SURGICAL MANAGEMENT OF GYNECOMASTIA BY FOUR-PLANE TUMESCENT SUBCUTANEOUS MASTECTOMY (TSM)

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ABSTRACT

Introduction: Gynecomastia or the enlargement of breast tissue in men is one of the most common problems. Surgical management includes surgical excision or liposuction or both based on the grade. Surgical excision by Subcutaneous mastectomy (SM) is the criterion standard for the management of gynecomastia with only glandular hypertrophy without skin excess. We have evaluated the ease, safety and pitfalls of SM with the tumescent technique.

Aims and objectives: To describe our technique of tumescent subcutaneous mastectomy (TSM), its operative ease, postoperative analgesia, and complications.

Patients and methods: The study was conducted in the department of plastic surgery of a tertiary care hospital from 2018 August to 2021 July. 53 SM without liposuction were included in the study.

Operative procedure: Infiltration solution consisted of Ringer Lactate - 500ml + 2% Lignocaine (12.5ml) + 1:1000 Adrenaline (0.5ml) + 0.5% Bupivacaine (12.5ml). 200-250 ml of tumescent solution was used per side using the four-plane technique (Sub glandular, glandular, supra glandular and subdermal). SM was done using a standard technique. Operative time, ease of surgery, duration of postoperative analgesia and post-operative complications were recorded on a performed questionnaire.

Results: 80% of operating surgeons reported very good visualization of tissue planes and 79.2% reported dissection was very easy. 85% of the excisions were performed using 2 or fewer gauze pieces. Postoperative analgesia was achieved for 4-6 hours in more than 75%. Complications like seroma (7.5%), epidermal loss (3.8%), contour abnormality (1.9%) and nipple flattening (3.8%) were noted.

Discussion: The effects of tumescent components like hydro-dissection, vasoconstriction and analgesia added to the benefits of this technique. The complications noted were like or less compared to standard SM. Conclusion: TSM being safe and easy, with an additional benefit of postoperative analgesia, is a worthy option in the management of gynecomastia with glandular hypertrophy without skin excess.

KEYWORDS: Gynecomastia, male breast, surgery, tumescent, subcutaneous mastectomy

Introduction

Breast tissue is made of mammary glands embedded in the fibrofatty stroma and is normally rudimentary in men. Gynecomastia, the enlargement of breast tissue, is one of the most common problems in males. There are multiple causes of gynecomastia, but the most common is idiopathic. It may involve glandular or fatty tissue or both. Gynecomastia is usually bilateral and, at times, unilateral. Most patients with gynecomastia have enlargement of both glandular and fatty tissue; when only fatty tissue is enlarged, it is known as Pseudo Gynecomastia (Lipomastia).

Simon et al. classified gynecomastia into 3 grades based on the grade of enlargement and skin redundancy. Various classification systems have been described, but none are comprehensive.
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Ultrasound imaging is enough to identify gynecomastia’s components and rule out other causes. Hormonal evaluation is done as and when necessary. Surgical management is explored in patients who have had their concerns for more than 12 months, for cosmetic reasons, psychological distress, or if there is any pain or suspicion of cancer. In the surgical management of gynecomastia, all the hypertrophied tissues like glands, fat and skin must be adequately addressed. So, a combination of liposuction, subcutaneous mastectomy (SM), skin excision, nipple-areola transposition and free nipple graft are essential per via peri areolar or trans areolar incision based on the need. When the gynecomastia has glandular hypertrophy alone, SM is the criterion standard. Contour irregularity, hematoma or seroma formation, nipple-areolar numbness, doughnut deformity, nipple necrosis and nipple flattening are not uncommon after surgical treatment.

