



Versatility and Morbidity of Pedicle Flaps Commonly Used at KTDH

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Abstract

Background: multiple technique has been used for soft tissue reconstruction since early of the last decade, the first reconstruction has been used was the pedicle flaps, starting by deltopectoral and pectoralis muscles. These pedicle flaps still the horseshoe in reconstruction even in this era, the era of free vascularised flaps.

Objectives: to show, most common types of pedicled flaps used for reconstruction in Khartoum Teaching Dental Hospital. To study their complication and effectiveness and we can still use it for the reconstruction of soft tissue defects in different sizes and different anatomical sites in the face.

Materials and methods: the material of this study consulted of 54 patients who had reconstruction of oral defect with pedicled flaps in Khartoum Teaching Dental Hospital.

Khartoum Teaching Dental Hospital, the main oral and maxillofacial referral centre, during the period 2008-2014. All the cases 53 has been operated in the hospital and followed there.

Results: - Fifty four patient with oral cancer have been operated in the period of 2008 - 2014. They were 38 cases of S.C.C (70.4%) ,4 cases of Adenoid cystic carcinoma (7.4), 3cases varroucs carcinoma (5.6%), 2 cases of osteosarcoma (3.7%), 2 cases acinic cell carcinoma (3.7%) , and 5 case of other cancer entity(9.3%).

The cancer was in different sites of the face, lower lip 25 patients (46.6%) check and mandible 8patients (14.8%), check 5 patients (9.3%), hard palate 3 patients (5.6%), mandible 8 patients (14.8%), and other sites 5 patients (9.3%). The most common used one is deltopectoral flap and we used it in 26 patients 48.1%, the other most common flap is pectoralis major flap which we used it in 19 patients 35.2%, and the least used flap is temporalis muscle flap in 5 patients 9.3%.

The total flap success rate was in 46 patients (85.9%) according to the acceptances of the flap, function and aesthetic.

While the 8 cases (14.8%) of flaps are failed according to intake of the flap because of infection and necrosis of flap. Then failure of restoring the function and aesthetic.

The deltopectoral flap success rate was in 24 patients 92.3%, pectoralis major flap in 15 patients 78.94% combined flap in 3 patients 75%, and 4 patients 80% of the temporal muscle flap.

Conclusion: The regional flaps are successful, reliable with less expenses, and with good result.

Abbreviation

ACC	Adenoid cystic carcinoma
BPPMMF	Bi-paddle pectoralis major muscle flap
DPF	Deltpectoral flap
HFN	Head, Face & Neck
HNC	Head & neck cancer
KDTH	Khartoum Dental Teaching Hospital
OC	Oral cancer
PMMC	pectoralis major Myocutaneous
SCC	Squamous cell carcinoma
TMF	Temporalis muscle flap

Introduction

Oral cancer (OC) is the sixth most common cancer in the world. It accounts for about 4% of all cancers and 2% of cancer deaths worldwide. In the United States, Europe, and Australia it accounts for 0.6% to 5% of all cancers, while, in India it mounts up to 30% of body cancers. In the United States alone, there are about 20,780 new cases and 5190 deaths from oral cavity cancer per year.[1] The incidence is twice as high in men as in women. Incidence rates have been slowly decreasing since the late 1970s.[1]

Early Stage Head and Neck Cancer:

It is widely accepted that early stage squamous cell carcinoma of the oral cavity are effectively treated by either surgery or radiotherapy[2]. Various factors like growth characteristics of the tumours, health status of the patients, functional and cosmetic recovery after treatment, compliance with regular follow-up, and the patient's acceptance of the proposed treatment should be considered in the initial treatment. Advanced HNC generally refers to those patients with large or locally progressive T3 or T4 tumours or those with involvement of lymph nodes within the neck.[2] Although in most other carcinomas the designation of stage IV is reserved for patients with metastatic disease, stage IV tumours of the head and neck include those that are locoregionally advanced, reflecting the morbidity and mortality of locoregionally advanced HNC. Nonetheless, it is very important to remember that non-metastatic stage IV HNC is curable.[2]

Reconstructive Oral and Maxillofacial Surgery is defined as the surgical correction of soft and/or hard tissue defects of the jaws, face, and contiguous structures, including reduction, revision, augmentation, grafting, and implantation for the correction or replacement of defective structures to assist in restoring function to the compromised patient.[5]

Reconstruction of composite defects of the oral cavity following radical surgical ablation remains a difficult and challenging task.

The main goal of reconstruction is to provide intraoral lining and soft tissue cover.[3]

Large full thickness lateral and central defects of the oral cavity can pose significant functional and cosmetic problems for the patient. The choice of reconstructive method depends upon the type of defect and surgical expertise available .[3]

Surgeons must consider numerous important factors before deciding on a reconstructive technique, including the size, location, and depth of the defect; the patient's general health status and expectations; the status of the possible donor sites for their availability; the planned or previous radiotherapy; the degree of morbidity, ease, cost, and recovery time involved with the planned reconstructive technique.[4]

The reconstructive techniques involved in head and neck surgery include secondary healing, grafts, local flaps, regional flaps, microvascular free flaps, and prosthetic rehabilitation. These techniques can be used individually or in combination depending on the nature of the defect.[4]

Pedicled flaps are widely used in KTDH and many successes and failures were experience include, together with different complications.

It is thought important to study the reliability of the outcome of these procedures at KTDH.

Justification:

In the Sudan the majority of oral cancer patients are treated at KTDH. Different reconstructive techniques are performed in this hospital to close defects following ablation of orofacial cancer. Due to resources constraints, both financial and technical most of cases managed by pedicled flaps, plates and bone grafts. It is felt worthy to study the outcome of the commonly used pedicled flaps.

