Intercostal Nerves Block for Mastectomy in Two Patients with Advanced Breast Malignancy

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Regional anesthesia is recognized as an alternative to general anesthesia for modern breast cancer surgery. Various techniques of block have been described. Each has its unique problems. Regional anesthesia was chosen for simple mastectomy in two patients with advanced breast malignancy, due to compromised pulmonary status resulting from widespread malignant infiltration of both lungs. We used intercostal nerves block. The block was supplemented with an infraclavicular infiltration to interrupt the branches of the superficial cervical plexus that provide sensation to the upper chest wall and subcutaneous infiltration in the midline to block the nerve supply from the contralateral side. Anesthesia was generally effective and the operations were uneventful. Both patients and surgeons expressed satisfaction.

We conclude that where patients have significant comorbidities that make general anesthesia undesirable, the use of intercostal nerves block remains a safe and reliable anesthetic option that allows the patient access to surgery for simple mastectomy.

Key words: intercostal block ■ mastectomy ■ breast cancer ■ lung cancer ■ anesthesia

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INTRODUCTION

The era of regional anaesthesia dates back to 1884 when Koller discovered the anesthesia properties of cocaine.[1] Since then, the scope of regional anesthesia has continued to widen and clinicians have succeeded in gaining access to almost every nerve in the body. Consequently, patients who for one reason or another are considered unsuitable for general anesthesia may now have their operations done under regional anesthesia. Such was the situation with the two patients discussed in this report. Since the breasts are ectodermal organs, which arose as a modification of the sweat glands,[2] they are more or less superficial structures, which can be isolated and selectively blocked for surgical excision. Combining intercostal nerves block with infraclavicular and midline subcutaneous infiltration with local anesthetic provided effective and reliable anesthesia for simple mastectomy in the two patients.

CASE 1

A 55-year-old postmenopausal woman presented with a four-month history of recurrence of a previously excised mass in the left breast. The mass had increased rapidly in size within two months prior to presentation. There was associated pain and left axillary swelling. She denied any history of nipple discharge, weight loss or cough. The mass was first noticed 16 months earlier, for which she had two previous excisions under local infiltration anesthesia in two different lower-level hospitals. The excised tissues were not subjected to histological examination. Physical examination revealed a middle-aged obese woman (weight 90 kg) in no apparent distress. Her pulse was 86 beats/min^{-1}, regular, full volume and blood pressure was 130/80 mmHg. She had a radial scar over an approximately 6-cm-x-3-cm tumor mass on the upper inner quadrant of the left breast. The tumor was nontender but fixed to the chest wall over the fourth-through-sixth ribs and adjacent part of the sternum. There were few discrete mobile ipsilateral axillary lymph nodes enlargement. The chest was

clear and there was no palpable hepatomegaly. Hematological and serum biochemistry results were essentially normal. Fine-needle aspiration cytology (FNAC) of the tumor mass and axillary nodes was positive for malignant cells. Radiological examination of the chest showed cannon-ball metastasis in both lung fields (Figure 1). Abdominal ultrasound scan was normal. A diagnosis of stage-IV carcinoma of the left breast with pulmonary metastasis was made. She was commenced on intravenous cyclophosphamide, methotrexate and 5-fluorouracil and oral tamoxifen. By the time she presented two weeks later, she had developed persistent unproductive cough, fever, dyspnea, tachypnea (respiratory rate 24 cycles/min^{-1}) and tachycardia (pulse 102 beats/min^{-1}). A repeat chest radiograph showed minimal pleural effusion on the right and fluid in the horizontal fissure of the right lung, in addition to the numerous malignant infiltrates in both lung fields (Figure 2). Hemograms showed PCV of 28% and WBC 11,800 mm^3. Following a course of antibiotics and therapeutic thoracocentesis instituted by the cardiothoracic surgical team, the patient's condition improved and the hemograms normalized (PCV 32%, WBC 6,200 mm^3). There was, however, a progression of the tumor mass, as demonstrated by an increase in size to about 8 cm x 4 cm and worsening pain.

After due consultation with the patient, a decision was taken to do palliative surgery (simple mastectomy) to prevent fungation of the mass and promote hygiene.

