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Reconstruction of surgical defects following Cancer surgery

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ABSTRACT

Introduction: The most common tumours in the skin are the SCC, BCC and malignant melanoma. Most of the tumours are excised with wide margins. Surgery remains the treatment of choice and adjuvant treatment is recommended in high-risk patients. **Aim:** The present is designed to study the different cancers of the skin, head and neck, oral cavity and breast, their reconstructive procedures for the surgical defects. **Materials and methods:** This prospective study includes patients with malignant skin tumours involving extremities, trunk, head and neck, face , carcinoma of breast and oral cancer who are diagnosed and treatment were studied and analyzed . For skin tumours, over 2 year period 14 patients were followed up in the present study **Results:** . Majority are in between 50-60 years. Most of the cases were amenable to surgery as primary modality of treatment. Peak incidence is noted in between 50-70 years with mean age 68.3, most common site being the head and neck (35.7%). Basal cell carcinoma is most common tumour in skin tumours. In breast cancer age group 41-50 years are most common group effected in study , Invasive ductal carcinoma is histological finding seen more in study. Majority of the patients 76% (16 out of 21), have expressed excellent to good results following oncoplastic breast surgery.Majority of the patients 88% (16 out of 21), have expressed excellent to good results following oncoplastic breast surgery. None of the patients had local recurrence. In oral cancers 61-70 years is the most common age group in the study. Out of 15 cases, maximum no of reconstructions were done with pectoralis major myocutaneous flap+delto pectoral flap (PMMC+DP). In 12 patients, while 2 of the cases underwent simple closure, while 1 Case was allowed to heal by secondary intention. Out of the 15 cases in the study, necrosis occurred in only 2(6.7%) of the PMMC+DP flaps, while infection and orocutaneous fistula were not Observed. **Conclusion:** The reconstructive procedures adopted in this study resulted in cosmetically acceptable results with very low recurrence rate.

Key words: Skin tumours, Breast carcinoma, Oral cancer, Reconstructive procedures.

Introduction

The most common tumours in the skin are the SCC, BCC and malignant melanoma. Excision of the tumour with free surgical margins is the primary modality of treatment for skin tumours. The defect may be closed primarily by direct suture/SSG/flap cover. Important consideration has to be given to the post-op radiotherapy for the SSG/flap. Most of the tumours are excised with wide margins. The defect can be closed primarily or with SSG. The advantage of SSG is that it does not obscure the field when recurrence is being watched for. One of the situations which would require cover by a flap is a surface left following excision which is unsuitable for grafting, for example bare cortical bone or tendon. The virtues of a flap would then have to be weighed against the degree of certainty of adequate excision, particularly in depth, this being the part most likely to be hidden by the flap. Important consideration to be given is the perfection of cosmesis to the patient and resection of the tumour with adequate margins.**Mohs surgery**, also known as **chemosurgery**, after each removal of tissue and while the patient waits, the tissue is examined for cancer cells. That examination informs the decision for additional tissue removal. Mohs surgery is one of the many methods of obtaining complete margin control during removal of a skin cancer (CCPDMA – complete circumferential peripheral and deep margin assessment[1-4]using frozen section histology[5].The cure rate with Mohs surgery cited by most studies is between 97%