General objectives:

To study the outcome of the most commonly used pedicled flaps in KTDH.

Specific objectives:

1. To study the outcome of distant pedicled flaps in relation the physiological function of the OC patients which include (swallowing, speech, mastication, mouth opening, tongue oral mobility)
2. To assess the patient satisfaction after treatment.
3. To assess the patient aesthetics and deformity after treatment.

Methodology

The study will be conducted in 2 parts Study one:

Study type: retrospective Descriptive cross sectional hospital based study.

Study area: Khartoum teaching dental hospital.

Study population: Records of all patients admitted to Khartoum teaching dental hospital diagnosed with oral squamous cell carcinoma from 2008 to 2013 and treated surgically with or without chemotherapy or radiotherapy.

Study two:

A prospective study for newly diagnosed patients from 2010-2014 and who will undergo definite treatment by reconstruction.

Inclusion criteria: Patient with primary oral cancer diagnosed and treated surgically with or without chemotherapy or radiotherapy in Khartoum teaching dental hospital in the period from 2008 to 2014

Exclusion criteria: Incomplete records, any reconstruction rather than the upper three flaps.

Variables:

- Background: gender, age.
- Site: oral cavity.
- Type: oral cancer.
- Type of reconstruction:

Distant pedicle flap

Sampling:

Sample size: All patient of primary or recurrent OC treated surgically in Khartoum teaching dental hospital in the period between 2008- 2014.

Plan for data collection:

The data will be collected prospectively and retrospective from OC patients in Khartoum teaching dental hospital and entered into a data collecting sheet.

Tools:

1. Data collecting sheet

Plan for data processing and analysis: All data will be analysed by using statistical package of social science (SPSS 17) program

Result

Fifty four cases of 58 patients with oral maxillofacial cancer who had record, with different types of cancer and different sites. They reconstructed by pedicle flaps. The male to female is 42 to 12. The age mean is 55 year.

They were 38 cases of S.C.C (70.4%) ,4 cases of Adenoid cystic carcinoma (7.4),3cases varroucs carcinoma (5.6%), 2 cases of osteosarcoma (3.7%), 2 cases acinic cell carcinoma (3.7%) , and 5 case of other cancer entity(9.3%). The cancer was in different sites of the face, lower lip 25 patients (46.6%) check and mandible 8patients (14.8%), check 5 patients (9.3%), hard palate 3 patients (5.6%), mandible 8 patients (14.8%), and other sites 5 patients (9.3%). The work of these patients was by resection and reconstruction by pedicled flaps. The most common used one is deltopectoral flap and we used it in 26 patients 48.1%, the other most common flap is pectoralis major flap which we used it in 19 patients 35.2%, and the least used flap is temporalis muscle flap in 5 patients 9.3%.

The total flap success rate was in 46 patients (85.9%) according to the acceptances of the flap, function and aesthetic.

While the 8 cases (14.8%) of flaps are failed according to intake of the flap because of infection and necrosis of flap. Then failure of restoring the function and aesthetic.

The deltopectoral flap success rate was in 24 patients 92.3%, pectoralis major flap in 15 patients 78.94% combined flap in 3 patients 75%, and 4 patients 80% of the temporal muscle flap.

Table (1): Age statistics of cancer patients admitted to KDTH

Valid	54
Missing	0
Mean	55.74
Std. Error of Mean	1.751
Median	55.50
Mode	60
Range	60
Minimum	25
Maximum	85

Table (2): Sex distribution of cancer patients admitted to KDTH

Sex	Frequency	Percent	Valid Percent
Male	42	77.8	77.8
Female	12	22.2	22.2
Total	54	100.0	100.0