The decision to employ regional anesthesia for the surgery was jointly taken by the anesthetic and surgical teams because of the widespread malignant infiltration of both lungs. This was discussed with the patient. She consented to this anesthetic option with intraoperative sedation and conversion to general anesthesia if necessary.

Anesthetic Management

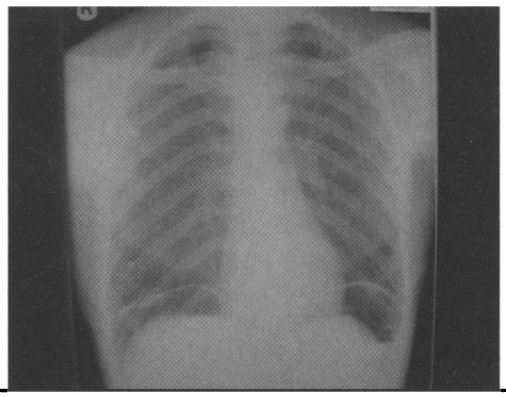
The patient was sedated overnight with oral diazepam 10 mg and premedicated with another 10 mg diazepam orally just before being transferred to the theater on the morning of operation.

In the preoperative holding area, the patient was connected to a Nellcor Puritan Bernnet multiparameter patient monitor and the baseline vital signs were recorded. The noninvasive blood pressure was 120/80 mmHg, pulse 90 beats/min^{-1} and peripheral arterial oxygen saturation 97% on room air. A peripheral intravenous access was established and the patient was sedated with intravenous diazepam 2.5 mg and pethidine 50 mg. This was followed by intercostal nerves block on the left side at thoracic levels 2–7, with 4 ml 0.375% bupivacaine with 1:200,000 epinephrine per nerve, using a size-22 gauge quincke spinal needle and the technique described by Brown.[3] The mid-axillary approach was used in the lower three thoracic levels (T5–T7), while the posterior approach was used for the remaining three upper levels (T2–T4) because of the technical difficulties encountered with the former approach due to the size of the patient. The block was supplemented with an infraclavicular infiltration of 5 ml of the same local anesthetic to interrupt the branches of the superficial cervical plexus that provide sensation to the upper part of the breast, and subcutaneous infiltration of another 5 ml in the midline in an "upside down" L-pattern to block those intercostal nerve fibers that cross the midline from the contralateral side.

After demonstration of adequate blockade by loss of sensation to pinprick about 15 minutes following placement of the block, the patient was transferred to the operating room. During the surgery, the patient was sedated with intermittent intravenous diazepam and pethidine as required. The doses of these drugs were titrated to ensure a minimally depressed patient who was able to maintain airway independently and responded to verbal command. The anesthetist maintained communication with the patient throughout the surgery. The pulse rate and oxygen saturation monitored continuously, and the noninvasive blood pressure monitored every five minutes using the Nellcor Puritan Bernett multiparameter monitor all remained two hours and were uneventful. Anesthesia was generally effective.

The patient was observed in the recovery room for about one hour before being transferred to the ward. She tolerated oral intake within four hours after the operation. The first dose of postoperative analgesic was given on request about five hours after the surgery. She had an uneventful postoperative course and was discharged home to continue on cytotoxic drugs and tamoxifen, while awaiting radiotherapy.

Figure 1. Chest x-ray of case 1 showing metastasis in both lung fields



CASE 2

A 60-year-old postmenopausal woman presented with 10 months history of painless left breast mass that increased rapidly in size three months prior to presentation. There was an associated productive cough, which subsided with cough mixture. Patient was a known hypertensive on nifedipine, moduretic and atenolol. There was no history of previous surgery. Family and social history was not contributory. Physical examination revealed a middle-aged woman who weighed 63 kg. Her pulse was 96 beats/min^{-1}, full, regular and blood pressure was 140/90. Respiratory rate was 22 cycles/min^{-1}. The chest was clinically clear with good air entry bilaterally. She had an enlarged firm left breast with inverted nipple and peau d'orange skin change. There was associated ipsilateral non-tender, matted axillary lymph nodes and a few discrete, firm, nontender contralateral axillary lymph node enlargements. Hematological and serum biochemistry results were essentially normal. However, radiological examination of the chest showed widespread cannon-ball metastasis in both lung fields (Figure 3). Abdominal ultrasound showed stones in the gall bladder but no evidence of metastasis in the liver. Electrocardiogram (ECG) showed left atrial enlargement. FNAC of the left breast mass and ipsilateral axillary lymph node was positive for malignant cells.

