

**“A PROSPECTIVE STUDY OF FACTORS  
INFLUENCING SEROMA FORMATION IN MODIFIED  
RADICAL MASTECTOMY ”**

**Dissertation Submitted for**

**M.S. DEGREE EXAMINATION BRANCH - I SURGERY**

**DEPARTMENT OF GENERAL SURGERY**

**KILPAUK MEDICAL COLLEGE CHENNAI - 600 010**



**THE TAMILNADU DR. M.G.R. MEDICAL UNIVERSITY CHENNAI  
6000032.**

**MAY – 2020**

## **CERTIFICATE**

This is to certify that this dissertation titled “**A PROSPECTIVE STUDY OF FACTORS INFLUENCING SEROMA FORMATION IN MODIFIED RADICAL MASTECTOMY**” is bonafide record of work done by **Dr R SARAVANAN**, during the period of his post graduate study from May 2017 – April 2020 under guidance and supervision in the department of general surgery, Kilpauk medical college, Chennai, in partial fulfillment of the requirement for **M.S. General surgery** degree Examination of the Tamilnadu Dr MGR Medical University to be held in MAY 2020.

**Prof. Dr.V.VIJAYALAKSHMI, M.S. (Gen), DGO,**  
Department Of General Surgery  
Govt Kilpauk Medical College  
Chennai

## **DECLARATION**

I, **Dr R SARAVANAN** hereby declare that this dissertation “**A PROSPECTIVE STUDY OF FACTORS INFLUENCING SEROMA FORMATION IN MODIFIED RADICAL MASTECTOMY**” is a bonafide, genuine research work done by me under the guidance of **Dr.V.VIJAYALAKSHMI, PROFESSOR OF THE DEPARTMENT OF GENERAL SURGERY,GOVT. KILPAUK MEDICAL COLLEGE, Chennai**

Place: Chennai

Signature of the candidate

Date:

**Dr R SARAVANAN**

## **GUIDE**

**Prof. Dr.V.VIJAYALAKSHMI, M.S. (Gen), DGO,**  
Prof of General Surgery  
Govt.Kilpauk Medical College  
Chennai

**ENDORSEMENT BY THE HOD/DEAN HEAD OF THE INSTITUTION**

This is to certify that this dissertation titled “**A PROSPECTIVE STUDY OF FACTORS INFLUENCING SEROMA FORMATION IN MODIFIED RADICAL MASTECTOMY**” is a bonafide work, under the guidance and supervision of **Dr.V.VIJAYALAKSHMI**, Professor, Department of Surgery, Govt.Kilpauk Medical College, Chennai

**Dr .V.VIJAYALAKSHMI, M.S(Gen), DGO,**  
Professor & HOD  
Department of General Surgery  
Govt.Kilpauk Medical College  
Chennai

Date:

Place:

**Dr .P.VASANTHAMANI.**  
MD,DGO.,MNAMS,DCPSY,MBA  
Professor & Dean  
Govt.Kilpauk Medical College  
Chennai

## **ACKNOWLEDGEMENT**

I take this opportunity to express my deep sense of gratitude and thanks to all those who have been instrumental in the successful completion of this work.

I am most pleased to acknowledge **Prof. Dr. P. VASANTHAMANI. MD, DGO.,MNAMS, DCPSY, MBA** Dean, Govt.kilpauk medical college and Hospital chennai for allowing me to conduct this study in the Department of General Surgery, Govt kilpauk medical college,chennai

I would like to express my profound gratitude and regards to my esteemed teacher and Guide, **Prof . Dr. V.VIJAYALAKSHMI**, Department of General Surgery, KMC, Chennai for her painstaking supervision invaluable suggestions throughout the period of this study. Without her guidance, support and personal involvement, this work would not have seen the light of the day.

I would like to express my gratitude to **Dr D ARUN, Dr. K.AMILTHAN, Dr YUVARAJ, Dr GUNASEKARAN** and my seniors and my colleagues **Dr SELVAKUMAR, Dr SUJITHA** and my juniors in the Department of General Surgery, KMC , CHENNAI for giving their support and guidance

I would like to express my gratitude to my dear parents **Mr D RAMA MURTHY and Mrs R THILAGA** and my dear wife **Mrs C GAJALAKSHMI** my lovable children **SG SHRUTHIKKA and SG RITHIKKA** who have always been an epitome of courage and fortitude for me. Their blessings have been a constant source of courage and inspiration for me has given me the strength to carry on through moments of uncertainty.

My acknowledgment will be incomplete if I do not thank all **my patients** without whose co-operation, I would not have been able to conduct this study.

Finally nothing is possible without the blessings of the omnipotent Almighty.

**Dr. R SARAVANAN**

## **ABBREVIATIONS**

|      |   |                                |
|------|---|--------------------------------|
| ALND | - | Axillary Lymph node dissection |
| BCS  | - | Breast Conservation Surgery    |
| MRM  | - | Modified radical mastectomy    |
| DCIS | - | Ductal carcinoma in situ       |
| EC   | - | Electrocautery                 |
| ER   | - | Estrogen Receptor              |
| FAL  | - | Functional Lymphadenectomy     |
| IDC  | - | Infiltrating Ductal Carcinoma  |
| ILC  | - | Infiltrating Lobular Carcinoma |
| LCIS | - | Lobular carcinoma in situ      |
| LN   | - | Lymph nodes                    |
| LVI  | - | Lymphovascular Invasion        |
| MRM  | - | Modified Radical Mastectomy    |
| NAC  | - | Neoadjuvant Chemotherapy       |
| NS   | - | Not Significant                |
| PR   | - | Progesterone Receptor          |
| RCT  | - | Randomized Control Trial       |
| SLNB | - | Sentinel Lymph node Biopsy     |
| US   | - | Ultrasonic Scalpel             |
| PM   | - | Pectoralis major               |

## **CONTENTS**

| <b>Sl No</b> | <b>CONTENTS</b>                 | <b>Page No</b> |
|--------------|---------------------------------|----------------|
| 1            | EVOLUTION OF SURGICAL TECHNIQUE | 1              |
| 2            | INTRODUCTION                    | 4              |
| 3            | REVIEW OF LITERATURE            | 7              |
| 4            | AIMS AND OBJECTIVES             | 33             |
| 5            | SURGICAL ANATOMY                | 34             |
| 6            | MATERIALS AND METHODS           | 46             |
| 7            | RESULTS                         | 53             |
| 8            | DISCUSSION                      | 70             |
| 9            | CONCLUSION                      | 75             |
| 10           | BIBLIOGRAPHY                    |                |
| 11           | ANNEXURE                        |                |



## LIST OF TABLES

| <b>SINo</b> | <b>CONTENTS</b>  | <b>Page No</b> |
|-------------|--|----------------|
| 1           | Seroma incidence   | 8              |
| 2           | Association of patient and disease factors with seroma Formation     | 11             |
| 3           | Association of operational factors with seroma formation             | 13             |
| 4           | Comparative studies between , electrocautery andltrasonic dissection | 15             |
| 5           | Obliteration of dead space by external pressure                      | 24             |
| 6           | Recent randomized trials using tissue selant                         | 31             |
| 7           | Histological classification of breast tumours                        | 39             |
| 8           | Ajcc/tnm clinical staging system                                     | 41             |
| 9           | Staging of breast cancer   | 45             |
| 10          | Distribution of seroma in study population                           | 53             |
| 11          | Distribution of mean age in the study population                     | 54             |
| 12          | Mean Duration of Symptoms in the study population                    | 55             |
| 13          | Distribution of tumour side in study population                      | 56             |
| 14          | Distribution of hypertension in study population                     | 57             |
| 15          | Distribution of Diabetes in study population                         | 58             |

|    |   |    |
|----|---|----|
| 16 | Distribution of mean tumour size in study population          | 59 |
| 17 | Distribution of Staging of tumour in study population         | 60 |
| 18 | Mean Haemoglobin in study population                          | 61 |
| 19 | Distribution of mean BMI in study population                  | 62 |
| 20 | Distribution of neo adjuvant chemotherapy in study population | 63 |
| 21 | Mean number of lymph nodes removed in the study population    | 64 |
| 22 | Distribution of preoperative radiotherapy in study Population | 65 |
| 23 | Mean total drain output in the study population               | 66 |
| 24 | Mean drain removal day in study population                    | 69 |

## LIST OF FIGURES

| <b>SINo</b> | <b>Contents</b>  | <b>Page No</b> |
|-------------|--|----------------|
| 1           | Mastectomy instruments of Fabry von Hilden in late sixteenth Century.                | 2              |
| 2           | En bloc removal with axillary lymphatic drainage                                     | 3              |
| 3           | Application of compression bandage – technique                                       | 23             |
| 4           | Dead space after Axillary dissection   | 28             |
| 5           | Suturing of dead space after mastectomy  | 28             |
| 6           | The contents of the axilla, axillary artery & vein components of the brachial plexus | 35             |
| 7           | Diagrammatic presentation of blood supply to breast                                  | 36             |
| 8           | Diagrammatic representation of lymphatic supply of breast.                           | 38             |
| 9           | Diagrammatic representation of level of lymph nodes in axilla                        | 38             |
| 10          | Specimen of Breast and Axillary pod of fat after MRM                                 | 48             |
| 11          | Axillary vein and thoracodorsal trunk seen after axillary lymph node dissection      | 49             |
| 12          | Exposed pectoralis major muscle after MRM  | 49             |
| 13          | Flap necrosis after MRM  | 51             |
| 14          | Post mastectomy seroma collection in left breast                                     | 51             |

**GOVT. KILPAUK MEDICAL COLLEGE,**  
**CHENNAI-10**

**Protocol ID. No.176/2019 Meeting held on 09/04/2019**

The Institutional Ethical Committee of Govt. Kilpauk Medical College, Chennai reviewed and discussed the application for approval "FACTORS INFLUENCING SEROMA FORMATION IN MODIFIED RADICAL MASTECTOMY- A PROSPECTIVE STUDY" submitted by Dr.Saravanan, P.G. Student-General Surgery, Department of General Surgery, Government Kilpauk Medical College, Chennai - 10.

The Proposal is APPROVED.

The Institutional Ethical Committee expects to be informed about the progress of the study any Adverse Drug Reaction Occurring in the Course of the study any change in the protocol and patient information /informed consent and asks to be provided a copy of the final report.

  
14.5.2019.

DEAN

Govt. Kilpauk Medical College,  
Chennai-10.

  
10/5/19

## Urkund Analysis Result

Analysed Document: DR SARAVANANMRM THESIS.docx (D57809652)  
Submitted: 10/28/2019 2:28:00 PM  
Submitted By: drsaravanan007@gmail.com  
Significance: 9 %

### Sources included in the report:

[https://www.researchgate.net/publication/5300229\\_Effect\\_of\\_harmonic\\_scalpel\\_on\\_seroma\\_formation\\_following\\_surgery\\_for\\_breast\\_cancer\\_A\\_prospective\\_randomized\\_study](https://www.researchgate.net/publication/5300229_Effect_of_harmonic_scalpel_on_seroma_formation_following_surgery_for_breast_cancer_A_prospective_randomized_study)  
<https://wjso.biomedcentral.com/articles/10.1186/1477-7819-10-8>  
<https://docplayer.net/147459912-A-study-of-factors-influencing-seroma-formation-after-modified-radical-mastectomy.html>  
<https://academic.oup.com/jjco/article/36/4/197/824107>  
[https://www.researchgate.net/publication/7096129\\_Evidence-Based\\_Risk\\_Factors\\_for\\_Seroma\\_Formation\\_in\\_Breast\\_Surgery](https://www.researchgate.net/publication/7096129_Evidence-Based_Risk_Factors_for_Seroma_Formation_in_Breast_Surgery)  
<https://academic.oup.com/jjco/article-pdf/36/4/197/5150306/hyl019.pdf>  
[https://www.researchgate.net/publication/43246691\\_Prevention\\_of\\_seroma\\_formation\\_after\\_mastectomy\\_and\\_axillary\\_dissection\\_by\\_lymph\\_vessel\\_ligation\\_and\\_dead\\_space\\_closure\\_A\\_randomized\\_trial](https://www.researchgate.net/publication/43246691_Prevention_of_seroma_formation_after_mastectomy_and_axillary_dissection_by_lymph_vessel_ligation_and_dead_space_closure_A_randomized_trial)  
[https://www.researchgate.net/publication/225301943\\_Seroma\\_Formation\\_after\\_Mastectomy\\_Pathogenesis\\_and\\_Prevention](https://www.researchgate.net/publication/225301943_Seroma_Formation_after_Mastectomy_Pathogenesis_and_Prevention)  
[https://www.researchgate.net/publication/6334079\\_Influence\\_of\\_surgical\\_technique\\_on\\_axillary\\_seroma\\_formation\\_A\\_randomized\\_study](https://www.researchgate.net/publication/6334079_Influence_of_surgical_technique_on_axillary_seroma_formation_A_randomized_study)

### Instances where selected sources appear:

41

## EVOLUTION OF SURGICAL TECHNIQUE

**Hippocrates** : associated breast cancer with cessation of menstruation, **Leonides** is acknowledged to be the 1<sup>st</sup> operative treatment for breast malignancy.

**Andreas Vesalius** (b. 1514), Flemish physician, advised mastectomy for breast cancer and practiced the use of sutures than cautery to control bleeding.

**Servetus**, advised that the underlying muscles ( pectoralis major & minor ) to be removed as well as the axillary glands.

**Wilhelm Fabry** (b. 1560), the, Father of German Surgery, devised an instrument for mastectomy as shown in figure 1.

**Mitchell Banks** of Liverpool, in 1877 practised removal of axillary glands in all cases of breast cancer.

**Dr. Joseph Pancoast** ,was first to show enblock removal of axillary glands as shown in figure 2

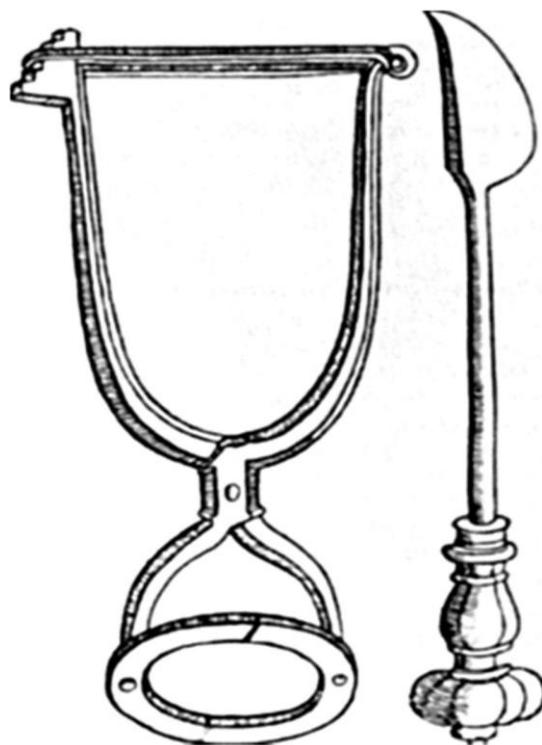
The rationale for the Halsted radical mastectomy was largely to achieve loco regional control of the breast malignancy.

In contrast to the Halsted radical mastectomy, the modified radical mastectomy defines a surgery of complete breast removal, with the inclusion of the tumour, overlying skin, and axillary lymphatics, with preservation of the pectoralis major muscle.

**Murphy in 1912** had stopped Halsted radical mastectomy and started preserving pectoral muscles. This was based on the experiences of **Bryant** .

**The Consensus Development. Conference** on the management of breast malignancy in 1979 stated that the modified radical mastectomy was the standard of treatment for women with stages I and II breast cancer<sup>4</sup>

**Figure 1: Mastectomy instruments of Fabry von Hilden in late. sixteenth century.**



**Figure 2: Mastectomy (1844) of Dr. Joseph Pancoast in the preanesthetic and pre antiseptic era En bloc removal with axillary lymphatic drainage**





## INTRODUCTION

The term breast is derived from **latin** word mamma ( cf. mammal from latin mammalis “ of the breast “ ). Breast are modified sudoriferous glands , composed of glandular , adipose , and connective. tissues .

Breast cancer is the commonest malignancy in women affecting one out of eight women worldwide and ranks among the top ten causes of death in women.<sup>1,2</sup> Breast cancer ranked number one cancer among indian females with age adjusted rate as high as 25.8 per 100,000 women and mortality 12.7 per 100,000 women.

More than a million cases are diagnosed each year , rise in incidence is due to increased life span , life style changes and improved survival from other illness, and better investigation to diagnose early breast malignancy. It forms thirty three percent of all female cancers and for twenty percent of cancer related deaths in women .

Almost half of all patients with a palpable primary breast cancer will have lymph node metastases at presentation compared with only one fifth of those with a non palpable cancer detected on mammography.<sup>2</sup> In majority of patients with breast malignancy, excision of the tumour with (ALND) remains the standard treatment for invasive breast cancer<sup>3</sup>

Metastases in axillary lymph nodes is the most determinant of prognostic factor in patients with primary breast malignancy.

Almost all patients develop patches of numbness or paraesthesia and many patients develop reduced shoulder mobility and chronic lymphoedema.<sup>4</sup> Seroma is an abnormal accumulation of serous fluid in the dead space of axilla, the breast following breast-conserving(BCT) surgery and is the commonest sequel.

The incidence of seroma formation varies between 5 and eighty five per cent.<sup>4, 9, 14-20</sup> Seroma can increase the morbidity , prolong the hospital stay , need for multiple aspirations , wound gaping , erythema , delay the chemotherapy cycles.<sup>4</sup>

The type of surgery, the operating surgeon, preoperative radiation or chemotherapy, the amount of post operative physical activity, use of electrocautery, use of closed suction drains and closure of dead space have been implicated as potential factors influencing the likelihood of seroma formation.<sup>4-7</sup>

Constant chest wall movement due to respiration and shoulder use creates shearing forces that delay flap adhesion.<sup>5</sup> For this, several techniques of

flap fixation or wound drainage, limitation of postoperative shoulder movement and the use of adhesive glue have been investigated to improve primary healing and minimize seroma formation.<sup>6</sup>

To reduce the incidence of seroma formation , it is essential to estimate individual risk for seroma formation , and future trials should be aimed at identifying predictive variables and thus reduce the incidence of seroma .

## REVIEW OF LITERATURE

### DEFINITION

There are various definitions for seroma as published in many article ,**Classe et al**<sup>7</sup> defined axillary seroma as a palpable fluid accumulation causing discomfort and needing aspiration.

**Woodworth et al**<sup>8</sup> during a retrospective analysis defined seroma as a clinically identifiable collection of serous fluid within a surgical cavity. They treated seromas with serial aspirations until no further fluid collections are detected.

**Nadkarni et al**<sup>9</sup> defined the presence of postoperative seroma as a need to aspirate serous fluid from the axillary cavity more than once, or, 2 or more times after removal of the axillary drain.

**Benjasirichai et al**<sup>11</sup> defined postoperative seroma as any collection in the axilla that was detected by ultrasonography 2 weeks after the patient was discharged.

**Hashemi et al**<sup>10</sup> defined axillary seroma as any clinically apparent fluid collection in the axilla or under skin flaps .

