerve. The bilateral deep lingual arteries anastomose posteriorly via the transverse lingual artery and at the tip of the tongue via a large anastomotic plexus.[5,6] Clinically, the rich anastomotic plexuses formed between the branches of the bilateral lingual arteries make hemorrhage control difficult with only unilateral lingual artery ligation.

The paired lingual veins are formed from the tributaries of the deep lingual veins, sublingual veins, suprahyoid veins, and the dorsal lingual veins. The lingual veins drain directly into the internal