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and99.8%[6] for primary basal cell carcinoma, the most common type of skin cancer. Mohs procedure is also used for squamous cell carcinoma, but with a lower cure rate. Breast carcinoma is the leading cause among women in most developed countries. It is not a single disease, which comprises of many biologically different entities with distinct pathological features and clinical implications. Accumulating evidence has suggested that breast cancers with different histopathological and biological features exhibit distinct behaviors that lead to different treatment responses and should be given different therapeutic strategies[7]Many women with early-stage cancers can choose between breast-conserving surgeries (BCS) and mastectomy. The main advantage of BCS is that a woman keeps most of her breast. But in most cases she will also need radiation. Women who have mastectomy for early-stage cancers are less likely to need radiation.Oncoplastic breast surgery continues to evolve along with advances in the detection and management of breast cancer. Restoration of the breast to a form as close as possible to its presurgical state continues to be the primary goal. The psychological, social, emotional and functional benefits of oncoplastic breast surgery have been well documented over the last 30years. Cancers of the oral cavity account for 3-4% of all the malignancies. In contrast incidence approaches 10.5% in our country. Buccal mucosa accounts for 30% of these tumours. The high incidence of oral cancers in our country has been attributed to the peculiar social habits which include tobacco chewing, betel nut, placing a quid (consisting of betel leaf smeared with slaked lime, areca nut, and other aromatic spices with or without catechu, powder of betel nut) either in the posterior half of gingivo buccal sulcus or in the gingivo labial sulcus. In the western countries, smoking and alcohol are the major causative agents. In our country other studies has demonstrated the association of bidi smoking in addition to pan chewing in oral cancer. Further they have been shown to have synergistic effect.

Materials and methods

This prospective study is designed to study different cancers of the skin, head and neck, oral cavity and breast, their reconstructive procedures for the surgical defects. Patients with malignant skin tumours involving extremities, trunk, head and neck ,face , carcinoma of breast and oral cancer which were referred to Osmania general hospital for diagnosis and treatment were studied and analyzed from 2013-2015. Consent from the patients was taken and were informed about the study.

Skin Tumours

Inclusion criteria: Patients with malignant skin tumours involving extremities, trunk, head and neck, face were included.

Exclusion criteria: Patients with age > 70 years were excluded.

14 adult patients were evaluated by clinical examination, chest X-ray, blood investigations, imaging studies (CT/MRI), FNAC, USG where ever indicated. Operative procedures and width of surgical margins varied according to the histology and extent of local infiltration by the tumour. For BCC, local excision was carried out with a minimum margin of 0.5 cm. For SCC, minimum taken was 1 cm. For malignant melanoma, minimum margin taken was 2 cm. Comprehensive regional lymph nodal dissection was performed if there was evidence of nodal involvement. Prophylactic lymph node dissection was not performed in any of the patients. For patients with skin cancers (SCC or Melanoma) of the extremities, where the disease had completely encased the neurovascular bundle or infiltrated bones, amputations were performed. For large surgical defects not suitable for primary closure, reconstruction was done using split skin grafts, local (transposition/rotational advancement) or regional (fasciocutaneous/ myocutaneous) flaps.After completion of treatment, all the patients were followed up at three monthly intervals to look for relapse of disease and distant metastasis.

Breast Cancer

Inclusion Criteria : All patients of carcinoma breast who desired and opted for breast conservation surgery and reconstruction for lumpectomy and mastectomy defects were included in this study.

Exclusion Criteria: Patients with age >70 years, not willing for breast conservation / reconstruction, with LABC who received neoadjuvant chemotherapy, with inflammatory breast cancer were excluded.

All cases of carcinoma breast were evaluated by clinical examination, mammography and cone needle history. Other investigations include CXR, USG abdomen, LFT, Alkaline phosphatase.21 patients were underwent oncoplastic breast surgery (BCS with or without reconstruction). The tumors were excised with a 1cm gross margin in all dimensions and axillary dissection was done. The specimens were marked for pathological assessment of the margin status (superior – short, lateral – long).Previous biopsy / lumpectomy scars were excised with 1cm margin all around and removed enbloc along with the residual tumor.

Axillary dissection was done using a separate in the axilla at the level of junction of the normal skin and hair bearing skin of the axilla. Lymph nodal levels I and II are routinely dissected and level III are removed only if level I and II nodes are involved with tumor. Care is taken so that the breast wound doesn't communicate with the axilla. Meticulous hemostasis is achieved in the wide excision cavity. Defects which amount to < 10% of total breast volume are closed primarily; defects between 10% - 20% are addressed by local flap rotation techniques and defects if > 20% of total volume is reconstructed with autologous tissue transfer.

The patients are regularly followed up by physical examination and yearly mammographic study. During physical examination, the patient is examined for any evidence of local recurrence / regional recurrence. The opposite breast and axilla are also examined. Symptomatic patients are subjected to imaging studies as deemed necessary. The maximum period of follow up is 26 months and the mean period of follow up is 12 months.