## SEROMA INCIDENCE

Seroma frequency varies between 5 & 85%.<sup>3, 9, 14-20</sup>

**Table 1: SEROMA INCIDENCE**

| <b>Authors</b>                           | <b>Study Type</b> | <b>Surgery</b> | <b>Patients(n)</b> | <b>Incidence (%)</b> |
|--|-------------------|----------------|--------------------|----------------------|
| Chen et. al, 1998 <sup>15</sup>          | RCT               | MRM,BCS        | 40                 | 4.8                  |
| Gupta et. al, 2001 <sup>16</sup>         | RCT               | MRM            | 121                | 48                   |
| Purshotham .et al,<br>2002 <sup>17</sup> | RCT               | MRM,BCS        | 375                | 51                   |
| Jain. et al, 2004 <sup>18</sup>          | RCT               | MRM,BCS        | 116                | 26                   |
| Lumachi .et al,<br>2004 <sup>19</sup>    | RCT               | MRM,BCS        | 92                 | 40                   |
| Unalp. et al, 2007 <sup>20</sup>         | Retrospective     | MRM,BCS        | 119                | 14.3                 |
| Nadkarni .et al,<br>2007 <sup>9</sup>    | RCT               | MRM,BCS        | 160                | 84.7                 |

## **PATHO PHYSIOLOGY**

Seromas are collection of lymph exudates or “serum” in cavities, invariably due to surgery and healing process of inflammation.<sup>14,22</sup> Continuous chest wall and shoulder movements disrupt the flap opposition to chest wall.<sup>24</sup>

**Bonnema et al**<sup>25</sup> showed that the fibrinogen level in seroma was very low compared with plasma on day 1 but on day 5 and 10 post operatively it was virtually undetectable, and that peripheral lymph does not clot and contains only a trace amount of fibrinogen.

**Oertli et al**<sup>14</sup>presumed that fibrinolytic process leads to seroma formation. **Tadych and Donegan**<sup>21</sup>believed that seroma is due to the leakage of lymph from disrupted lymphatics in the axilla. Extensive manipulation and to the tissues creating a raw area in (MRM) leads to seroma formation from severed blood vessels & lymphatics and compared to (BCT) which produces less seroma.<sup>22</sup> Ideal closure of wound will reduce lymph spillage& serum ooze, will approximate flaps to the underlying structures appropriately thus eliminating the dead space.<sup>3</sup>

## **FACTORS AFFECTING SEROMA FORMATION**

**Seroma** is considered to be a side effect of surgery than a complication ,it can lead to significant morbidity like wound dehiscence , delay in initiation of adjuvant chemotherapy .

**Kuroi et al**<sup>28</sup>, review included one Meta analysis, 51 RCTs, 7 prospective &retrospective. They divided the risk factors for seroma formation into four categories: Patient and tumor characteristics, Surgical Factors, Post operative management, Non Surgical Modalities.

## **PATIENT AND DISEASE FACTORS**

The incidence of seroma has been shown to correlate with patient's age, breast size, and hypertension, presence of malignant nodes in the axilla, number of malignant nodes, previous surgical biopsy and use of heparin<sup>19, 28, 29</sup> patients who received chemotherapy before surgery had problems of wound healing and increased seroma occurrence.<sup>8</sup>

**Gonzalez et al**<sup>27</sup> observed that neo adjuvant chemotherapy did not affect seroma occurrence.

**Kumar et al**<sup>29</sup> found a significant association b/w **BW** and **HTN** with seroma **but no association between nodal status or positivity of lymph nodes**, hormone receptor status and stage with seroma formation there was no correlation with other factors such as ,DM , size of the breast, grade of the tumour side

**Table 2: Association of Patient and Disease factors with Seroma formation<sup>28</sup>**

| <b>Patient Factors</b> | <b>Association</b> | <b>Disease Factors</b>  | <b>Association</b> |
|------------------------|--------------------|-------------------------|--------------------|
| Age                    | Inconclusive.      | Disease Stage           | —                  |
| Menstrual Status       | —                  | LN Status.              | —                  |
| Side/Tumor location    | —                  | Tumor size              | Inconclusive       |
| Hypertension           | —                  | .Histological type      | —                  |
| Diabetes               | —                  | ..Grade. .              | —                  |
| Body weight            | ‡                  | Specimen size/weight.   | —                  |
| Anemia.                | —                  | Pathological Tumor size | —                  |
|                        |                    | LN positivity.          | Inconclusive       |
| Breast size            | —                  | Hormone Receptor Status | —                  |
| NAC/ Prior Biopsy/RT   | —                  |                         |                    |
| BMI/Obesity            | Inconclusive       |                         |                    |

‡ = Increases seroma formation

— = No definite association



## **SURGICAL FACTORS**

### **Type of Surgery**

Seroma incidence is lower after BCS than MRM<sup>9,27</sup> sentinel lymph node biopsy has prevented larger dissections thus in BCS seroma is less.

**Woodworth et al**<sup>8</sup> proved that reconstruction following MRM decreased seroma formation. There was no correlation seen with preserving pectoral fascia<sup>30</sup>.

### **AXILLARY DISSECTION**

Time and again large number of studies have proved there is no correlation with number of axillary lymph nodes removed and seroma.<sup>27, 31-33</sup>

**Purushotham et al**<sup>32</sup> in the RCT involving 298 patients with early breast cancer who were clinically node negative, patients were randomly allocated to undergo ALND (control group) or SLNB followed by ALND if subsequently found to be lymph node positive (study group) (SLNB) is associated with very less seroma & morbidity than ALND.

Its been demonstrated that a long procedure time and diagonal skin incision as compared to vertical skin incision increased seroma.<sup>28,34</sup>

**Table 3: Association of operational factors with seroma formation<sup>28</sup>**

| <b>Increases Seroma</b> | <b>Decreases Seroma</b>         | <b>No Association</b>                        | <b>Inconclusive Evidence</b>            |
|-------------------------|---------------------------------|--|---|
| Extended RM             | Ultrasonic Dissection           | Extent of LN Dissection                      | Surgeon                                 |
| Diagonal Skin Incision  | Immediate Breast Reconstruction | Removal of pectoral Fascia                   | Pressure. Garment/ Compression dressing |
| Operation time          | Suture Flap fixation            | Type of Anesthesia                           | MRM Vs BCS                              |
| Electrocautery          | SLNB Vs ALND                    | Laser Scalpel<br>Adhesive Glue<br>Blood loss | Skin graft                              |

### **SURGICAL TECHNIQUE/ INSTRUMENT**

Tissue handling & dissection play a vital role in determining the occurrence of seroma. It is learnt that proper tissue handling and to minimize the bleeding and trauma to lymphatics can prevent seroma formation.<sup>3</sup>

Electro cautery has its own advantages of short duration, with less amount of blood loss but has its own problems of wound complications & seroma as shown by **Porter et al**<sup>35</sup> and **Keogh et al**<sup>36</sup> through RCTs However, studies by **Unalp and Onal**<sup>20</sup> and **Nadkarni et al**<sup>9</sup> have failed to show any statistically significant difference in seroma formation between knife dissection and electrocautery dissection **Irshad and .Campbell**<sup>37</sup> said harmonic scalpel reduced seroma formation.

**Lumachi et al**<sup>19</sup> randomized ninety-two women to undergo axillary dissection by either using ultrasound scissors (Group A, 45 patients) or not (Group B, 47 patients). Twenty-eight patients developed wound seroma In patients with ultrasonic dissection drains were removed earlier.

**Kontos et al**<sup>39</sup> prospectively randomized 32 patients who underwent modified radical mastectomy to either HS or electrocautery (EC) First 48 h drainage, total drained volume, aspirated volume, complications and required analgesia were comparable in the two groups and concluded that no significant reduction in seroma formation or wound complications and pain could be found with the use of HS.

**Kerin et al**<sup>41</sup> failed to show the difference in postoperative seroma drainage between argon-enhanced electro surgery and conventional diathermy.

**Table 4: comparative studies between , electrocautery and Ultrasonic dissection**

| <b>Authors</b>                       | <b>Type of Study</b> | <b>Total Patients</b> | <b>Surgical Technique. (No. of patients with seroma)</b> | <b>P value</b> |
|--------------------------------------|----------------------|-----------------------|--|----------------|
| Porter et al, 1998 <sup>35</sup>     | RCT                  | 80                    | EC(38) Vs .Sharp(13)                                     | 0.01           |
| Galatius et .al, 20030 <sup>42</sup> | Comparative          | 59                    | Sharp(69) . Vs US(67)                                    | NS             |
| Lumachi. et al, 2004 <sup>19</sup>   | RCT                  | 92                    | Sharp. (42) Vs US(20)                                    | NS             |
| Nadkarni .et al, 2007 <sup>9</sup>   | RCT                  | 158                   | EC(68) Vs .Sharp(59)                                     | NS             |
| Unalp et. al, 2007 <sup>20</sup>     | Retrospective        | 119                   | EC(12) Vs. Sharp(5)                                      | NS             |

Sharp = dissection with sharp scissors Laser = dissection with argon laser

## **DRAINS**

Frequently drains are used after breast cancer surgery with the understanding that it will reduce seroma formation. The mechanism proposed is that the suction helps skin flaps to adhere to the underlying structure & axilla sealing off all leaking lymphatics. And thus, may facilitate wound healing, decrease wound infection, flap necrosis and prevent seroma formation.<sup>3</sup>

### **Drain Vs. No Drain.**

**Talbot and agarey**<sup>43</sup> evaluated prospectively three groups of consecutive patients with breast cancer having axillary lymph node clearance. In the delayed removal group, 30 patients had total or partial mastectomy with axillary dissection, followed by closed suction drainage until the fluid output was < 50 mL in 24 h. In the early removal group, 30 patients had the same procedures, except that the drains were removed 2 days postoperatively, irrespective of the volume of drainage. In the 'no drain' group, 30 patients underwent partial mastectomy and axillary clearance without inserting any drain. Patients without drain needed more serial aspiration. The aspiration in each group being 2.1, 2.9, and 3.9, respectively. They observed that earlier removal of drain following ALND got discharged earlier with not much of wound infections.

**Jain et al<sup>18</sup>** randomized 116 patients undergoing MRM to receive suction drainage or no drain. There was a significant reduction in hospital stay and postoperative pain scores in patients who did not have a drain. Following mastectomy without a drain, the use of fibrin sealant reduced seroma formation ( $P < 0.012$ ). **They observed that drains did not prevent seroma formation.**

### **Single vs many Drains.**

**Terrell and Singer in 1992<sup>44</sup>** randomized 84 women undergoing (MRM). 37 patients had one axillary drain and 47 had two drains placed postoperatively, one in the axilla and the other beneath the pectoral flaps. The average total drainage was 870.4 mL per patient in the group with single drain and 997.4 mL per patient in the group with two drains and the overall complication rate was 35.0 percent and 31.9 for single drain group and two drain groups respectively. These differences did not reach statistical significance. They concluded that use of a single axillary drain after MRM seems to result in no increase in postoperative complications, may reduce the incidence of flap necrosis.

**Petrek et al<sup>45</sup>** in their study randomized 65 patients with carcinoma to two groups, single or multiple drains. For axillary dissection, randomization to multiple drains meant placement of four catheters in the axilla, and randomized to the single drain, one catheter in the axilla. Multiple drains didn't confer any added advantage to single drain over amount & duration of fluid drainage.

## **Suction vs Passive drain**

Traditionally, wound drainage was done using static drains, such as tube or Penrose drains. However, since the development of continuous closed suction drainage in 1947 by Murphy<sup>46</sup>, closed suction drainage has superseded static wound drainage, as this increases freedom of movement, decreases need for bulky dressings and the incidence of infection is drastically reduced and requires less time for nursing care.

**Nadkarni et al**<sup>9</sup> randomized 160 patients with breast malignancy, This enabled them to know the effect of 2 different factors use of scissors/electrocautery and suction/corrugated drains on the occurrence of postop seroma formation. They concluded that the use of different surgical methods or drainage has no effect on the postop seroma formation.

## **Low pressure Suction vs High-pressure drain**

The negative pressure on the suction drainage has been found to be significantly influence postoperative drain output, a high negative suction drain may disrupt the severed lymph vessels from sealing off thus leading to prolonged drainage leading to increased hospital stay.<sup>47</sup>

**Wedderburn et al**<sup>48</sup> compared the use of low pressure and high pressure drains in 69 patients following mastectomy and axillary clearance. The results revealed no statistically significant difference between the two groups of patients ( $P > 0.05$ ) in terms of daily drainage.

**Bonnema et al**<sup>49</sup> compared effect of negative pressure on fluid production RCT in 141 patient. Not much difference noticed b/w the low & the high Vacuum group in volume and duration 9.5 vs 10 days of seroma production, There was **a positive correlation b/w BMI and seroma.**

### **Early Drain removal vs Late Drain removal**

Many surgeons removed drain when it is less than 20–50 mL in the preceding 24 hr , which delayed their discharge, causes discomfort to the patient, and increased the overall costs.<sup>16,21,51-55</sup> This also delays starting on adjuvant radiotherapy or chemotherapy and wound healing Prolonged. drainage may also increase the hospital stay and the risk of infection by allowing retrograde migration of bacteria. Indiscriminate or premature withdrawal of postoperative drains irrespective of the amount of fluid drained may be accompanied by an increase in the incidence of axillary seromas.<sup>51-54</sup>

**Gupta. et al**<sup>16</sup> randomized 121 patients into five-day group (n=64) and eight- day group (n=57). They concluded that 5-day post-operative drainage is as safe as 8-day post-operative drainage in the management of patients undergoing major breast surgery, but results in an increase in seroma aspiration and aspiration volume

**Parikh et al**<sup>52</sup> randomized 100 patients having undergone (MRM) to either drain removal at 3 or at 6 days. post-operatively more seroma occurred in the group whose drain was left in situ longer.



**Liu and McFadden<sup>53</sup>** studied 50 consecutive patients undergoing a standard breast conservation surgery & ALND for breast cancer. The axilla drained with 7-Fr suction drain drains were removed after POD 1 & prior to discharge from the outpatient surgical center. No complications were seen in all 50 patients **This short-term method reduced the incidence & the morbidity of seroma formation.**

**Baas-Vrancken Peeters et al<sup>54</sup>** conducted an RCT comparing twenty fourhr to long-term drainage. Mainly duration in hospital stayed was taken into account and followed by seroma and its complications. Each group had 50 patients. In 24 h drainage, short stay in hospital noted (**2.5 vs., 4.6, P < 0.001**). They **observed that 24 h drainage following ALND is economical and free of wound complications and seroma formation compared to long term drainage.**

**Dalberg et al<sup>30</sup>** studied the results from a multicentre randomized trial which included 247 patients had undergone (MRM) five Swedish hospitals between 1993 and 1997. Of these 247 patients a total of 198 patients were supposed to have the drain removed 24 h later or to keep the drain till < 40 ml / day discharge. **earlyremoval had more chances of seroma formation(48% vs. 20% P < 0.001)** and a shorter stay in hospital (2.8 days vs. 4 days, P < 0.001)

The evidence in established works opined in favour of early drain removal with less wound complications .

## **EXTERNAL COMPRESSION DRESSING**

The use of pressure garment or compression dressings is to reduce the dead space by giving an external force onto the flaps and to facilitate flap attachment to underlying muscle, and thus reduces the seroma formation.

**Chaturvedi**<sup>57</sup> used external compression and found less seroma occurrence. He used 6” crepe bandages, which were applied circumferentially around the chest wall, immediately after the operation with the opposite breast was included in it.

**Chen et al**<sup>15</sup> in their study randomized 41 patients with breast cancer to get pressure garment to be used after surgery or not. The garment was worn from the 1st post-op day up to 14 days. They found no added advantage in post-op drainage with the use of a pressure garment. More problems were seen with the patients without pressure garments seroma occurred in patients not using the garment. The use of the pressure garment appeared to increase the duration of use of the drain (6.8 vs. 6.1 days), these differences in the two groups was not significant.

**O’Hea et al**<sup>58</sup> in an RCT randomized 135 patients undergoing surgical treatment for breast malignancy to receive a external compression or conventional dressing. Dressing remained till postop day 4 Patients in the standard dressing were done with a front-fastening Surgibra only. Drains were taken out when the drainage was < 50 cc only. Duration of drains in both the groups were almost **similar**. The external compression dressing did not give any additional **advantage to prevent seroma formation**, frequent use of a compression in all cases to reduce postoperative drainage after ALND for breast cancer is not warranted.

**Kontos et al**<sup>59</sup> compared 200 patients who had undergone MRM were given external compression on the skin flaps and the axilla immediately (group A) with a patients of no external dressing group (B). Drains were removed when drain output < 30 ml per day, or on post op day 8. Mean time with drains kept in situ were 4.9 and 5.5 days in groups A and B. The differences seen were significant. They concluded that these findings are supportive of pressure dressing as an effective method to reduce seroma formation .

**Unalp and Onal**<sup>20</sup>, in their retrospective analysis of 119 patients observed out of 101 patients who were given compression dressing postoperatively, 12 developed seroma whereas five patients developed seroma out of the 18 patients who did not use compression dressing. The P value of 0.158 was not significant and they concluded that compression dressing was not a factor that reduces seroma formation

Figure3 : Application of Compression Bandage – Technique



Sterile gauze pads kept over the surgical wounds

**Table 5: Obliteration of dead space by external pressure**

| <b>Authors</b>                    | <b>Type of Study</b> | <b>Patients (n)</b> | <b>Study Method</b>                   | <b>P value</b>           |
|-----------------------------------|----------------------|---------------------|---------------------------------------|--------------------------|
| Chen. et al, 1998 <sup>15</sup>   | RCT                  | 40                  | Pressure Garment (0)<br>Vs None (5%)  | NS.                      |
| O’Hea. et al, 1999 <sup>58</sup>  | RCT                  | 135                 | CD Vs .Normal Dressing                | CD > Normal.<br>(P<0.01) |
| Unalp. et al, 2007 <sup>20</sup>  | Retrospective        | 119                 | Pressure Garment (12%) Vs None (28%)  | NS.                      |
| Kontos. et al, 2008 <sup>59</sup> | Comparative          | 400                 | Pressure Garment (2.5%) Vs None (16%) | Significant.             |

NS = Not Significant

CD = Compression Dressing



Elastoplast bandages applied with pressure covering Ipsilateral Hemithorax in layers



Post application of Compression dressing

## SUTURING OF SKIN FLAPS

**Larsen .et al<sup>61</sup>** used subcutaneous suture to fix the flaps to the deep muscles and fascia with 35 to 50 fine cotton sutures after (MRM) with external pressure dressing. This procedure gave good cosmetic result and with less morbidity and faster recovery and drastically reduced seroma formation and drains were removed earlier than other patients.

**Chilsonet al<sup>31</sup>** used a flap tacking Procedure that closes the axillary fossa dead space and tacks the mastectomy flaps to the chest wall. This study in (MRM) demonstrated a significant decrease (25.4% vs. 38.6%,  $P = 0.038$ ) in the incidence of seroma when flap tacking was performed. They opined that the flap tacking procedure reduced post mastectomy seromas, ( $P < 0.0001$ ).

**Schuijtvlot et al<sup>62</sup>** in a prospective audit 97 patients following breast-conserving surgery for carcinoma with axillary dissection found that the use of an additional buttress suture inserted between the axillary skin and the chest wall decreased the occurrence of seroma from 52% to 24% ( $P < 0.007$ ). The buttress suture was a no. 1 size prolene suture was placed through the axillary skin, passed into the Serratus Anterior muscle on the chest wall, thus obliterating the axillary space.

In the RCT by **Hamy et al<sup>63</sup>**, axillary padding with FAL gave satisfactory cosmesis, reduced seroma occurrence (27% vs. 80%,  $P < 0.001$ ) in patients undergoing BCS without axillary drainage.

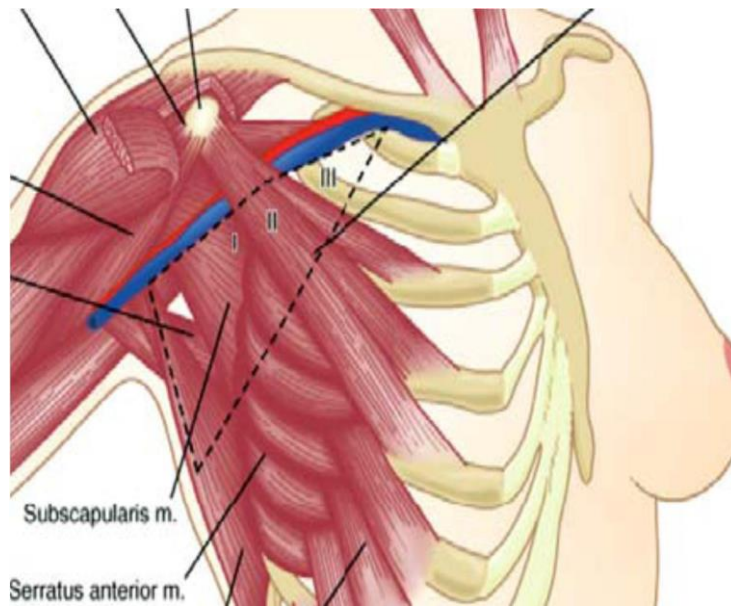
Prospective study by **Classe et al**<sup>7</sup>, 100 women were randomly allocated to two groups, axillary padding without drain (n=47) or axillary suction drain (n=51). In the axillary padding group, the length of hospital stay was significantly reduced from 4.5(±2) days to 1.8(±1) days (P <0.001).

