Aesthetic outcome following prosthetic rehabilitation after ablative maxillary surgery. A Preliminary Study.

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Abstract

Objective: Psychological impact of poor dento-facial aesthetics constitutes a major part of the low quality of life in maxillectomy patients. The purpose of this study was to present the aesthetic outcome following prosthetic rehabilitation after ablative maxillary surgery.

Method: All consecutive patients that had surgery for tumours affecting the upper jaw and gave their consent were included in the study. Classification of maxillectomy was based on the Brown's classification. Facial attractiveness after final prosthetic rehabilitation was graded by two independent observers with a modified Liekert scale into four grades. For the purpose of comparison of facial attractiveness, the patients were divided into 2 groups: those below 2A and those above 2A.

Result: Seventeen patients with tumours affecting the upper jaw were operated. Ten (58.8%) were females and 7 (41.2%) were males. The age range was 6-65 years, mean (SD), 37.6 (18.5) years. Two (11.8%) cases were children. There were 3 (17.6%) cases in the level 1, one case was 1A, two cases were 1B; 11 (64.7%) cases in level 2, 8 (47.1%) cases were 2A, 3 (17.6%) cases were 2B and 3 (17.6%) cases in level 3. Two (11.8%) patients, both in the level 2B had moderately attractive appearances and also, 2(11.8%) patients in the levels 2B and 3B respectively had least attractive appearances.

Conclusion: Majority of our patients had resections at levels 2A and below and there was no obvious difference between the two groups, immediate prosthetic obturation may have minimized collapse of midface in those above 2A.

Key words: Classification, Maxillectomy, Prosthetic rehabilitation, Aesthetics

Introduction

Resection of the maxilla/upper jaw is the treatment for most neoplastic swellings especially benign invasive tumours such as ameloblastoma and malignancies while excision is done for well encapsulated benign tumours like ossifying fibromas[1]. Most malignant tumours either start from within maxillary sinus or palate, then extend to involve the surrounding bones, while most benign lesions affect and may be confined to the dento-alveolar and skeletal bone depending on the duration and rate of growth[2]. The primary goal in the management of benign tumours is the entire removal of the mass. Radiotherapy with or without chemotherapy is applicable when the tumour is malignant and radiosensitive[1,2].The collapse of the face, extraoral scars and loss of teeth constitutes the aesthetic problems after extensive surgery while functional problems are related to mastication, speech and swallowing. Surgeries at the primary site should be accompanied by either primary or secondary reconstruction of the defect and prosthetic rehabilitation of patients[3-8]. Primary reconstruction for resections of malignant tumours is not supported by some authors because of uncertainty of having a recurrence but it is achievable with free flaps even when radiotherapy will be done[4]. Surgical rehabilitation could be simple and limited to the use of partial skin grafts to line the intraoral defect or could be more complex with the use of vascularized bone, soft or composite flaps from calvarium, iliac or supraclavicular region[5,6]. However, defects created by resections or excisions of the maxilla are mostly covered with a prosthesis[9]. The wider the defect created, the more difficult the restoration of aesthetics and function which also influences the quality of life of the patient[10,11]. The approach and type of surgery required depend on the histological nature of the lesion and the extent of the involvement of the upper jaw[12]. Many studies have related the functional outcome of these surgeries to the classification of resections but only few articles exist on the esthetic outcome and extent of resection. The aim of this report was therefore to present the aesthetic outcome following prosthetic rehabilitation after ablative maxillary surgery.

Materials and method

This was a prospective study carried out in the Department of Oral and Maxillofacial Surgery, University of Port Harcourt Teaching Hospital, Rivers State, Nigeria, between June, 2010 and August, 2013. All consecutive patients that had surgery for tumours affecting the upper jaw were included. Patients' bio-data and relevant clinical information were documented. The cases were classified into benign (locally aggressive and non-aggressive) and malignant tumours. Information regarding presenting complaint, onset, duration of swelling, ulcerations, site, extent, consistency, direction of bony expansion, tooth mobility, nasal discharge, altered sensation, exophthalmos, diplopia and altered vision were obtained. Periapical views, posterior anterior and occipitomental views of the skull were done as well as computerized tomographic scans. Incisional biopsies were done and sent for evaluations to determine histological diagnoses and indications for surgery.

