Stent fabrication for graft immobilization following wide surgical excision of myofibroblastic sarcoma of the buccal mucosa: A clinical report

Ioli-Ioanna Artopoulou, DDS, MS,[a] James C. Lemon, DDS,[b] Gary L. Clayman, DDS, MD,[c] and Mark S. Chambers, DMD, MS[d]
University of Texas M.D. Anderson Cancer Center, Houston, Tex

Sarcomas of the head and neck are rare tumors derived from cells of mesenchymal origin. This article briefly discusses the epidemiology, etiology, and classification of head and neck sarcomas. Emphasis is placed on myofibrosarcoma, a malignant tumor of the myofibroblasts. Histologic criteria, prognostic factors, and the multidisciplinary management of these tumors are reviewed. A situation of a surgically excised myofibrosarcoma of the buccal mucosa is reported. In this patient, a stent was fabricated to stabilize a split-thickness skin graft used for the buccal mucosa reconstruction. (J Prosthet Dent 2006;95:280-5.)

Sarcomas are rare neoplasms, accounting for only 1% of all cancer diagnoses in the United States.[1,2] These tumors do not commonly manifest as primary malignancies in the head and neck region except in the pediatric population, in which 35% of all sarcomas affect the head and neck region.[3] Sarcomas of the head and neck area account for only 1% of all head and neck primary cancers.[4] A review of the admissions records of The University of Texas M.D. Anderson Cancer Center (MDACC) for the past 30 years revealed that more than 30,000 new patients were registered by the Department of Head and Neck Surgery, and only 802 of these patients were diagnosed with sarcomas.[5] In most studies, head and neck primary sarcomas represent only 5% to 15% of all sarcoma cases in adults.[6,7] Gorsky and Epstein[8] reviewed a tumor registry of a period of over 45 years and identified a total of 11,250 patients diagnosed with head and neck cancer in British Columbia. Of those head and neck cancers, 139 were sarcomas; 16 (0.14%) of the sarcomas were of intraoral soft-tissue origin.

The etiology of these malignancies remains uncertain; however, an interaction between genetic and environmental factors likely occurs in many head and neck sarcomas.[5] The p53 and the Rb1 tumor suppressor genes, neurofibromatosis type I, Gardner syndrome, nevoid basal cell carcinoma syndrome, Carney triad, hereditary hemochromatosis, and Werner syndrome are some of the predisposing host factors linked to sarcomas.[9] In addition, environmental exposures to elements such as ionizing external-beam radiation, radioisotopes, high electromagnetic fields, phenoxyacetic acid-based herbicides, agent orange, dioxin, polyvinylchlorides, thorium oxide, inorganic arsenic, and tobacco use have been proposed as causative agents in the development of sarcomas.[9]

Sarcomas can arise from bony, cartilaginous, muscular, fibrous, vascular, fatty, and neural tissue, depending on their mesenchymal origin. Most tumors (approximately 80%) are of the soft-tissue type; the remaining 20% are of bony or cartilaginous origin.[6] The term "myofibrosarcoma" to indicate a rare malignant tumor of myofibroblasts was suggested by Ghadially[10] in 1980, by analogy with the term, fibrosarcoma. It represents spindle cell or pleomorphic neoplasms of the soft tissues with a spectrum of histological grades (low, intermediate, or high grade).[11] Low- and intermediate-grade myofibrosarcomas are spindle cell neoplasms resembling fibrosarcoma or leiomyosarcoma. They appear to be positive for myoid immunohistochemical markers, infiltrate deep soft tissue, and recur locally but infrequently metastasize. Their differential diagnosis includes benign myofibroblastic lesions as well as other types of spindle cell sarcoma.[11] High-grade sarcomas are pleomorphic lesions and resemble malignant fibrous histiocytoma in morphology and behavior.[11]

For sarcomas in general, histologic grade is a reliable predictor of prognosis because the high rate of distant metastases in high-grade tumors supports the role of combined modality therapy.[5] Surgery has been recommended as the primary method of treatment for achieving local control except in situations of high-grade tumors, in which the anatomic location in the head and neck region would result in unacceptably increased morbidity, making nonoperative treatments more appropriate.[5] Adjuvant radiation therapy is generally recommended for high-grade sarcomas, large tumors, close or positive surgical margins, and certain histologic variants. Systemic chemotherapy is recommended for those tumors with a significant risk of distant metastases.[5]