**Coveney et al**<sup>64</sup> in RCT involving 39 patients undergoing (MRM) were randomized to undergo flap fixation to underlying muscle or conventional skin closure. Drainage had reduced significantly than in skin closure patients (P < 0.05) in the group with flaps fixed, in flap sutured group few developed seromas, 5 (25%) vs. 17 (85%), P < 0.001. They concluded that suturing skin flaps to underlying muscle reduces local morbidity

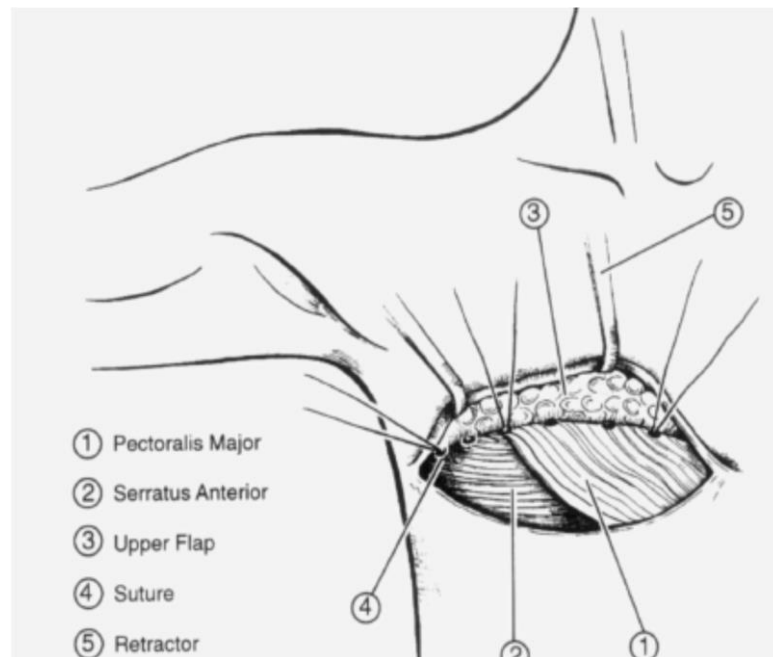
In the RCT by **Purushotham et al**<sup>17</sup>, 375 patients undergoing surgery for breast malignancy were segregated to conventional surgery or suturing of flaps with no drain. Patients segregated to control arm had 2 suction drains mastectomy flap which were removed, once volume was <fifty ml/day or at post op day 5, whichever occurred earlier. In the study arm, the flaps were fixed to the underlying PM muscle and Serratus anterior muscles with multiple 3 – 0 Vicryl sutures, starting at the apex of the axilla and cephalic aspect of upper flap. Long thoracic nerve was secured. No sutures were inserted in the cavity of the breast following wide local excision. The results revealed a significant reduction in hospital stay.



**Figure 4: Dead space after Axillary dissection<sup>11</sup>**



**Figure 5: Suturing of dead space after mastectomy<sup>17</sup>**



## POST OPERATIVE FACTORS

### Shoulder Exercise

**Shamley et. al**<sup>23</sup>, in a study of delayed vs early postoperative exercise following (MRM), showed that evidence from 12 RCT recommend the use of delayed exercise ( $P = 0.00001$ ) to reduce seroma formation. Delayed shoulder exercise is much more better than immediate post operative exercise at reducing seroma and there is no evidence that it wil derange shoulder movements .

### Drain Output.

**Barwell et al**<sup>51</sup> compared 63 patients after BCS ( $n = 37$ ) or MRM ( $n=26$ ). Suction drains were removed after a median of 4 days . In all, 32 patients (51%) later developed seroma requiring needle aspiration. Seroma formation was associated with a larger total suction drain volume. The median yield of axillary lymph nodes was significantly greater in those who developed seromas (11 vs. 8;  $P < 0.002$ ). There was not much change in the volume drained 24 h preceding drain removal (mean 60 ml vs. 50 ml). Thus, they observed that longer in situ drains was not much useful to prevent seroma formation.

**Kopelman et al**<sup>47</sup> in a RCT trial defined the correct time to remove the drain after MRM 90 patients 42 were randomized to have the drain removed on postoperative day 3, and the rest to keep it till  $<35$  ml/24 hours. Main outcome measure are the formation of seroma, wound infections, need to reinsert the

drain, and duration of hospital stay. Earlier the drain removed, carried a risk of seroma formation (9/42 compared with 2/48,  $p = 0.02$ ) unless the total amount of fluid drained during the first 3 postop days was less than 250 ml.

**Unalp and Onal**<sup>20</sup> from their retrospective analysis of 119 patients conclude that later removal of drains didn't increase seroma occurrence rate. They observed that a drain volume  $> 50$  mL/day for 2 days following surgery affected seroma development. They recommend drainage to be continued till flow rate at 48 hours is seen and daily drainage is lower than acceptable limit (up to 25 mL/ days).

**Loo and Chow**<sup>12</sup> in their retrospective analysis of 119 patients identified drain output exceeding 500 ml in first three postoperative days and drainage more than eight days as significant risk factors for seroma formation. **Lumachi et al**<sup>19</sup> observed that total drainage is a predictor for seroma formation.

## **ADJUVANT THERAPY**

Seroma can delay the initiation of adjuvant therapy in patients after MRM. However, adjuvant chemotherapy and radiotherapy can contribute to seroma formation **Sultan and Madhere**<sup>65</sup> reported a case of seroma formation 4 years after breast reconstructive procedure and while on docetaxel . They did not establish a definite causal relationship between seroma formation and docetaxel.

## NON-SURGICAL MODALITIES

Due to the associated complications and time constraints associated with the surgical management, Fibrin glue was used which interacted with the damaged tissues and favouring the fibroblasts growth and in wound healing . It favors haemostasis by preventing hematomas, which delay the surgical healing processes, blocks the lymphatic channels and thus reducing seroma formation; closes the dead spaces through tissue adhesion.

**Table 6: Recent randomized trials using tissue sealants**

| <b>Author</b>                       | <b>Total Patients</b> | <b>Sclerosant used</b>   | <b>Seroma with / without sealant (%)</b> | <b>P value</b> |
|-------------------------------------|-----------------------|--------------------------|--|----------------|
| Ulusoy. et al, 2003 <sup>68</sup>   | 54                    | Fibrin glue              | 18/11                                    | NS             |
| Jain et .al, 2004 <sup>18</sup>     | 58                    | Fibrin glue              | 34/41                                    | 0.01           |
| Mustenan. et al, 2004 <sup>69</sup> | 40                    | Fibrin glue + aproptinin | 20/26                                    | NS             |
| Johnson. et al, 2005 <sup>70</sup>  | 82                    | Fibrin glue              | 37/45                                    | NS             |
| Ruggiero. et al, 2008 <sup>71</sup> | 50                    | Fibrin glue + collagen   | 11/16                                    | 0.02           |

NS = Not Significant.

**Bonnema et al**<sup>25</sup> noted that seroma contained less amount of fibrinogen. Thus use of fibrin glue with its clot forming properties reduced seroma formation.

**Jain et al**<sup>18</sup> showed that there was a positive correlation with the use of fibrin sealant on seroma occurrence, consequent use of drains led to clot disruption and not adding to much advantage .

**Johnson et al**<sup>70</sup> found no reduction in seroma formation and concluded that the fibrin glue was not cost effective , technique involved in its application is difficult indicated that it has no added advantage over normal suction drains

**Ruggiero et al**<sup>71</sup> conducted an RCT randomized 50 patients who underwent MRM. Fibrin glue spray and a collagen patch were applied to the axillary fossa in half of the patients, the other half were treated conventionally. Suction drainage was removed b/w post op days 3 & 4. Seroma amount and duration were significantly reduced and seroma aspiration and multiple hospital visits drastically reduced .

**Mustenan et al**<sup>75</sup> studied the use of fibrin glue & fibrinolysis inhibitor, he demonstrated that there was not much effect on seroma formation. Still further randomized control studies are needed to effectively point out the causative factors for seroma formation and it is difficult to identify patients who will suffer from seroma.

## **AIMS AND OBJECTIVES**

### **Aim:**

To study an association between various risk factors of seroma formation

### **Objectives:**

- To estimate the incidence of seroma in KMCH
- To assess the risk factors like pre-operative status of patients, intra operative techniques, and post-operative observations of patients undergoing MRM for seroma formation
- To predict high-risk individuals for seroma formation and to recommend measures that can reduce the occurrence of seroma formation

## **SURGICAL ANATOMY**

### **Gross Anatomy**

Breast is situated in superficial fascia of anterior thoracic wall .it consists of 15 to 20 lobes wit fibrous tissue and adipose tissues Deep layer of superficial fascia covers the posterior aspect of breast, the retro mammary bursa is situated between deep layer of superficial fascia and clavipectoral fascia .<sup>4</sup>

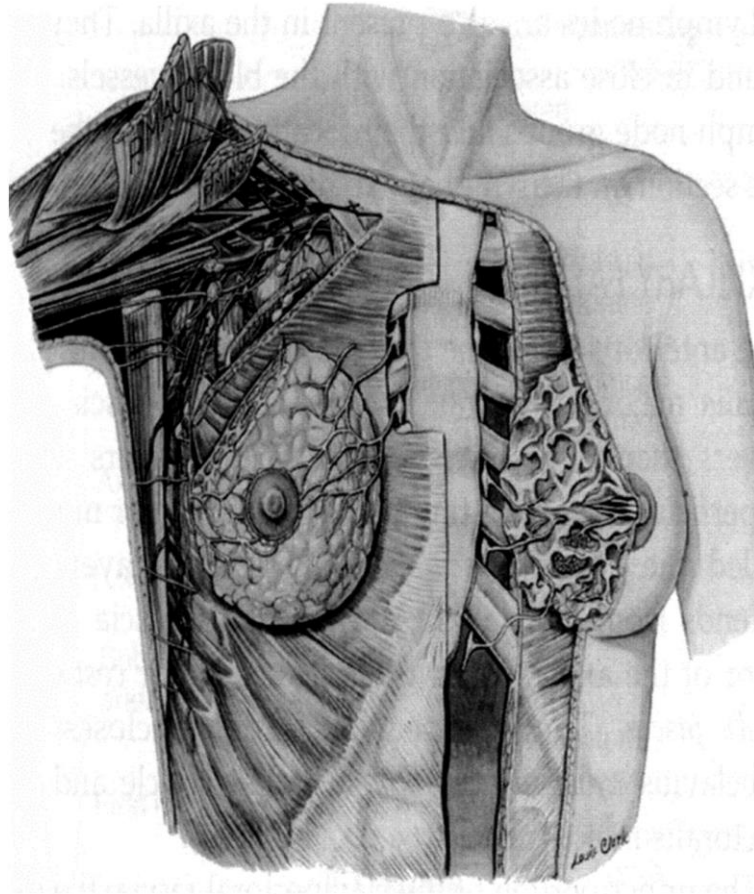
### **Axilla**

Pyramidal shaped between the upper extremity and thoracic wall .it consists of 4 walls, an apex ,& a base . Base is made up of axillary fascia and skin . Apex is an aperture and extends into neck through cervicoaxillary canal. The anterior wall is made up of pectoralis major(PM) and minor muscle(Pm) .posterior wall is made up of subscapularis muscle , lateral wall is made up of humerus , medial wall is made up of serratus anterior muscle .

Breast is located just deep to dermis, suspensory ligaments of cooper pass from the septa that divides the breast into multiple lobules .

components of the brachial plexus, and axillary LN groups are seen. On the left side, the breast is cut to expose its structure in saggital view.

**Figure 6: The contents of the axilla, axillary artery & vein**



## **BLOOD SUPPLY**

### **Breast is supplied by**

1. Branches of internal mammary artery
2. Branches of posterior intercostal arteries
3. axillary , lateral thoracic , & thoracoacromial artery .

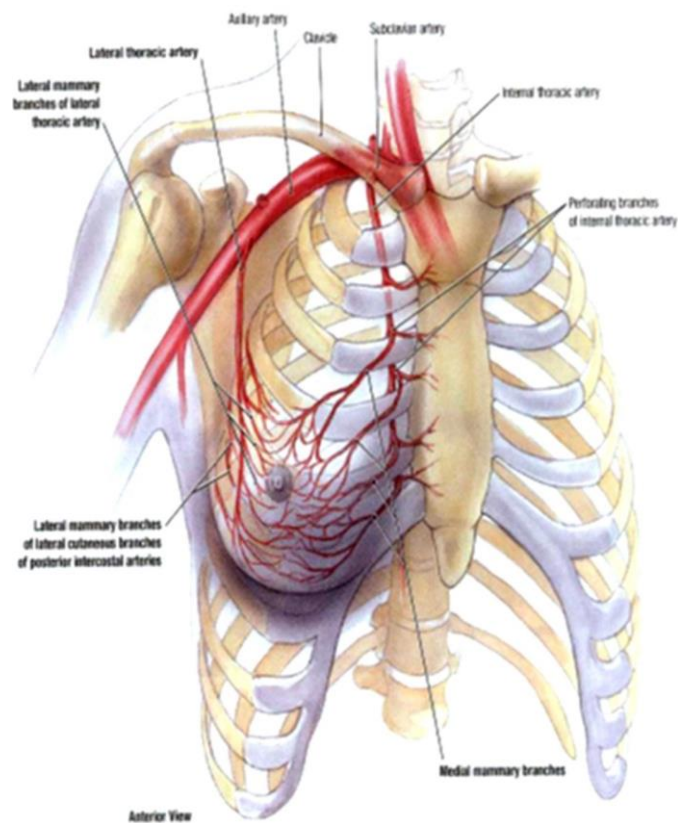


## Venous Drainage

1. Drain into internal thoracic vein
2. Tributaries of axillary vein
3. Perforating branches of posterior intercostal veins

Bastons plexus of veins provide a route for metastatic emboli to reach the vertebral bodies , ribs and CNS.

**Figure 7: Diagrammatic Presentation of blood supply to breast**



## LYMPHATIC DRAINAGE OF THE BREAST

1. The lateral group, made up of 4 to 6 LN that lie near to axillary vein
2. The anterior group consists of 4 or 5LN major portion of the drainage of lymph from breast is to this group . Lymph drains primarily from these lymph nodes into the central LN
3. The posterior group, made up of 6 to 7 LN that lie along the subscapular vessels.
4. The central group made up of 3 to 4 lymph nodes that are present in the axillary pad of fat usually behind to the pectoralis muscle. Lymph from the central nodes passes directly to the sub clavicular (apical) nodes.
5. The apical group, made up of 6 to 12 LN located partly posterior to the upper border of the Pm. and partly superior to it. They may receive lymph directly or indirectly from all the other groups of axillary lymph nodes.
6. The Rotter's group, consists of 1 to 4 small LN that are located Between the PM and minor muscles in association with the pectoral branches of the thoraco acromial vessels Internal mammary group is situated in retrosternal spaces, the right internal mammary group drains into right lymphatic duct, and the left enters the main thoracic duct. Cross communication between lymphatics from each breast, explains the metastatic involvement of opposite breast and axilla. Sub areolar plexus plays no important in lymphatic drainage of breast.

**Figure 8: diagrammatic representation of lymphatic supply of breast.**

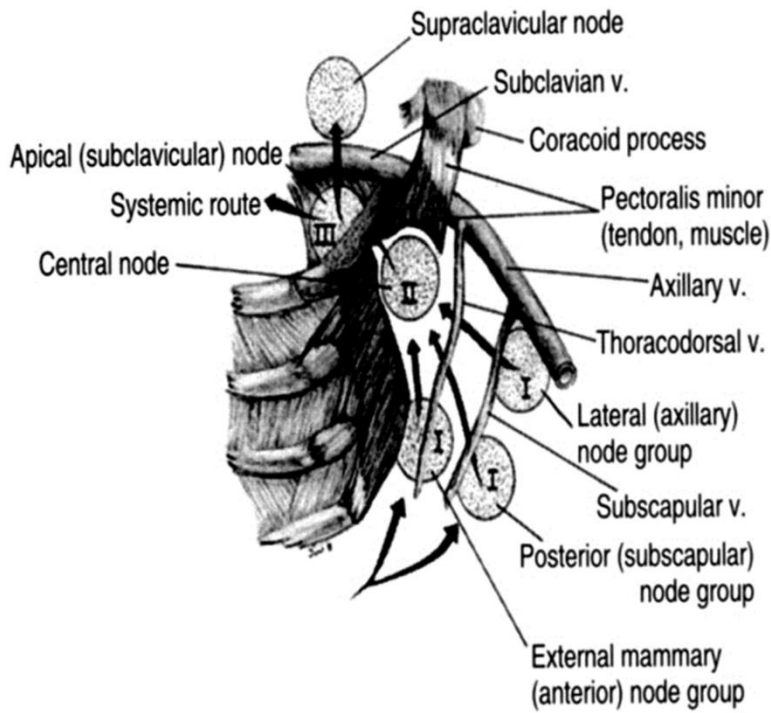
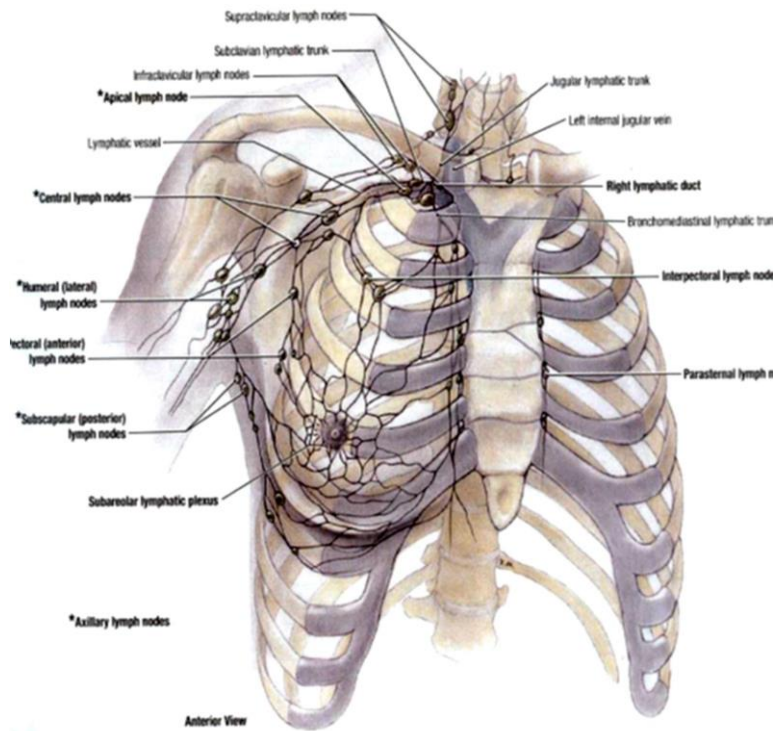


Figure 9: Level I lymph nodes include the anterior, lateral & scapular groups; level II, the central group; and level III, the apical. There are three levels or groups of lymph nodes that are defined by their location relative to the pectoralis minor. The direction indicates the general direction of lymph flow. The axillary vein and its major tributaries associated with the pectoralis minor are included

## **CLASSIFICATION OF BREAST TUMORS**

**Table 7: Histological Classification of Breast Tumors**

### **1 EPITHELIAL TUMOURS.**

#### **A. Benign**

1. Intraductal papilloma
2. Adenoma of the nipple
3. Adenoma
  - a. Tubular
  - b. Lactating

#### **B. Malignant**

1. Non invasive
  - a. DCIS
  - b. LCIS

2. Invasive
  - a. Invasive ductal carcinoma(IDC)
  - b. IDC with predominant Intra ductal component
  - c. Invasive lobular carcinoma.
  - d. Mucinous carcinoma.
  - e. Medullary carcinoma.
  - f. Papillary carcinoma.
  - g. Tubular carcinoma.
  - h. Adenoid cystic carcinoma.
  - i. Secretory carcinoma.
  - j. Apocrine.
  - k. Carcinoma with metaplasia

3. Squamous type
4. Spindle cell type.
5. Cartilaginous and osseous type.
  - a. Mixed type.
  - b. Others.

## II Mixed connective tissue and Epithelial tumors

- a. Fibro adenoma.
- b. Phyllodes tumour.
- c. Carcino sarcoma.