Patients were fully informed about the treatment planning. Informed consent for both the procedure to be performed and inclusion in the study was obtained. Approval to carry out the study was obtained from the Hospital's Ethics and Research Committee. The approach and extent of resections were determined based on clinical dimensions, radiological appearance and histological nature. Resection achieved either by combined intraoral/extraoral or only intraoral approach to the upper jaw was documented. Resection was carried out with osteotome with safety margins around the lesion. The dimension of the safety margins depended on the amount of bone available around the lesion but about 1.5cm was used for malignant tumours.

Classification of maxillectomy and excisions were based on the Brown's classification[12] which graded resections into vertical[1-4] and horizontal components (a-c),

1- Resections/excisions without oroantral fistula or only resection of palate leaving the tooth bearing portion,

2- Low maxillectomy- extends to a level below the infra-orbital margin,

3- High resection/excision which involves the floor of the orbit with or without skull base,

4- Extended or radical maxillectomy; Resection/excision and orbital exenteration; levels 2- 4 can have a horizontal component,

a - Less than or equal to half of the palate is involved,

b - More than half of the palate is involved and half of maxillary alveolus and

c - The entire palate and entire alveolar process. Presence of recurrence was determined from 3 months follow-up.

For those without recurrence, facial attractiveness after final prosthetic rehabilitation was assessed and graded by two independent observers with a modified Liekert scale into four grades: - very attractive- no extraoral scar and no collapse of the midface

4- Moderate attractiveness- presence of inconspicuous extraoral scar and/or mild collapse of the lower part of the mid-face

3- Least attractive- presence of hypertrophic scar and/or moderate collapse of the upper and lower part of the midface

2- Unattractive appearance; presence of keloid and/or gross collapse of upper and lower part of the midface with or without enophthalmos

1- Where the two independent assessors do not agree, a common position had to be agreed upon and agreement was reached based on the opinion of a third observer.

Data obtained were analyzed with SPSS version 16. Age range, mean and standard deviation were determined. Patients were classified into two groups based on the level of maxillary resection, those with level 2A and below, and those above 2A. Facial attractiveness was presented in the two groups by simple frequencies and proportions.

Results

We operated a total of 17 patients with tumours affecting the upper jaw within the study period. Ten (58.8%) were females and 7 (41.2%) were males. The age range was 6-65 years, mean (SD), 37.6 (18.5) years. 2(11.8%) cases were children. There was 4(23.5%) locally aggressive, 6(35.3%) non aggressive benign tumours and 7(41.2%) malignant lesions. There were 5 (29.4%) cases that originated from the maxillary antrum, all of which were malignant tumours and 2(11.8%) cases originated from the palate. Out of the benign tumours, 2(11.8%) were adenomatoid odontogenic tumour, 3 (17.6%) ossifying fibroma, and 1(5.9%) fibrous dysplasia, **(Table 1).**

There was 2 (11.8%) ameloblastomas, 1(5.9%) pleomorphic adenoma, and 1(5.9%) hemangioperiocytoma **(Table 2)**.

Of the malignant tumours, 3(17.6%) were squamous cell carcinoma, 2 (11.8%) mucoepidermoid carcinoma, 1(5.9%) osteogenic sarcoma and 1(5.9%) polymorphous low grade adenocarcinoma **(Table 3)**.