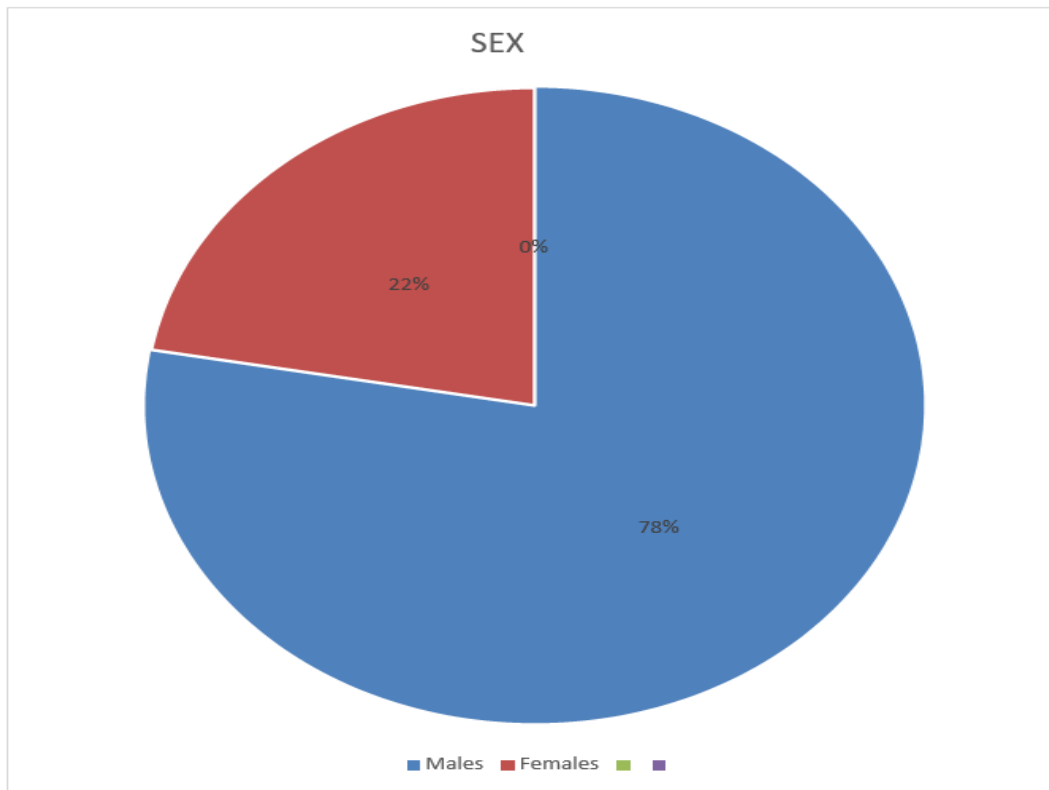


Figure (1): Sex distribution of cancer patients admitted to KDTH

Table (3): Lesion site among cancer patients admitted to KDTH

Lesion site	Frequency	Percent
hard palate	3	5.6
Mandible	8	14.8
lower lip	25	46.3
Check	5	9.3
other sites	5	9.3
check and mandible	8	14.8
Total	54	100.0

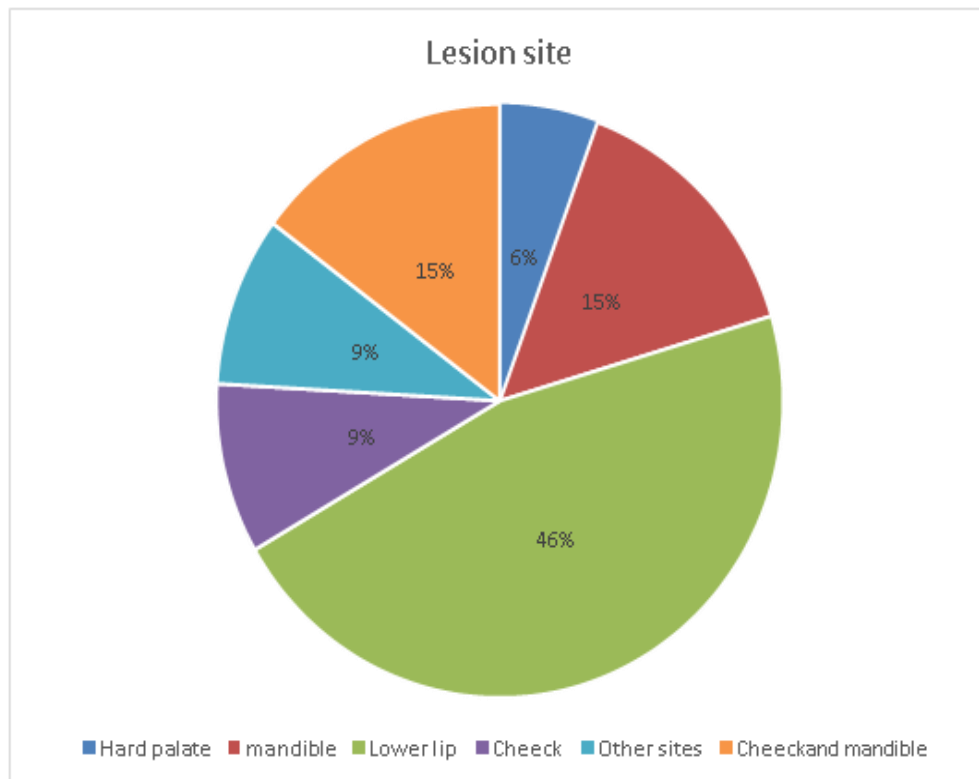


Figure (2): Lesion site among cancer patients admitted to KDTH

Table (4): Prevalence of different cancers among patients admitted at KDTH

Prevalence of different cancers	Frequency	Percent
Squamous cell carcinoma	38	70.4
Adenoid cystic carcinoma	4	7.4
Varroucs carcinoma	3	5.6
osteosarcoma	2	3.7
Acinic cell carcinoma	2	3.7
Others	5	9.3
Total	54	100.0

