for the prevention of alar necrosis. However, no safe method of preventing instrument-related pressure sores during surgical treatment of mandibular condylar process fractures has been reported. Although some surgeons use gauze to prevent pressure sores of the skin near the wound, this narrows the operative field. In another craniofacial operation, the use of a rubber tube was described to help remove a retained screw after the head had broken off.[5] The rubber tube is therefore a convenient surgical tool, which can be used as described here to prevent the development of pressure sores and necrosis. This method is simple as well as cost-effective and can also be used during surgical procedures in other areas.

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Evaluation of Preoperative Model Surgery and the Use of a Maxillary Sinus Surgical Template in Sinus Floor Augmentation Surgery

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Abstract: Maxillary sinus augmentation is an accepted technique for dental implant placement in presence of insufficient maxillary bone. There are various techniques in the literature, either by crestal or lateral approach in maxillary sinus augmentation that have high percentage of success, while all have complications. Schneiderian membrane perforation is the most common complication encountered during surgery. The aim of this study was to evaluate the benefits of preoperative model surgery and the ease of use of a maxillary sinus surgical template (MSST) during maxillary sinus augmentation surgery with a lateral approach. Ten patients included in the study needed rehabilitation of a partially or totally edentulous maxilla with an implant-supported fixed prosthesis and requiring sinus augmentation. A questionnaire was asked to performing surgeons, and study results showed the use of an MSST was found to be effective in terms of adaptation (62.5%), window preparation (87.5%), ease of elevation (95.9%), ease of grafting (95.9%), reduction of perforation risk (91.7%), and achieving immobility during the procedure (62.5%); however, the use of an MSST was also found to prolong the surgical procedure (100%) and restrict the view of the surgical area (79.2%). Maxillary sinus augmentation appears to be a useful tool for locating an appropriate entrance to the sinus cavity, allowing for safe elevation of the sinus membrane and effectively grafting the sinus floor.

Key Words: Maxillary sinus, surgical template, augmentation

Insertion of a posterior dental implant in an edentulous maxilla requires sufficient distance between the alveolar crest and the maxillary sinus. In cases where alveolar crestal height is insufficient, the sinus floor membrane can be elevated and alveolar bone volume increased using various grafting material. First introduced by Tatum[1] and Boyne and James,[2] 2 basic techniques for sinus elevation have been described to date, one through the lateral wall and the other through the alveolar crestal ridge. The lateral wall technique, which is performed as a single-stage procedure with simultaneous sinus augmentation and implant insertion, is preferred in situations where there is residual crestal height of at least 4 mm and sufficient support to provide implant stability. In cases where residual height is less than 4 mm or stability cannot be achieved, implant insertion should be delayed for 4 to 6 months after initial sinus augmentation surgery to allow for osteogenesis.[3] The lateral wall technique has a very high success rate when an attentive preoperative assessment is carried out and surgery is performed with care.

The first step in the lateral approach involves the preparation of a window in the lateral wall of the maxillary sinus, taking care not to perforate the Schneiderian membrane. Once the window has been opened, the sinus floor membrane is carefully elevated medially, inferiorly, and anteriorly to create a space above the sinus floor. The space is then grafted, with the bony window used as either the floor for the elevated membrane or as a tap for the window created.

Intraoperative complications using the lateral approach to sinus augmentation include bleeding, laceration of the buccal flap, infraorbital nerve damage, alveolar ridge fracture, damage to the adjacent tooth root, and membrane perforation.[4] Membrane damage, the most common complication, occurs in 10% to 40% of cases and can be attributed to anatomical variations in the maxillary sinus cavity, wall, and membrane thickness as well as iatrogenic-related conditions.[5] In addition to lengthening the time required to complete the surgical procedure, membrane perforation also increases the amount of required biomaterials and the length of the overall treatment period.[5,6]

Computed tomography (CT) was first used for diagnostic purposes in the beginning of the 1980s.[7] Since then, technological and software improvements have led to an increase in the use of CT in presurgical

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TABLE 1. Patients and Operations

