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ARTICLE

Intraoperative local instillation anesthesia using injection technique from J-VAC™ drain for postoperative pain relief in male-type chest wall contouring surgery

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ABSTRACT

For postoperative acute pain during mastectomy, a few studies have reported the usefulness of an intraoperative local anesthesia instillation technique in which analgesics are injected through a drain placed under the skin, intraoperatively. This study presented a novel administration method, and the efficacy of local instillation anesthesia in male-type chest wall contouring surgery was assessed. Fifty-four patients underwent chest wall contouring surgery under general anesthesia. The 27 patients in each of the study and control groups, with our instillation technique and without the technique were compared, in terms of the maximum numerical rating scale (NRS) score within 24 h after surgery, the postoperative analgesic use frequency, and dosage until 6 d. The analgesic used was a mixture of 5 ml 1% lidocaine hydrochloride, epinephrine (0.05 mg), 10 ml 0.75% bupivacaine, and 10 ml saline. Thereon, 25 ml analgesia was administered from the left and right drain (15-Fr J-VACTM) and infiltrated for 15 min. Both NRS scores of postanesthesia care unit (PACU) discharge and the maximum NRS score within 24 h after PACU discharge were significantly lower in the study group than in the control group ($p < 0.001$, $p = 0.048$). The frequency of analgesics administered within 24 h after surgery was significantly lower in the study group than in the control group ($p = 0.025$). Our anesthesia instillation method for chest wall contouring surgery was effective in relieving acute pain occurring within 24 h after surgery and can be a useful analgesic administration method.

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Introduction

Chest wall contouring is a surgical procedure to relieve psychosomatic symptoms and improve the male patients' quality of life (QOL) [1]. It is important to manage and reduce postoperative pain and complications, as it can cause anxiety and fear, leading to excessive consumption of analgesics [1,2]. Recent studies have reported the effectiveness of intraoperative local infiltration anesthesia (LIA), local instillation anesthesia, epidural anesthesia, and intercostal nerve block anesthesia for postoperative acute pain relief after breast cancer resection and implant insertion [3–6]. LIA and local instillation anesthesia are cost-effective and easier to perform than epidural anesthesia or intercostal nerve block anesthesia [3–6]. However, there are limited studies on the administration technique, and its efficacy in chest wall contouring surgery is limited.

We conducted a retrospective cohort study to evaluate the efficacy of this intraoperative local instillation anesthesia for analgesia following chest wall contouring surgery.

Patients and methods

We started performing local instillation anesthesia for postoperative pain in chest wall contouring surgery in October 2018, and this retrospective cohort study included 54 consecutive patients who underwent chest wall contouring surgery. We compared 27 patients in the control group between January and September 2018 and 27 patients in the study group between October 2018 and March 2019. This study was approved by the Clinical Ethics Committee of Okayama University Hospital (Study No. 1808-030). All 54 patients underwent chest wall contouring surgery under general anesthesia and were hospitalized for 6 d after surgery. In all cases, for both the right and left sides, the same plastic surgeon performed mastectomy from the lower-half circumferential incision on the areola, followed by nipple and areola reduction [2]. In all 27 cases in the control group, the J-VAC™ drainage system (Ethicon, Somerville, Ni, 15 Fr. BLAKE™ Silicon Drain) was inserted subcutaneously on each side and connected to the J-VAC™ suction reservoir. Similarly, in the 27 cases in the study group, the J-VAC™ drainage system was inserted subcutaneously on each side, and the anesthetic was infused from the inserted silicon drain, as shown in Figure 1. A mixture of 5 ml of 1% lidocaine hydrochloride, epinephrine (0.05 mg), 10 ml of 0.75% bupivacaine, and 10 ml of saline was used as the analgesic agent. A total of 50 ml analgesia was administered to one patient, 25 ml each from the left and right drain. After instillation for 15 min, the inserted silicon drain was connected to the J-VAC™ suction reservoir, and excess anesthetic was drained (Figure 2). The numerical rating scale (NRS) was used to evaluate postoperative pain, and the NRS score for postanesthesia care unit (PACU) discharge and maximum pain score from PACU discharge to 24 h postoperatively were evaluated. Analgesics were administered in response to complaints of pain, regardless of the degree of pain. In the first 24 h after surgery, postoperative analgesics were administered intravenously or orally. Two analgesics, flurbiprofen axetil (every