- III. Miscellaneous tumours.
  - a. Soft tissue tumours.
  - b. Skin tumours.
  - c. Tumours of haematopoietic and lymphoid tissues.
- IV. Unclassified tumours.

### STAGING OF BREAST CANCER

TNM staging system requires microscopic confirmation and histological typing of the tumour before attempting any stage classification.

**Table 8: AJCC/TNM Clinical Staging System**

|            |                                   |
|------------|-----------------------------------|
| TUMOUR(T)  |                                   |
| Tx         | Primary tumour cannot be assessed |
| T0         | No evidence of primary tumour     |
| Tis        | Carcinoma in situ                 |
| Tis (DCIS) | DCIS                              |
| Tis(LCIS)  | LCIS                              |

|                    |  |
|--------------------|--|
| Tis pagets disease | Pagets disease of the nipple with no tumour  |
| T1                 | Tumours <2cm in greatest dimension   |
| T2                 | Tumour > 2cm and not more than 5 cm in greatest dimension.                                       |
| T3                 | Tumour > 5cm in greatest dimension   |
| T4                 | Tumour of any size with direct extension to  |
| T4a                | Extension to chest wall , not including Pectoralis muscle  |
| T4b                | Oedema or ulceration of the skin of the breast or satellite nodules confined to the same breast. |
| T4c                | Both T4a and T4b.  |
| T4d                | Inflammatory carcinoma.  |

## REGIONAL LYMPH NODES.

|     |   |
|-----|---|
| Nx  | Regional lymph nodes cannot be assessed   |
| N0  | No regional lymph node metastasis   |
| N1  | Metastasis to movable axillary lymph node   |
| N2  | Metastasis in ipsilateral axillary lymph nodes fixed or matted or clinically apparent ipsilateral internal mammary nodes in the absence of clinically evident axillary lymph node metastasis. |
| N2a | Metastasis to ipsilateral axillary lymph nodes fixed to one another or to other structure   |
| N2b | Metastasis only in clinically apparent ipsilateral internal mammary nodes and in the absence of clinically evident axillary lymph node metastasis   |



|     |   |
|-----|---|
| N3  | Metastasis in ipsilateral infraclavicular lymph nodes or clinically apparent ipsilateral internal mammary nodes and in the presence of clinically evident axillary lymph nodes metastasis or metastasis in ipsilateral supraclavicular lymph nodes with or without axillary or internal mammary lymph nodes involvement |
| N3a | Metastasis in ipsilateral infraclavicular lymph nodes and axillary lymph nodes  |
| N3b | Metastasis in ipsilateral internal mammary nodes and axillary lymph nodes   |
| N3c | Metastasis in ipsilateral supraclavicular lymph nodes   |
| Mx  | Distant metastasis cannot be assessed   |
| M0  | No distant metastasis.  |
| M1  | Distant metastasis.   |

**Table 9: Staging of Breast Cancer**

|             |   |
|-------------|---|
| Stage 0     | Tis N0M0.   |
| Stage 1     | T1 N0M0.  |
| Stage IIA   | T0 N1 M0. T1 N1 M0.<br>T2 N0 M0.                    |
| Stage II B  | T2 N1 M0.<br>T3 N0 M0.                              |
| Stage III A | T0 N2 M0. T1 N2 M0. T2 N2 M0. T3 N1 M0.<br>T3 N2 M0 |

|             |                                  |
|-------------|----------------------------------|
| Stage III B | T4 N0 M0.<br>T4 N1 M0 .T4 N2 M0. |
| Stage III C | Any T N3 M0                      |
| Stage IV    | Any T Any N M1                   |

## MATERIALS AND METHODS

**Study design** : Prospective study.

**Study Place** : Department of General Surgery.  
Kilpauk medical college and .  
Government Royapettah Hospital

**Duration of Study** : April 2019 to October 2019

**Number of patients:** 49 Patients .

**Ethical committee clearance obtained.**

**Written informed consent obtained**

**Inclusion criteria.**

- All cases of breast cancer undergoing Modified Radical Mastectomy.

**Exclusion criteria.**

- Cases of Mastectomy and Axillary dissection for indications other than carcinoma
- Cases undergoing palliative mastectomies and incomplete axillary dissection.
- Cases of breast cancer surgery in males
- Previous surgical procedures in and around the axilla

- Bilateral breast cancer
- Simultaneous reconstructive surgery
- Other serious underlying medical illness(es) precluding full study participation

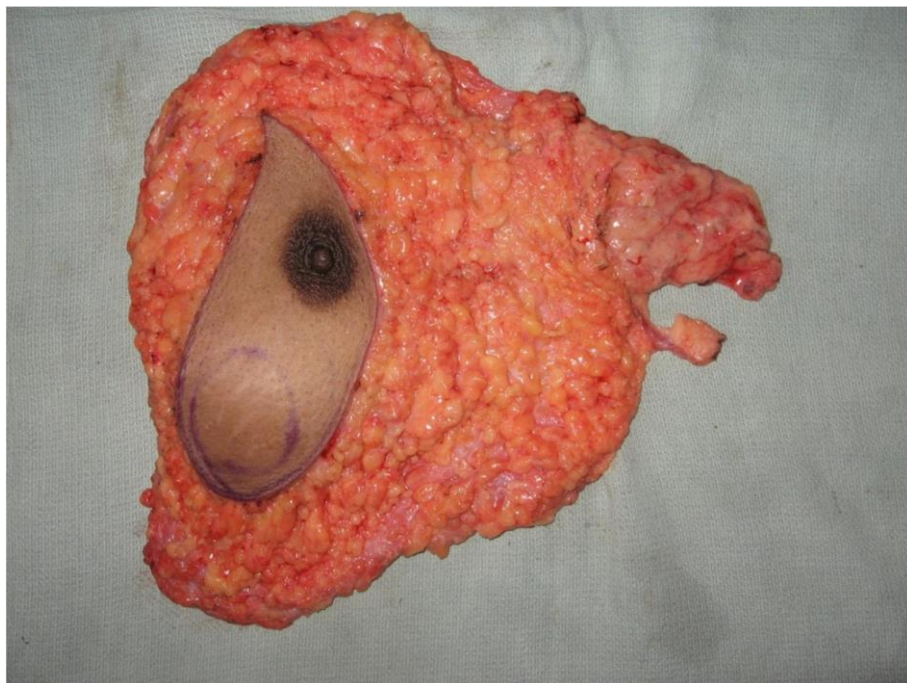
## **OPERATIVE TECHNIQUE.**

All patients underwent a complete clinical examination and relevant investigations required for diagnosis and staging. All participating women were informed about their diagnosis, the surgery to be performed and about the study before the surgery.

The surgery was performed under general anesthesia with patient supine on the operating table with both arms abducted. A third generation cephalosporin Cefotaxime was used as perioperative antibiotic and perioperative analgesics were used as per standard protocol. The operated side was painted and draped as per protocol. The operative technique was same throughout the study period in patients undergoing mastectomy, a horizontal elliptical incision was used which included the tumor with at least 2 cm skin margin. The flaps were raised using electrocautery medially up to mid sternum, superiorly up to the clavicle and inferiorly 2 cm below the infra mammary crease. Skin was closed with ethilon.

Axillary node dissection consisted of an en bloc removal of level I & II lymph nodes. Flaps were raised using electrocautery. The axillary contents were cleared from the axillary vein extending from the chest wall to the anterior border of latissimus dorsi muscle posteriorly & anteriorly lateral border of PM muscle. The inferiorly extended up to 5th intercostal space. The ipsilateral arm was then flexed, the PM and Pm muscles were retracted, and elevated and axillary contents dissected to the apex of the axillary cavity. Care was taken to preserve the nerve to Serratus anterior and thoracodorsal nerves and vessels. A 14 to 16 Fr closed suction drain was placed in the axilla. The wounds were dressed with sterile gauze pads.

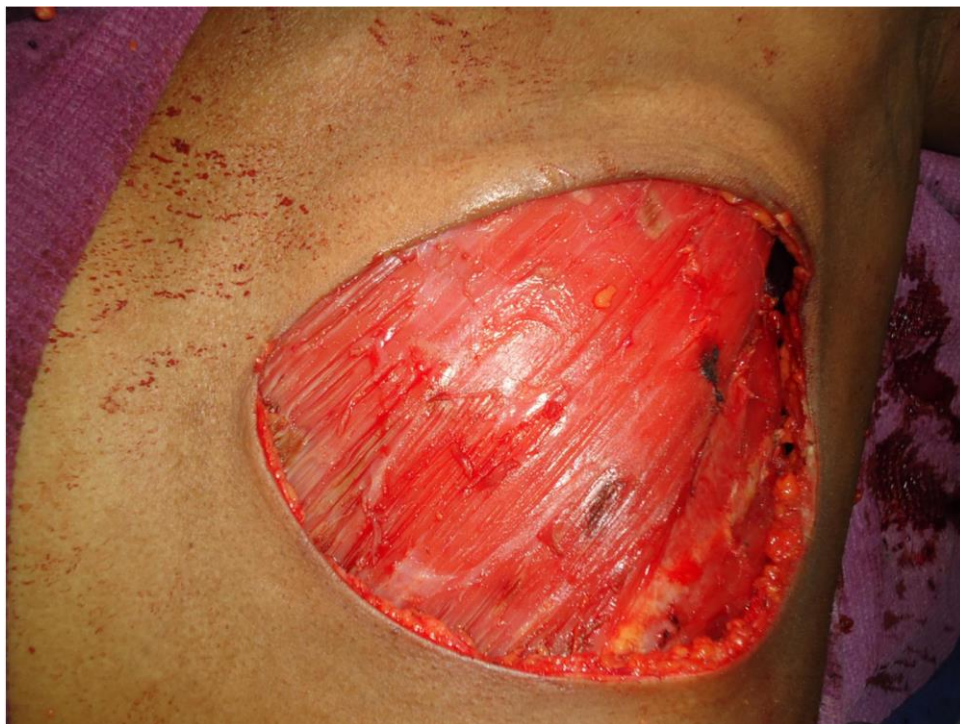
**Figure 10 : Specimen of breast and axillary pad of fat after MRM**



**Figure 11 : axillary vein and thoracodorsal trunk seen after axillary lymph node dissection**



**Figure 12: exposed pectoralis major muscle after MRM**



## **Definitions**

1. A seroma is defined as any palpable fluid collection in the axilla. Any seroma aspirated once a week or earlier if required and a sample sent for culture and sensitivity.
2. Wound infection was defined as erythema, cellulitis, purulent drainage, wound gaping, skin necrosis, or positive microbiology at the incision site that needed antibiotics.

All patients were followed up in the outpatient clinics. Data was collected and recorded longitudinally output, cumulative postoperative day 7 drain output, total drain output, duration of drainage,

## **Outcome Measures.**

The primary endpoint of the study was the incidence of seroma formation. The other parameters that were measured were postoperative day 1 drain output, cumulative postoperative day three drain , Operative details like; use of electrocautery, suction drains ,axillary padding were also noted, implementation of upper limb (on the side operated) physiotherapy were noted. The number of lymph nodes removed & wound Complications were noted. Analysis of risk factors for seroma formation was also done. Seroma was managed by regular aspirations under aseptic precautions and the drain removal was delayed until the resolution of seroma

**Figure 13 : flap necrosis after MRM**



**Figure 14: post mastectomy seroma collection in left breast**





## **METHOD OF STATISTICAL ANALYSIS**

Descriptive statistical analysis has been carried out in the present study. The collected data were analysed with IBM.SPSS statistics software 23.0 Version. To describe about the data descriptive statistics frequency analysis, percentage analysis were used for categorical variables and the mean & S.D were used for continuous variables. To find the significant difference between the bivariate samples in Independent groups the Unpaired sample t-test was used To find the significance in categorical data Chi-Square test was used similarly if the expected cell frequency is less than 5 in 2×2 tables then the Fisher's Exact was used. In all the above statistical tools the probability value .05 is considered as significant level.

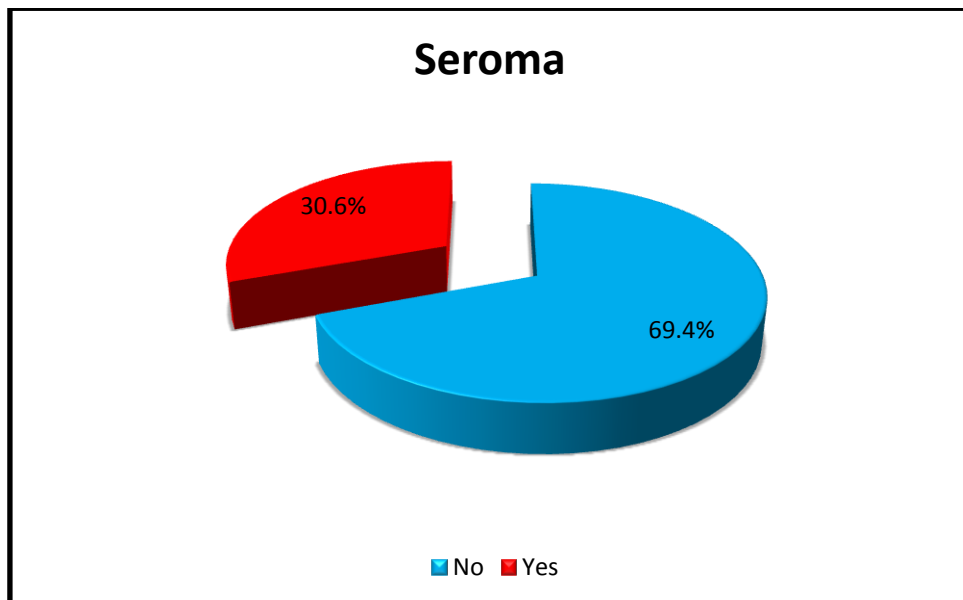
## RESULTS

### DEMOGRAPHIC DATA

49 consecutively admitted female patients with the diagnosis of carcinoma breast counseled for MRM were included in the study 15 out of 49 patients, accounting for 30.6 percent, developed seroma

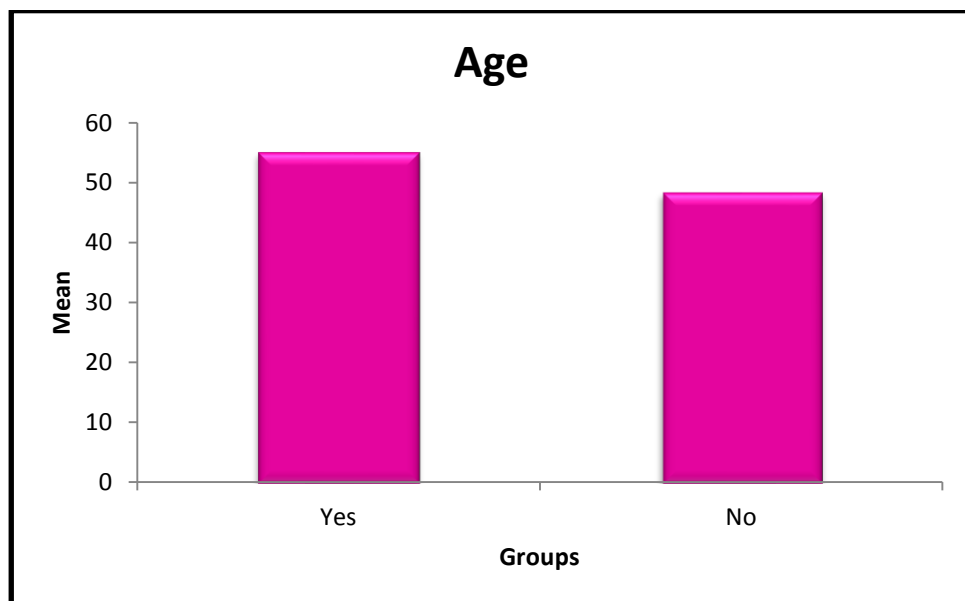
**Table 10 : Distribution of seroma. in study population**

|       | Frequency | Percent |
|-------|-----------|---------|
| No    | 34        | 69.4    |
| Yes   | 15        | 30.6    |
| Total | 49        | 100.0   |



**TABLE 11: DISTRIBUTION OF MEAN AGE IN THE STUDY POPULATION**

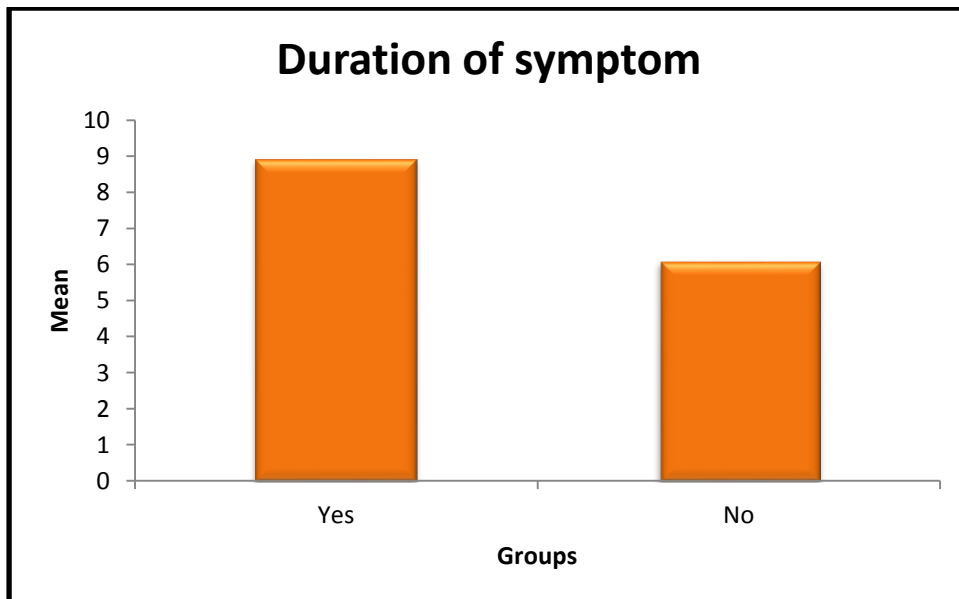
| Age comparison by Unpaired T-Test            |     |    |      |       |         |         |
|--|-----|----|------|-------|---------|---------|
| Seroma                                       |     | N  | Mean | S.D   | t-value | P-value |
| Age  | Yes | 15 | 55   | 6.80  | 2.121   | 0.039   |
|  | No  | 34 | 48   | 11.30 |         | *       |
| * Statistical Significance at P < 0.05 level |     |    |      |       |         |         |



The mean age of patients who developed seroma was **55 + 6.80**, whereas the mean age of those without seroma was **48 + 11.30** years. **P value was statistically Significant 0,039**

**TABLE 12: MEAN DURATION OF SYMPTOM IN THE STUDY POPULATION**

| Duration of symptom comparison by Unpaired T-Test |     |    |      |      |         |         |
|---|-----|----|------|------|---------|---------|
| Seroma  |     | N  | Mean | S.D  | t-value | P-value |
| Duration of symptom                               | Yes | 15 | 9    | 4.10 | 2.488   | 0.023 * |
|   | No  | 34 | 6    | 2.44 |         |         |
| * Statistical Significance at P < 0.05 level      |     |    |      |      |         |         |