Table 1: Characteristics and outcome in 6 patients with non aggressive benign tumours

S/No	Age/Sex	Site	Extent	Diagnosis	Approach	Procedure	CL	Outcome
1.	6yrs/F	Anterior portion of Skeletal bone	Buccal expansion upper left lateral incisors to first primary molars	Fibrous dysplasia	Intraoral	Ostectomy, No Obturator	2A	Very attractive, No recurrence
2.	29yrs/F	Anterior portion of the skeletal bone with invasion into the antrum	Buccal expansion from upper right lateral incisors to first premolars	Ossifying fibroma	Intraoral	Excision, Partial denture given	2A	Very attractive, No recurrence
3.	14yrs / M	Anterior part of the left maxila	From first incisors to first premolar with palatal expansion	Cemento-ossifying fibroma	Intraoral	Excision, No obturator	2A	Very attractive, No recurrence
4.	16yrs / F	Anterior portion of the Right maxillary antrum	Infraobital margin, extend to first molar	Adenomatoid odontogenic tumour	Intraoral	Excision, level partial denture given	2A	Very attractive, No recurrence
5.	59yrs / F	Anterior part of dentoalveolar and skeletal bone	Upper lateral incisors to upper first mola	Adenomatoid Odontogenic tumour	Intraoral	Partial Maxillectomy partial denture given	2A	Moderately attractive, No recurrence
6.	30yrs / M	Anteiror portion of the skeletal bone with invasion into the antrum	Buccopalatal expansion from upper right lateral incisors to first premolars	Ossifying fibroma	Intraoral	Partial Maxillectomy Obtrurator given	2A	Moderately attractive No recurrence

CL - Classification

Table 2: Characteristics and Outcome in 4 patients with aggressive benign tumours

S/No	Age/Sex	Site	Extent	Diagnosis	Approach	Procedure	CL	Outcome
1.	42yrs/F	Left Maxillary antrum, palate dentoalveolar	Buccopalatal expansion from upper right lateral incisors to first premolars	Solid/ multicystic Ameloblastoma	Intraoral	Hemi-maxillectomy Obturator given	3B	Less attractive, No recurrence
2.	31yrs/M	Right Maxilliary antrum, palate, dentoalveolar	Floor, anterior wall and palatal expansion	Solid/ multicystic Ameloblastoma	Intraoral	Hemi-maxillectomy Obtrator given	2B	Moderately attractive No recurrence
3.	60yrs / F	Posterior part of the left maxillar	From the first premolar to the last molar with palatal erosion	Recurrent pleomarphic adenoma	Intraoral	Partial hemi-maxillectomy, No obturator	1B	Very attractive, No recurrence
4.	45yrs / F	Right post palatal and dentoalveolar segment	Posterior palate expansion	Hemangio periocytoma	Intraoral	Resection of the palate and dentoalveolar segment. Obturator given	1B	Very attractive, No recurrence

Table 3: Characteristics and Outcome in 7 patients with malignant tumours

S/No	Age/Sex	Site	Extent	Diagnosis	Approach	Procedure	CL	Outcome
1.	35yrs/M	Right Maxillary antrum	Floor, anterior wall of antrum, and palatal expansion. Upper central incisors to upper third molar	Squamous cell carcinoma of the antrum	Intraoral	Hemimaxillectomy Radiotherapy Obturator given	2A	Moderately attractive. No recurrence
2.	50yrs/F	Left Maxilliary antrum	Floor, anterior wall and palatal expansion	Squamous cell carcinoma of the antrum	Extraoral and Intraoral	Subtotal maxillectomy Radiotherapy, Obturator given	2B	Least attractive No recurrence
3.	58yrs / F	Posterior part of the left maxilla to the soft palate	From the first premolar to retromolar area and soft palate	Polymorphous low grade adenocarcinoma	Intraoral	Partial maxillectomy, Obturator given	2B	Moderately attractive, No recurrence
4.	27yrs / M	Right Maxillary antrum, palate, dentoalveolar	Floor, anterior wall and palatal expansion	Mucoepidermoid carcinoma of the antrum	Extraoral/ Intraoral	Hemimaxillectomy rhinectomy. Delayed radiotherapy	3B	Recurrence occurred within 3 months, lost to follow up
5.	16yrs / M	Right Maxillary antrum	Floor, anterior wall and palatal expansion	Osteogenic sarcoma of the antrum	Extraoral / Intraoral	Hemimaxillectomy Radiotherapy	3B	Recurrence occurred within 3 months, lost to follow up
6.	56yrs / M	Palate	Upper right canine to right upper second molar	Squamous cell carcinoma of the palate	Intraoral	Palatal resection and lateral rhinectomy Radiotherapy	2A	Recurrence occurred within 6 months
7.	65yrs / F	Right palate dentoalveolar	Upper right 3 to right 7	Squamous cell carcinoma	Intraoral	Rhinotomy and palatal excision, No obturator	1A	Defaulted