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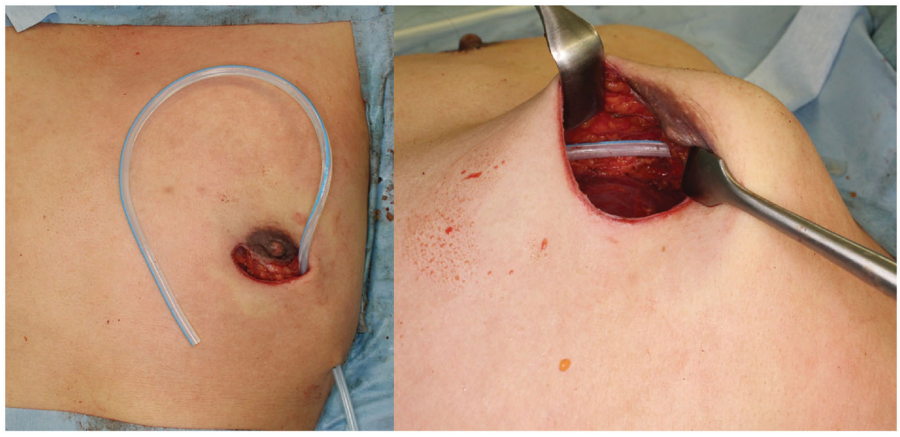

Figure 1. The J-VAC™ Drainage System (Ethicon, Somerville, Ni, 15 Fr. BLAKE™ Silicon Drain) was inserted subcutaneously on each side above the pectoralis major muscle.

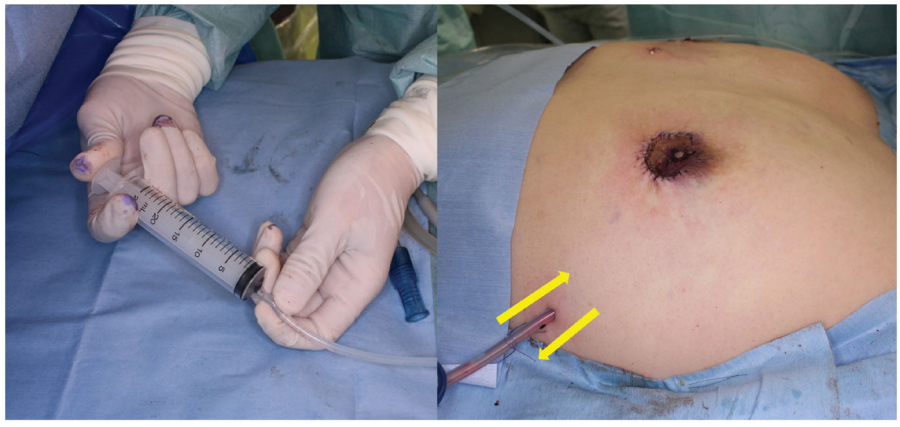

Figure 2. The anesthetic was infused from the inserted silicon drain as shown. Total 50 ml of local anesthesia infiltrated the entire bilateral chest wall. After instillation for 15 min, the inserted silicon drain was connected to the J-VAC™ suction reservoir and all excess anesthetic was drained.

8 h, up to 180 mg/d) or acetaminophen (every 8 h, up to 3000 mg/d), were administered. From 24 h to 6 d postoperatively, only oral analgesics (without intravenous administration) were administered, and flurbiprofen axetil (three times a day, maximum 180 mg/d) or acetaminophen (three times a day, maximum 1200 mg/d) was administered, and concomitant use was permitted.

Statistical analysis

We considered a difference in NRS score of 2 between the treated and the control group as clinically relevant and specified such an effect to be detected with 80% power (0.80), a significance level alpha of 0.05, and calculated that the sample size in each treatment group was 27 cases. The total doses of analgesics used from 24 h to 6 d postoperatively, were compared using logistic regression analysis. In addition, for each factor showing significant differences between groups, the Mann-Whitney U test was used to confirm the significance of the observed differences. Statistical analyses were performed using Bell Curve for Excel version 2.0 (Social Survey Research Information, Tokyo).

Results

In both groups, there were no significant differences in age, body mass index, operation time (min), intraoperative blood loss (g), and mastectomy volume (g). None of the patients developed complications requiring reoperation during hospitalization, and this cohort study was examined in 54 consecutive cases. All 54 patients were hospitalized for 6 d after surgery. Both the NRS score when leaving the PACU and the maximum NRS score within 24 h after PACU discharge were significantly lower in the study group than in the control group. The frequency of analgesics administered within 24 h after surgery was significantly lower in the study group than in the control group (Table 1; Figure 3). Multivariate analysis of analgesic dose within 24 h after surgery showed a significant difference in the dose administered between the groups, and a decrease in the dose of flurbiprofen axetil in the study group compared to that in the control group. There was no significant difference between the groups in terms of the oral analgesic dose administered from 24 h to 6 d after surgery (Table 2).