A diagnosis of stage-IV carcinoma of left breast with pulmonary metastasis was made. Patient was commenced on daily oral dose of tamoxifen 20 g as an outpatient, and scheduled for palliative simple mastectomy. A decision was taken jointly by the anesthetic and surgical teams to employ regional anesthesia with intraoperative sedation. This was discussed with the patient with an assurance of conversion to general anesthesia if necessary. Patient consented to this anesthetic option.

Anesthetic Management

The patient was sedated overnight with oral diazepam 10 mg and premedicated with another 10 mg orally just before being transferred to the theater on the morning of operation.

The patient was brought to the preoperative holding area where a Nellcor Puritan Bernett Multiparameter patient monitor was connected and baseline vital signs recorded. The pulse was 88 beats/min^{-1}, blood pressure was 120/80 mmHg and peripheral arterial oxygen saturation was 96% on room air. A peripheral intravenous access was established and the patient was sedated with intravenous diazepam 2.5 mg and pethidine 50 mg. Using the same technique and drug described for patient 1, intercostal

Figure 2. Repeat chest x-ray of case 1 showing right pleural effusion and metastasis in both lung fields

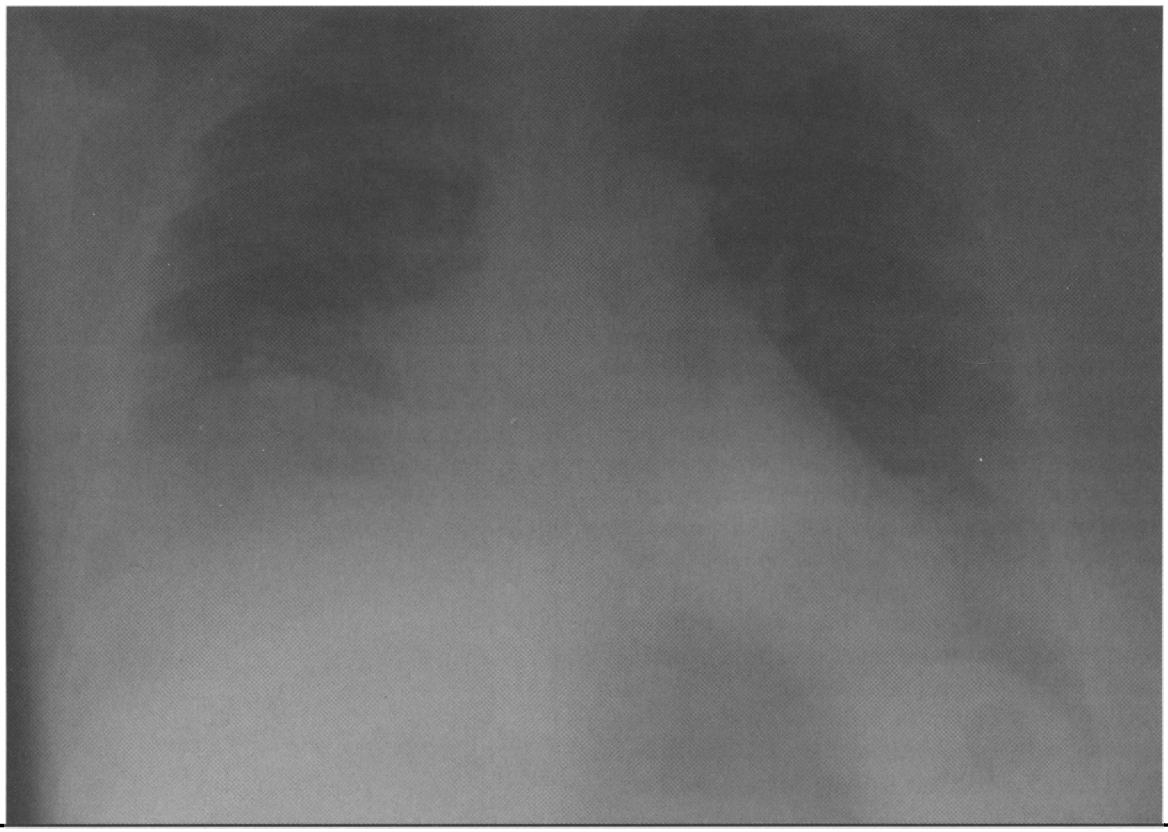
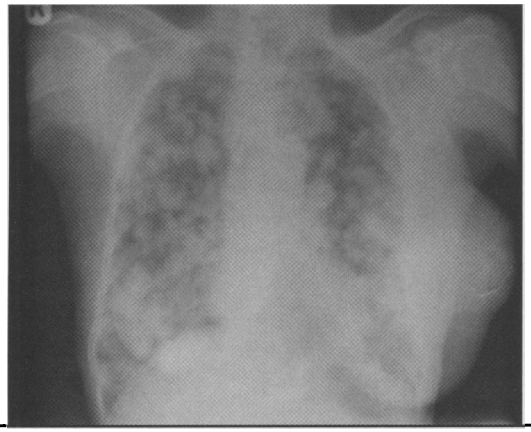