This clinical report describes a patient with myofibroblastic sarcoma of the buccal mucosa treated by surgical resection and skin graft reconstruction. The diagnosis of this rare lesion, based on histologic and

[a]Fellow, Section of Oncologic Dentistry and Prosthodontics, Department of Head and Neck Surgery.
[b]Professor (retired), Section of Oncologic Dentistry and Prosthodontics.
[c]Professor, Deputy Chairman, Department of Head and Neck Surgery.
[d]Associate Professor, Deputy Chief, Section of Oncologic Dentistry and Prosthodontics.
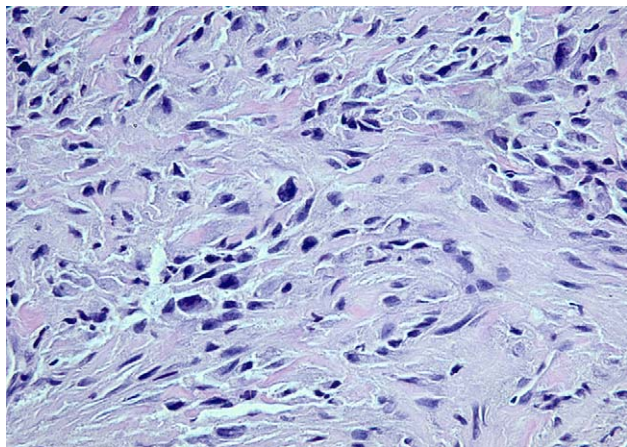
Fig. 1. Low-grade spindle cell sarcoma of myofibroblastic origin. Original magnification ×200; hematoxylin-eosin stain.

Fig. 2. Full-thickness skin graft sutured in place (patient in supine position).

Fig. 3. Ivy loops placed on the maxillary and mandibular canine/lateral area (patient in supine position).

immunohistochemical criteria, and use of a skin-graft immobilization are discussed.

CLINICAL REPORT

A 37-year-old white woman presented to the Department of Head and Neck Surgery at M. D. Anderson Cancer Center with a sarcoma of the right buccal mucosa that had recently been diagnosed by biopsy. The patient had found a mass on her right cheek 2 months earlier and had undergone a biopsy at another institution that revealed a low-grade sarcoma with myofibroblastic features.

Her medical history was significant for hypothyroidism, controlled with hormone replacement therapy, and her review of systems was unremarkable. She denied head and neck symptoms—for example, epistaxis, dysphagia, odynophagia, otalgia, trismus, hemoptysis,

dysarthria, airway obstruction, or sore throat. Her surgical history indicated a left knee arthroscopy, and her family history consisted of a paternal grandmother with lymphoma and a sister with breast cancer. She denied using tobacco or alcohol.

A baseline physical examination of the head and neck area indicated a 2-cm mass in the patient's right buccal mucosa that extended to the mandibular vestibule. The mass was firm, nontender, immobile, and nonfluctuant. It appeared to be adherent to the scar tissue at the previous excision site. There was no discharge. Oral examination showed that her dentition was in good condition and that her oral hygiene was appropriate with no other lesions noted. On examination, her temporomandibular joint was asymptomatic, and her oral interincisal opening was within normal limits. There was no palpable lymphadenopathy in the head and neck area.

A magnetic resonance imaging scan of the head and neck was performed, and a 2-cm ill-defined area was noted in the right buccal mucosa and in the buccal fat pad. The pathology slides from the biopsy were reevaluated to confirm the diagnosis and finalize the treatment plan. Histologically, the lesion was composed mostly of bland stellate or spindled cells with tapered or ovoid nuclei, small nucleoli, and scanty or moderate amounts of eosinophilic cytoplasm with variably distinct cell boundaries (Fig. 1). Immunoperoxidase stains showed that the tumor cells were positive for vimentin, an antigen used to identify mesenchymal tissue, and for actin, used for smooth muscle tissue detection.