	Patient	Age, y	Sex	Operated Sinus	Simultaneous/ 2-Stage Surgery	Implant Astra Tech Osseospeed Diameter/Length		Intraoperative Complication	Postoperative Complication
Maxillary sinus surgical template group	1	45	F	Bilateral	Simultaneous	15	4.0/13	None	None
						16	4.5/11		
						25	4.0/13		
						27	5.0/11		
	2	54	M	Bilateral	Left sinus (2-stage)	15	4.0/13	None	None
						16	5.0/11		
						25	4.0/11		
						26	4.5/13		
	3	65	F	Right	Simultaneous	14	4.0/11	None	None
						15	4.0/13		
	4	48	M	Left	Simultaneous	24	4.0/11	None	None
						25	4.0/13		
						26	4.0/11		
	5	51	M	Bilateral	Simultaneous	16	4.5/13	None	None
						25	4.0/13		
						26	4.5/11		
Surgical implant guide group	6	48	M	Bilateral	Simultaneous	17	5.0/11	None	None
						16	5.0/11		
	7	49	M	Left	Simultaneous	26	4.0/11	None	None
						27	4.5/11		
	8	55	F	Bilateral	Simultaneous	16	5.0/11	None	None
						17	5.0/11		
						27	4.0/13		
	9	59	F	Left	Simultaneous	25	4.0/13	None	None
						26	4.5/11		
	10	63	M	Right	Simultaneous	16	4.5/11	None	None
						17	4.0/11		

F indicates female; M, male.

planning using virtual or model surgery. Stereolithographic models constructed using numerical values obtained from CT images[8] can be used to create implant guides that allow for the identification of appropriate implant locations and axes before surgery, there by reducing intraoperative risks and patient discomfort by minimizing the invasive procedure and shortening the operation time.[9,10] Constructing a lateral wall approach template and testing it in model surgery make it possible to properly localize the bony window, thereby reducing risks during augmentation of the sinus floor. This article evaluates the use of preoperative model surgery and a maxillary sinus surgical template (MSST) in maxillary sinus augmentation using a lateral approach.

MATERIALS AND METHODS

The study was conducted with 10 individuals who were referred to our clinic for rehabilitation of a partially or totally edentulous maxilla with an implant-supported fixed prosthesis and who required sinus augmentation surgery (Table 1). All patients were informed about surgery and cone-beam CT examination, which is routine method in our clinic, and written consents were obtained before the operations. Cone-beam CT images were used to construct a three-dimensional model of each patient; the number, dimension, location, and vector of implants to be inserted were digitally planned

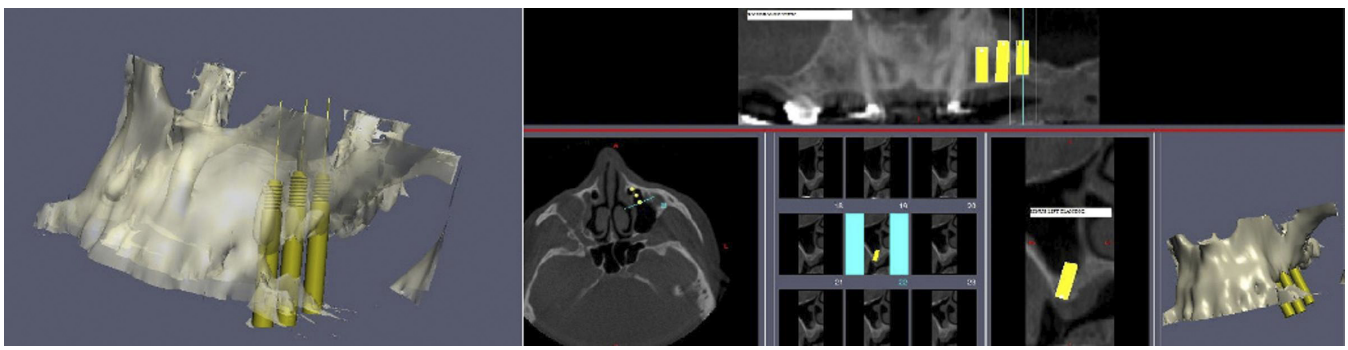

FIGURE 1. Detailed planning of patients was conducted by using three-dimensional implant software over cone-beam CT data.