The mean duration of symptom in seroma group was 9 + 4.10 and in noseroma group was 6 + 2.44 days , **P value is 0.023, statistically significant**

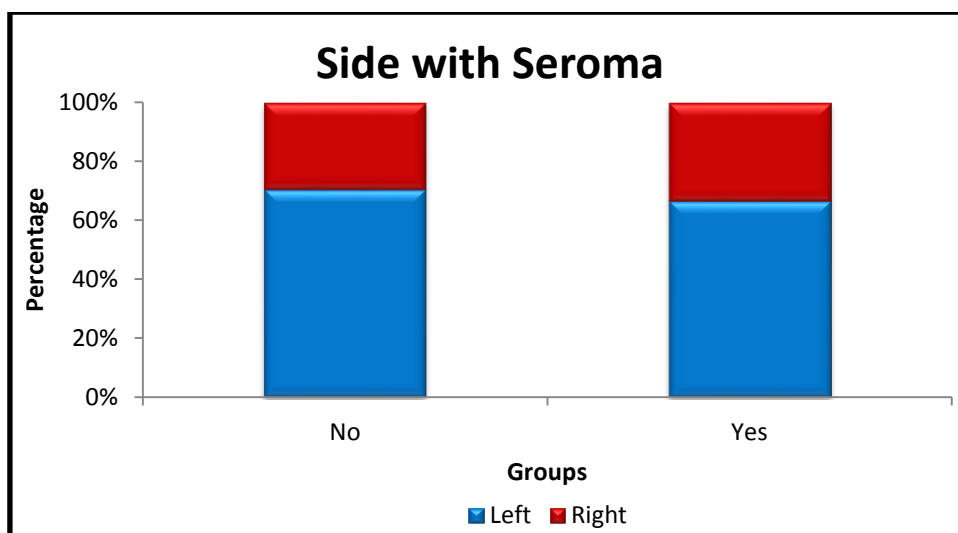
**TABLE 13: DISTRIBUTION OF TUMOUR SIDE IN STUDY**

**POPULATION**

| Comparison between Side with Seroma |       |       |        |        |        |                        |         |
|-------------------------------------|-------|-------|--------|--------|--------|------------------------|---------|
|                                     |       |       | Seroma |        | Total  | χ <sup>2</sup> - value | P-value |
|                                     |       |       | No     | Yes    |        |                        |         |
| Side                                | Left  | Count | 24     | 10     | 34     | 0.075                  | 1.000 # |
|                                     |       | %     | 70.6%  | 66.7%  | 69.4%  |                        |         |
|                                     | Right | Count | 10     | 5      | 15     |                        |         |
|                                     |       | %     | 29.4%  | 33.3%  | 30.6%  |                        |         |
| Total                               |       | Count | 34     | 15     | 49     |                        |         |
|                                     |       | %     | 100.0% | 100.0% | 100.0% |                        |         |

# No Statistical Significance at P>0.05 level

|       | No    | Yes   |
|-------|-------|-------|
| Left  | 70.6% | 66.7% |
| Right | 29.4% | 33.3% |



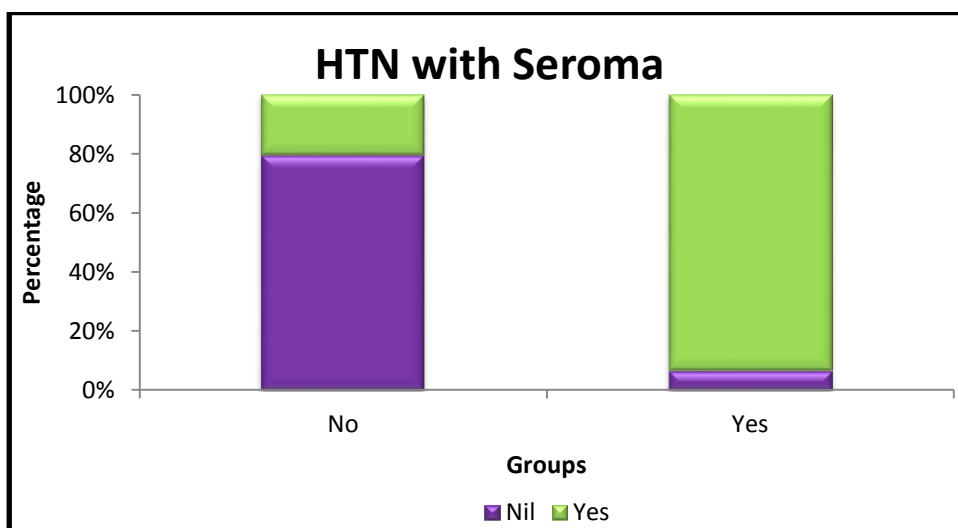
5 among the seroma group were found to be right sided tumors accounting for 33.3%, 10 among the seroma were found to be left sided tumors (66.7%).P value was insignificant 1.000

**TABLE 14: DISTRIBUTION OF HYPERTENSION IN STUDY POPULATION**

| Comparison between HTN with Seroma |     |       |        |        |        |                        |              |
|------------------------------------|-----|-------|--------|--------|--------|------------------------|--------------|
|                                    |     |       | Seroma |        | Total  | χ <sup>2</sup> - value | P-value      |
|                                    |     |       | No     | Yes    |        |                        |              |
| HTN                                | No  | Count | 27     | 1      | 28     | 22.490                 | 0.0005<br>** |
|                                    |     | %     | 79.4%  | 6.7%   | 57.1%  |                        |              |
|                                    | Yes | Count | 7      | 14     | 21     |                        |              |
|                                    |     | %     | 20.6%  | 93.3%  | 42.9%  |                        |              |
| Total                              |     | Count | 34     | 15     | 49     |                        |              |
|                                    |     | %     | 100.0% | 100.0% | 100.0% |                        |              |

\*\* Highly Significant at P < 0.01 level

|     | No    | Yes   |
|-----|-------|-------|
| No  | 79.4% | 6.7%  |
| Yes | 20.6% | 93.3% |



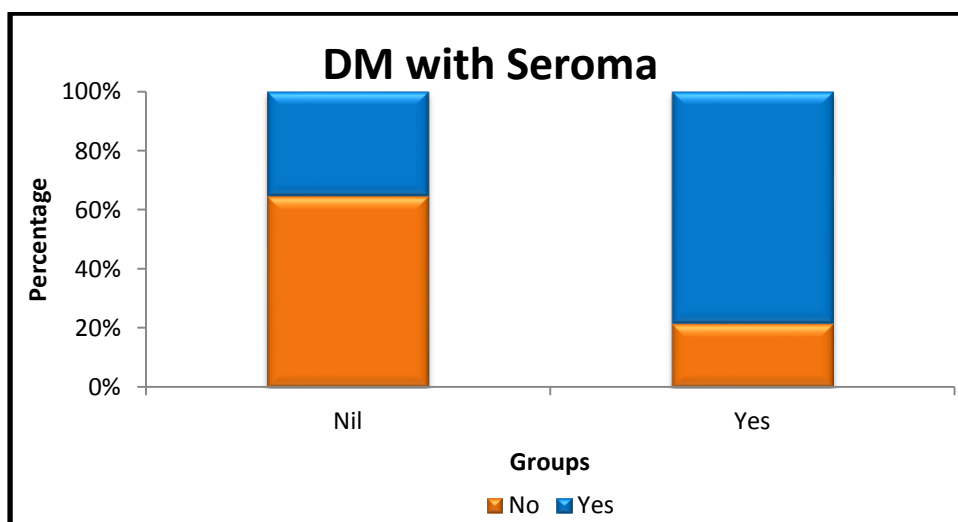
14 among the seroma group were found to be hypertensive accounting for 93.3%; 7 among the non-seroma group were hypertensive, 20.6%. **P value was significant. 0.0005**

**TABLE 15 : DISTRIBUTION OF DIABETES IN STUDY POPULATION**

| Comparison between DM with Seroma |     |       |        |        |        |             |          |
|-----------------------------------|-----|-------|--------|--------|--------|-------------|----------|
|                                   |     |       | Seroma |        | Total  | □ 2 - value | P- value |
|                                   |     |       | No     | Yes    |        |             |          |
| DM                                | No  | Count | 29     | 7      | 36     | 7.967       | 0.011 *  |
|                                   |     | %     | 85.3%  | 46.7%  | 73.5%  |             |          |
|                                   | Yes | Count | 5      | 8      | 13     |             |          |
|                                   |     | %     | 14.7%  | 53.3%  | 26.5%  |             |          |
| Total                             |     | Count | 34     | 15     | 49     |             |          |
|                                   |     | %     | 100.0% | 100.0% | 100.0% |             |          |

\* Statistical Significance at P < 0.05 level

|     | No    | Yes   |
|-----|-------|-------|
| No  | 85.3% | 46.7% |
| Yes | 14.7% | 53.3% |

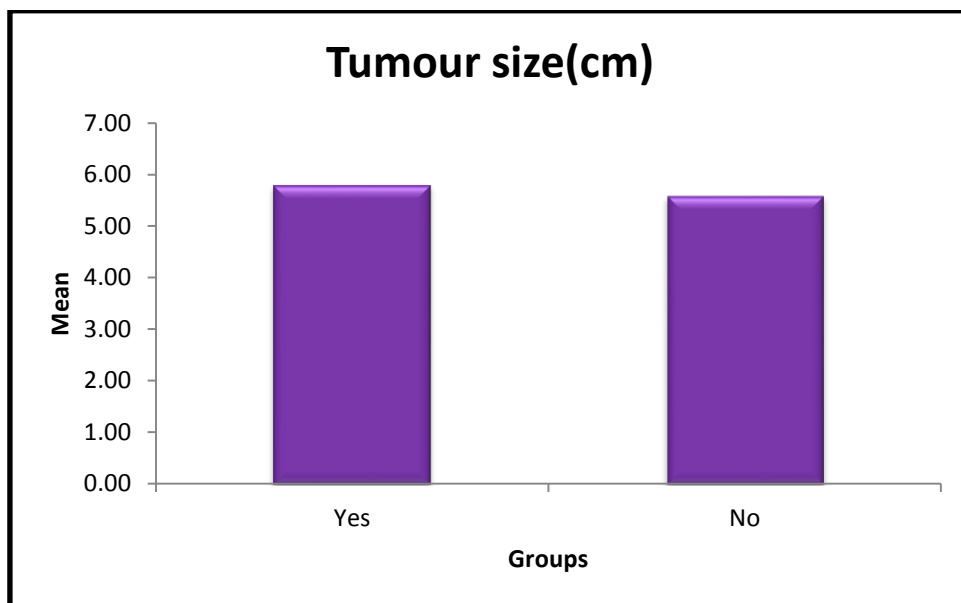


8 among the seroma group were found to be diabetic accounting for 53.3%; 5 among the non-seroma group were diabetic, 14.7%. **P value was significant. 0.011**

**TABLE 16: DISTRIBUTION OF MEAN TUMOUR SIZE IN STUDY**

**.POPULATION**

| <b>Tumour size(cm) comparison by Unpaired T-Test</b> |     |    |      |      |         |            |
|--|-----|----|------|------|---------|------------|
| Seroma   |     | N  | Mean | S.D  | t-value | P-value    |
| Tumour size(cm)                                      | Yes | 15 | 5.80 | 1.57 | 0.321   | 0.749<br># |
|  | No  | 34 | 5.59 | 2.32 |         |            |
| # No Statistical Significance at P>0.05 level        |     |    |      |      |         |            |



The mean tumour size of patients who developed seroma was **5.80 + 1.57**, whereas the mean tumour size of those without seroma was **5.59+2.32 cm**. P value was 0.749, statistically insignificant.

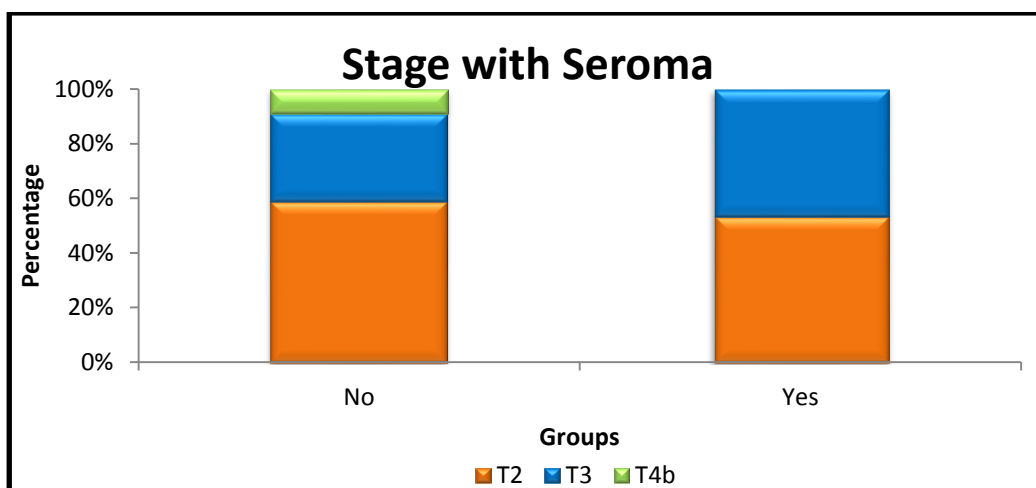


**TABLE 17 : DISTRIBUTION OF STAGING OF TUMOUR IN STUDY POPULATION**

| Comparison between Stage with Seroma |     |       |        |        |        |             |          |
|--------------------------------------|-----|-------|--------|--------|--------|-------------|----------|
|                                      |     |       | Seroma |        | Total  | □ 2 - value | P- value |
|                                      |     |       | No     | Yes    |        |             |          |
| Stage                                | T2  | Count | 20     | 8      | 28     | 1.959       | 0.376 #  |
|                                      |     | %     | 58.8%  | 53.3%  | 57.1%  |             |          |
|                                      | T3  | Count | 11     | 7      | 18     |             |          |
|                                      |     | %     | 32.4%  | 46.7%  | 36.7%  |             |          |
|                                      | T4b | Count | 3      | 0      | 3      |             |          |
|                                      |     | %     | 8.8%   | 0.0%   | 6.1%   |             |          |
| Total                                |     | Count | 34     | 15     | 49     |             |          |
|                                      |     | %     | 100.0% | 100.0% | 100.0% |             |          |

# No Statistical Significance at P>0.05 level

|     | No    | Yes   |
|-----|-------|-------|
| T2  | 58.8% | 53.3% |
| T3  | 32.4% | 46.7% |
| T4b | 8.8%  | 0.0%  |

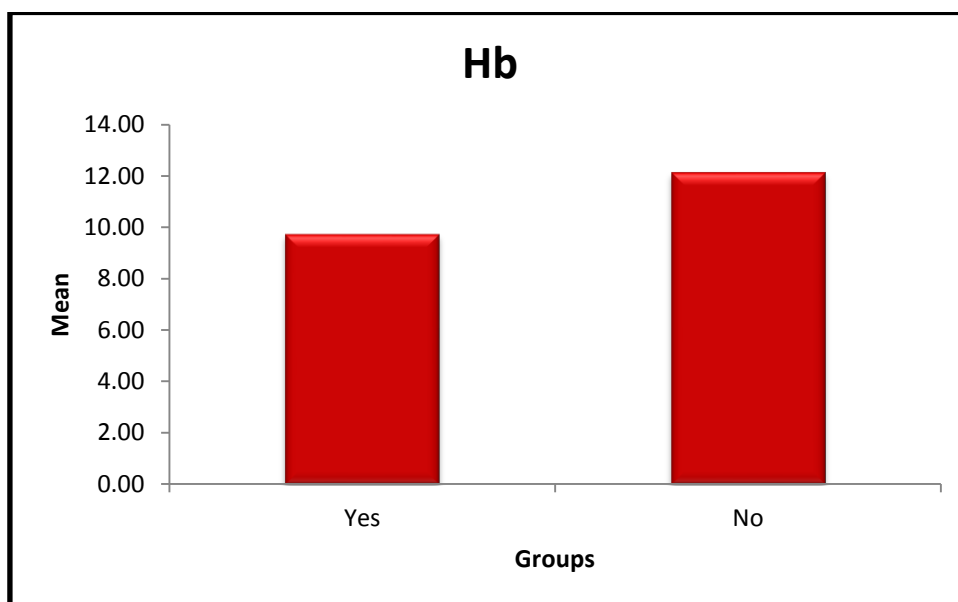


15 among the seroma group were found to be T2 -53.3%,T3-46.7% , T4b – 0% . P value was 0.376 statistically insignificant.

**TABLE 18: MEAN HAEMOGLOIN IN THE STUDY POPULATION**

| <b>Hb comparison by Unpaired T-Test</b> |     |    |       |      |         |            |
|---|-----|----|-------|------|---------|------------|
| Seroma                                  |     | N  | Mean  | S.D  | t-value | P-value    |
| Hb                                      | Yes | 15 | 9.74  | 0.93 | 1.367   | 0.178<br># |
|   | No  | 34 | 12.15 | 6.77 |         |            |

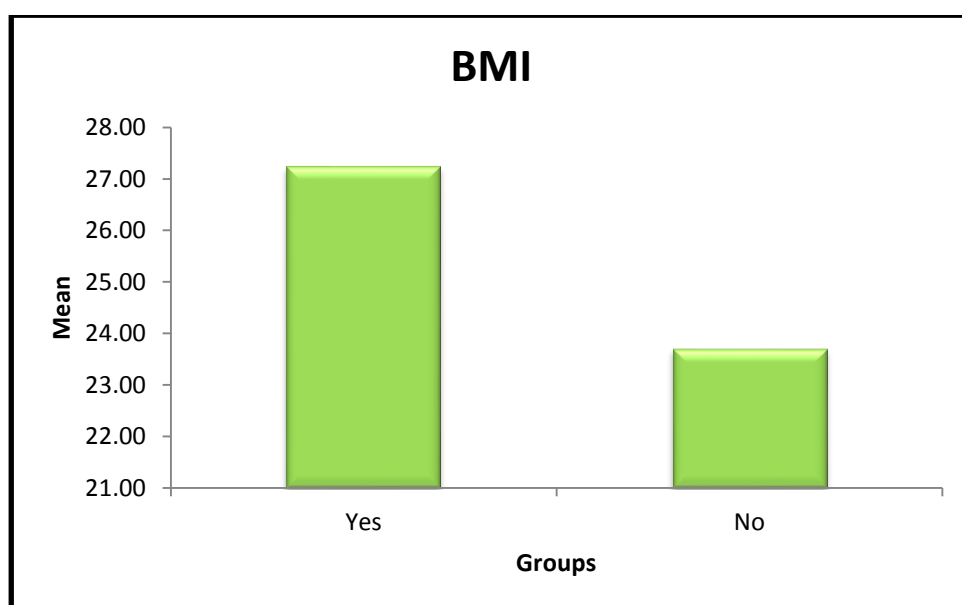
# No Statistical Significance at P>0.05 level



The mean haemoglobin in seroma group was 9.74 + 0.93 and in no seroma group was 12.15 + 6.77 gm/dl P value is 0.0178, statistically insignificant.