These findings, along with the clinical morphologic features of the tumor, favored a spindle cell tumor consistent with a T_2, N_0, M_0[12] low-grade spindle cell sarcoma of myofibroblastic origin, and the recommended treatment was surgical removal. A wide surgical excision was made, extending 7 mm from the vermillion border of the lip to the retromolar trigone and to the
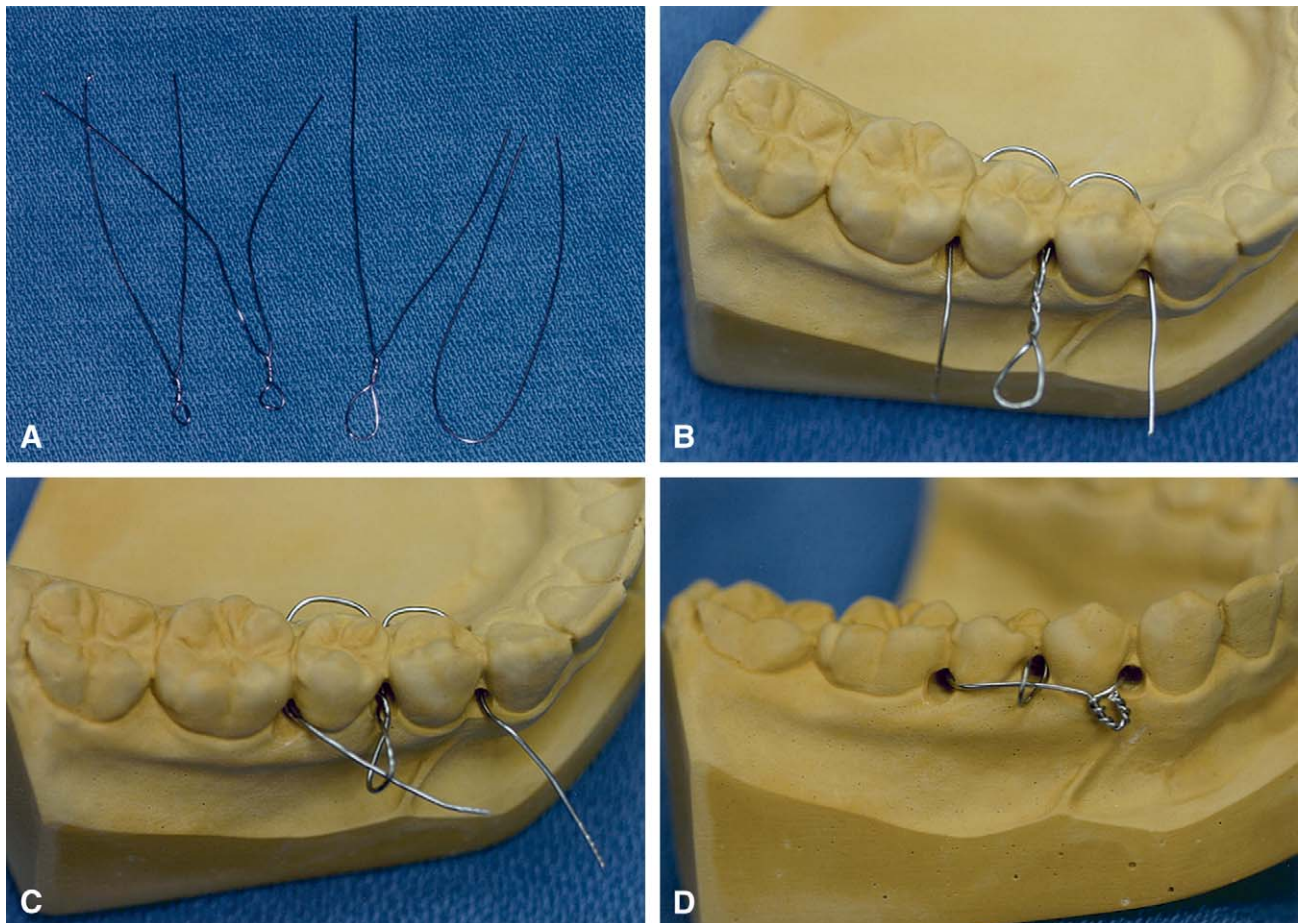
Fig. 4. Four steps involved in Ivy loop wiring. **A,** Loop is formed in center of wire and twisted once. **B,** Two tails of wire are placed in embrasure from buccal to lingual side. **C,** One wire tail is carried around lingual surface of distal tooth, pushed through embrasure on distal side of that tooth, bent around buccal surface, and meets other wire, which is carried around lingual surface of mesial tooth and passed through embrasure on mesial side of that tooth. **D,** Two wires are crossed and twisted together with needle holder, and loop is tightened and bent toward gingiva.