There were 3 (17.6%) cases in the level 1, 1(5.9%) was 1A and 2(11.8%) were 1B; 11 (64.7%) cases in level 2, of which 8 (47.1%) were 2A and 3 (17.6%) were 2B. **(Figure 1)**

There were 3 (17.6%) cases in level 3 and all the 3 cases were 3B.

Intraoral approach was used for all 14 (82.4%) cases in levels 1 and 2, both extraoral and intraoral approaches were used in 3 (17.6%) cases, in 1(5.9%) of the cases of extra-oral, the incision was extended below the infraorbital margin. 2 (11.8%) cases were confined within the anterior region between first incisors and first premolar, 13(76.5%) lesions were within the anterior region to the molar/retromolar region and 2 lesions were within the posterior region from between the first premolar to the molar/retromolar area. Only one (5.9%) case extended to the adjacent structures which were the nasal cavity and pterygopalatine fossa. There was no skin and intracranial extension in any of our cases.

Immediate obturation of defects was achieved with gauze pack and acrylic base plates. **(Figure 2)**

Within 6 months to 1 year, permanent obturator was fabricated for 7(41.2%) patients. **(Figure 3)**

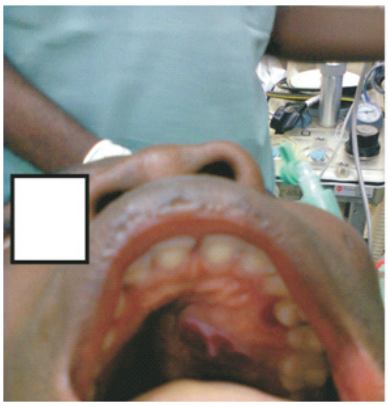

Figure 1: Showing preoperative photograph of a 31-year-old male patient with Maxillary tumor due to ameloblastoma for level 2B Maxillectomy

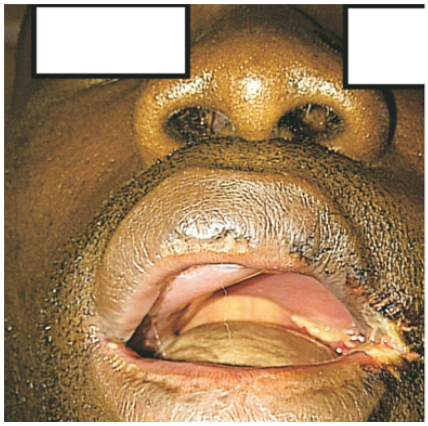

Figure 2: Showing post-operative photograph of the patient with immediate prosthesis

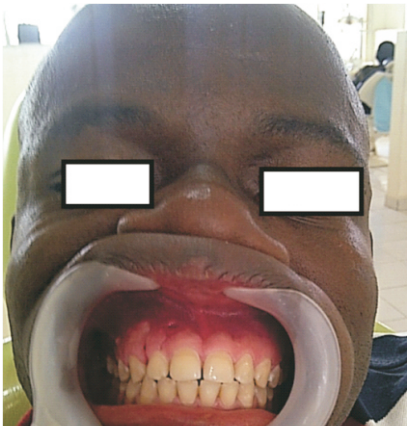

Figure 3: Showing post-operative photograph of the patient with definitive prosthesis

3 (17.6%) patients that had no oro-antral defect received partial dentures, 3(17.6%) patients did not need prosthesis due to sufficient residual bone and teeth. Three (17.6%) patients did not have prosthesis due to recurrence and were subsequently lost to follow up after referral for radiotherapy and 1(5.9%) patient defaulted without having prosthesis.