**TABLE 19: DISTRIBUTION OF MEAN BMI (KG/M<sup>2</sup>) IN THE STUDY POPULATION**

| <b>BMI comparison by Unpaired T-Test</b> |     |    |       |      |         |              |
|--|-----|----|-------|------|---------|--------------|
| Seroma                                   |     | N  | Mean  | S.D  | t-value | P-value      |
| BMI                                      | Yes | 15 | 27.25 | 2.45 | 3.990   | 0.0005<br>** |
|  | No  | 34 | 23.72 | 3.01 |         |              |
| ** Highly Significant at P < 0.01 level  |     |    |       |      |         |              |



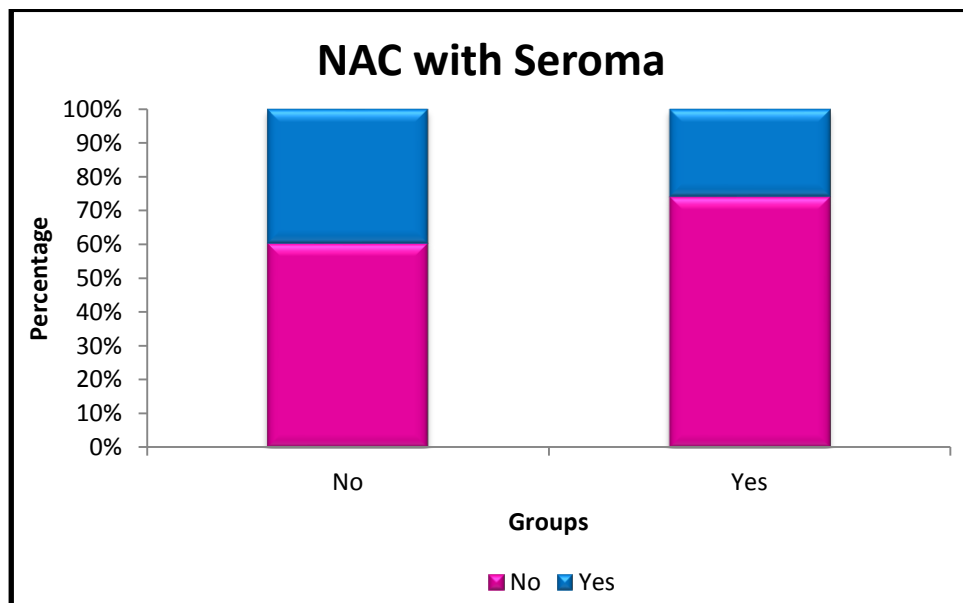
The mean BMI of those with seroma was 27.25 + 2.45; the BMI for patients without seroma was 23.72 + 3.01 kg/m<sup>2</sup>. **P value was highly significant 0.0005**

**TABLE 20: DISTRIBUTION OF NEOADJUVANT CHEMOTHERAPY IN STUDY POPULATION**

| Comparison between NAC with Seroma |     |       |        |        |        |             |          |
|------------------------------------|-----|-------|--------|--------|--------|-------------|----------|
|                                    |     |       | Seroma |        | Total  | □ 2 - value | P- value |
|                                    |     |       | No     | Yes    |        |             |          |
| NAC                                | No  | Count | 24     | 8      | 32     | 1.368       | 0.331 #  |
|                                    |     | %     | 70.6%  | 53.3%  | 65.3%  |             |          |
|                                    | Yes | Count | 10     | 7      | 17     |             |          |
|                                    |     | %     | 29.4%  | 46.7%  | 34.7%  |             |          |
| Total                              |     | Count | 34     | 15     | 49     |             |          |
|                                    |     | %     | 100.0% | 100.0% | 100.0% |             |          |

# No Statistical Significance at P>0.05 level

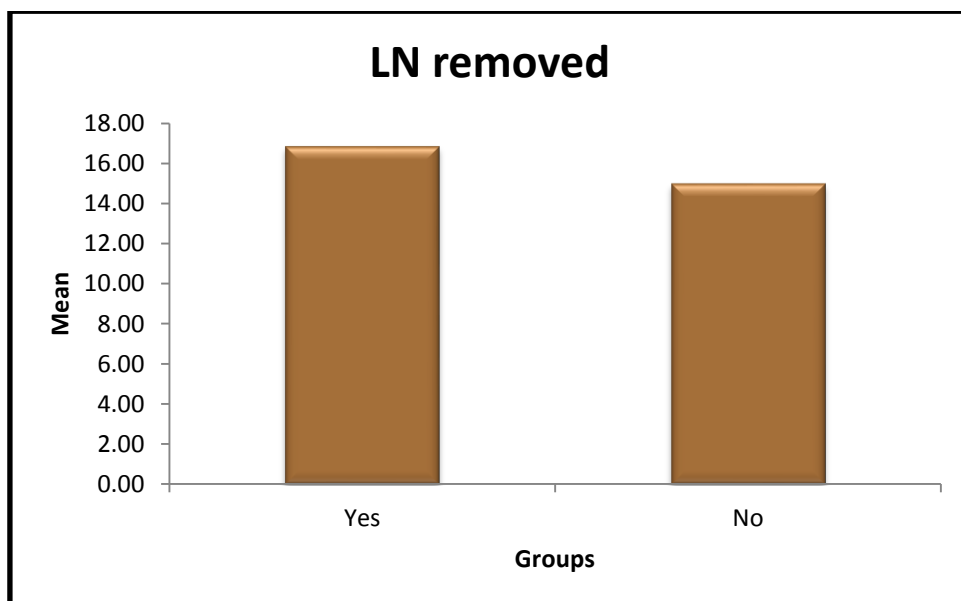
|     | No     | Yes    |
|-----|--------|--------|
| No  | 100.0% | 100.0% |
| Yes | 65.3%  | 34.7%  |



7 patients who had received neoadjuvant chemotherapy developed seroma, and 8 patients who received no neoadjuvant chemotherapy developed seroma. P value was 0.331, statistically Insignificant

**TABLE 21: MEAN NUMBER OF LYMPH NODES REMOVED IN THE STUDY POPULATION**

| <b>LN removed comparison by Unpaired T-Test</b> |     |    |       |      |         |         |
|---|-----|----|-------|------|---------|---------|
| Seroma  |     | N  | Mean  | S.D  | t-value | P-value |
| LN removed                                      | Yes | 15 | 16.87 | 7.96 | 0.857   | 0.403 # |
|   | No  | 34 | 15.00 | 4.19 |         |         |
| # No Statistical Significance at P>0.05 level   |     |    |       |      |         |         |



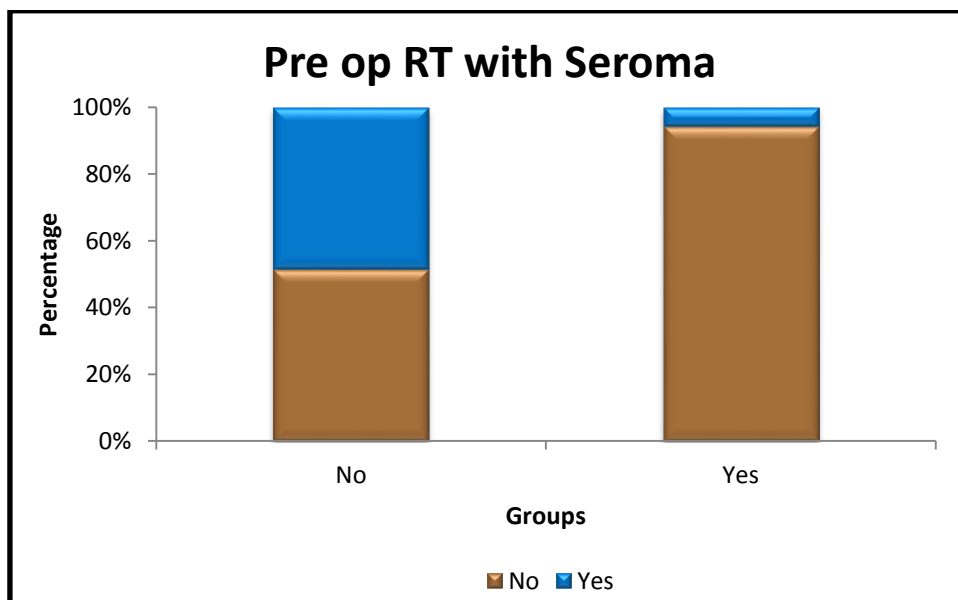
The mean number of lymph nodes removed in the seroma group was 16.87+7.96 , whereas in no seroma group was 15 + 4.19 P value was insignificant 0.403

**TABLE 22: DISTRIBUTION OF PREOPERATIVE RADIOTHERAPY IN STUDY POPULATION**

| Comparison between Pre op RT with Seroma |     |       |        |        |        |             |          |
|--|-----|-------|--------|--------|--------|-------------|----------|
|  |     |       | Seroma |        | Total  | □ 2 - value | P- value |
|  |     |       | No     | Yes    |        |             |          |
| Pre op RT                                | No  | Count | 32     | 14     | 46     | 0.11        | 1.000 #  |
|  |     | %     | 94.1%  | 93.3%  | 93.9%  |             |          |
|  | Yes | Count | 2      | 1      | 3      |             |          |
|  |     | %     | 5.9%   | 6.7%   | 6.1%   |             |          |
| Total                                    |     | Count | 34     | 15     | 49     |             |          |
|  |     | %     | 100.0% | 100.0% | 100.0% |             |          |

# No Statistical Significance at P>0.05 level

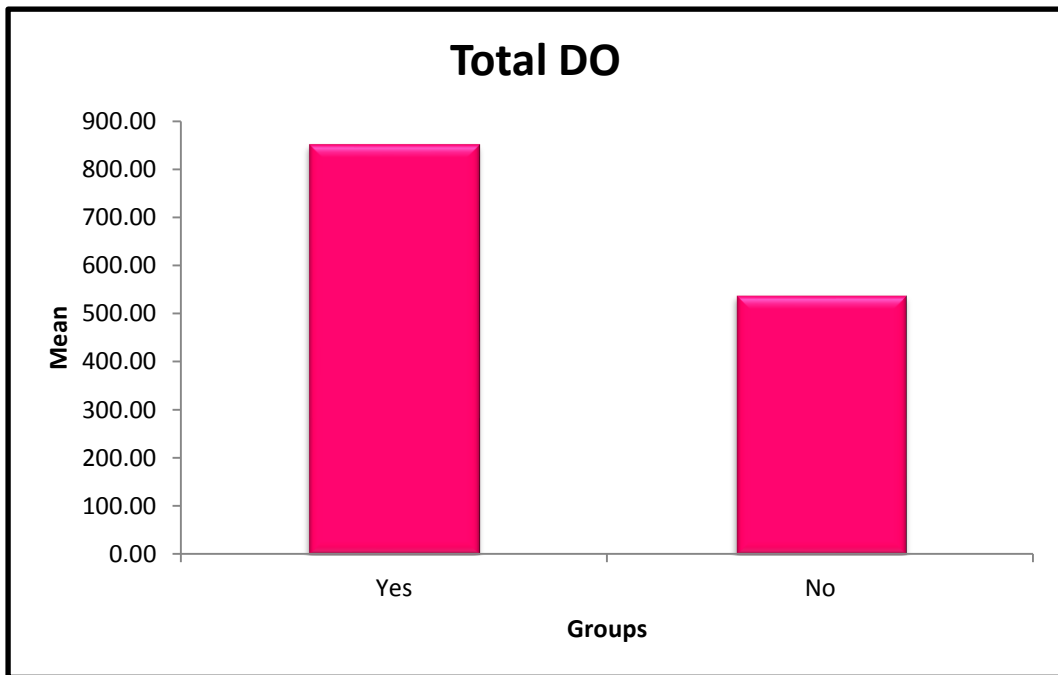
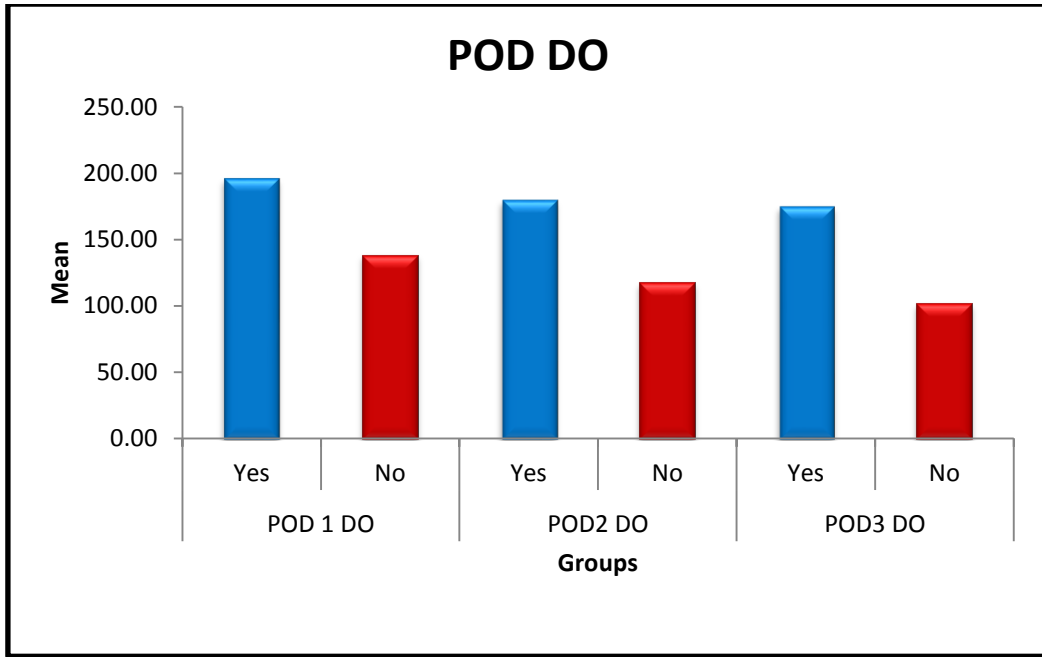
|     | No     | Yes    |
|-----|--------|--------|
| No  | 100.0% | 100.0% |
| Yes | 93.9%  | 6.1%   |



Out of 3 patients, who received preop radiotherapy only 1 developed seroma, 14 patients who had not received radiotherapy developed seroma. P value was 1.000, statistically insignificant

**TABLE 23 : MEAN DRAIN OUTPUT IN STUDY POPULATION**

| <b>POD DO comparison by Unpaired T-Test</b> |     |    |        |        |         |              |
|---|-----|----|--------|--------|---------|--------------|
| Seroma                                      |     | N  | Mean   | S.D    | t-value | P-value      |
| POD 1<br>DO                                 | Yes | 15 | 196.33 | 30.03  | 6.404   | 0.0005<br>** |
|   | No  | 34 | 138.53 | 28.72  |         |              |
| POD2<br>DO                                  | Yes | 15 | 180.00 | 24.49  | 7.166   | 0.0005<br>** |
|   | No  | 34 | 117.35 | 35.19  |         |              |
| POD3<br>DO                                  | Yes | 15 | 175.33 | 18.46  | 9.492   | 0.0005<br>** |
|   | No  | 34 | 101.76 | 35.63  |         |              |
| Total<br>DO                                 | Yes | 15 | 851.67 | 79.86  | 8.871   | 0.0005<br>** |
|   | No  | 34 | 538.09 | 167.43 |         |              |
| ** Highly Significant at P < 0.01 level     |     |    |        |        |         |              |





The mean drain output on day 1 in seroma group was  $196.33 \pm 30.03$  and in no seroma group was  $138.53 \pm 28.72$  milliliters (ml), P value is 0.0005, statistically highly significant.

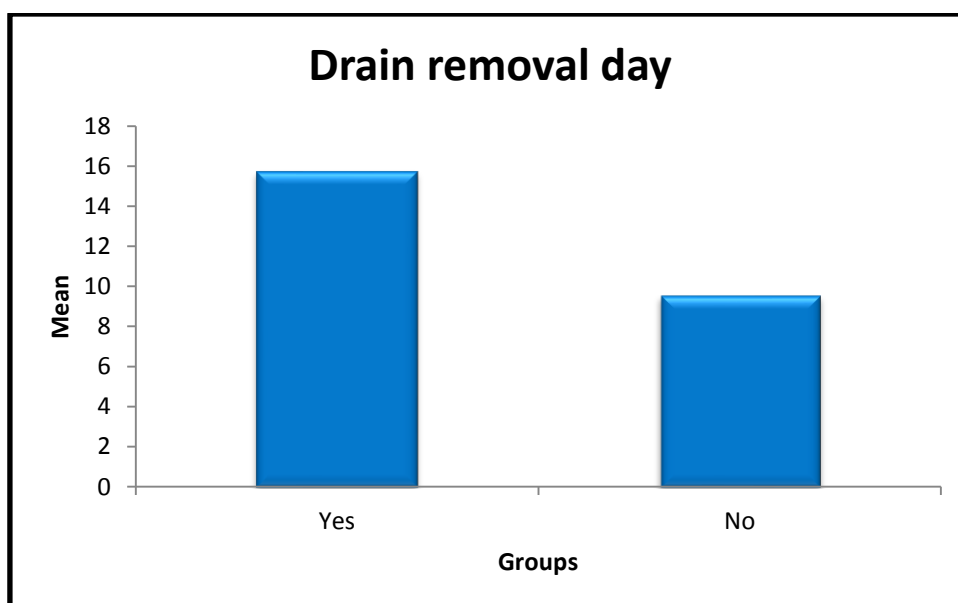
The mean drain output on day 2 in seroma group was  $180 \pm 24.49$  and in no seroma group was  $117.35 \pm 35.19$  milliliters (ml), P value is 0.0005, statistically highly significant.

The mean drain output on day 3 in seroma group was  $175.33 \pm 18.46$  and in no seroma group was  $101.76 \pm 35.63$  milliliters (ml), P value is 0.0005, statistically highly significant

The mean total drain output in seroma group was  $851.67 \pm 79.86$  and in no seroma group was  $538.09 \pm 167.43$  milliliters (ml), P value is 0.0005, statistically highly significant.

**TABLE 24 : MEAN DRAIN REMOVAL DAY IN STUDY POPULATION**

| Drain removal day comparison by Unpaired T-Test |     |    |      |      |         |              |
|---|-----|----|------|------|---------|--------------|
| Seroma  |     | N  | Mean | S.D  | t-value | P-value      |
| drain removal day                               | Yes | 15 | 16   | 1.49 | 9.925   | 0.0005<br>** |
|   | No  | 34 | 10   | 2.19 |         |              |
| ** Highly Significant at P < 0.01 level         |     |    |      |      |         |              |



The mean drain removal day in seroma group was 16 + 1.49 and in no seroma group was 10 + 2.19 days. **P value is 0.0006 statistically highly significant.**

## DISCUSSION

Breast cancer is the most common cancer in women and surgical management remains the main line of management. The most common types of breast surgeries are MRM and BCS. Seroma is the commonest sequel following breast cancer surgery.

Seroma accumulation elevates the flaps from the chest wall and axilla thereby hampers their adherence to the tissue bed. Although it usually resolves within a few weeks, excessive fluid accumulation will stretch the skin and cause it to sag, resulting in patient discomfort and prolongation of the hospital stay.

It can thus lead to significant morbidity such as wound hematoma, wound infection, flap necrosis, wound break down, prolonged hospitalization, psychological distress, delayed recovery, & delay in starting chemotherapy.<sup>22</sup>

Thus, although a number of factors have been correlated with seroma formation, strong data on factors associated with seroma formation are still rare, and it is difficult to identify patients who will ultimately suffer from seroma. Various studies have shown that suturing of skin flaps is a successful means of reducing seroma formation.<sup>7, 17, 60-64</sup>

The success of external compression dressings have not yet been validated adequately through randomized studies.<sup>15,58,59</sup> Early drain removal has also been shown not to significantly affect seroma formation while reducing duration of drainage and other postoperative morbidity. Complications due to these methods are not much different from the standard drain method and are not frequent or serious.

Our study included 49 randomly selected patients with the diagnosis of Carcinoma breast undergoing modified radical mastectomy. In our study, 30.6 %of patients developed Seroma . E. Hashemi et al in their study on 158 patients with breast cancer undergoing either modified radical mastectomy or breast preservation, overall seroma rate was 35%. Gonzalez E. A. et al in their study on 359 patients undergoing either modified radical mastectomy or wide local excision and axillary lymph node dissection showed overall seroma rate of 15.8%, 19.9% in modified radical mastectomy group and 9.2% in breast-conserving group. Seroma rate in a study by Unalp H. R. et al. was 14.28%.