Post OP Complications:

None of the patients who underwent BCS with primary closure of the defect had any wound related postoperative complications. One patient who underwent Wide excision of the tumour with LD flap reconstruction had partial necrosis of the flap on the medial side and the wound healed by secondary intention.

Local recurrences and distant metastasis:

None of the patients had local recurrence, however one patient developed distant metastasis in the liver following BCS with LD flap reconstruction and post operative chemoradiation.

ORAL CANCER-

Inclusion criteria: Patients with lesions in the oral cavity were included.

Exclusion criteria: Patients with synchronous malignancies elsewhere in the body were excluded.

15 patients were included in study, most important risk factor being tobacco chewing and most common site is buccal mucosa. All the patients were diagnosed and confirmed by wedge biopsy, FNAC of nodes in the neck, x-ray mandible, OPG, LFT and surgical profile. The patients were followed up in the monthly and subsequently yearly basis for a period of 2 years.

RESULTS

This prospective study of different cancers of the skin, head and neck, oral cavity and breast, their reconstructive procedures for the surgical defects.

Patients with malignant skin tumours involving extremities, trunk, head and neck ,face , carcinoma of breast and oral cancer were studied and analyzed for 2 years.

Skin Tumours

Table 1: Complete data of skin tumours

Characteristic	No of Patients	Percentage (%)
Age distribution in years		
11-20	1	7
31-40	2	14
41-50	1	7
51-60	5	35
61-70	5	35
Sex distribution		
Female	7	50
Male	7	50
Site of presentation		
Lower limbs	4	28
Upper limbs	2	14
Head	5	35
Trunk	3	14
Duration of presentation		
<6 months	8	57
6-12 months	6	42.8
Type of surgery performed		
WLE+PRIMARY CLOSURE	2	14

WLE+FLAP RECONSTRUCTION	5	35
WLE+SSG	5	35
AMPUTATION	3	21
AMPUTATION+LN DISSECTION	2	14
Type of treatment performed		
Surgery alone	12	85
Surgery + RT	2	16

Peak incidence is noted in between 50-70 years with mean age 68.3, most common site being the head and neck (35.7%),

Table 2: Histological types of skin tumors

TYPE	TRUNK	UL	LL	HEAD	TOTAL
SCC	-	1	2	1	4(28.5%)
BCC	1	1	-	4	6(42.8%)
MELANOMA	-	-	2	-	2(14.2%)
MCC	1	-	-	-	1(7.1%)
SEBACEOUS	1	-	-	-	1(7.1%)

Basal cell carcinoma is most common tumour in skin tumours.

Table 3: Complete data of breast cancer

Characteristics	No. of Cases	Percentage
Age distribution		
10-20	0	0
21-30	2	9.5
31-40	9	42
41-50	7	33.3
51-60	1	4.7
>60	2	9.5
Staging		
T1N0	4	19
T1N1	0	0
T2N0	8	38
T2N1	6	28
T3N0	1	4
T3N1	0	0
TxN0	2	9
Type of oncoplastic surgery		
BCS with Primary closure	16	76
Wide excision with LD flap	3	14.2
Wide excision with TRAM flap	1	4.7
Wide excision with implant based reconstruction	1	4.7
Histology		
Invasive ductal carcinoma	17	80
Invasive lobular carcinoma	3	14
Phyllodes tumour	1	4.7
Margin status		
Positive margin	1	4.7
Close margin (<1mm)	0	0

Negative margin	20	95
Level of satisfaction		
Excellent	3	14
Good	16	76
Average	1	4.7
Poor	1	4.7