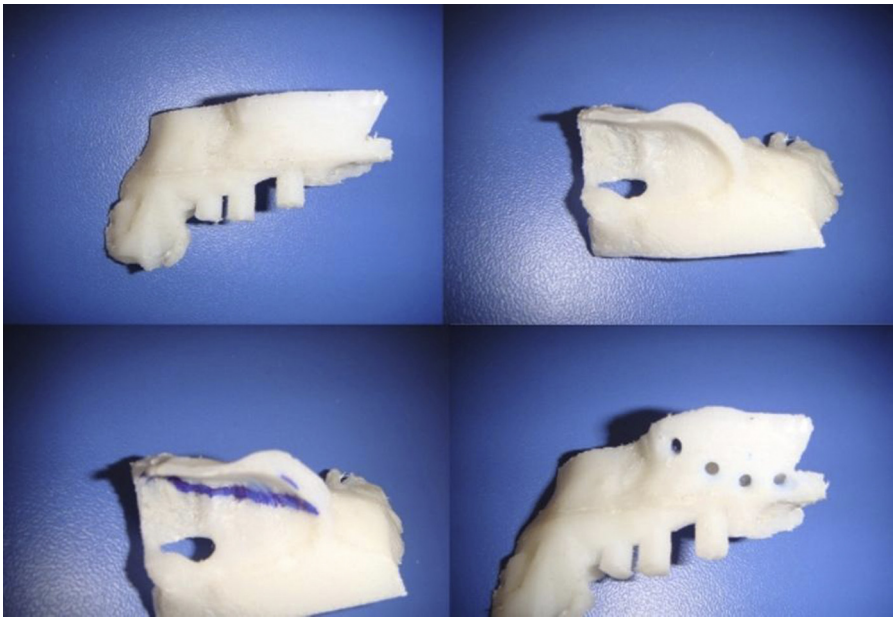

FIGURE 2. Complete or partially maxillary model was produced by using a fast prototyping machine.

(Implant 3D Rel.3.0.8; Media Lab Software 2007, La Spezia, Italy), and MSSTs were constructed accordingly (Fig. 1).

Stereolithographic models were constructed using a rapid prototyping machine. Sinus osteotomy borders were outlined on the models of 5 randomly selected patients, and implant localization of all patients was simulated in model surgery. Maxillary sinus surgical templates and stereolithographic surgical implant guides were constructed in the laboratory based on the findings of model surgery (Fig. 2).

Following routine surgical preparations, a full-thickness mucoperiosteal flap was raised to expose the lateral wall of the maxillary sinus, and an MSST was located at the lateral wall. Under guidance of the MSST, an osteotomy line was outlined on the cortical bone using a fine bur, and a bony window was removed (Fig. 3). Using the same template, implants were inserted in accordance with the model surgery. In the control group, implants were inserted using stereolithographic surgical implant guide, whereas localization of lateral sinus wall and osteotomy was performed in traditional surgical procedure. Primary closure of the surgical wound was achieved, and postsurgery antibiotics, analgesics, antibacterial mouthwash, and antihistaminic decongestants were prescribed. All patients were recalled for follow-up visits on 3, 6, and 10 days after surgery. Fixed prosthetic restorations were completed between 6 and 10 months after implant surgery (average, 8 months) (Fig. 4). Astra Tech Osseospeed TX dental implants (Mölndal, Sweden) were inserted in diameters of 4.0, 4.5, and 5.0 mm and in lengths of 11 and 13 mm in all patients.

Immediately following the procedure, an oral questionnaire was administered to the 3 participating surgeons to evaluate the following: adaptation of the guide to the area, immobility of the template during the procedure, ease of creation of the lateral window, sufficiency of the window for elevation and grafting, and the effects of template use on the duration of the procedure.

RESULTS

Sinus elevations were performed in 10 patients (6 men, 4 women; age range, 45–65 years). In total, 15 sinus elevations were performed (5 bilateral elevations and 5 unilateral elevations). In 14 of 15 surgeries, sinus elevation and implant insertion were performed simultaneously, whereas in 1 case, implant insertion was performed

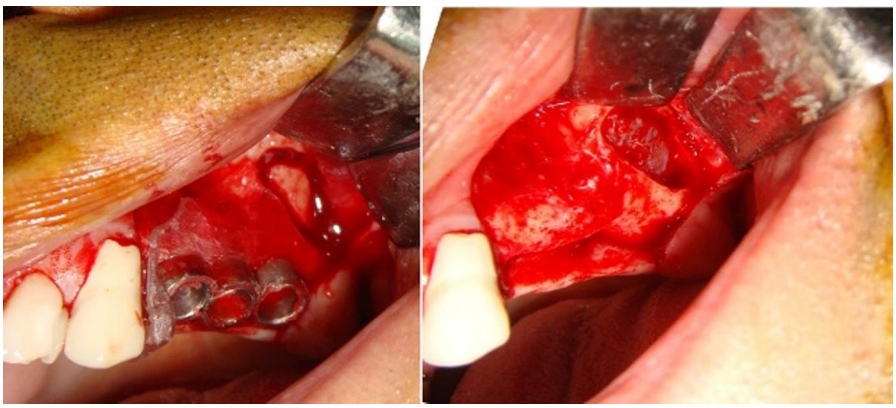

FIGURE 3. Full-thickness mucoperiosteal flap was elevated, and the MSST was located on the area. Sinus window was prepared for both implant locations and lateral sinus wall over the same template.