In our study the mean age of presentation was 55 + 6.80 years, p value was 0.039 significant association was established between age of the patient and seroma formation. Menton M. et al opine that seroma formation increases with increasing age of the patient. On the contrary, K. Kuroi et al quoted that existing evidence was inconclusive for age with respect to seroma formation, as did E. Hashemi et al. The mean age in E. Hashemi et al study was 46.3 years

(SD+11.9). Unalp et al reported a mean age of 53.13 years (SD+13.26), which is comparable to the mean age of patients in studies from India like Nadkarni et al<sup>9</sup> and Chintamani et al.<sup>50</sup> The mean age is lower than patients in studies from other parts of the world like Gupta et al<sup>16</sup>, Purushottam. et al<sup>17,32</sup>, Jain et al<sup>18</sup>, Lumachi et al<sup>19</sup>, Galatius et al<sup>42</sup>, O'Hea et al<sup>59</sup> and Ruggerio et al.<sup>73</sup> This underlines the fact that breast cancer occurs at an earlier age in India than in the western countries.

In our study the mean duration of symptom in seroma group was 9 + 4.10 and in no seroma group was 6 + 2.44 days, **P value is 0.023, statistically significant**

In our study, mean BMI was **27.25 kg/mm<sup>2</sup>**(SD+ 2.45).In our study BMI of patients from No seroma group had a lower BMI (23.72), the **difference was statistically significant. Our study opines that there is association between BMI and seroma formation.**

In our study among the seroma group ,14 of 15 patients (93.3%), were hypertensive, while in non seroma group , 7 of 34 patients were known hypertensives. There was **significant association between seroma formation and history of arterial hypertension in the patient.** Literature shows that high BMI and arterial hypertension are considered risk factors , Douay et al, **Kumar et al<sup>29</sup>** found a **significant association b/w BW. and HTN with seroma.**

In our study 8 among the seroma group were found to be diabetic accounting for 53.3%; 5 among the non-seroma group were diabetic, 14.7%. **P value was significant. 0.011**

In our study the mean haemoglobin in seroma group was  $9.74 \pm 0.93$  and in no seroma group was  $12.15 \pm 6.77$  gm/dl P value is 0.0178, statistically insignificant.

In our study, 7 of the seroma group patients received neo adjuvant Chemotherapy, Whereas 10 patients who had not received neoadjuvant chemotherapy developed seroma significant reduction in seroma rate could not be demonstrated from the study as similarly concluded by Unalp H. R. et al

The mean drain output on day 1 in seroma group was  $196.33 \pm 30.03$  and in no seroma group was  $138.53 \pm 28.72$  milliliters (ml), P value is 0.0005, statistically highly significant.

The mean drain output on day 2 in seroma group was  $180 \pm 24.49$  and in no seroma group was  $117.35 \pm 35.19$  milliliters (ml), P value is 0.0005, statistically highly significant.

The mean drain output on day 3 in seroma group was  $175.33 + 18.46$  and in no seroma group was  $101.76 + 35.63$  milliliters (ml), P value is 0.0005, statistically highly significant

In our study the mean total drain output in seroma group was  $851.67 + 79.86$  and in no seroma group was  $538.09 + 167.43$  milliliters (ml), P value is 0.0005, statistically highly significant suggesting the probability of seroma formation in those patients with higher drain output on post op Day 3. k.kuroi et al , suggested that a positive association between drainage volume during the initial 72 hrs and seroma formation was consistent.

In the study the mean number of lymph nodes removed in the seroma group was  $16.87+7.96$  , whereas in no seroma group was  $15 + 4.19$  P value was insignificant 0.403

In the study the mean drain removal day in seroma group was  $16 + 1.49$  and in no seroma group was  $10 + 2.19$  days. **P value is 0.0006 statistically highly significant.** Although k.kuroi et al showed that seroma formation rate was significantly high in patients following drain removal on post op day 5 when. compared to drain removal on post op day 8 .

## CONCLUSION

The factors influencing seroma formation following modified radical mastectomy for carcinoma breast are as follows;

The following factors has significant association for seroma formation.

- Age
- Duration of Symptom
- BMI
- Hypertension
- Diabetes
- Drain output
- Drain removal

The following factors has no significant association for seroma formation.

- Side of the tumour
- Size of the tumour
- New adjuvant chemotherapy
- Pre Op Radiotherapy
- Haemoglobin status
- Lymph node removal status



Hypertension and High Body Mass Index has strong association for seroma formation. Higher drain output on post operative day 1, pod 2 and pod 3 is likely to predict the increased possibility of seroma formation. Delayed removal of drain showed increased seroma formation. Age, duration of symptom, Diabetes are associated with increased seroma formation.

## BIBLIOGRAPHY

1. Stewart BW and Kleihues P (Eds) World Cancer Report. IARC Press. Lyon 2003, p-188-93.
2. U. S. Cancer Statistics Working Group. United States Cancer Statistics: 2003 Incidence and Mortality (preliminary data). Department of Health and Human Services, Centers for Disease Control and Prevention and National Vital Statistics Vol. 53, No.5, 2004
3. Goldhirsch A, Wood WC, Gelber RD, Coates AS, Thürlimann B, Senn HJ. Meeting highlights: Updated international expert consensus on the primary therapy of breast cancer. *J Clin Oncol* 2003;21:3357-65.
4. Agrawal. A, Ayantunde AA, Cheung KL. Concepts of seroma formation and prevention in breast cancer surgery. *ANZ J Surg* 2006;76:1088–95.
5. Osteen RT and Karnell LH. The national cancer database report on breast cancer. *Cancer* 1994; 73: 1994–2000.
6. Kuroi K, Shimosuma K, Taguchi T, Imai H, Yamashiro H, Ohsumi S et al. Pathophysiology of seroma in breast cancer. *Breast Cancer* 2005; 12:288-93.
7. Classe JM, Berchery D, Campion L, Pioud R, Dravet F, Robard S. Randomized clinical trial comparing axillary padding with closed suction drainage for the axillary wound after lymphadenectomy for breast cancer. *Br J Surg* 2006; 93(7):820-4
8. Woodworth PA, McBoyle MF, Helmer SD, Beamer RL. Seroma formation after breast cancer surgery: Incidence and predicting factors. *Am Surg* 2000; 66:444–

50; disc 450–1

9. Nadkarni MS, Rangole AK, Sharma RK, Hawaldar RV, Parmar VV, Badwe RA. Influence of surgical technique on axillary seroma formation: A randomized study. *ANZ J Surg* 2007;77:385–9
10. Hashemi E, Kaviani A, Najafi M, Ebrahimi M, Hooshmand H, Montazeri A. Seroma formation after surgery for breast cancer. *World J Surg Oncol* 2004; 2:44.
11. Benjasirichai V, Piyapant A, Pokawattana C, Dowreang J. Reducing Postoperative Seroma by Closing of Axillary Space. *J Med Assoc Thai* 2007;90(11):2321-5
12. Loo Wings TY and Chow Louis WC. Factors predicting seroma formation after mastectomy for Chinese breast cancer patients. *Ind J Cancer* 2007;44(3): 99–103.
13. Pogson CJ, Adwani A, Ebbs SR. Seroma following breast cancer surgery. *Eur J Surg Oncol* 2003;29:711-7.
14. Oertli D, Laffer U, Haberthuer F, Kreuter U, Harder F. Perioperative and postoperative tranexamic acid reduces the local wound complication rate after surgery for breast cancer. *Br J Surg* 1994; 81: 856–9.
15. Chen CY, Hoe AL, Wong CY. The effect of a pressure garment on post- surgical drainage and seroma formation in breast cancer patients. *Singapore Med J* 1998;39:412–5.
16. Gupta R, Pate K, Varshney S, Goddard J, Royle GT. A comparison of 5-day and 8-day drainage following mastectomy and axillary clearance. *Eur J Surg Oncol* 2001;27:26–30.
17. Purushotham AD, McLatchie E, Young D, George WD, Stallard S, Doughty J, Brown DC et al. Randomized clinical trial of no wound drains and early discharge

in the treatment of women with breast cancer. *Br J Surg* 2002; 89:286-92.

18. Jain PK, Sowdi R, Anderson AD, MacFie J. Randomized clinical trial investigating the use of drains and fibrin sealant following surgery for breast cancer. *Br J Surg* 2004;91:54–60.
19. Lumachi F, Brandes AA, Burelli P, Basso SM, Iacobone M, Ermani M. Seroma prevention following axillary dissection in patients with breast cancer by using ultrasound scissors: a prospective clinical study. *Eur J Surg Oncol* 2004;30:526–30.
20. Unalp HR and Onal MA. Analysis of risk factors affecting the development of seromas following breast cancer surgeries. *The Breast Journal* 2007;3(6):588–92.
21. Tadych K and Donegan WL. Post mastectomy seromas and wound drainage. *Surg Gynaec Obst* 1987;165:483-7.
22. Kuroi K, Shimozuma K, Taguchi T, Imai H, Yamashiro H, Ohsumi S et al. Effect of mechanical closure of dead space on seroma formation after breast surgery. *Breast Cancer* 2006;13( 3):260-5.
23. Shamley DR, Barker K, Simonite V, Beardshaw A. Delayed versus immediate exercises following surgery for breast cancer: a systematic review. *Breast Cancer Res Treat* 2005;90:263–71.
24. Aitken DR and Minton JP. Complications associated with mastectomy. *Surg Clin North Am* 1983; 63:1331-52.
25. Bonnema J, Ligtenstein DA, Wiggers T, van Geel AN. The composition of serous fluid after axillary dissection. *Eur J Surg* 1999;165:9–13
26. Petrek J, Peters M, Nori S, Knauer C, Kinne D, Rogatko A. Axillary lymphadenectomy. A prospective, randomized trial of 13 factors influencing

- drainage, including early or delayed arm mobilization. *Arch Surg* 1990;125:378–82.
27. Gonzalez EA, Saltzstein EC, Riedner CS, Nelson BK. Seroma formation following breast cancer surgery. *Breast J* 2003;9:385–8.
28. Kuroi K, Shimosuma K, Taguchi T, Imai H, Yamashiro H, Ohsumi S et al. Evidence-Based Risk Factors for Seroma Formation in Breast Surgery. *Jpn J Clin Oncol* 2006;36(4):197–206.
29. Kumar S, Lal B, Misra MC. Post-mastectomy seroma: a new look into the aetiology of an old problem. *J R Coll Surg Edinb* 1995;40:292–4.
30. Dalberg K, Johansson H, Signomklao T, Rutqvist LE, Bergkvist L, Frisell J, et al. A randomised study of axillary drainage and pectoral fascia preservation after mastectomy for breast cancer. *Eur J Surg Oncol* 2004;30:602–9.
31. Chilson TR, Chan FD, Lonser RR, Wu TM, Aitken DR. Seroma prevention after modified radical mastectomy. *Am Surg* 1992; 58:750–4.
32. Purushotham AD, Upponi S, Klevesath MB, Bobrow L, Millar K, Myles JP. Morbidity after sentinel lymph node biopsy in primary breast cancer: results from a randomized controlled trial. *J Clin Oncol* 2005;23: 4312–21.
33. Soon PS, Clark J, Magarey CJ. Seroma formation after axillary lymphadenectomy with and without the use of drains. *Breast* 2005;14:103– 7.
34. Schultz I, Barholm M, Grondal S. Delayed shoulder exercises in reducing seroma frequency after modified radical mastectomy: a prospective randomized study. *Ann Surg Oncol* 1997;4:293–7.
35. Porter KA, O'Connor S, Rimm E, Lopez M. Electrocautery as a factor in seroma formation following mastectomy. *Am J Surg* 1998;176: 8–11.

36. Keogh GW, Doughty JC, McArdle CSM, Cooke TG. Seroma formation related to electrocautery in breast surgery: a prospective randomised trial. *The Breast* 1998;7:39–41
37. Irshad K, Campbell H. Use of hormonal scalpel in mastectomy and axillary dissection for breast cancer. *Eur J Cancer* 2002; 38 (Suppl. 3):104
38. Adwani A and Ebbs SR. Ultracision reduces acute blood loss but not seroma formation after mastectomy and axillary dissection: a pilot study. *Int J Clin Pract* 2006; 60(5):562-4.
39. Kontos M, Kothari A, Hamed H. Effect of harmonic scalpel on seroma formation following surgery for breast cancer: a prospective randomized study. *J BUON* 2008;13(2):223-30.
40. Ridings P, Bailey C, Bucknall TE. Argon beam coagulation as an adjunct in breast-conserving surgery. *Ann R Coll Surg Eng* 1998;80:61–2.
41. Kerin M, O’Hanlon D, Kenny P, Kent P, Given H. Argon enhanced cutting and coagulation confers advantages over conventional electrocautery for mastectomy. *Eur J Surg Oncol* 1996;22:571–3.
42. Galatius H, Okholm M, Hoffmann J. Mastectomy using ultrasonic dissection: effect on seroma formation. *Breast* 2003;12:338–41.
43. Talbot ML, Magarey CJ. Reduced use of drains following axillary lymphadenectomy for breast cancer. *ANZ J Surg* 2002;72:488–90
44. Terrell G, Singer J. Axillary versus combined axillary and pectoral drainage after modified radical mastectomy. *Surg Gyne Obst* 1992;175:437–40
45. Petrek J, Peters M, Cirrincione C, Thaler H. A prospective randomized trial of

single versus multiple drains in the axilla after lymphadenectomy. *Surg Gynaecol Obst* 1992;175:405–9.

46. Murphey DR. The use of atmospheric pressure in obliterating dead space following modified radical mastectomy. *South Surgeon* 1947;13:372–5.
47. Kopelman D, Klemm O, Bahous H, Klein R, Krausz M, Hashmonai M. Postoperative suction drainage of the axilla: for how long? Prospective randomized trial. *Eur J Surg* 1999;165:117–20.
48. Wedderburn A, Gupta R, Bell N, Royle G. Comparison between low and high pressure suction drainage following axillary clearance. *Eur J Surg Oncol* 2000;26:142–4.
49. Bonnema J, van Geel AN, Ligtenstein DA, Schmitz PI, Wiggers T. A prospective randomized trial of high versus low vacuum drainage after axillary dissection for breast cancer. *Am J Surg* 1997;173:76–9.
50. Chintamani, Singhal V, Singh J, Bansal A, Saxena S. Half versus full vacuum suction drainage after modified radical mastectomy for breast cancer – a prospective randomized clinical trial [ISRCTN24484328]. *BMC Cancer* 2005;5:11.
51. Barwell J, Campbell L, Watkins RM, Teasdale C. How long should suction drains stay in after breast surgery with axillary dissection? *Ann R Coll Surg Engl* 1997;79:435–7.
52. Parikh HK, Badwe RA, Ash CM, Hamed H, Freitas R Jr, Chaudary MA, et al. Early drain removal following modified radical mastectomy: a randomized trial. *J Surg Oncol* 1992;51:266–9.

53. Liu CD and McFadden DW. Overnight closed suction drainage after axillary lymphadenectomy for breast cancer. *Am Surg* 1997;63:868–70.
54. Baas-Vrancken Peeters MJ, Kluit AB, Merkus JW, Breslau PJ. Short versus long-term postoperative drainage of the axilla after axillary lymph node dissection. A prospective randomized study. *Breast Cancer Res Treat* 2005;93(3):271-5
55. Somers RG, Jablon LK, Kaplan MJ, Sandler GL, Rosenblatt NK. The use of closed suction drainage after lumpectomy and axillary node dissection for breast cancer. A prospective randomized trial. *Ann Surg* 1992;215:146–9.
56. Barton A, Blitz M, Callahan D, Yakimets W, Adams D, Dabbs K. Early removal of postmastectomy drains is not beneficial: results from a halted randomized controlled trial. *Am J Surg* 2006 May;191(5):652-6
57. Pankaj Chaturvedi, Uma Chaturvedi. Axillary compression with delayed drain removal reduces prolonged seroma formation. *J Surg Oncol* 2001;78:279-80
58. O’Hea BJ, Ho MN, Petrek JA. External compression dressing versus standard dressing after axillary lymphadenectomy. *Am J Surg* 1999;177:450–53.
59. Kontos M, Petrou A, Prassas E, Tsigris C, Roy P, Trafalis D, et al. Pressure dressing in breast surgery: is this the solution for seroma formation? *J BUON* 2008;13(1):65-7.
60. Halsted WS: Developments in the skin grafting operations for cancer of the breast. *JAMA* 1913;60:416-451.
61. Larsen BB, Hagan C, Jr. Fixation of skin flaps in radical mastectomy by subcutaneous sutures; observations. *AMA Arch Surg (contd. as Arch Surg)* 1955;71:419-423.



62. Schuijtvlot M, Sahu AK, Cawthorn SJ. A prospective audit of the use of a buttress suture to reduce seroma formation following axillary node dissection without drains. *The Breast* 2002;11:94-96
63. Hamy A, Bouchot-Hermouet FB, Bouchot O, Drianno JC, Guillard Y: Wadding of the axilla in the conservative treatment of cancer of the breast. Prevention of lymphocele. *J Chir (Paris)* 1990;127:99-102
64. Coveney EC, O'Dwyer PJ, Geraghty JG, O'Higgins NJ. Effect of closing dead space on seroma formation after mastectomy- a prospective randomized clinical trial. *Eur J Surg Oncol* 1993;19:143-6.
65. Sultan MR, Madhere SM. Delayed seroma formation secondary to docetaxel. *Ann Plast Surg* 2003;50(4):429-32
66. Gilly FN, Francois Y, Sayag-Beaujard AC, Glehen O, Brachet A, Vignal J. Prevention of lymphorrhea by means of fibrin glue after axillary lymphadenectomy in breast cancer: prospective randomized trial. *Eur Surg Res* 1998;30: 439-43.
67. Rice DC, Morris SM, Sarr MG et al. Intraoperative topical tetracycline sclerotherapy following mastectomy: a prospective, randomized trial. *J Surg Oncol* 2000;73:224-7.
68. Ulusoy AN, Polat C, Alvur M, Kandemir B, Bulut F. Effect of fibrin glue on lymphatic drainage and on drain removal time after modified radical mastectomy: a prospective randomized study. *Breast J* 2003;9:393-6.
69. Mustonen PK, Harma MA, Eskelinen MJ. The effect of fibrin sealant combined with fibrinolysis inhibitor on reducing the amount of lymphatic leakage after

axillary evacuation in breast cancer. A prospective randomized clinical trial. Scand J Surg 2004;93:209–12.

