

Improving post-operative analgesia in mastectomy patients by instillation of local anaesthetic into the surgical drain

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Abstract:

Objective: Mastectomy is a surgical procedure which compounds psychological suffering with post-operative pain. Local anaesthetic instillation through a surgical drain is a widely utilised intervention which may improve post-operative analgesia

Material and Methods: Retrospective service evaluation involving a cohort of patients over a four-year time frame comparing two sub-cohorts, one in which the surgeon had adopted the service improvement and with one surgeon who had not. Anaesthesia was standard with intravenous induction with alfentanil, propofol, laryngeal mask insertion followed by maintenance with sevoflurane. In the sub-cohort of patients in which local anaesthetic (40 ml of 2.5 mg/ml levobupivacaine) was instilled into mastectomy wound drain post-procedure, the drain clamp was released after 30 minutes. Comparison was made with the sub-cohort who did not have instillation of local anaesthetic.

Results: A total of 89 women, were evaluated in 2 groups, group-A (62) treated with infiltration of bupivacaine through surgical drains, and group-B (27) had local infiltration of bupivacaine along the surgical incision. Post-operative morphine consumption was 15%(9) less in group-A then in local infiltration group-B that was 67%(18) which was statistically significant. Also in the group-A. The median post-operative pain scores at rest as well as on movement were higher in local infiltration group than in group-B. Oral paracetamol as first analgesia was 85%(53) before discharge from hospital in group-A compared with group-B 33%(9) which was statistically significant

Conclusions: Local anaesthetic instillation through a surgical drain after mastectomy is an established low risk intervention which may provide improved post-operative analgesia and decrease the oral analgesic requirements. We believe this technique has considerable promise and requires rigorous evaluation incorporating careful matching of patient groups to avoid selection bias and standardisation of instillation technique as well as assessment of agreed endpoints and complications.

Keywords: Post-operative analgesia, Mastectomy wound drain, local anaesthetic instillation.

Introduction:

Breast cancer is the most frequent cancer among women, impacting 2.1 million women each year, and also causes the greatest number of cancer-related deaths among women. In 2018, it is estimated that 627,000 women died from breast cancer that is approximately 15% of all cancer deaths among women. While breast cancer rates are higher among women in more developed re-

gions, rates are increasing in nearly every region globally.¹

Just over 80% of people diagnosed with breast cancer in the UK have surgery, under half (43%) of women who have surgery for breast cancer have a mastectomy and just over half (57%) have breast-conserving surgery.²

Mastectomy is a surgical procedure which compounds psychological distress, depression, anxiety, loss of emotional well-being, loss of self-esteem, sense of mutilation, altered body image and suffering with post-operative pain.

Tissue damage resulting from surgery causes, in the first phase, a nociceptive stimulation reaching the Central nervous system (CNS), and, in the second phase, a transient inflammatory reaction.^{3,5} Pre-emptive analgesia is one of the methods of pain management used in the peri-operative period. The pre-emptive strategy originated in early 1980s.⁶ Application of analgesic agents in the area of the surgical incision reduces the number of signals generated by pain receptors (nociceptors), preventing central hypersensitivity of the CNS and consequently reduces the incidence of disproportionate pain sensation in the peri-operative period.

Reducing post-operative pain following breast cancer surgery to achieve a more rapid recovery and shorten the hospital stay has become a crucial objective.

Modified radical mastectomy (MRM) involves extensive tissue dissection. Infiltration of local anaesthetic along the line of incision is not recommended in malignant lesions, because of the fear of needle track seedlings and cutaneous spread of malignancy.⁷ Moreover, the tissue dissection extends beyond the surgical incision hence Infiltration along the line of surgical incision may not provide adequate analgesia.

We tested the hypothesis that pre-emptive analgesia with bupivacaine instilling through wound drain in patients undergoing mastectomy for carcinoma of the breast would reduce post-operative acute pain and would reduce the amount of analgesics used the post-operative period. The primary objective of the study was the efficacy of the wound instillation through wound drains, which was assessed by duration of analgesia, number of analgesic demands and cumulative analgesic requirement for pain relief.

Material and Methods:

Retrospective service evaluation involving a cohort of patients over a four-year time frame comparing two sub-cohorts, one in which the surgeon had adopted the service improvement and with one surgeon who had not. Anaesthesia was standard with intravenous induction with alfentanil, propofol, laryngeal mask insertion followed by maintenance with sevoflurane.