mandibular buccal mucosa area, and from the maxillary alveolar attached mucosa at the right central incisor level to the right hamular notch. The right parotid duct, the buccal fat pad, and the subcutaneous facial musculature were resected. A biopsy of frozen tissue sections suggested the tumor margins were free of neoplasm. A full-thickness skin graft was harvested from the abdomen for reconstruction of the defect. The skin graft was thinned to the immediate dermis and secured with 3-0 and 4-0 sutures (Vicryl; Ethicon Inc, Somerville, NJ) (Fig. 2). The applied skin graft provided a thin epithelial surface to replace oral mucosa without including close proximity to teeth.

To improve graft adherence by bolstering and immobilizing the full-thickness flap, an intraoral stent was fabricated and sutured in place. Two Ivy loops, composed using a 24-gauge stainless steel wire (Cardinal Health, Dublin, Ohio), were placed on the maxillary and mandibular canine/lateral area to help secure the stent

(Fig. 3). The Ivy loop wiring is shown in Figure 4. An adequate amount of interim resilient liner (Trusoft; Harry J. Bosworth Co, Skokie, Ill) was mixed and adapted to the underlying structures in the right cheek area. A portion of the material was placed between maxillary and mandibular teeth, allowing precise trimming to the buccal surfaces of the teeth. The bolus was molded and positioned to stabilize the graft and distend the cheek without applying excessive pressure. This allowed for better adaptation and healing of the skin graft to the underlying buccal mucosa recipient area. Following the initial polymerization of the material, it was removed, trimmed, and thinned at the borders. Special care was taken to not allow excess material at the commissure area. Once the stent was in place, a 2-0 silk suture was passed in the inferior and superior portion of the bolus and secured to the Ivy loops (Fig. 5). One interrupted 2-0 silk suture was also placed into the soft tissue of the right commissure for more stability. For cleaning

Fig. 5. Buccal stent secured (patient in supine position).

Fig. 7. Appearance of skin graft after stent removal.

Fig. 6. Photograph of surgical area 1 week after surgery with stent in place.

DISCUSSION

Skin graft reconstruction has long been recognized as a standard oral surgical procedure. Primary grafting of the defect maintains functional mobility within the oral cavity, prevents tissue contraction, and provides a sturdy tissue base.[13] A split-thickness skin graft has an epithelial origin, provides a thin reliable coverage to the tissue bed, and consists of a sheet of epidermis and a variable thickness of underlying dermis (0.008 to 0.030 inch). In contrast, a full-thickness graft consists of epidermis and the full thickness of dermis that results in less postoperative contraction and has a texture and pigment appearance more similar to normal skin. Generally, a full-thickness skin graft is preferred over a split-thickness graft because wound contraction may result in a functional deformity and a less desirable cosmetic result.[14] Because full-thickness skin grafts retain most of the donor site qualities, careful choices regarding these qualities at the time of the surgery should minimize any color and texture problems.[13] Several factors can be attributed to the donor site selection in this situation: accessibility due to the patient's supine position at the time of the surgery, favorable thickness of the

the surgical defect, a power-spray lavage system (Water Pik; Water Pik Technologies, Newport Beach, Calif) available for patient use was recommended. Initially, the patient was advised to cleanse the surgical site 3 times each day with a saline solution made by adding 1 teaspoon each of salt and soda to 20 oz of water. The patient was advised to take care to avoid injuring the surgical defect and the skin graft; injury can occur if the lavage system is too forceful during the initial healing period (first 3 weeks). Routine dental hygiene (tooth brushing and flossing) was also advised at this time.