Age group 41-50 years are most common group effected in study , Invasive ductal carcinoma is histological finding seen more in study. Majority of the patients 76% (16 out of 21), have expressed excellent to good results following oncoplastic breast surgery. Only one patient expressed dissatisfaction over the result of reconstruction citing scarring over the breast secondary to partial flap necrosis and minor wound infection.(Table 3). All patients were subjected to wide excision of the tumour with 1cm of gross margin. However 1 patient had microscopic margin positivity on post operative HPE report. Out of the two patients, one underwent wide excision of the tumour with axillary dissection and immediate reconstruction with LD flap in December 2013. On post op HPE the medial margin was microscopically positive. She was not considered for further surgery and was treated with adjuvant chemotherapy and radiotherapy with boost to the tumour bed. She completed treatment in Dec 2014, is under regular follow up and has no evidence local recurrence or distant metastasis. The other patient with margin positivity had a wide excision with axillary dissection for carcinoma breast in the upper outer quadrant of the Right Breast. The pathologist could not mention site of margin positivity as the silk tie tagged to the specimen was lost during processing. As we did not know which margin was positive, the patient was not considered for re-excision and was treated with post operative chemoradiation with boost to the tumour bed. The patient is doing well postoperatively with no evidence of local recurrence or distant metastasis.

Table 4: Oral cancer

Characteristics	No. of Patients	Percentage
Site of the lesion		
Tongue	2	13.3
Buccal mucosa	8	53.3
Lip	2	13.3
Hard palate	1	6.7
Floor of mouth	1	6.7
Retro molar	-	-
Age distribution		
21-30	1	10
31-40	2	13.3
41-50	1	10
51-60	4	26.7
61-70	6	40
Sex distribution		
Male	9	60
Female	6	40
TNM staging		
STAGE I	3	20
STAGE II	2	13.3
STAGE III	4	26.7
STAGE IV	6	40
Reconstruction Flaps		
PMMC	2	13.3
PMMC+DP	9	30
FOREHEAD	1	6.7

61-70 years is the most common age group in the study. Out of 15 cases, maximum no of reconstructions were done with pectoralis major myocutaneous flap+delto pectoral flap (PMMC+DP). In 12 patients, while 2 of the cases underwent simple closure, while 1 Case was allowed to heal by secondary intention. Out of the 15 cases in the study, necrosis occurred in only 2(6.7%) of the PMMC+DP flaps, while infection and orocutaneous fistula were not Observed. (Table 4)

Discussion

Skin tumours

Peak incidence is noted in between 50-70 years with mean age 68.3. Mean age of the entire study population was 51.8 in Deo SV et al[8] study. From both the studies it is clear that the chances of skin cancer increases with advancing age and more common after 50 years of age and in the Present study the mean age is on the higher side.The site of incidence in our present study roughly correspond to other series with most common site being the head and neck (35.7%), followed by lower limbs, trunk, and upper limb and in the head and Neck, face was the most affected site with BCC being the commonest histological variety. Being a surface malignancy, most of the patients presented early to the hospital with 57% reported within 6 months of presentation and 42.8% within a year.(Table 1)

Treatment of the nodal disease may involve local RT, lymph node dissection, or combination of both. Although, surgery is the mainstay of treatment for all the three common skin cancers, the extent of surgery, both local and regional disease varies. Adequate surgery is most important to prevent recurrence and long term cure rates for patients with recurrent lesions are significantly lower than those for patients with primary lesions. Although recurrent skin cancer is more likely to metastasize, as occurred in one case in whom amputation of great toe was done and again 6 months later patient presented to us with recurrence in the foot with inguinal lymph nodes, for which the patient underwent wide excision and ilio-inguinal block dissection and took radiotherapy.One patient had distant metastasis with lung metastasis in case of MCC. When she presented with local recurrence, she initially presented with swelling over the right iliac region for which wide local excision was done and post operative biopsy report came out to be MCC. The patient was followed up every 3 months, after 6 months she presented to us with lung metastasis. In the surgeries done, most of the surgery done is wide local excision with flap reconstruction, which is also the most common surgery done in the deo et al group, which indicates that the tumours were presented with large size and wide margins created a large defect for flap reconstruction was to be done to cover the defect. Brodland and Zitelli[9] have demonstrated that lesions of less than 2cm can be safely treated by excision, with a 95% confidence interval using margins of 4mm and 6mm for low risk and high risk tumours respectively. These investigators found that certain characteristics were associated with a greater risk of subclinical tumour extension, thus qualifying such tumours as high risk. These included the size of 2cm or larger, histologic grade higher than 2, invasion of the subcutaneous tissue and location in high risk areas. Adequate surgical margin is very important, particularly for melanoma, where margin depends upon the thickness (depth of infiltration) of cancer.The tendency for regional lymph node metastasis is variable. Tumours arising in areas of chronic inflammation and at muco-cutaneous junction have a 10% to 30% rate of progression to metastatic disease, whereas the incidence of metastasis in the absence of pre-existing inflammatory or degenerative conditions varies widely from 0.05% to 16%.