In the cohort (group-A) of patients in which local anaesthetic (40 ml of 2.5 mg/ml levobupivacaine) was instilled into mastectomy wound drain post-procedure, the drain clamp was released after 30 minutes. Comparison was made with the sub cohort (group-B) who infiltrated local anaesthetic along the line of incision.

This study was conducted on 89 cases aged 32-81 years. Patients with a history of clinically significant cardiovascular, pulmonary, hepatic, renal, neurologic, and psychiatric or metabolic disease were excluded from the study. Patients with a history of chronic analgesic drug usage were also excluded from the study. Patient's with history of allergies to NSAID or local anaesthetic agents were also excluded from the study.

A standard general anaesthesia was induced with propofol 2 mg/kg and the opioid used was fentanyl at 2 µg/kg. Trachea was intubated with appropriate sized endotracheal tube, which was facilitated with atracurium besylate 0.1 mg/kg. Oxygen in nitrous oxide mixture in a ratio of 30:70, and end tidal concentrations of sevoflurane of 1-2%. were maintained throughout the operative period. At the end of the surgical procedure, two drains were replaced in mastectomy and axillary clearance, one in the axilla near the axillary vessels and the second in the chest wall below the skin flap, while one drain used in mastectomy or mastectomy with sentinel node biopsy.

Group-A patients received 40 ml of 0.25% bupivacaine, 20ml through each of the drain. After instillation the drains were clamped for 30 min. Group-B patients received local infiltration of

Table-1: Patient Characteristics

	Group A (bupivacaine) (62)	Group B (local infiltration) (27)
Age (years)	61.7 (32–81)	59.2 (34–80)
Body weight (kg)	72 (50–105)	70 (50–110)
BMI (kg/m ²)	29.0 (19–41)	28.7 (18.7–39)
ASA		
I	12	6
II	36	16
III	14	5
Duration of Anaesthesia (min)	80 (50–170)	103.5 (65–210)
Duration of Operation (min)	69 (32–168)	80 (45–181)
Hospital Stay (Day)	1.0 (1–5)	2.0 (1–6)

BMI- body mass index in Kilogram/meter²; ASA- anaesthesia risk according to American Society of Anaesthesiology

Table-2:

Intraoperative analgesia	No LA	LA
Average IV morphine (mg)	8.1	9.3
IV paracetamol (%)	100	100
IV parecoxib (%)	43	43

IV- intravenous; mg- milligram; LA- local anaesthesia; ml- millilitres.

Table-3:

Post-operative outcome	Group A	Group B
% pain-free in recovery	71 (44)	33 (9)
Mean pain score in recovery	0.37	1.3
% receiving IV morphine in recovery	15% (9)	67% (18)
Average time to 1st analgesia (hrs)	10.2	1.1
% oral paracetamol as 1st analgesic	85 (53)	33 (9)

bupivacaine along the surgical incision.

Patients were transferred to the recovery room for further monitoring. Intra-operative pain score at “0” hour was noted after extubation and subsequently every four hourly by a trained post-operative nurse, who was blinded to the study group. Pain scores both static visual analog scale (VAS) and dynamic (DVAS) were assessed using a 10-point VAS (0 - no pain and 10 - worst imaginable pain) VAS was noted as pain at rbest and DVAS was noted as pain on moving the ipsilateral arm. If the VAS exceeded ‘4’ at any point of time, rescue analgesia was administered and recorded. The duration of analgesia was defined from the time of instillation of local anaesthetic agent to the time for the first analgesia given.

The number of demands and the total cumulative analgesic requirement were also noted for 24 h. Surgical site related untoward effects like haematoma, infection and wound dehiscence were observed clinically till the patient was discharged home. Adverse effects like nausea and vomiting were not noted as all patients received prophylactic antiemetic ondansetron. Statistical analysis was performed using SPSS version 13.

Results:

A total of 89 women, were evaluated in 2 groups, Group-A (62) treated with infiltration of bupivacaine through surgical drains, and group-B (27) had local infiltration of bupivacaine along the surgical incision. After surgery 2 patients were excluded from group-A, one because of advance disease in axilla and other had fell in ward and injured her arm. Two groups were comparable with demographic data table-1. The mean intravenous morphine given to group-A was 9.3mg and group-B received 8.1mg, all patients received intravenous paracetamol peri-operatively table-2.