The tumescent technique is routinely employed for liposuction. The tumescent solution typically consists of lignocaine, adrenaline in ringer lactate or normal saline with or without bupivacaine. Lignocaine and bupivacaine provide analgesia, and adrenaline causes vasoconstriction and decreases bleeding. After thoroughly evaluating the advantages like prolonged analgesia, decreased bleeding, and better tissue delineation provided by tumescent solution for liposuction, we intended to employ this tumescent technique for SM without liposuction. We have evaluated the ease, safety and pitfalls of tumescent subcutaneous mastectomy (TSM).

Aims and objectives

- To describe our surgical technique (Four-plane TSM)
- To determine the operative ease of SM using the tumescent technique. i.e., TSM
- To assess the post-operative analgesia following the tumescent technique.
- To determine the complications of the tumescent technique.

Patients and methods

The study was conducted in the department of plastic surgery of a tertiary care hospital from 2018 August to 2021 July. Informed consent was obtained from all patients. The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional guidelines and with the Helsinki Declaration of 1975, as revised in 2008. All male patients with idiopathic gynecomastia with only glandular hypertrophy without skin excess confirmed by ultrasound examination in the 18-40 year age group requiring only excision, SM without liposuction were included in the study. Patients with co-morbidities like DM, HTN, CAD and patients on anticoagulants hypersensitive to components of the tumescent solution (Ringer Lactate + 2% Lignocaine+ 1:1000 Adrenaline + 0.5% Bupivacaine) were excluded from the study.

Operative procedure

All patients were operated on by one of the assistant professors in the department of plastic surgery. Pre-operative marking was done. Surgery was done under general anaesthesia. The tumescent solution was prepared during induction. Once the patient is under general anaesthesia, a peri-areolar incision is marked from 3’o clock to 9’o clock.

Injection of tumescent solution

- Composition: Ringer Lactate - 500ml + 2% Lignocaine (12.5ml) + 1:1000 Adrenaline (0.5ml) + 0.5% Bupivacaine (12.5ml).
- 200-250 ml of tumescent solution was used per side.
- Four-plane injection technique was followed:
  1. Sub glandular: Injected into the plane between glandular tissue and deep pectoral fascia. The gland was lifted with one hand to inject around 100 ml of tumescent in the deep plane by fanning technique using 22G spinal needle. (Figure 1).
  2. Glandular: Around 50 ml of tumescent solution was injected into the glandular tissue with a 16G needle. (Figure 2)
  3. Supraglandular: Injected into the plane between the gland and the skin. Around 75 ml was injected into this plane. (Figure 3)
  4. Subdermal: Subdermal infiltration at the site in the incision.

Tumescence is achieved after four plane infiltration (Figure 4).

20min was allowed for the infiltration to act. A peri areolar incision was made, leading to a subdermal bloodless plane due to subdermal infiltration; it is deepened to reach the glandular tissue. (Figure 5). The dissection is continued caudally in between the gland and subcutaneous fat, and this plane is relatively bloodless and clear owing to the supra glandular infiltration(Figure 6). Once the lower border of the gland is reached, the gland is lifted, and traction is given superiorly to dissect the gland of the pectoral fascia, which is facilitated by the sub-glandular infiltration. (Figure 7)

Then the gland is freed medially and laterally. The dissection is continued between the gland and the skin-NAC, maintaining adequate NAC thickness to reach the cephalic limit of the gland. (Figure 8). The gland is delivered out of the peri areolar incision. Perfect hemostasis is achieved, and the incision is closed with monocryl 5-0 in 2 layered without drain. Pre-tailored pressure garment was immediately applied.

The operating time was recorded, and the ease of surgery with respect to visualization, dissection and bleeding was documented using a preformed questionnaire. (Table 1)

Follow up:

Patients were observed for the duration of analgesia using the Wong-Baker faces pain rating scale (0 to 10) and post-operative complications distinctly for both sides. NAC was reviewed on post-op day 1; dressing changed at 48 hrs. Regular follow-up at 1 week, 1 month, 3 month and 6 month was routinely done. All the patients were advised to continue pressure garments for 3 months and observed for a minimum of 6 months.

