General Surgery

AN OBSERVATIONAL STUDY TO ELUCIDATE THE VARIOUS PRE-OPERATIVE FACTORS AND ASSOCIATION IN POST MASTECTOMY SKIN FLAP NECROSIS.

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ABSTRACT **Background:** A PMSFN is an important post-operative complication which need to be addressed properly. Various preoperative factors like cardiovascular disease, respiratory disease, anemia and preoperative chemotherapy may be interlinked with each other and with the PMSFN. Here we have presented a short study on analysis of various these factors and their degree of association. **Method:** This was a prospective study with a total number of 172 cases of modified radical mastectomy, operated at our institute in period from august 2021 to august 2022, in which 33 cases developed the PMSFN. We studied the above-mentioned factors in all cases and did the statistical analysis with the chi square test and odd's ratio. **Results:** Only one patient was male in our study rest all were females and that too were concentrated more in age group of 41 to 60 years. As seen here out of total 172 cases, we encountered the PMSFN in 33 patients. In 15 patients it was congestion only and in 12 patients we encountered the partial thickness PMSFN and in 6 patients there were full thickness PMSFN. **Conclusions:** The result shows that anemia, higher number of chemotherapy and cardiovascular diseases impart a greater risk for the MSFN. So these factors need to be assessed and managed meticulously.

KEYWORDS : post mastectomy PMSFN, SKIN score, breast cancer.

INTRODUCTION

The breast cancer has been described in literature approximately 2000 years ago and the description has gradually evolved from basics to advance in these years.

Famous scientist Claude Galen in around 100-200 AD gave opinion of breast tumor which resemble like crab.[1] Around 200 years ago by Morgagni, father of advanced pathology, done simple mastectomy with or without axillary clearance were more frequently undertaken.[1] Around 100 years ago C.H. Moore of united kingdom had done complete surgical removal of the breast for malignancy ,also said that enlarged lymph nodes in axilla should be surgically removed.[1]Then after William S. Halsted and Willy Meyer performed radical mastectomy for breast neoplasia.[1] The MRM[modified radical mastectomy] was first done by Patey and Dyson from united kingdom around 70 year ago.[1]

Mastectomy is done in cases where big size growth (according to breast), neoplasia under the nipple (central quadrant), multifocal growth of tumor, local recurrence of growth of tumor or patient's willingness.[3] Halsted's mastectomy, which is more radical and extensive include not only breast, axillary lymph nodes but also involve both pectoralis major and minor muscles, is no longer done because of more mortality and morbidity with no improved survival rate.[3] Now a days MRM is more commonly performed over radical mastectomy.[3]

Early postoperative serious complications are [1] seroma formation [2] surgical site infection [SSI] and [3] PMSFN. Seromas beneath the skin represent the most frequent complication after modified radical mastectomy.[2] Next common complication is the surgical site infection [SSI]. The majority surgical site infection [SSI] are a result of skin-flap necrosis.[2] PMSFN has a reported incidence of 5%–30% in the literature.[5] Above mentioned all complications can frequently occur simultaneously.[5]

Flap necrosis is associated with patient factors such as advanced age, breast size, diabetes mellitus, hypertension, smoking, tobacco usage and other cardiovascular disease.[4]

Significant morbidity (prolonged hospitalization and home-office wound care, lymphedema, and restricted shoulder function) is associated with even marginal wound necrosis.[4] Chemotherapy after surgery is also delayed due to this local complication. Our study purpose is to identify risk factor associated with PMSFN in cases of carcinoma breast and thus by minimize this complication we can reduce morbidity associated with PMSFN and can start post-operative chemotherapy early.

AIM & OBJECTIVES

To compare the strength of association of pre-operative factors like Diabetes Mellitus, anemia, cardio vascular diseases and respiratory diseases like tuberculosis, asthma, pre-operative chemotherapy with PMSFN.

MATERIALS AND METHODS

Patient Population

This study was approved by the GCS Medical college ethics committee and after approval the study was started. As being prospective study the potential candidates were the patients going for modified radical mastectomy in cases of carcinoma of breast. We have taken the cases from august 2021 to august 2022, the patients were walk in patients in our own medical college and was either diagnosed previously or diagnosed at GCS medical college with the carcinoma of breast on HPE.

Total 220 cases were diagnosed with carcinoma of breast and out of it most of the patients (n=172) were planned for modified radical mastectomy, 13 patients having the advanced disease, were planned for toilet mastectomy and 24 patients with early breast cancer chose for breast conservative surgery with radiotherapy option, and rest 11 patients were not giving the consent for the study so was excluded. So, we left with the 172 patients whose findings are composed here.

Each patient was explained about the nature of the study and consent was taken for being the part of the study.