Discussion

Chest wall contouring surgery for transmen patients includes mastectomy and nipple-areola reduction, and the purpose of surgery is QOL improvement and relaxation of gender dysphoria. Although postoperative complications have been reported, there are no established methods for optimal acute postoperative pain relief [1,2]. Systemic opioids are effective for postoperative analgesia during chest wall contouring surgery. However, the use of opioids is associated with addiction, nausea, and vomiting especially with an increase in dose [7]. Intraoperative local anesthesia

Table 1. Patient demographics in the transmen group.

Characteristics	Study group ($n = 27$)	Control group ($n = 27$)	Hedges' g [95% CI]	p-value
Age, mean (SD), years	28.0 (6.8)	26.6 (4.0)		0.99
BMI, mean (SD), kg/m^2	23.1 (3.6)	25.3 (3.6)		0.19
Operation time, mean (SD), min	124 (120)	127 (126)		0.49
Intraoperative blood loss, mean (SD), g	39 (30)	29 (20)		0.65
Mastectomy volume, mean (SD), g	184 (95)	199 (107)		0.56
NRS score of when leaving PACU, mean (SD)	2.3 (2.2)	4.2 (1.8)	0.95 [0.82, 3.02]	<0.001*
Maximum NRS score within 24 h after PACU discharge, mean (SD)	3.6 (2.1)	4.6 (1.7)	0.54 [0.0064, 2.06]	0.048*
The frequency of analgesic administrations, mean (SD)	1.6 (0.86)	2.1 (1.0)	0.63 [0.078, 1.15]	0.025*

SD: standard deviation; CI: confidence interval.
Number of analgesic administrations: Number of analgesic administrations within 24 h after surgery.
*$p < 0.05$.

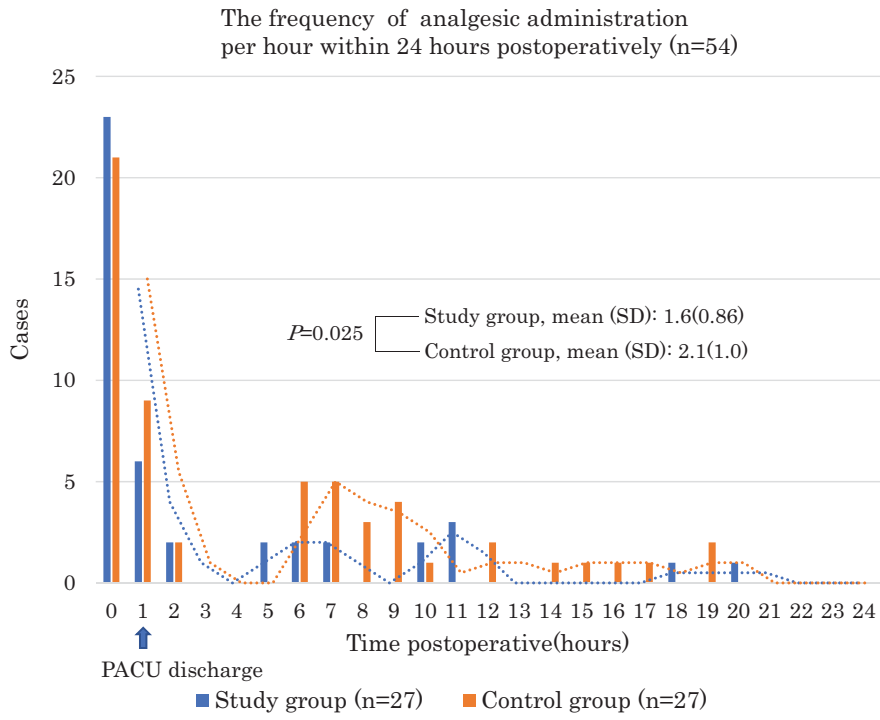

Figure 3. The frequency of analgesics administered within 24 h after surgery was significantly lower in the study group than in the control group ($p = 0.025$).

Table 2. The odds ratio of analgesic dose.