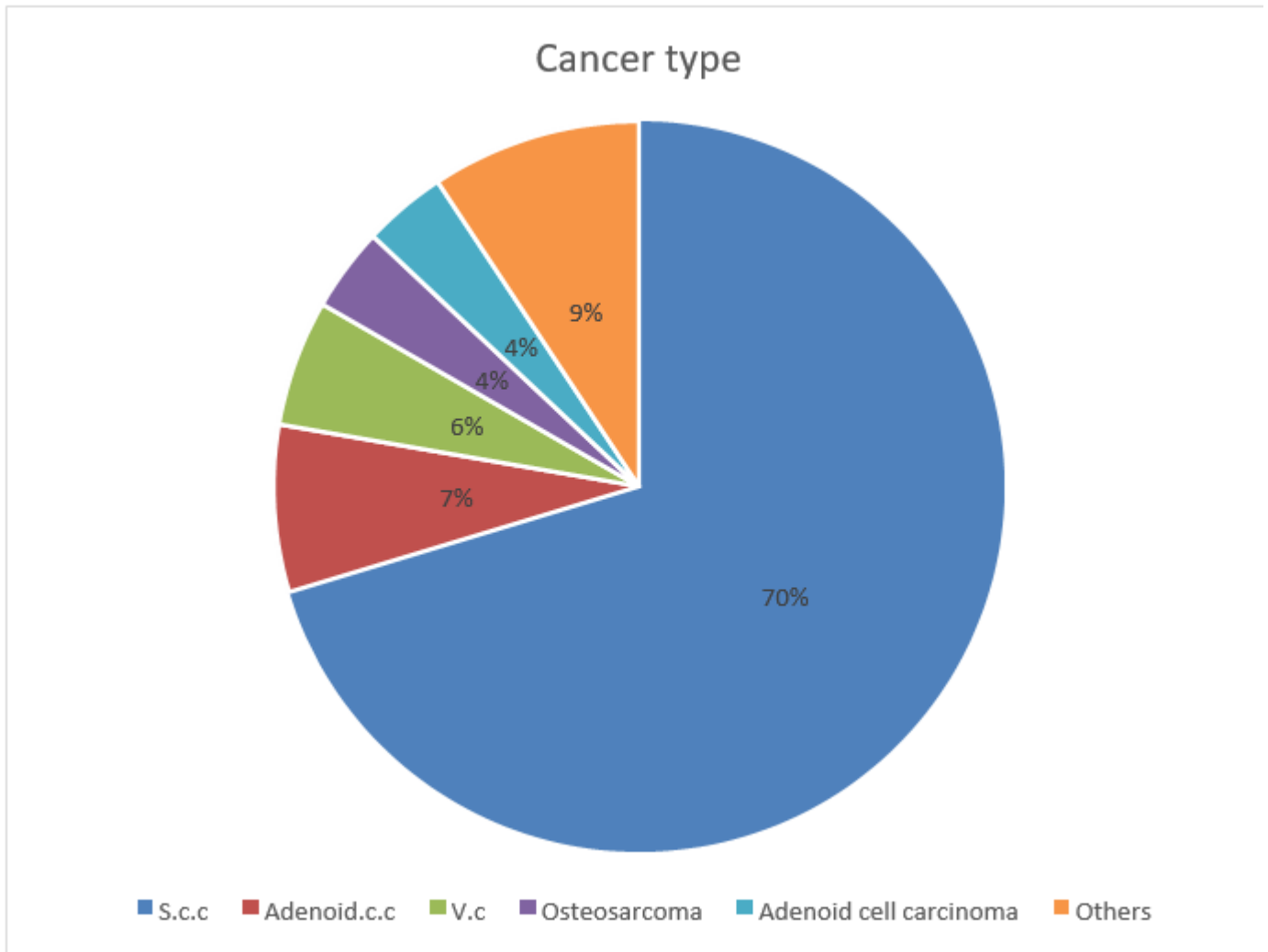


Figure 3: Prevalence of different cancers among patients admitted at KDTH

Table (5): Types of flaps among patients with cancer operated at KDTH:

Types of flaps	Frequency	Percent
Deltopectoral flap	26	48.1
Pectoralis major flap	19	35.2
Temporalis muscle flap	5	9.3
Combined	4	7.4
Total	54	100.0