All patients were operated by general surgeons at our institute who were doing the MRM from last 4 years and has operated independently minimum 40 cases per surgeon. The preoperative details were recorded previous the operation and various intra operative factors were asked to the respective surgeon and was noted.

The post-operative photo showing the PMSFN was taken on serial interval and the worst outcome was recorded and taken in account during the study. The review of photograph was done by the separate breast surgeon and not the operative breast surgeon to avoid the bias.

The working definition of PMSFN was defined broadly as a condition of observable skin changes of hypoxic injury resulting from local impairment of perfusion following mastectomy[6].

Scoring System

The literature has not yet classified the exact method for classification of the PMSFN. So, we have adopted the SKIN (skin ischemia and necrosis) score[6] from the research paper published by a mayo's clinic.

The consultants at mayo's clinic standardized the classification system according to the size, area and depth of necrosis as routinely done in calculation of burn's area by the rule of wallance[7] (rule of 9) and degrees of burn.

The SKIN score assigns a composite score to each operated breast:
(1) A letter score i.e. A, B, C, D on a 4-point scale for depth of MSFN and
(2) A numerical score i.e. 1,2,3,4 on a 4- point scale for surface area of the deepest MSFN.

Depth of PMFSN	
Score	
A	No evidence of PMSFN
B	Color change of skin flap (may be cyanosis)
C	Partial thickness necrosis leading to epidermal sloughing
D	Full thickness PMSFN

Surface area of PMSFN	
Score	
1	No evidence of PMSFN
2	Changes involve 1-10% of breast skin
3	Changes involve 11-30% of breast skin
4	Changes involve >30% of breast skin

All photographs were reviewed by the panel of 5 surgeons excluding the operating surgeon to avoid the bias.

Preoperative Parameters
We have taken account the various pre-operative factors and their respective strength of association with the PMSFN maintaining the intra operative factors equal in all cases. We have taken the following factors and has quantified them as per followings.

Age	Less than 40 years	41 to 50 years	51 to 60 years	>60 years
Sex	male	female		
BMI	Less than 18	18 to 25	25 to 30	>30
How many pre-operative cycles of chemotherapy taken?	No cycles	2 cycles	4 cycles	6 cycles
Pre-operative major systemic illness	Diabetes mellitus	Cardio vascular disease	Respiratory diseases (asthma, tuberculosis)	Chronic anemia

We have taken into account the age, sex, BMI, number of chemotherapy cycles before surgery and presence of major systemic illness i.e. diabetes, hypertension, asthma, tuberculosis. We also have quantified them according to severity as per shown in table but we have not taken account the full details of particular chronic disease and its whole history and medications.

Statistical Analysis
For Statistical Analysis, we chose the multivariate analysis and we have analyzed each case and placed the respective in each category. In all cases we have calculated the odd's ratio and have applied the chi square test[8] and has derived the p- value and significance was decided on the basis of that. In some cases it was not possible to do because some cells were zero in number, so chi square test can not be applied on that data.

RESULTS
1. Patients Demographics
Only one patient (0.005% male v/s 99.995% female) was male in our study rest all were females and that too were concentrated more in age group of 41 to 60 years (62.5% combined) while the extremes of ages i.e. less than 40 years and more than 60 years were 15.11% and 20.93% respectively as shown in table.

age	Less than 40 years	41 to 50 years	51 to 60 years	>60 years	total
female	26	54	55	36	171
male	-	-	1	-	1
total	26	54	56	36	172

2. Results of PMSFN
As discussed earlier that out of 220 total cases, only 172 cases were suitable and fulfilling the criteria for the study. So the results are subjected it.

Surface area score →	1	2	3	4	Total
Depth score ↓					
A	139	-	-	-	139
B	-	7	5	3	15
C	-	6	4	2	12
D	-	1	3	2	6
total	139	14	12	7	172

As seen here out of total 172 cases, we encountered the PMSFN in 33 patients (19.18%)and 139 patients were not having any PMSFN. In 15 patients (45% out of 33) it was congestion only and in 12 (36% out of 33) patients we encountered the epidermal peeling i.e. partial thickness PMSFN and in 6 patients (18% out of 33) there were full thickness PMSFN.

Most cases of congestion and partial thickness PMSFN was managed conservatively with regular dressings and application of nitroglycerine ointment and the cases with full thickness PMSFN only 4 patients needed re operation and 2 patients were allowed to develop the line of demarcation and as area was less so the skin above it grown beneath it and eventually the dyed skin patch fallen off. Out of 4 patients going for re operation, 2 patients needed split thickness grafting to cover the large area of gap and 2 patients were gone for resuturing. Operations done after mean 18 days of primary surgery when the slough and necrosis skin removed and pink granulation tissue started to appear after regular dressings.