The following observations were made:

1. For tumours greater than 2cm in diameter, recurrence rates double from 7.4% to 15.2%.
2. For tumours less than 4mm in depth are at low risk for metastasis (6.7%) compared with tumours deeper than 4mm (45.7%).

In the present study no loco regional metastasis was seen in BCC, and no local recurrence was noticed. Moh's micrographic surgery[10] has been implied for recurrent lesions or those located in the vital areas such as eyelid, digits, penis, nose, etc., but it requires a dedicated surgeon, pathologist and onsite facility for pathologic examination which is not present in our centres.The role of adjuvant therapy is limited in skin cancers. Although radiotherapy can be used as a primary mode of treatment for SCC and BCC located at certain sites such as nose, lip, eyelid and canthus, where surgery is technically difficult or likely to result in poor cosmesis. Radiotherapy has a very limited role in the management of melanoma. Post –operative radiotherapy is indicated in patients with advanced lesions, positive margins, lymph node metastasis, and intransit metastasis in melanoma and for palliation.

Surgical margin and the possibility of requirement of reconstruction are directly related to each other and there is always a critical tradeoff between them. Any compromise of the adequacy of surgical margins increases the chances of recurrence. A reconstructive procedure is always preferred to a potentially

suboptimal surgical excision. In the study only one case showed recurrence. Hence we feel that reconstruction expertise is necessary for proper management of skin cancers, especially in locally advanced growths.

Breast cancers

Patients who had greater loss of volume (>20% of total breast volume) underwent reconstruction of the defect with volume replacement techniques. Of the 10 patients in this group 8 patients underwent LD flap reconstruction, 1 patient had TRAM flap reconstruction and 1 patient underwent single stage silicone implant based reconstruction of the defect following surgery for phyllodes tumour of the breast.Most of the patients underwent LD flap reconstruction because of its reliability and minimal donor site morbidity. Pedicled TRAM was not considered for most of the patients in this study because the donor site morbidity of pedicled TRAM is greater when compared to donor site morbidity of LD flap[11]. One patient with Phylloides tumour underwent wide excision of the tumour with silicone implant based single stage reconstruction. Implants were not used for reconstruction because of the higher costs in implant based reconstructions as compared to reconstruction with autologous tissues. Moreover the tolerance of implants to postoperative radiation is poor resulting in complications like capsular contracture, deflation and exposure.Patients with locally advanced breast cancer who need preoperative chemotherapy were not considered oncoplastic breast surgery as facilities for preoperative clip/marker placement were not available in our set up. Also, published data indicate that only 25-30% patients, who received chemotherapy preoperatively, were able to undergo breast conservation surgery.Patients who underwent BCS with or without reconstruction had better psychological health, self esteem, sexuality and body images compared to the other published studies[12].An overview of all the trials has also demonstrated comparable survival indicating that survival for most patients with breast cancer does not depend on the choice of mastectomy versus BCS. The incidence of local recurrence after BCS has declined over time from 10 year rates of 8% to 19% seen in retrospective studies to 2% to 7% in patients excised to negative margins in more recent studies. This decrease in local recurrence rates is the result of a combination of improved mammographic and pathological evaluation, and the more frequent use of adjuvant systemic therapy. In contrast, rates of the after mastectomy have remained stable over the same time period. The major factor determining the cosmetic result is the extent of surgical resection. A variety of factors must be considered together (the size of the patient's breast, the size of the tumor, the depth of the tumor within breast and the quadrant of the breast in which the tumor is located) Because of the potential options for treatment of early stage breast cancer, careful patient selection and a multi-disciplinary approach are necessary.