Table (6): Flaps success among patients with cancer operated at KDTH

Flap success	Frequency	Percent
Succeed	46	85.9%
Failed	8	14.8%
Total	54	100.0%

S.E = .046 P.value =0.05

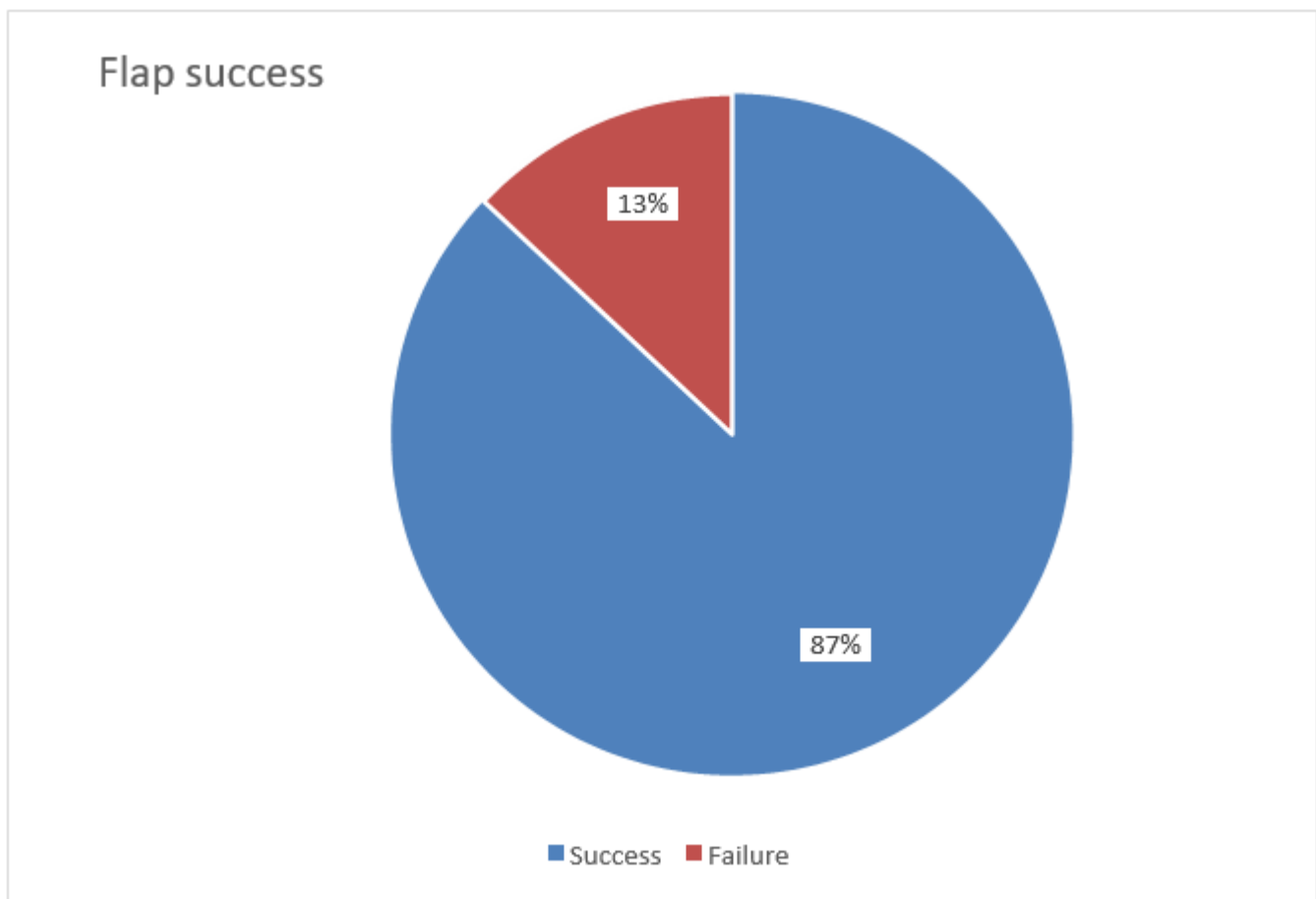


Figure (4): Flaps success among patients with cancer operated at KDTH

Table (7): Flaps in the order of frequency among patients with cancer operated at KDTH

Type of flap	Success	Failure	Total number
Deltopectoral flap	24 cases (92.3%)	2 cases (7.6%)	26 cases (100%)
Pectoralis major flap	15 cases (78.94%)	4 cases (21.05%)	19 cases (100%)
Temporalis muscle flap	4 cases (80%)	1 case (20%)	5 cases (100%)
Combined flap (Pectoralis and deltopectoral)	3 cases (75%)	1 cases (25%)	4 cases (100%)

S.E = .046

P. value =0.05

Deltopectoral muscle flap

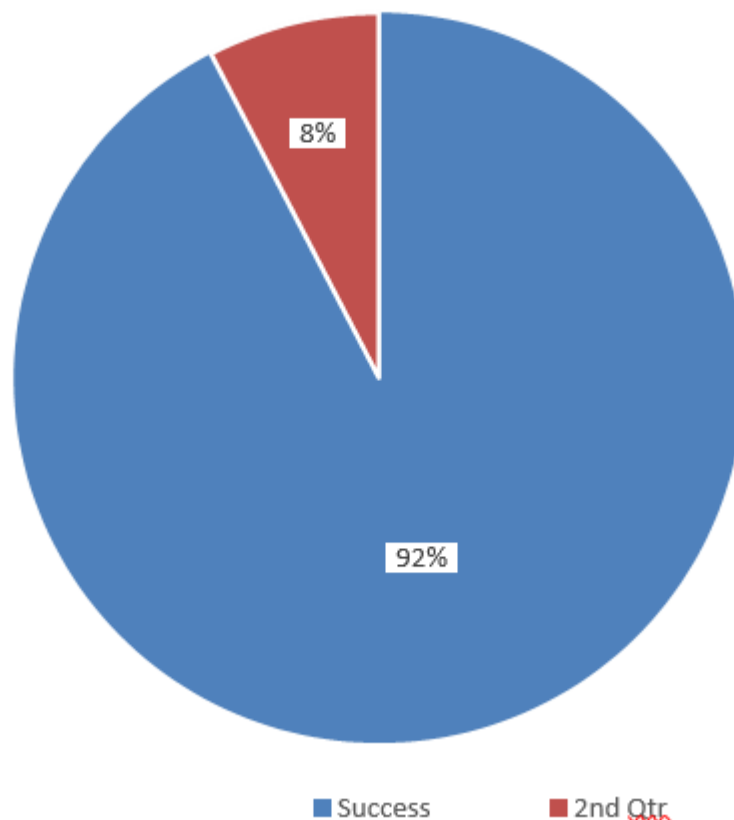


Figure (5): Deltopectoral muscle flaps in the order of frequency among patients with cancer operated at KDTH