The data were analyzed using IBM SPSS 28. Descriptive statistics with ordinal scale and frequency tables were used to tabulate the results.

Results

The study included 28 patients after considering all the inclusion and exclusion criteria. There were 25 patients with bilateral gynecomastia and 3 with unilateral gynecomastia among the 28 patients. In total, 53 excisions were performed using the tumescent approach.
Table 1 Questionnaire for assessment.

| Intra Operative                          | Very good | Good | Fair | Poor | Very poor |
|------------------------------------------|-----------|------|------|------|-----------|
| Visualization of tissue planes           |           |      |      |      |           |
| Ease of dissection                       | Very easy | Easy | Neutral | Hard | Very hard |
| Bleeding (Number of gauzes)              | 1         | 2    | 3    | 4    | 5         |
| Duration of surgery (Per side) in min    | <30       | 30-45| 45-60| 60-75| >75       |

Post-operative analgesia (In hrs.)

| Post-Operative complications            |            |      |      |      |            |
|-----------------------------------------|------------|------|------|------|------------|
| Tumescent toxicity                      | Yes        | No   |      |      |            |
| Hematoma/seroma                         | Yes        | No   |      |      |            |
| Nipple necrosis                         | Yes        | No   |      |      |            |
| Epidermal loss                          | Yes        | No   |      |      |            |
| Contour deformity                       | Yes        | No   |      |      |            |
| Nipple flattening                       | Yes        | No   |      |      |            |

The study included patients from the age of 19 to 36 years with a mean age of 26.6 years. 77.4% belonged to the age group 19 to 30 years.

Operative

After analysis, it was noted that more than 80% of the excisions had very good visualization of tissue planes. In the remaining excisions, it was reported to be good to fair (Figure 9). None of the operating surgeons reported poor or very poor visualization. The dissection in more than three-fourths of the excisions (79.2%) was very easy, and around 20% found it easy to neutral (Figure 10). When the tumescent technique was employed in SM, not more 5 gauze pieces were used, more than 85% of procedures were completed by using 2 or less gauze pieces. Procedure took 30-45 minutes in more than 70% cases, and all the procedures were completed within 75min time. (Table 2)

Post-Operative analgesia

Wong baker scores of more than 4 were taken to be the end point of post-operative analgesia provided by tumescent. Postoperative analgesia was achieved for 4-6 hours in more than 75% of TSM, 2-4 hours in 22.6% and 6-8hrs in only 1.9%. (Figure 11)

Post-operative complications

Hematoma/seroma was noted in 7.5% of excisions. All the collection was less than 15ml and was managed conservatively by ultrasound-guided needle aspiration. The epidermal loss was noted at 3.8% and was managed with regular dressings. Contour abnormality/asymmetry was noted in 1 patient and was mild, which did not require any intervention. Nipple flattening was noted in 2 patients and was observed without surgical intervention. (Table 3). None of the patients reported toxicity related to the tumescent solution. NAC necrosis was not noted in any patients.

Discussion

When it comes to the surgical management of gynecomastia, there have been numerous procedures described, but the ultimate goal of surgery has remained the same, which aims to eliminate the inframammary fold, flatten the thoracic region, achieve symmetric hemi-thoraxes, correct the position and symmetry of NAC with excision of redundant skin and scar containment.8 Despite the natural desire to favour minimally invasive treatments, refining the current techniques to achieve surgical ease and post-operative results plays a key role.
Table 2 Intraoperative assessment (Result)

| No. | Intra Operative assessment | Visualize of tissue planes | Very good | Good | Fair | Poor | Very poor |
|-----|---------------------------|-----------------------------|-----------|------|------|------|----------|
| 1   |                           | Number                      | 43        | 9    | 1    | 0    | 0        |
|     |                           | %                           | 81.1      | 17.0 | 1.9  | 0    | 0        |
| 2   | Ease of dissection        | Very easy                   | 42        | 9    | 2    | 0    | 0        |
|     |                           | %                           | 79.2      | 17.0 | 3.8  | 0    | 0        |
| 3   | Bleeding (Number of gauzes) | 1                           | 14        | 33   | 2    | 3    | 1        |
|     |                           | %                           | 26.4      | 62.3 | 3.8  | 5.7  | 1.9      |
| 4   | Duration of surgery (Per side) in min | <30 | 5 | 38   | 7    | 3    | 0        |
|     |                           | %                           | 9.4       | 71.7 | 13.2 | 5.7  | 0        |