Oral cancers

In this study it has been found that 66.7% of the patients indulged in tobacco chewing while 13.3% indulged in smoking and tobacco and 20% indulged in tobacco chewing, smoking and alcohol consumption.In this study the mean age group involved was 64.3 years, highest incidence is seen in 61-70 years with males 60% predominating over females, similar to the observations seen with the other studies.(table no 4)In the present study, 8 hemi-mandibulectomy, 2 marginal mandibulectomy and 4 segmental mandibulectomies were performed. In the past hemi-mandibulectomies were performed even for early lesions, since it was believed that the periosteal lymphatics contain tumour emboli but it has been proved that spread to the mandible is governed by the proximity of the tumour other than periosteal lymphatics. Mandibulectomies was not done in 3 patients. Maxillectomy was done in 1 patient for hard palate involvement.

Reconstruction:- In cases where the defects were larger a major reconstructive surgery was done. Out of 15 patients 3 required a single flap, while 9 required a double flap while 2 cases underwent simple closure and the remaining one case was allowed to heal by secondary intention.(table 4)PMMC and PMMC+DP were used maximum (73.3%) in the present study. It can be used in large defects to provide inner and outer lining. They provided excellent cover individually and in combination, these flaps are suitable in advanced stage carcinoma patients with limited life expectancy, relatively rapid procedure and inexpensive technique, where it supplies the required volume of tissue to obliterate the neck dead space, secures carotid sheath from exposure, protects the mandibular wound. Pedicle of the flap lies in its natural resting position. It tolerated well following radiation therapy. It is accepted by patients in terms of oral competence, speech, swallowing, etc.

Loco-regional recurrences:- The loco-regional recurrence rate in this study was found to be (3.3%). In this study the low rate is due to patients treated with surgery followed by radiotherapy and combined with chemotherapy in advanced cases. The loco-regional rate in the literature is (37-45%) comparable with the

study conducted by Spiro. The complication rate in my study is low, with only one case of PMMC+DP flap has suffered from necrosis. A study done at a research centre showed that well differentiated squamous cell carcinoma of buccal mucosa had statistically significant relationship with metstasis. Patient with early node negative cancers (stage I and stage II) have better survival rate than advanced cancers. The presence of lymph node in the neck is of grave prognostic significance. Relationship exists between T and N stage. Neck dissection was done in 7 cases. 6 were modified radical neck dissection and 1 was supraomohyoid neck dissection.In the management of metastatic cervical lymph nodes, most authors agree that a radical neck dissection has to be done. In a recent study it was found that radical neck dissection is superior to radiation therapy in treating metastatic lymph nodes. In this study out of 7 cases, 2 cases showed no evidence of malignancy on histopathological examination. This means the false positive rate was (14.3%). This enlargement of nodes is due to secondary infection. In these cases MRND was done. This could be avoided by using frozen section analysis of the lymph nodes. If it is positive we can do MRND, but if is negative supraomohyoid dissection can be carried out. Cut margins of the resected tumour were negative in all the cases.

Conclusion

In skin tumours, wide excision of the tumour was possible in most of the cases and reconstructed with skin grafts and local flaps. During follow up, no case had any flap necrosis or infection. Good results can be obtained with radical surgery and optimal surgical margins along with reconstructive procedure when needed. Oncoplastic breast surgery continues to evolve along with advances in the detection and management of breast cancer. The techniques adopted in this clinical study in obtaining symmetry and contour of both the treated and untreated breast have resulted in cosmetically acceptable results. There were no local recurrences so far in this study suggesting that the procedures adopted are oncologically safe. Patients with carcinoma of buccal mucosa were subjected to reconstruction with PMMC +DP flaps showed better results in terms of oral competence, speech, swallowing, and cosmetic appearance when compared to other flaps.

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