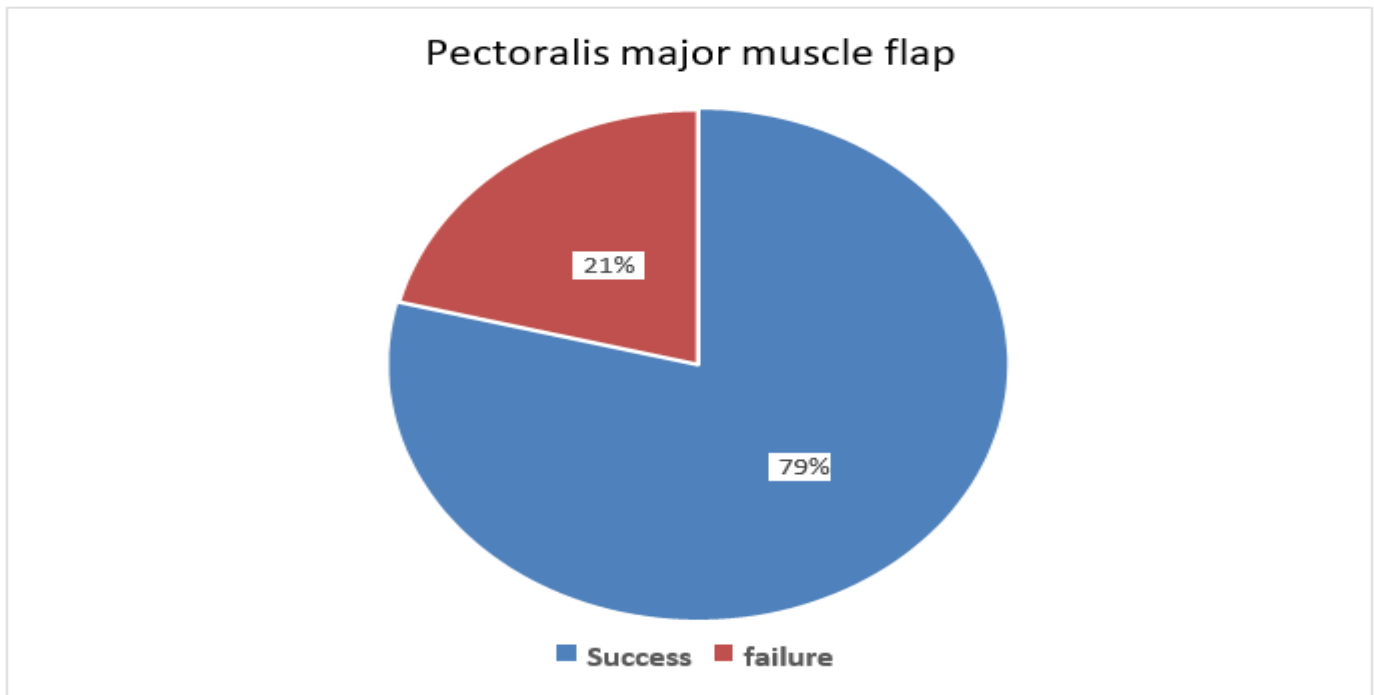


Figure (6): Pectoralis major muscle flaps in the order of frequency among patients with cancer operated at KDTH

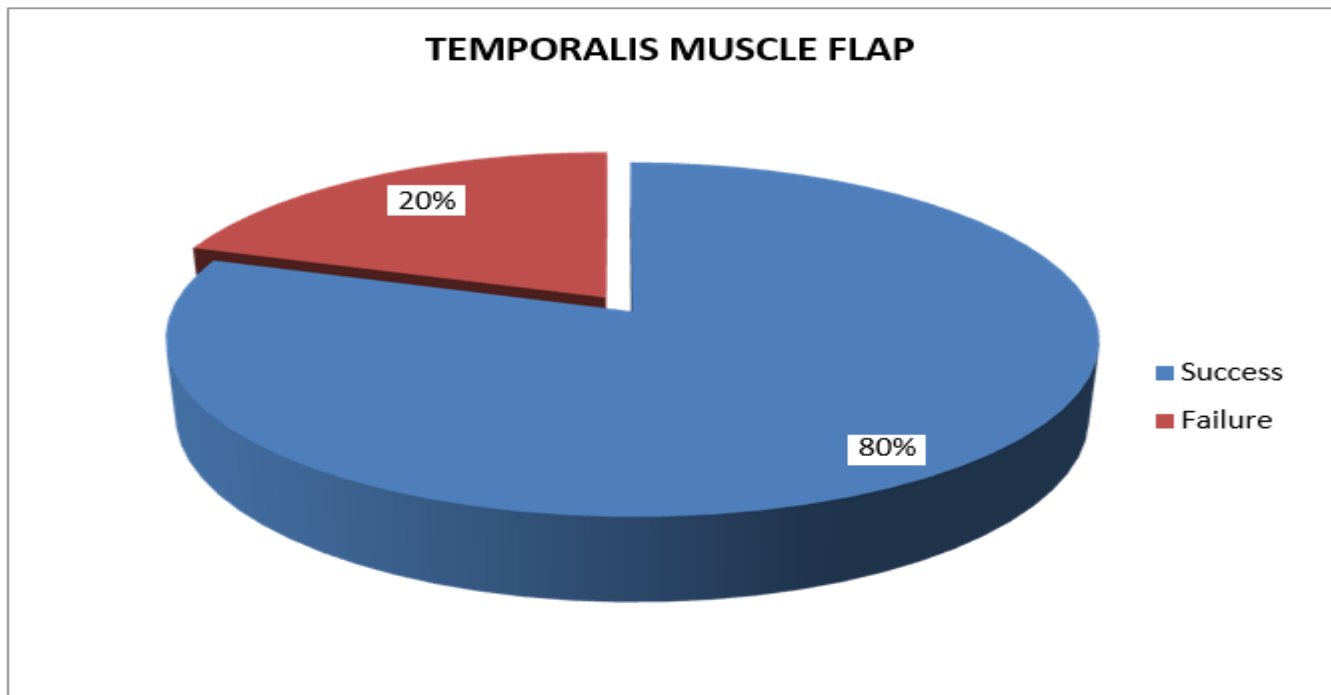


Figure (7): Temporalis muscle flaps in the order of frequency among patients with cancer

operated at KDTH

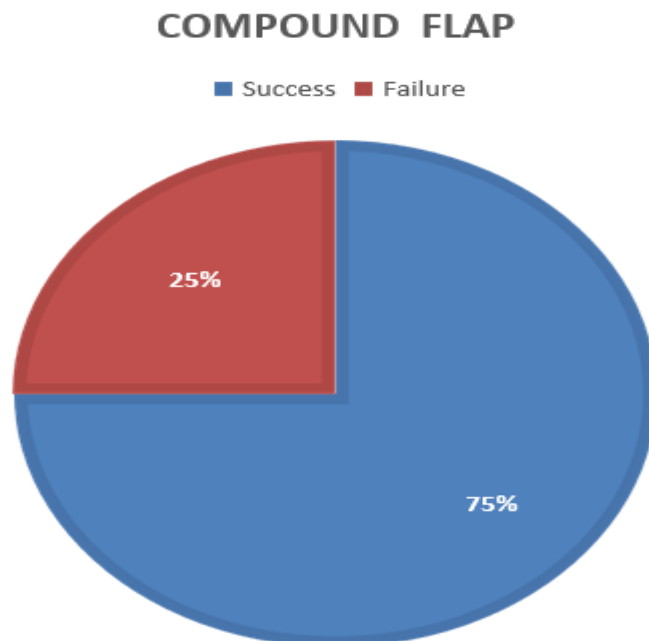


Figure (8): Compound muscle flaps in the order of frequency among patients with cancer operated at KDTH