70. Johnson L, Cusick TE, Helmer SD, Osland JS. Influence of fibrin glue on seroma formation after breast surgery. Am J Surg 2005;189: 319–23.
71. Ruggiero R, Procaccini E, Piazza P, Docimo P, Iovino F, Antoniol F, et al. Effectiveness of fibrin glue in conjunction with collagen patches to reduce seroma formation after axillary lymphadenectomy for breast cancer. Am J Surg 2008;196:170–4.
72. Sanders RP, Goodman NC, Amiss LR Jr, Pierce RA, Moore MM, Marx G, et al. Effect of fibrinogen and thrombin concentrations on mastectomy seroma prevention. J Surg Res 1996;61:65–70.
73. BMI Classification. World Health Organisation Global Database on Body Mass Index. Available from:  
URL: [http://www.who.int/bmi/index.jsp?introPage=intro\\_3.html](http://www.who.int/bmi/index.jsp?introPage=intro_3.html)

## **ANNEXURE**

### **PROFORMA**

Name :

Age :

Adm. No.:

Study No.:

D.O.A.:

D.O.Sx:

D.O.D.:

#### **Presenting History**

Duration and side of swelling/lump:

#### **Past and Personal history**

Co morbid illness : a. diabetes mellitus  
b. hypertension

Past Surgical/drug history

Prior Therapy

1. Chemotherapy
2. Radiotherapy

#### **General examination**

Height (cm):                      Weight (kg):                      BMI :                      Pulse:                      BP:

#### **Local examination**

Lump (SIZE, skin and nipple areola) Lymph Nodes (Location, number & fixity)

1. Axillary
2. Internal mammary/ Supra clavicular/Infra clavicular.:

3. Hb% (g/dL):

**Course and Events in Hospital**

Surgery Performed Electro Cautery Used

Use of suction drain

Axillary padding

Upper Limb Exercise

Number of Lymph Nodes Removed:

**Drain output:**

|                   |    |    |    |    |    |    |    |    |    |    |
|-------------------|----|----|----|----|----|----|----|----|----|----|
| POD               | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 |
| Drain output (ml) |    |    |    |    |    |    |    |    |    |    |
| POD               | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| Drain output (ml) |    |    |    |    |    |    |    |    |    |    |
| POD               | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| Drain output (ml) |    |    |    |    |    |    |    |    |    |    |

Date of drain removal:

Total duration of drainage (days):

Total volume of drainage (mL):

## KEY TO MASTER CHART

|           |                             |
|-----------|-----------------------------|
| SI No     | Serial number               |
| R         | RIGHT                       |
| L         | LEFT                        |
| Y         | YES                         |
| NAC       | NEO ADJUVANT CHEMOTHERAPY   |
| BMI       | BODY MASS INDEX             |
| PRE OP RT | PREOPERATIVE RADIOTHERAPY   |
| MRM       | MODIFIED RADICAL MASTECTOMY |
| POD       | POSTOPERATIVE DAY           |





**சுய ஒப்புதல் படிவம் (Consent Form)**

**ஆய்வு செய்யப்படும் தலைப்பு :**

“ மார்பக புற்றுநோய் அறுவைச்சிகிச்சைக்குப் பிறகு அறுவைச் சிகிச்சைப் பகுதியில் தெளிவான திரவம் உருவாவதற்கான காரணிகள் என்ன எ□□□□□ □□□□□ □□□ □□□□□”

*“A prospective study of factors influencing seroma formation in modified radical mastectomy in Government Kilpauk Medical college”*

**ஆய்வு செய்யப்படும் துறை :** பொது அறுவைச்சிகிச்சை துறை  
**ஆய்வு செய்யப்படும் மருத்துவமனை :** அரசு கீழ்பாக்கம்  
மருத்துவக்கல்லூரி மருத்துவமனையில்

**பங்கு பெறுபவரின் பெயர் :**

**பங்கு பெறுபவரின் வயது :**

**பங்கு பெறுபவரின் மருத்துவமனை எண் :**

**பங்கு பெறுபவர் இதனை (✓)குறிக்கவும் :**

மேலே குறிப்பிட்டுள்ள மருத்துவ ஆய்வின் விவரங்கள் எனக்கு விளக்கப்பட்டது. என்னுடைய சந்தேகங்களை கேட்கவும் அதற்கான தகுந்த விளக்கங்களைப் பெறவும் வாய்ப்பளிக்கப்பட்டது.

நான் இவ்வாய்வில் தன்னிச்சையாகத்தான் பங்கேற்கிறேன். எந்தக் காரணத்தினாலோ எந்தக் கட்டத்திலும் எந்த சட்ட சிக்கலுக்கும் உட்படாமல் நான் இவ்வாய்வில் இருந்து விலகிக் கொள்ளலாம் என்றும் அறிந்து கொண்டேன்.

இந்த ஆய்வு சம்மந்தமாகவும், மேலும் இது சார்ந்த ஆய்வு மேற்கொள்ளும்போதும், இந்த ஆய்வில் பங்குபெறும் மருத்துவர் என்னுடைய மருத்துவ அறிக்கைகளைப் பார்ப்பதற்கு என் அனுமதி தேவையில்லை என அறிந்துகொள்கிறேன். நான்



ஆய்வில் இருந்து விலகிக் கொண்டாலும் இது பொருந்தும் என அறிகிறேன்

இந்த ஆய்வின் மூலம் கிடைக்கும் தகவல்களையும், பரிசோதனை முடிவுகளையும் மற்றும் சிகிச்சை தொடர்பான தகவல்களையும் மருத்துவர் மேற்கொள்ளும் ஆய்வில் பயன்படுத்திக் கொள்ளவும், அதைப் பிரசுரிக்கவும் என் முழு மனதுடன் சம்மதிக்கிறேன்.

இந்த ஆய்வில் பங்கு கொள்ள ஒப்புக்கொள்கிறேன். எனக்குக் கொடுக்கப்பட்ட அறிவுரைகளின் படி நடந்துகொள்வதுடன், இந்த ஆய்வை மேற்கொள்ளும் மருத்துவ அணிக்கு உண்மையுடன் இருப்பேன் என்றும் உறுதியளிக்கிறேன். என் உடல் நலம் பாதிக்கப்பட்டாலோ அல்லது எதிர்பாராத வழக்கத்திற்கு மாறாக நோய்க்குறி தென்பட்டாலோ உடனே அதை மருத்துவ அணியிடம் தெரிவிப்பேன் என உறுதி அளிக்கிறேன்.

இந்த ஆய்வில் எனக்கு மருத்துவப் பரிசோதனை மற்றும் ஆய்வு குறித்து ஆராய்ச்சி செய்து கொள்ள நான் முழு மனதுடன் சம்மதிக்கிறேன்.

பங்கேற்பவரின் கையொப்பம் ..... கட்டைவிரல்  
ரேகை:.....

இடம் .....

தேதி .....

பங்கேற்பவரின் பெயர் மற்றும் விலாசம்

.....

...

ஆய்வாளரின் கையொப்பம் .....

ஆய்வாளரின் பெயர் .....

இடம் .....

தேதி .....

| sno | name          | age | ip no | duration of symptom | side | HTN | DM  | Tumour size(cm) | Stage | height | weight | BMI     | NAC | Pre op RT | Hb   | surgery | LN removed | electro cautry | POD 1 DO | POD2 DO | POD3 DO | Total DO | upper limb physio therapy | drain removal day | seroma |
|-----|---------------|-----|-------|---------------------|------|-----|-----|-----------------|-------|--------|--------|---------|-----|-----------|------|---------|------------|----------------|----------|---------|---------|----------|---------------------------|-------------------|--------|
| 1   | lakshmi       | 52  | 24132 | 8                   | L    | Y   | Y   | 6               | T3    | 1.5    | 60.6   | 26.9333 | N   | N         | 7.6  | mrm     | 14         | Y              | 210      | 180     | 170     | 800      | Y                         | 16                | Y      |
| 2   | valli         | 44  | 27184 | 5                   | L    | NIL | NIL | 5               | T2    | 1.61   | 53     | 20.4467 | N   | N         | 10   | mrm     | 17         | Y              | 120      | 90      | 90      | 365      | Y                         | 8                 | N      |
| 3   | devaki        | 54  | 14738 | 9                   | L    | Y   | NIL | 7               | T3    | 1.63   | 73     | 27.4756 | N   | N         | 9.4  | mrm     | 20         | Y              | 265      | 240     | 210     | 800      | Y                         | 19                | Y      |
| 4   | rajeshwari    | 63  | 18044 | 12                  | R    | NIL | NIL | 5               | T2    | 1.53   | 66     | 28.1943 | Y   | N         | 9.2  | mrm     | 18         | Y              | 190      | 180     | 190     | 910      | Y                         | 13                | N      |
| 5   | sairabee      | 65  | 29429 | 16                  | L    | Y   | Y   | 5               | T2    | 1.58   | 68.6   | 27.4796 | Y   | Y         | 8.9  | mrm     | 23         | Y              | 180      | 180     | 180     | 810      | Y                         | 17                | Y      |
| 6   | panjalai      | 44  | 23406 | 8                   | L    | NIL | NIL | 8               | T3    | 1.6    | 64     | 25      | N   | N         | 13.8 | mrm     | 12         | Y              | 120      | 110     | 120     | 440      | Y                         | 9                 | N      |
| 7   | sarojadevi    | 60  | 39147 | 7                   | L    | NIL | Y   | 7               | T3    | 1.59   | 67.4   | 26.6603 | N   | N         | 10.2 | mrm     | 14         | Y              | 160      | 130     | 90      | 515      | Y                         | 8                 | N      |
| 8   | karpagani     | 48  | 29654 | 4                   | L    | Y   | NIL | 5               | T2    | 1.54   | 59.6   | 25.1307 | N   | N         | 11   | mrm     | 15         | Y              | 150      | 140     | 120     | 610      | Y                         | 9                 | N      |
| 9   | saraswathy    | 66  | 31032 | 5                   | L    | NIL | NIL | 5               | T2    | 1.49   | 54.7   | 24.6385 | N   | N         | 9.2  | mrm     | 19         | Y              | 170      | 180     | 160     | 765      | Y                         | 14                | Y      |
| 10  | thulasi       | 55  | 21124 | 8                   | L    | Y   | NIL | 4               | T2    | 1.59   | 68.6   | 27.135  | N   | N         | 9.9  | mrm     | 17         | Y              | 210      | 180     | 150     | 920      | Y                         | 15                | Y      |
| 11  | mary          | 48  | 31366 | 6                   | R    | NIL | NIL | 3               | T2    | 1.47   | 43     | 19.8991 | N   | N         | 10.6 | mrm     | 7          | Y              | 190      | 120     | 110     | 640      | Y                         | 10                | N      |
| 12  | selvi         | 42  | 37893 | 5                   | R    | NIL | Y   | 10              | T4b   | 1.48   | 59     | 26.9357 | N   | N         | 12.6 | mrm     | 10         | Y              | 150      | 160     | 130     | 720      | Y                         | 11                | N      |
| 13  | saroja        | 58  | 31843 | 4                   | R    | Y   | Y   | 6               | T3    | 1.54   | 57.6   | 24.2874 | Y   | N         | 10.6 | mrm     | 13         | Y              | 180      | 170     | 190     | 1040     | Y                         | 15                | Y      |
| 14  | tamilarasi    | 40  | 28014 | 7                   | L    | NIL | NIL | 7               | T3    | 1.56   | 56     | 23.0112 | N   | N         | 10.2 | mrm     | 15         | Y              | 140      | 150     | 130     | 710      | Y                         | 12                | N      |
| 15  | narayani      | 50  | 32044 | 5                   | L    | Y   | NIL | 8               | T3    | 1.59   | 72     | 28.4799 | N   | N         | 11   | mrm     | 10         | Y              | 180      | 160     | 140     | 920      | Y                         | 16                | Y      |
| 16  | rani          | 60  | 34459 | 4                   | L    | Y   | NIL | 5               | T2    | 1.42   | 46     | 22.8129 | Y   | N         | 12.2 | mrm     | 11         | Y              | 110      | 100     | 60      | 400      | Y                         | 8                 | N      |
| 17  | thangammal    | 45  | 32274 | 7                   | L    | NIL | NIL | 4               | T2    | 1.51   | 53     | 23.2446 | N   | N         | 10.6 | mrm     | 13         | Y              | 120      | 100     | 90      | 440      | Y                         | 7                 | N      |
| 18  | varalakshmi   | 37  | 30134 | 4                   | R    | NIL | NIL | 3               | T2    | 1.56   | 56.9   | 23.381  | N   | N         | 11.2 | mrm     | 10         | Y              | 130      | 120     | 80      | 415      | Y                         | 7                 | N      |
| 19  | muniammal     | 50  | 29323 | 7                   | L    | Y   | Y   | 5               | T2    | 1.5    | 54     | 24.24   | Y   | N         | 10.2 | mrm     | 11         | Y              | 170      | 160     | 180     | 770      | Y                         | 15                | Y      |
| 20  | vijaya        | 49  | 31355 | 6                   | L    | NIL | NIL | 3               | T2    | 1.59   | 56.7   | 22.4279 | N   | N         | 11.6 | mrm     | 15         | Y              | 150      | 100     | 80      | 500      | Y                         | 9                 | N      |
| 21  | kasthuri      | 56  | 43004 | 17                  | R    | Y   | Y   | 5               | T2    | 1.54   | 56.4   | 23.7814 | Y   | n         | 9.6  | mrm     | 21         | Y              | 190      | 160     | 160     | 815      | Y                         | 15                | Y      |
| 22  | baby          | 42  | 36981 | 8                   | L    | NIL | NIL | 8               | T3    | 1.56   | 48.9   | 20.0937 | Y   | N         | 12.6 | mrm     | 19         | Y              | 150      | 100     | 90      | 620      | Y                         | 10                | N      |
| 23  | devi          | 48  | 33482 | 7                   | L    | NIL | NIL | 4               | T2    | 1.53   | 51     | 21.7865 | N   | N         | 9    | mrm     | 17         | Y              | 120      | 100     | 80      | 345      | Y                         | 11                | N      |
| 24  | lakshmi       | 53  | 36021 | 11                  | R    | Y   | Y   | 8               | T3    | 1.46   | 58     | 27.2096 | Y   | N         | 8.6  | mrm     | 9          | Y              | 160      | 170     | 170     | 745      | Y                         | 14                | Y      |
| 25  | kumari        | 62  | 35288 | 10                  | L    | NIL | NIL | 7               | T3    | 1.6    | 57.6   | 22.5    | Y   | Y         | 7.8  | mrm     | 15         | Y              | 150      | 140     | 150     | 595      | Y                         | 9                 | N      |
| 26  | malliga       | 30  | 34215 | 3                   | L    | NIL | Y   | 4               | T2    | 1.52   | 54     | 23.3726 | N   | N         | 13.1 | mrm     | 17         | Y              | 190      | 170     | 150     | 860      | Y                         | 17                | N      |
| 27  | kurshid begum | 75  | 22885 | 7                   | L    | NIL | NIL | 3               | T2    | 1.53   | 51     | 21.7865 | N   | N         | 9.4  | mrm     | 15         | Y              | 100      | 90      | 100     | 390      | Y                         | 10                | N      |
| 28  | bhavani       | 70  | 35838 | 6                   | L    | Y   | Y   | 5               | T2    | 1.5    | 48.2   | 21.4222 | N   | N         | 8.8  | mrm     | 14         | Y              | 110      | 80      | 70      | 340      | Y                         | 9                 | N      |
| 29  | vanaja        | 46  | 32141 | 5                   | R    | Y   | NIL | 4               | T2    | 1.54   | 76     | 32.0459 | N   | N         | 9.9  | mrm     | 39         | Y              | 220      | 190     | 180     | 865      | Y                         | 14                | Y      |
| 30  | sudha         | 26  | 5552  | 2                   | R    | NIL | NIL | 3               | T2    | 1.52   | 57     | 24.6711 | N   | N         | 49.2 | mrm     | 18         | Y              | 120      | 100     | 80      | 340      | Y                         | 9                 | N      |
| 31  | ponnammal     | 55  | 29917 | 10                  | R    | NIL | NIL | 6               | T4b   | 1.5    | 74.5   | 33.1111 | N   | N         | 8.8  | mrm     | 13         | Y              | 170      | 130     | 100     | 625      | Y                         | 10                | N      |
| 32  | rajalakshmi   | 56  | 31017 | 9                   | L    | Y   | NIL | 7               | T3    | 1.54   | 63     | 26.5643 | Y   | Y         | 11.6 | mrm     | 25         | Y              | 130      | 90      | 110     | 675      | Y                         | 8                 | N      |
| 33  | valasal       | 69  | 29177 | 14                  | L    | Y   | Y   | 9               | T3    | 1.47   | 66     | 30.5428 | N   | N         | 10   | mrm     | 8          | Y              | 250      | 230     | 190     | 870      | Y                         | 16                | Y      |
| 34  | ragini        | 60  | 32226 | 8.5                 | L    | NIL | NIL | 6               | T3    | 1.58   | 59     | 23.634  | Y   | N         | 9.8  | mrm     | 15         | Y              | 100      | 70      | 60      | 520      | Y                         | 9                 | N      |
| 35  | gandhimathi   | 40  | 33178 | 6                   | R    | NIL | NIL | 11              | T3    | 1.54   | 63     | 26.5643 | N   | N         | 15.2 | mrm     | 12         | Y              | 110      | 60      | 50      | 500      | Y                         | 8                 | N      |
| 36  | sundari       | 47  | 29317 | 4                   | L    | Y   | NIL | 4               | T2    | 1.56   | 46     | 18.902  | N   | N         | 10.2 | mrm     | 13         | Y              | 120      | 90      | 60      | 450      | Y                         | 7                 | N      |
| 37  | latha         | 41  | 36806 | 5                   | L    | NIL | NIL | 6               | T3    | 1.48   | 51     | 23.2834 | N   | N         | 9.8  | mrm     | 18         | Y              | 120      | 70      | 60      | 390      | Y                         | 8                 | N      |
| 38  | chinnaponnu   | 60  | 35677 | 3                   | L    | Y   | NIL | 8               | T3    | 1.5    | 65.6   | 29.1556 | Y   | N         | 11.2 | mrm     | 28         | Y              | 110      | 190     | 170     | 870      | Y                         | 14                | N      |
| 39  | achammal      | 50  | 39773 | 11                  | R    | Y   | NIL | 5               | T2    | 1.52   | 64.4   | 27.874  | Y   | N         | 10.2 | mrm     | 19         | Y              | 180      | 160     | 170     | 840      | Y                         | 15                | Y      |
| 40  | shanthi       | 48  | 29889 | 10                  | L    | NIL | NIL | 12              | T4b   | 1.53   | 50.7   | 21.6583 | N   | N         | 11.6 | mrm     | 9          | Y              | 90       | 80      | 60      | 340      | Y                         | 8                 | N      |
| 41  | sahayarani    | 40  | 41204 | 7                   | R    | NIL | NIL | 3               | T2    | 1.62   | 58.9   | 22.4432 | N   | N         | 12.6 | mrm     | 14         | Y              | 110      | 80      | 80      | 290      | Y                         | 8                 | N      |
| 42  | dilshad       | 60  | 31195 | 3                   | L    | NIL | NIL | 5               | T2    | 1.5    | 54     | 24      | Y   | N         | 8.9  | mrm     | 16         | Y              | 160      | 110     | 80      | 560      | Y                         | 10                | N      |
| 43  | lakshmi       | 54  | 21302 | 8                   | L    | Y   | Y   | 4               | T2    | 1.52   | 70     | 30.2978 | N   | N         | 11.2 | mrm     | 9          | Y              | 200      | 180     | 180     | 865      | Y                         | 17                | Y      |
| 44  | shanthi       | 45  | 19288 | 5                   | R    | NIL | NIL | 6               | T3    | 1.58   | 61     | 24.4352 | N   | N         | 13   | mrm     | 15         | Y              | 140      | 120     | 80      | 365      | Y                         | 8                 | N      |
| 45  | sundari       | 40  | 21431 | 7                   | L    | Y   | NIL | 5               | T2    | 1.54   | 45.4   | 19.1432 | N   | N         | 12   | mrm     | 18         | Y              | 170      | 160     | 170     | 780      | Y                         | 13                | N      |
| 46  | padmavathy    | 48  | 34394 | 6                   | L    | Y   | NIL | 6               | T3    | 1.62   | 69.6   | 26.5203 | Y   | N         | 9.8  | mrm     | 21         | Y              | 180      | 160     | 200     | 950      | Y                         | 18                | Y      |
| 47  | sumathy       | 40  | 24307 | 6                   | L    | NIL | Y   | 4               | T2    | 1.5    | 59.4   | 26.4    | N   | N         | 10.6 | mrm     | 19         | Y              | 190      | 140     | 130     | 535      | Y                         | 8                 | N      |
| 48  | thasilim      | 30  | 36970 | 4                   | L    | NIL | NIL | 3               | T2    | 1.54   | 50     | 21.0828 | N   | N         | 14.6 | mrm     | 13         | Y              | 170      | 130     | 120     | 600      | Y                         | 9                 | N      |
| 49  | kungumayee    | 50  | 38057 | 2                   | R    | NIL | NIL | 5               | T2    | 1.51   | 53     | 23.2446 | Y   | N         | 10.2 | mrm     | 10         | Y              | 150      | 190     | 120     | 640      | Y                         | 11                | N      |
| 50  | poumali       | 55  | 27001 | 5                   | R    | Y   | Y   | 4               | T2    | 1.56   | 57.9   | 23.7919 | N   | N         | 9.6  | mrm     | 9          | Y              | 110      | 180     | 210     | 880      | Y                         | 16                | Y      |