Table 3 Postoperative complications

| Complications              | Frequency | Percent |
|----------------------------|-----------|---------|
| Hematoma/Seroma            | 4         | 7.5     |
| NAC Epidermal loss         | 2         | 3.8     |
| Contour abnormality/ Asymmetry | 1       | 1.9     |
| Nipple flattening          | 2         | 3.8     |

Hydro dissection is a technique that uses sterile fluid to dissect the target tissue from the surrounding tissue, allowing for a more precise demarcation of tissue planes. Breast lesions have been successfully biopsied using this approach. When performing TSM, the same hydro dissection technique has been employed with ringer lactate to improve visibility and demarcation of tissue planes, making the dissection easier. Vasoconstrictive effects of Adrenaline in the infiltration solution have been effectively used in burn surgery and cleft lip and palate surgery to reduce bleeding and bruising. Similarly, adrenaline was used to reduce bleeding in SM as well. In most cases, the tumescent method provided postoperative analgesia for 4 to 6 hours. When combined with adrenaline, lignocaine has a 2min onset of action and a duration of 2-6 hours, but bupivacaine has a 5min onset and a duration of 3-7 hours.

Various liposuction and excision techniques have side effects that range from 0% to 20%, which is about the same as the side effects documented in our study (17%). However, all the side effects in our study were mild, none...
required re-exploration, and all were managed conservatively.
Seroma and hematoma are the most prevalent complications of
gynecomastia surgery\textsuperscript{10}. Because of the vasoconstriction effect of
adrenaline\textsuperscript{18}, TSM minimizes the risk of seroma and hematoma,
and the addition of an immediate compression garment is also
beneficial. Only four patients had seroma/hematomas and
were treated conservatively with ultrasound-guided aspiration,
with no need for re-exploration. Lignocaine is safe at a dose of
7mg/kg when combined with adrenaline, while bupivacaine
is safe at 3mg/kg or 400mg in 24 hours when mixed with
adrenaline\textsuperscript{15,19}. No patient in our trial reported experiencing
any toxicity from lignocaine.
Alternatively, bupivacaine indicates that both lignocaine and
bupivacaine can be administered safely in a tumescent solution.

**Conclusion**

SM is a time-honoured technique. The refinement of this pro-
cess in our study by including a tumescent technique has the
intraoperative benefit of improved vision of tissue planes, which
results in easier dissection and a shorter surgical time. Addition-
ally, there is less bleeding, which reduces the occurrence of
hematoma and seroma postoperatively. Because the dosage
of the components of tumescent solution is significantly less
than the toxic level, no signs or symptoms of tumescent toxicity
were seen. While a few minor adverse events were reported,
none were directly related to the tumescent utilized and were
self-limiting and non-surgically handled. TSM is simple, safe,
and provides great post-operative analgesia. Because of the
tissue deformation caused by tumescent infiltration, contour
irregularities and asymmetry must be carefully predicted.
More research is needed to establish the effectiveness of
hyaluronidase as a spreading agent in the tumescent fluid. Fur-
thermore, in compliant patients, a tumescent solution contain-
ing lignocaine and bupivacaine can be used without the need
for general anaesthesia. The addition of sodium bicarbonate
reduces discomfort during the injection of non-ionized lipid-
soluble form, which hastens the onset of action.
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Conflict of interest
There are no conflicts of interest to declare by any of the authors of this study.

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