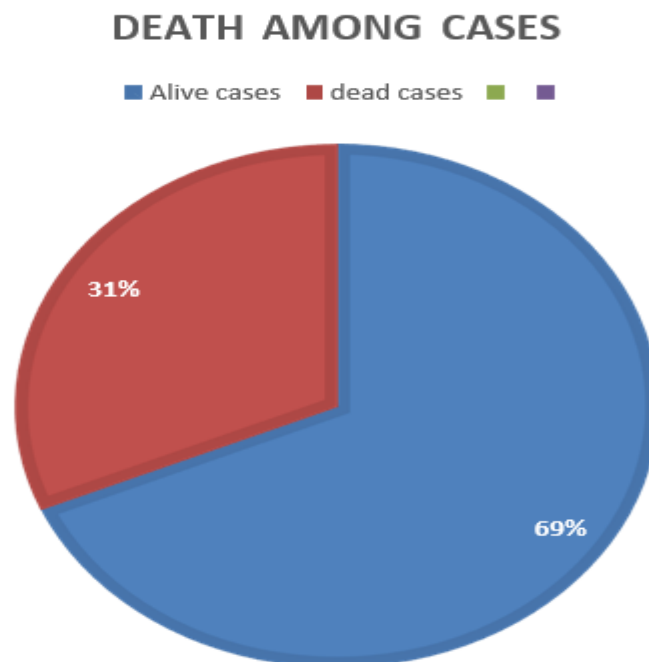


Figure (9): Deaths among operated cancer patients at KDTH

The analysis done by data sheet which with it we monitor the categories, which can interfere after the reconstruction, like:

1/ pain, 2/satisfaction, 3/activity, 4/aesthetics, 5/function and mood.

The appearance concerned by the patient cover his face at public or not. The functions concerned by:

- Opening,
- swallowing,
- tongue movement,
- chewing and
- Speech.

Table (8): Quality of life assessment (aesthetic, function and pain) after operation

Variable analysis for follow up	Frequency	Percent
Appearance satisfaction		
No	23	42.6
Yes	31	57.4
Daily activity		
normal activity	50	92.6
with difficulties	4	7.4
Mouth opening		
Normal	44	81.5
drooling saliva	7	13.0
Deformity	3	5.6
Pain with opening		
Pain	1	1.9
no pain	53	98.1
Opening limitation		
Normal	45	83.3
Limited	9	16.7
Pain with swallowing		
Yes	0	0.0

No	54	100.0
Pain in tongue		
Pain	5	9.3
no pain	49	90.7
Mobility of tongue		
Mobile	46	85.2
Restricted	8	14.8
Pain with chewing		
Pain	1	1.9
no pain	53	98.1
Difficulty in chewing		
Normal	38	70.4
Difficult	16	29.6
Ability to chew		
hard food	5	9.3
soft food	45	83.3
Liquids	4	7.4
Pain with speech		
Pain	2	3.7
no pain	52	96.3
Clearly of speech		
Understandable	47	87.0
not understandable	7	13.0
Mood of patient		
Good	49	90.7
Bad	5	9.3

Discussion

Reconstruction of complex oral cavity defects following radical excision of oral cancer is a great challenge to the head and neck surgeon. Various methods have been described to reconstruct these defect including skin

grafts, fasciocutaneous flaps, myocutaneous flaps and free flaps. [14]

The main characteristics to be considered in choosing a reconstructive technique for repairing head and neck defects are, in descending order of importance, reliability, function, and cosmesis. In addition, the status of the donor tissues should be taken into consideration. It is important to assess the regional vascular status and take into account previous surgery or trauma, body habits, and the patient's overall medical condition. [10]

Khartoum Dental Teaching Hospital is the major centre for management of oral and maxillofacial cancer in total Sudan.

The reported study was aimed to throw light on the types of reconstruction carried in the hospital, and the possible sequel of such reconstructions.

It is not easy in country like Sudan to follow up patients or contact them. In the period of study we managed to contact 54 patients who had reconstruction and are alive.

The common flaps used in reconstruction of soft tissue in Khartoum dental teaching hospital mainly three flaps:-

Deltopectoral. Pectoralis major muscle. Temporalis muscle.

The most common flap used was deltopectoral flap 26 cases, its popular flap, easily taken, with good result in its standard use or modification. The flap can be used in both male and females. We used it for lip reconstruction, neck defect cover and small defects in the cheek. The deltopectoral flap provides 44cm² surface of reconstruction.

One of the advantages of the flap is short operation time and technique after the lesion is removed, and this is one of the advantages of the regional flap, over the free vascularised flaps. Another advantage is the minimal cost of the operation and easy to follow up the patient. These make the regional flaps the best choice.

We used 26 deltopectoral flaps, two flaps from the 26 were failed, and the main causes of failure were infection and necrosis. Necrosis may result from several factors such as tension, kinking, and infection. We had also some minor complications like haematoma, and mild dehiscence of the flap which was solved by local measures. The overall flap survival rate was 92.3%.

Some patients would have had some saliva drooling which would stop after a while, and after they get used to the reconstruction.