Post-operative morphine consumption was 15%(9) less in group-A then in local infiltration group-B that was 67%(18) which was statistically significant. Also in the group-A. The median post-operative pain scores at rest as well as on movement were higher in local infiltration group than in group-B. Oral paracetamol as first analgesia was 85% (53) before discharge from hospital in group-A compared with group-B 33%(9) which was statistically significant table-3.

Discussion:

Post-operative pain and discomfort is inevitably associated with any surgical procedure specially in MRM involves extensive tissue dissection. Traditionally, post-operative pain managed by taking narcotics or nonsteroidal anti-inflammatory drugs (NSAID) however, these drugs cause side effects such as nausea, vomiting, gastritis etc.⁸ Surgical wound infiltration with a local anesthetic solution is routinely performed in many surgical procedures. Bupivacaine is an

ideal choice for local analgesia in breast cancer surgery, ropivacaine is also a long-acting local anesthetic that is structurally related to bupivacaine. Recent data show that ropivacaine produces fewer CNS and cardiovascular side effects compared with bupivacaine.⁹ Several published randomized controlled trials (RCTs) have investigated the efficacy of intraoperative instillation of bupivacaine or ropivacaine along the surgical wound of mastectomy; however, the results were inconclusive.¹⁰

Different techniques like thoracic epidural, paravertebral block, pectoral block (between Pectoralis major and minor to block medial (C8-T1) and lateral pectoral nerve (C5-7) have been tried for post-operative analgesia following mastectomy.^{11,12} However, these techniques are technically challenging and associated with its own complications. Infiltration of local anaesthetic along the suture line also provides analgesia but, for malignant lesions (specially involving skin or cutaneous lymphatic channels) this method may not be recommended because of fear of needle track seedlings and cutaneous spread of malignancy.⁷ Sidiropoulou and his colleagues¹³ in their study compared analgesic effect of single injection of thoracic paravertebral block (PVB) with ropivacaine and continuous irrigation of wound with ropivacaine through two dedicated multi-lumen catheters placed subcutaneously at the end of the procedure following mastectomy for 24 h. They found that early post-operative analgesia first 4 hour was good with PVB and late post-operative analgesia was good with continuous irrigation and concluded that continuous wound irrigation is as effective as PVB with low pain scores and good patient satisfaction.

Legeby et al¹⁴ following breast reconstruction surgery, levobupivacaine injected locally every three hourly as a supplement to paracetamol orally, and morphine given by PCA resulted in improved pain relief at rest and during mobilization compared with placebo.

Talbot et al¹⁵ in their study to determine the effect of local anaesthetic irrigation of axillary

drains on post-operative pain following a modified mastectomy felt it did not appear to offer any contribution for post-operative analgesia in some of their patients. They opined that this could be because of malpositioned drain, blockade of some holes of the drain or unequal distribution of the local anaesthetic due to gravity and concluded that further refinement in the technique was needed. We have instilled through both the chest wall and axillary drains placed to overcome this limitation. This could have resulted in more uniform distribution of the drug improving the efficacy of the technique, and the patients were pain free in the postoperative period.

The technique of drug instillation through the drains is technically simple, and operation theatre time is also not a constraint because it takes very little time to install the drug through the drains. The technique of instillation of the drug through drains is well established in surgical procedures like laparoscopic cholecystectomy,¹⁶ abdominal hysterectomy^{17,18} where the results have shown some positive impact on post-operative analgesia. Moreover, this is well accepted by the patient and the surgeons.

Conclusion:

Local anaesthetic instillation through a surgical drain after mastectomy is an established low risk intervention which may provide improved post-operative analgesia and decrease the oral analgesic requirements. We believe this technique has considerable promise and requires rigorous evaluation incorporating careful matching of patient groups to avoid selection bias and standardisation of instillation technique as well as assessment of agreed endpoints and complications

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Role and contribution of authors:

Dr Syed Mansoor Yousuf, conceived, designed and did statistical analysis & editing of manu-

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Dr Rabia Arshad, literature search, review and editing

Dr Julie Cox, did review and final approval of manuscript

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