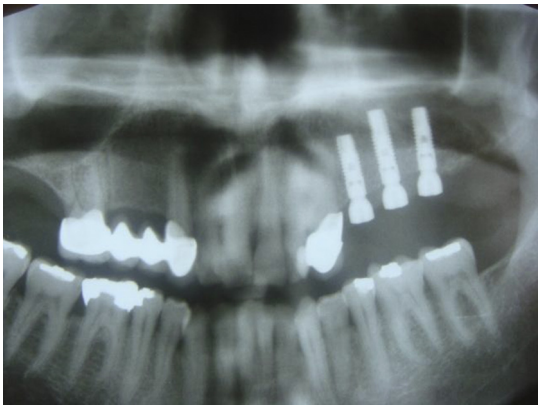

FIGURE 4. Panoramic x-ray of the patient 6 to 10 months after implant surgery.

6 months after sinus augmentation. No operative or postoperative complications were observed in any patient (Table 1).

The use of an MSST was found to be effective with regard to adaptation (62.5%), window preparation (87.5%), ease of elevation (95.9%), ease of grafting (95.9%), reduction of perforation risk (91.7%), and immobility during the procedure (62.5%). However, the use of an MSST was also observed to prolong surgery (100%) and restrict the view of the surgical area (79.2%). Overall, model surgery was found to be an effective means of preparing for actual sinus elevation surgery (87.5%) (Table 2).

DISCUSSION

Implant-supported fixed prosthetic restorations in the posterior maxilla require an adequate degree of bone. In cases where residual bone height in the posterior maxilla is insufficient for maintaining the support required by fixed restorations, maxillary sinus elevation must be performed before or in conjunction with implant surgery. A lateral wall approach is generally preferred in sites with inadequate residual bone height.[11] However, intraoperative complications may sometimes occur including bleeding, membrane perforation, alveolar crest fracture, damage to adjacent teeth, and infraorbital nerve damage.[9] Membrane perforation, the most frequently reported complication in the literature may occur as a result of variations in anatomic structures, difficulties in accessing the surgical area, indirect and/or blind manipulation, failure to clearly identify a lateral window, instrument-related complications during elevation, and the thin nature of the membrane itself.[11,12]

Membrane perforation may lead to delay or termination of the surgery as well as postoperative complications such as bacterial infection in the osteomeatal region and unfavorable bone healing.[13] The risk of membrane perforation can be avoided through the optimal positioning of a lateral window of an appropriate width. In some patients, the lateral wall of the maxillary sinus is very thin, and even experienced surgeons may find it difficult to identify the sinus mucosa border.

The literature contains several reports of maxillary sinus anterior osteotomy surgical guides that were designed and constructed using software and prototyping machines.[12] In the present study, an MSST was created in the laboratory on a three-dimensional model and used in surgery. Model surgery was found to be an effective means for the surgeon to become familiar with the surgical field before actual surgery, and the templates that were developed allowed for optimum osteotomies with no perforations or other operative or postoperative complications.

Following tooth loss, there is a decrease in the amount of bone available in the posterior maxilla, which causes the maxillary sinus to expand inferiorly. Given the influence of the anatomic interaction between the sinus floor and antrum on the pneumatization and health of the sinus, it is important to maintain a smooth floor, with no "blind holes" and a good structural relationship with the antrum. The success of sinus elevation and augmentation depends on adequate elevation of the membrane on the medial, inferior, and anterior aspects of the sinus cavity. Failure to achieve proper elevation will inhibit grafting and increase the risk of infection. An MSST helps to delineate the osteotomy line before augmentation, thereby facilitating the preparation of the window to secure adequate elevation, which indirectly helps to eliminate blind holes and ease the placement of graft material in blind corners of the maxillary sinus. The use of an MSST also helps to minimize bone loss by preventing excessive window preparation.

TABLE 2. MSST Evaluated Side by Side From the Surgeons With the Questionnaire, Who Were Engaged in the Operations