Many authors' reported the same complications and even more according to their experience, Chung-Ho Chen and colleagues reported fistula, dehiscence, and haematoma, in their study of 49 patients, with 92% success. [10] Amr Selim used a modification to make the flap safely reach and cover the skin based on the lateral pedicles;

the modification result in total flap failure in only one patient, when patient had flap discoloration on the partial distal part.[11] From our experience the DP flap remains a readily available tissue source that is technically easy. DP flap success rates are reported to range from 90.5% to 83%.[10]

Necrosis which can start from the beginning in the operation room, and, that would be due to flap made too long for its blood supply, or flap was thin, a very thick flap in an overweight patient, and kinking or tension these complications according to Rudei P. and colleges.[9]

The necrosis which happened to our flaps were possible to be, because of kinking, tension, and trauma to the feeding vessels.

It was mentioned the tubing can cause kinking of the flap but in our cases we managed it in a good way.[9]

The infection beneath the flap, will end with necrosis, and happen because the oral hygiene, patient immunity and the antibiotic used to control the infection from the beginning is not sufficient.

Water tight suture is of great importance in finishing surgical wound, leakage of saliva, drinks and even food invite infection and subsequently loss of the flap.

The most second flap we used in Khartoum Dental Teaching Hospital is pectoralis muscle flap, we worked on 15 flaps, with 4 flap failure, with 78.94% over flap survival rate. The pectoralis major muscle is very strong muscle which can even fracture the mandible, so bulky, and better use in male than females, because of the deformity which can happen to the breast tissue, female best reconstruct by Latissimus dorsi rather than pectoralis. One of its complications, it restrict the shoulder movement if not properly harvested. We did not face in our cases.

We used it in the large defects and if we need 2 epithelial surfaces for reconstruction, through and through defect, which make the handling of the flap and contour it with the surrounding tissue difficult. This resulted in dehiscence, saliva drooling and infection, especially cheek surgery as we did in the majority of patients.

The most complication we had is necrosis in 2 cases, from the beginning at the other 2 cases, became infected and then necrotic. There was dehiscence, solved by local measures under local anaesthesia. Usually we deal with old medically compromised patient which make the flap intake, a little bit challenging.

V.D Kekatpure reported 41% of pectoralis muscle flap complication in his patients, and mentioned that the result are the same reported in the literature. He reported necrosis, is not common because of the vascularity, of the pectoralis muscle. Wound infection and delayed healing are more common following chemo radiation. [13]

Umanath K. reported about satisfaction of 75% of patients after pectoralis major reconstruction. The satisfaction he reported is on function and cosmetic. [28] In our study we have 78% of our patients satisfied

as general, of function and cosmetic.

Quazi revealed that the availability of skin paddle is limited for larger defects and most patients develop unaesthetic neck contracture band.[30]

The temporalis muscle flap was the least flap in the present study. There were 5 cases. There was one failure, overall flaps, successful rate was 80%. The temporalis myofascial flap can be used both as single and as a composite flap with cranial bone, coronoid process or skin island. [25]

The failure of flap was due to necrosis, which might happened due to the tension on the vessels from the pedicel of the flap itself.

The other four patients had successful reconstruction followed by satisfactory obturator. One of the common complications of the temporalis, is the deformity which would show at the temporal area, an obvious depression. However, it's usually not bothering, because it can easily covered by Emma or Toab. And we can also fill the defect area with acryl or grafts.

In addition to the deformity cause by using the flap, the flap masks any recurrence that might occur. Luckily on follow up (4 years) none of our patients develop this complication.

Luigi Clauser, reported different uses of the temporal flap, in syndromic patients, trauma and cancer, and mentioned that phonation is the most difficult function to maintain, while swallowing and chewing are restored to a large extent. Some cases result in persistence of hypernasality. [25]We had this problem in all our patients. The important issue in reconstruction in any type of its soft tissue or bone, not to sacrifice the oncologic principles of the operation in order to perform the reconstruction.

All the recent studies showed that the success rate of the free flaps over the regional flap is higher. However hospital setting, the financial ability of the patients and the experience of the surgeon influence the decision and choice of the technique to be used.

KDTH is the major centre for referral oral cancer in whole Sudan. The majority of cases came in late stage, which means a big operations, which will ended spontaneously with huge defects. In the era of the microvascular flaps, are not usually familiar in the poor countries, not because of the knowledge leakage but because of the facilities demands of these kinds of flap.

In the rich countries the free vascularized flaps become the most commonly used flap. Nevertheless they still used the regional flaps, still very frequently used and the horseshoe in reconstruction of the face.

The regional flaps are easy to use and handle, the operation time is shorter, not costly, and can be done with normal instrumentation.

According to the present study regional flaps are successful and reliable. It is the corner stone in our practice.

The most common complications we have with flaps is infection, and this can be due to large defect, the age of the patient, oral hygiene and nursing. The big defect needs sufficient bed of tissue to close and contour together with oral mousa surround the whole oral cavity with proper water seal suture, not to allow saliva to seal beneath the flap tissue.

On other hand the age of the patient play a role in the elasticity and the blood supply. So good care and close follow up must be done to avoid any contiguous infection, which can result in the necrosis. The patient immunity plays another role in infection and great care must be considered about the medical compromised patient, the nutrition of the patient, and good hospital setting with well-trained stuff.

Anther most complication is the necrosis, which is one of the important complication which can happen if the blood supply is jeopardised. It happened in 3 patients. So we have to consider all these facts and impaired deep in mind and we have to be meticulous during the operation for maintain the blood supply, and put the flap without any tension at pedicle and at the recipient site.

Conclusion

The regional flaps are successful, reliable with less expense and with good result.

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Conflicts of Interest: There are no conflicts of interest.

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