3. Relation of BMI & and pre-operative chemo therapy with PMSFN.

Skin score →		A1	B2	B3	B4	C2	C3	C4	D2	D3	D4	total
BMI	<18	34	2	-	1	1	-	1	-	1	1	41
	18 to 25	58	1	2		2	1	-	1	1	1	67
	25 to 30	32	3	3	2	3	2	-	-	1	-	46
	>30	15	1	-	-	-	1	1	-	-	-	18
Total		139	7	5	3	6	4	2	1	3	2	172
Number of chemotherapy cycles preoperatively	0 cycle	106	2	-	2	3	1	1	-	-	-	115
	2 cycle	23	-	3	1	2	3	-	-	1	-	33
	4 cycle	7	3	2	-	1	-	1	-	2	1	17
	6 cycle	3	2	-	-	-	-	-	1	-	1	7
total		139	7	5	3	6	4	2	1	3	2	172

In the data regarding the BMI, it is evident that the BMI 25 to 30 group, i.e. overweight group has the highest number of PMSFN total 14 cases (42% out of 33) v/s in BMI<18 there is only 7 (21% out of 33) cases and in obese group i.e. BMI>30, there are 3 cases (10% out of 33) only.

Regarding the chemotherapy, the data shows that the patients with the worst SKIN score of D4 are having the 4 or 6 cycles of chemotherapy taken.

4. Relation of various systemic disease with PMSFN

		PMSFN		Odd's ratio	χ2 TEST	p-value	significance
		present	absent				
Diabetes	present	6	6	8	5.56	0.018	significant
	absent	2	16				
Cardiovascular disease	present	3	4	14.25	5.888	0.015	significant
	absent	1	19				
Respiratory diseases	present	2	4	5.5	0.45	0.5	Not significant
	absent	1	11				
Anemia	present	5	7	10.7	5.1	0.02	significant
	absent	1	15				
Diabetes + Cardiovascular disease	present	2	6	3.6	NA	NA	NA
	absent	0	11				
Cardiovascular disease + Respiratory diseases	present	2	3	NA	NA	NA	NA
	absent	0	7				
Respiratory diseases+ Anemia	present	3	3	6	1.93	0.16	Not significant
	absent	1	6				

Anemia+ Diabetes	present	1	4	3.75	0.46	0.49	Not significant
	absent	1	11				
Diabetes + Cardiovascular disease+ Respiratory diseases	present	1	0	NA	NA		NA
	absent	0	3				
Diabetes + Cardiovascular disease+ Anemia	present	1	1	NA	NA		NA
	absent	0	2				

The above master table compiles the major systemic diseases and their outcome and relative strength of association and significance. As in some groups it is not possible to apply these tests [cells that are zero]. Almost all are associated with good strength with the cardiovascular disease being the highest. Diabetes, hypertension and anemia shows the significance in chi square test where the p-value is <0.05. as the combination of various disease may show the more strength but the number decreases as the disease combination starts, so the application of both tests are not valid/ results are not comparable.

DISCUSSION

The above result patterns are worth the discussion on some important points. Regarding the demographics, only 1 male patient was there as the literature states the ratio of breast cancer in male is approximately 1 male in 150 cases[9]. The result is consistent with the same findings. Though the breast cancer is now seeing at the relatively younger age group, the reason for the same may be more estrogen exposure owing to less cycles of pregnancy and early menarche[10].

The data regarding the body mass index is little bit unusual and difficult to justify as ideally malnutrition and over nutrition should be the risk factors for the flap necrosis but it is not seen here, may be cases numbers need to be more. The lower cases in obese group is may be attributable to the fact that their nutrition is good and relatively thicker flap are possible in obese patients as compared to malnutrition. But still the fact that why normal and overweight group has the highest number is still elusive.

The highest grade of skin necrosis is present in the cases of higher cycles of preoperative chemotherapy. This may be attributable to the fact that the disease might be aggressive or the nutrition has suffered due to the more cycles of chemo therapy.

The anemia shows the greater strength of association and significance; it might be due to the less oxygenation in it.[11] The elusive factor here is cardio vascular association which surprises us. In respiratory disease it may be due to the fact that oxygenation may be poor.

CONCLUSION

In conclusion, PMSFN is an important complication that has previously lacked a standardized assessment tool. We have used the SKIN score as a benchmark and assessed various pre-operative factors. The result shows that anemia, higher number of chemotherapy and cardiovascular diseases impart a greater risk for the PMSFN. So, these factors need to be assessed and managed meticulously.

Abbreviations
- MRM – Modified radical mastectomy
- PMSFN – Post mastectomy skin flap necrosis
- SKIN – Skin ischemia and necrosis
- BMI – Body mass index
- HPE – Histopathology examination

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