	Is the Adaptation of the MSST Easy?			Is It Immobile During Surgery?			Is MSST Restricting the View of the Operation Area?			Is MSST a Useful Tool for Preparation of the Lateral Window?			Do You Think That MSST Reduces the Perforation Risk?			Do You Think That the MSST Alters (Increases/ Decreases) the Duration of the Surgery?			Is MSST Facilitating the Elevation of the Sinus Membrane?			Is MSST Facilitating the Sinus Grafting Procedure?			Is Model Surgery Effective?		
Patient	**S1**	**S2**	**S3**	**S1**	**S2**	**S3**	**S1**	**S2**	**S3**	**S1**	**S2**	**S3**	**S1**	**S2**	**S3**	**S1**	**S2**	**S3**	**S1**	**S2**	**S3**	**S1**	**S2**	**S3**	**S1**	**S2**	**S3**
Case 1 (right)	Y	Y	N	N	Y	Y	Y	N	Y	Y	Y	Y	Y	N	Y	INC	INC	INC	Y	Y	Y	Y	Y	Y	Y	Y	N
Case 1 (left)	Y	N	N	N	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	INC	INC	INC	Y	Y	Y	Y	Y	Y	Y	Y	Y
Case 2 (right)	Y	Y	Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	Y	Y	INC	INC	INC	Y	Y	Y	Y	Y	Y	Y	Y	Y
Case 2 (left)	N	Y	Y	N	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	INC	INC	INC	Y	Y	Y	Y	Y	Y	Y	Y	Y
Case 3	Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	INC	INC	INC	Y	Y	Y	Y	Y	Y	Y	Y	Y
Case 4	Y	N	Y	Y	N	N	Y	Y	Y	Y	N	Y	Y	N	Y	INC	INC	INC	Y	N	Y	Y	N	Y	Y	Y	Y
Case 5 (right)	Y	N	N	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	INC	INC	INC	Y	Y	Y	Y	Y	Y	Y	Y	N
Case 5 (left)	N	Y	N	Y	Y	N	Y	Y	N	Y	N	Y	Y	Y	Y	INC	INC	INC	Y	Y	Y	Y	Y	Y	Y	Y	N
	62.5%, Y			62.5%, Y			79.2%, Y			87.5%, Y			91.7%, Y			100 INC			95.9%, Y			95.9%, Y			87.5%, Y		
	37.5%, N			37.5%, N			20.8%, N			12.5%, N			8.3%, N						4.1%, N			4.1%, N			12.5%, N		

Y indicates yes; N, no; INC, increase.

Maxillary sinus augmentation requires a graft volume of approximately 2 to 3 mL.[14] The amount of graft required can be calculated during model surgery. Moreover, not only can model surgery using an MSST prevent excessive graft use and potentially improve cost-effectiveness,[12] it can also help inexperienced clinicians and junior surgeons to familiarize themselves with sinus anatomy and the surgical procedure.

The high cost of model and template production involved in the use of an MSST may be discounted, given the important benefits an MSST can provide, such as achieving a more ideal lateral window and reducing the risk of infection.

Recent studies in computer-guided implant dentistry have focused on planning, drill guides, and immediate restoration.[10] The need for sinus guides has increased with the increase in popularity of sinus lift procedures; however, the literature still includes only limited reports on the use of surgical templates for maxillary sinus augmentation osteotomies. From the authors' experiences, an MSST appears to be an effective tool for locating an appropriate entrance to the sinus cavity, achieving safer membrane elevation and successfully grafting the sinus floor.

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Clinical and Pathological Features of the Giant, Invasive Basal Cell Carcinoma of the Scalp

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Background: The giant, invasive basal cell carcinoma of the scalp is a rare clinical form of this tumor that appears on the skin, but may spread to some of the following structures: soft tissues of the scalp, bones, meninges, and the brain. In literature, so far, it is known as the GBCC. It is caused by aggressive BCC subtypes.

Methods: We will present here a research of clinical and pathological features of 47 pathological specimens in 31 patients where the following features were examined: the dimension of the tumor, the dimension of the tissue segment, tumor area, segmentation area, resection margin width, microscopic resection margin status, tumor invasion level, and the outcome.

Results and Conclusions: We have concluded that microscopic resection margin dimensions from 1 to 10 mm are safe and that relapse occurrences in giant, invasive BCCs of the scalp depend on microscopic resection margin dimensions, resection margin status, tumor invasion levels, risky occupation, and risky behavior of the patient.

Key Words: Giant, invasive basal cell carcinoma, scalp, relapse, resection margins

Abbreviations: AJCC, American Joint Committee of Cancer, NMSC, Non-melanoma skin cancer, MIN, Microscopic dimensions of resection margins, INH KCS, Institute for neurosurgery of the Clinical Center of Serbia, KOPRH KCS, Clinic for Burns, Plastic and Reconstructive Surgery of the Clinical Center of Serbia, GBCC, Giant basal cell carcinoma, BCC, Basal cell carcinoma, BSC, Carcinoma basosquamosum, BCCs, Superficial form of BCC, BCNS, Basal cell nevus syndrome, 5-FU, 5-Fluorouracil (Efudix), EHO, Echosonography, NMR, Nuclear magnetic resonance imaging, CT, computed tomography

Basal cell carcinoma (BCC) is the most frequent malignant skin tumor.[1–4] It is characterized by high incidence and low mortality rate (<0.1%),[2] with rare occurrence of metastasis (<0.1%).[5,6]

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