Figure 3. Chest x-ray of case 2 showing metastasis in both lung fields



nerves block and infraclavicular and midline subcutaneous local anesthetic infiltrations were performed. Surgical anesthesia was demonstrated within 15 minutes, and the patient was transferred to the operating room. The patient was hemodynamically stable throughout the surgery, which lasted one hour and 15 minutes. Her subsequent postoperative course was uneventful.

DISCUSSION

Mastectomy is a common surgical procedure for breast malignancies. General anesthesia is traditionally favored for the operation. However, there are situations when general anesthesia may be considered unsuitable. Regional anesthesia was chosen for mastectomy in our patients due to compromised pulmonary status, resulting from widespread malignant infiltrations of the lungs.

Although intercostal nerves block has been used for minor breast procedures, its use for major breast surgery is not common.[4] The block, alone, cannot guarantee adequate anesthesia for surgical excision of the entire breast, as in simple mastectomy. Intercostal nerves block was combined with blockade of the supraclavicular branches of the superficial cervical plexus, which provide sensation to the upper part of the breast and the intercostal nerve supply from the contra-lateral side. These combinations provided a complete block of the sensory supply to the breast. The technique thus provided optimal surgical condition with stable hemodynamics, in the absence of sympathetic blockade that often complicates alternative techniques, such as paravertebral and thoracic epidural blocks.[5,6]

Intercostal nerves block is credited with a higher risk of local anesthetic toxicity compared with paravertebral or epidural blocks.[4,7] This is because the absorption kinetics of local anesthetics in the intercostal space is comparably more rapid than in any of these less vascularized sites.[7] However, none of our patients exhibited any evidence of local anesthetic toxicity. This was probably due to the small volume of local anesthetic used (4 ml) at each intercostal space. Furthermore, the addition of a vasoconstrictor (epinephrine) to limit absorption and the use of low concentration of the local anesthetic agent to limit total dose, no doubt, assisted in preventing a large bolus of local anesthetic being delivered into the blood stream within a short time. The actual amount of bupivacaine delivered into the intercostal spaces in any of the two patients was less than the maximum recommended dose (2–3 mg/kg^{-1}).[8] Pleural puncture with subsequent development of pneumothorax is another potential complication of intercostal nerves block.[3,8] However, the incidence of this complication is extremely low, and it's claimed to be less than 1%.[8] Neither of the two patients in this report experienced pneumothorax.

Although all patients are candidates for intercostal nerves block, it is known that as patients become more obese, the blocks may be technically more difficult to carry out.[9] This was the situation with our first patient, in whom the mid-axillary approach had to be abandoned for a posterior approach, which was found easier for the block in the obese patient.

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