Postoperative elapsed time	The type of analgesic	Odd ratios	95% CI	p Value
Within 24 h	Acetaminophen	0.9997	0.9987–1.0006	0.51
Postoperatively	Flurbiprofen axetil	0.9836	0.9684–0.9991	0.037*
From 24 h to 6th postoperative day	Acetaminophen	1.0001	0.9974–1.0029	0.71
	Flurbiprofen axetil	1.0001	0.9996–1.0007	0.92

*$p < 0.05$.
Acetaminophen: used every 8 h, maximum 3000 mg/d).
Flurbiprofen axetil: Flurbiprofen axetil (used every 8 h, maximum 180 mg/d).

reduces the opioid doses required [3,4]. Continuous epidural anesthesia, continuous or single intercostal nerve block anesthesia, and LIA have been used for intraoperative local anesthesia [3–7]. As epidural anesthesia is cumbersome and intercostal nerve block requires injection of anesthetics into multiple intercostal nerves, depending on the skill of the technique, the analgesic effect varies [6]. Intraoperative LIA and local instillation anesthesia are cost-effective and easier to perform than epidural anesthesia or intercostal nerve block anesthesia [3–6].

In our study, the concentration of bupivacaine was adjusted to 0.3% bupivacaine and 1:500,000 epinephrine, in a bilateral total volume of 50 ml. Regarding bupivacaine dosage in the instillation anesthesia method, under the pectoralis major muscle implant insertion site, the efficacy of a single administration of 10 ml of bupivacaine (0.125% to 0.25%) for unilateral thorax has been reported [3]. In LIA cases, an analgesic effect has been reported with the use of a bupivacaine concentration of 0.125%–0.25% [5,8,9]. Regarding epinephrine dosage with bupivacaine in LIA, studies reported that when 1:200,000–1:3,000,000 epinephrine was added to bupivacaine and lidocaine, the duration of action of analgesics gets prolonged [8,9]. The lidocaine concentration used in this study was 0.2%. It has been reported that 0.5%–1% lidocaine is effective when used in combination with bupivacaine. However, in another report, the concentration of bupivacaine, and not the concentration of lidocaine, affected the duration of action [8,9]. Therefore, we consider that the concentration of lidocaine is not more important than bupivacaine and epinephrine concentration. In this study, 0.2% lidocaine provided sufficient analgesia.

The anesthetic infiltration time was decided for 15 min. The effective infiltration time of the analgesic administration method from a drain after mastectomy was reported to be approximately 10 min [6]. In a report on an ultrasound-guided regional anesthetic technique for thoracic wall nerve block, it took 30 min after the levobupivacaine 0.125% injection to demonstrate dermatomal paresthesia from T2 to T9 and numbness [10]. Therefore, the instillation time for anesthesia using bupivacaine was set to 15 min, considering an effective instillation time between 10 and 30 min.

The NRS score (mean [SD]) within 24 h after PACU discharge was 2.3 (2.2) in the study group. In two cohort studies, acute postoperative pain within 24 h after surgery with concomitant analgesics has been reported, the average maximum NRS score within 24 h after surgery was 3.26 and 2.98 for minor surgery in the studies [11,12]. These cohort studies, as well as our comparison study ($p < 0.05$) between the study group and the control group indicate the efficacy of our local instillation technique.

There was a significant difference between the study and control groups in the frequency and dose of postoperative analgesics administration within 24 h after leaving PACU. Since it is necessary to consider the analgesic effect of acetaminophen and Flurbiprofen-axetil administration, the frequency and dose of these analgesic administrations were compared between the two groups. As a result, a significant difference was found between the two groups, so it was concluded that the efficacy of intraoperative local anesthetic was obtained (Table 1; Figure 3). On the other hand, there was no significant difference in the postoperative analgesic dose between the study and control groups from 24 h to 6 d postoperatively. Regarding the analgesic effect within 24 h after surgery, compared with continuous epidural anesthesia or continuous intercostal nerve block, local instillation anesthesia has the disadvantage that analgesia from 24 h after surgery cannot be expected. However, postoperative pain improves rapidly from 24 h after surgery, and we believe that pain can be controlled by administering analgesics, especially in male-type chest wall contouring surgery [5].

The study was retrospective rather than a prospective randomized controlled trial, which is a key limitation of this study. Factors such as postoperative examination by a psychiatrist, postoperative nursing care, and patient motivation, which may have influenced the variation in pain scores, were not included. Furthermore, QOL assessments of patients should also be considered.

Conclusion

Intraoperative local instillation anesthesia from the drain for chest wall contouring surgery is effective in relieving acute pain occurring within 24 h after surgery. The procedure of this local instillation anesthesia is simple and can prove to be one of the more useful methods in male-type chest wall contouring surgery.

Disclosure statement

The authors declare no conflict of interest. The authors alone are responsible for the content and writing of this paper.

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