One week later, the patient was seen in the Oncologic Dentistry and Maxillofacial Prosthetics clinic to remove the stent and monitor the healing of the skin graft that had adapted well without infection or perforation (Figs. 6 through 8). At the 6-month follow-up appointment there were no complications, no trismus or buccal contracture were apparent, there was no necrosis associated with the skin graft, and the graft had 100% graft viability.
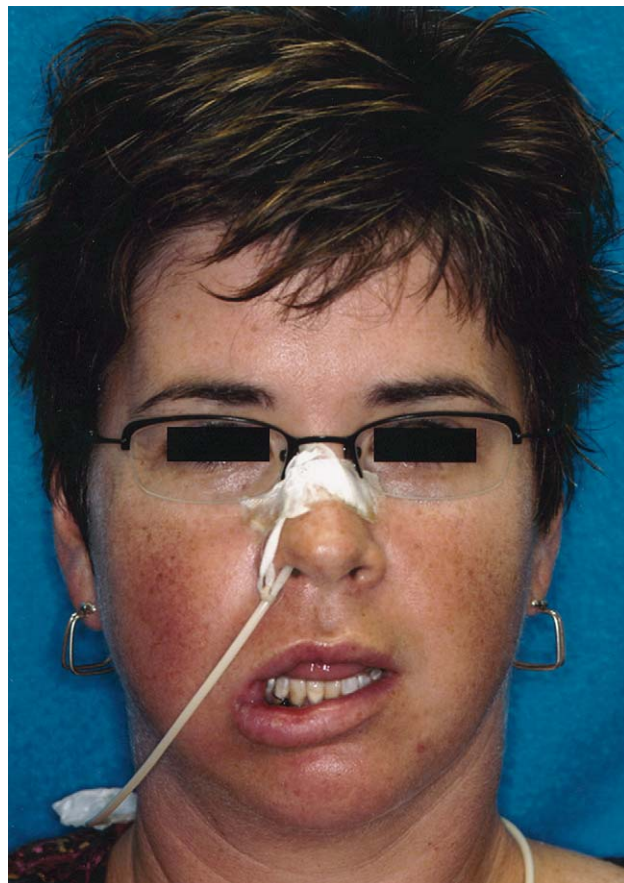
Fig. 8. Lingual (left) and buccal (right) view of stent.

selected site, surface area of the recipient site, and cosmetic reasons.[14] In addition, the selected donor site presents fewer hair follicles in women, resulting in a more esthetic outcome. Alternative donor sites for intraoral reconstruction are the pectoralis muscle area as well as the anterior-lateral thigh.[13]

A poor graft "take" or viable adaptation in the oral cavity can be attributed to multiple factors: constant movement of the muscles of mastication and facial expression, moist environment due to continuous salivary secretion, oozing of blood from the surgical site, and microbial contamination. The loss of the graft can result in contracture and postoperative trismus. It is particularly important to maintain constant pressure over the graft-recipient tissue surface to maximize the adherence of the graft to the underlying tissue bed.[15] Several techniques have been used to accomplish this, including using different dressings and stent materials and securing methods.[14] Fenestrations have been advocated to prevent subgraft hematoma; however, there have not been notable problems with hematoma or seroma formation encountered when skin grafts are used for intraoral reconstruction.[13] Meticulous hemostasis and catheter irrigation of subgraft blood accumulation after placement of the quilting sutures has been highly effective in preventing the occurrence of incomplete graft survival resulting from hematoma.[13] In addition, constant and even compression provided by the stent further decreases the risk of hematoma formation.[13,14]

The use of an interim resilient liner provides a simpler method of stent fabrication for graft fixation and presents several advantages, including ease of manipulation, soft consistency, and replication of the topography of the required area. After polymerization becomes firm, appropriate pressure is applied to the recipient site while, at the same time, the material remains smooth and non-irritating to the underlying soft tissue. In addition, oral hygiene is easier to maintain because the resilient liner is a nonabsorbent material. As a result, and due to a short intraoral stenting period, patients do not complain about poor taste and malodor, which are associated with the use of gauze-based stent materials.

Appropriate physical therapy to avoid postoperative trismus is necessary after removing the stent. Immediate range-of-motion oral-opening exercises were instituted, and soon thereafter, a mouth-opening device (Thera-Bite mouth opener; Atos Medical AB; Hörby, Sweden) was dispensed, and appropriate instructions were given to the patient.

SUMMARY

In general, surgical intervention has been suggested as the primary treatment of head and neck sarcomas. This clinical report illustrates a simple method for skin-graft immobilization following surgical resection of a myofibrosarcoma of the buccal mucosa. A stent made of soft reline material was used to secure an autograft and enhance its adherence and adaptation to the underlying buccal mucosa recipient site, with reduction of postoperative tissue contraction.

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