Resections graded as Class 2A and below were done in 11(64.8%) patients and 6 (35.2%) patients were in the second category of resection which was those above 2A.

In total, 6(35.2%) patients had very attractive appearance (Grade 4), 5(29.5%) patients had moderately attractive appearance (Grade 3) and 2(11.8%) patients had least attractive appearance (Grade 2); it could not be assessed in 3(17.6%) cases with recurrence and in the case that defaulted **(Table 4)**.

Table 4: Esthetic outcome in 13 patients after Ablative Surgeries and Prosthodontic Rehabilitation

	Very attractive N (%)	Moderately attractive N (%)	Least attractive N (%); Total score	Unattractive N (%)
Non aggressive benign				
Level 2A and below	4(23.5)	2(11.8)	0(0)	0(0)
Level above 2A	0(0)	0(0)	0(0)	0(0)
Aggressive benign				
Level 2A and below	2(11.8)	0(0)	0(0)	0(0)
Level above 2A	0(0)	1(5.9)	1(5.9)	0(0)
Malignant				
Level 2A and below	0(0)	1(5.9)	0(0)	0(0)
Level above 2A	0(0)	1(5.9)	1(5.9)	0(0)

Discussion

Various classifications exist in literature on maxillectomy and excisions of lesions in the upper jaw, based on the number of walls affected by the lesions and resected, Spiro et al.[13] classified resections of the maxilla into limited when only one wall is removed, subtotal for involvement of at least two walls including palate, total maxillectomy when all the walls are removed and extended total maxillectomy when orbital contents, malar bone, zygomatic arch and skin/mimetic muscles are removed. Aramany[14] also classified maxillectomy based upon the Kennedy RPD classification system and obturator design. Another classification based on the removal of the buttresses has also been documented, and this stated three categories in which removal of the pterygomaxillary buttress (PMB) and partial removal of nasomaxillary buttress (NMB) was classified as Category 1, removal of zygomaticomaxillary buttress and partial NMB as Category 2 and when the three buttresses are removed as Category 3[6,15]. Other nomenclatures have also been used to indicate the extent of resection done and these include extended, radical and partial, while it may be confusing or difficult to describe what partial exactly means, extended usually reflect involvement of any contiguous structure around the maxilla and radical may be used for surgeries of malignant lesions that have invaded a significant portion of the head and neck with necessity for neck dissection[15].

Although, a systematic review concluded that for a classification to be universally acceptable, it must be based on six criteria which include dental status, oro-antral communication status, involvement of soft palate, superior-inferior, medial–lateral and anterior-lateral extent[15].We used the Brown's classification because of its easy adaptability and description of the extent of resection required in individual cases. We documented the three dimensions and involvement of other contiguous tissues in the upper jaw as well as the teeth involved. The patients with pleomorphic adenoma, adenocarcinoma and hemangioperiocytoma had resections of part of the hard palate and soft palate. Most of our malignancies fell within level 2B, while most of the benign tumours were up to level 3. There was more palatal expansion in ameloblastomas (3B) compared to fibroosseous lesions in (2A) thereby increasing the amount of palate removed. Loss of hard palate worsens the collapse/depression of the face in benign invasive and malignant tumours. In our study, the

anterior portion of the orbital floor (level 3) was removed in 3 cases, but we did not do orbital floor reconstruction. One of the patients had a recurrence. In others, the enophthalmos was not severe enough to request for reconstruction and there was no other visual disturbance.

Based on Brown's classification[12], there was no level 4 which would have needed extended/radical total maxillectomy (hemi or bilateral) with orbital exenteration. One of our cases extended beyond the medial and posterior walls of the antrum into the nasal cavity and pterygoid bones/pterygopalatine fossa. Maxillary tumours mostly spread posteriorly, and in our centre, it was difficult to get cases that had involved the entire palate (level 3C) or extended to destroy the entire orbit and invaded the eye globe (level 4), however many of such cases would have been undesirable because of the possibility of distant metastases and discretion is highly required to operate such cases.

Various approaches have been used for maxillectomies, and these include peroral, transfacial, craniofacial, upper cheek flap and medial approaches either individual or in combination[13]. Generally, per oral or intraoral approach only are applicable for 1 and 2 vertical levels, and horizontal levels A and B. Total or extended maxillectomies can be combined with any of the extra oral approaches and bicoronal (craniofacial) approaches can be used for bilateral maxillectomies[13-15]. In this study, the lesions were removed by only intraoral approach in 82.4% of cases in contrast to the 18% documented in a large data series study. It was observed that despite the high percentage of limited maxillectomy (57%) done in that study[13], intraoral approach used was not directly related to the extent of resection. From our study, it is recommended that attempts to remove most lesions through intraoral approach should be done first and extra oral incisions should be made only when it becomes very necessary.

Following ablative surgeries, rehabilitation of a patient is very essential, and it could be surgical, prosthetic or both, but several factors such as age, co-morbidities, type of lesion, stage of the lesion, available facilities, skills, request of the patients and oncologists opinion influence the mode of rehabilitation[6-9,16-19].Yamamoto et al.[6] documented surgical rehabilitation of moderate and extensive maxillary defects based on buttress reconstruction and presented an algorithm for reconstruction of these defects with various composite free flaps. Their aesthetic and functional outcomes in 38 patients were moderately satisfactory with regards to the three categories of defects they reconstructed. They concluded that the free latissimus dorsi composite flap with V shaped scapula bone is useful for reconstruction of the ZNB and PMB buttress bones. However, it is still not conclusive that surgical rehabilitation gives better outcome than prosthetic devices but in case of gross upper midface collapse, surgical reconstruction may be very necessary. Also even after surgical rehabilitations, conventional or implant retained/supported prosthesis will still be required.

Since most of our resections were not so extensive to require complex surgical reconstruction, we relied more on conventional prosthesis, about 60% of our patients underwent definitive prosthetic rehabilitation, and 17% did not require post-operative rehabilitation because they had sufficient dentition remaining. It has been documented by a study that radiotherapy and the category of resection adversely affect the aesthetic outcome of this management but the degree of compromise will also be determined by the amount and rate of radiation however the influence of class of resection was not very obvious in our study[11].

One of our patients had moderately attractive appearance following radiotherapy. Timing of prosthesis fabrication is also very important in the aesthetic outcome following maxillectomy. Delay in fabrication increases the degree of collapse of the midface. Immediate prosthesis in form of acrylic plates and packing of defects minimizes initial gross collapse and contraction referred to as button holing effects, thereby maintaining bony support and facial profile/form while gradual and continuous collapse is prevented over the subsequent months by modifications of immediate plate and definitive prosthesis[20,21]. Further studies to analyze the effects of obturators on the functions of the jaws post maxillectomy will help to assess the total quality of life of these patients.

In conclusion, majority of our patients had resection or excision at level 2A and below, and these were operable through intraoral approach alone, following prosthetic rehabilitation, esthetics was satisfactory in most of the patients who had no recurrence of the tumours, those at 2A and below had better facial appearance. Regardless of the amount of tissue loss, improvements in facial appearance can be enhanced by immediate prosthesis which minimizes the rate of collapse of the mid-face.

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