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Risk Assessment and Anesthesia Classification in Breast Cancer Surgery

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ABSTRACT

Background: There are various factors affecting the effectiveness of the treatment of breast cancer patients. Although the disease pathology, along with surgery and other therapeutic modalities, plays the principal role in patient outcomes, anesthesia still plays an important role in the success of treatment. This study was designed to show the effects of anesthetic plans on risk classification and assessment in breast cancer surgeries.

Methods: Two hundred sixty patients receiving different types of breast cancer surgery for therapeutic and reconstructive purposes were enrolled in this study. They were divided into three groups according to the anesthesia risk assessment. Group 1 consisted of low-risk patients (ASA I) who received small surgeries such as lumpectomy. Patients with intermediate risk of anesthesia (ASA II) or those who underwent breast cancer and axillary surgery with overnight admission (ASA I or II) were considered as group 2. Group 3 comprised the patients with higher risk for anesthesia (ASA class III) regardless of the surgery type or those in any ASA class who were about to undergo advanced and prolonged surgeries such as breast reconstruction with free or pedicle flaps.

Results: Two hundred sixty-eight surgical interventions were done in 260 patients. There were 106, 107, and 47 patients in groups 1, 2, and 3, respectively. In group 1, five patients out of 106 were admitted in the hospital for 24 hours after surgery and the remaining 101 patients were discharged from the hospital in a few hours after the operation when they were fully conscious and could tolerate the diet completely. All 107 patients in group 2 were admitted in the hospital for a few days after the operation, though the vast majority of them (98 patients) discharged from the hospital the day after surgery. In the last group, 6 out of 47 patients showed the signs of surgical complications such as partial flap ischemia in the postoperative period, mostly after TRAM or DIEP flap breast reconstruction surgery.

Conclusion: The findings of this study support the idea that breast surgeries can be done in an ambulatory situation with no considerable risk. In contrast, all medical and anesthetic considerations should be taken into account in more complex surgeries, especially when they are applied in high-risk patients.

Introduction

All patients who undergo anesthesia must have a preanesthetic evaluation by an anesthesia clinician to assess the patient's perioperative risk and readiness for the planned procedure and to create an anesthetic plan.[1] Different factors can affect anesthetic outcomes, e.g., underlying systemic disease,

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especially those affecting the respiratory, cardiac, or immune system. Also, the type of disease is important in anesthesia risk of the patients. Surgery for the treatment of cancer is a good example demonstrating the importance of the type of disease in peroperative care of the patients. Cancer patients may have a higher risk in the perioperative period compared with other patients. As an example, cancer patients have higher-than-normal numbers of platelets and clotting factors in their blood. On the other hand, some treatment modalities applied in the management of breast cancer patients may increase the risk of postoperative complications such as developing a blood clot. Chemotherapy, with or without targeted therapy, and tamoxifen can increase the risk of thromboembolic events.[2,3] Research indicates that there is an association between thrombosis and malignancy.[3]

Reoperation can independently increase the risk of anesthesia. One of the most common reasons for reoperation in breast cancer patients is thrombotic events in autologous breast reconstruction. The pattern of early thrombosis is variable and is governed by the complex interplay between tumor factors, cancer treatment medications, and patient factors. The trauma of major surgery and extensive surgical dissections in the trunk may itself play animportant role in increasing thrombotic events after autologous breast reconstruction.[4]

In the modern era, with the intensive preioperative monitoring of the patients, the risk of anesthesia and preioperative complications has decreased considerably. Early postoperative mobilization and the earlier discharge of the patient from the hospital are important in the prevention of thromboembolic events and the complications.[5]

Among all cancers that need surgery, breast cancer has the most varied extent of the surgery—from small, short-duration surgeries to extensive, long operations affecting a considerable area of the trunk with microscopic vascular anastomoses.

This study was designed to show the anesthesia complications in three study groups.

Methods

Two hundred sixty patients receiving different types of breast cancer surgery for therapeutics and reconstructive purposes were enrolled in this study from April 2017 to July 2018 in Imam Khomeini referral hospital. Patients who were candidates for surgery were referred to preoperative anesthesia clinic of the hospital as part of the surgery preparation process. They were assessed in the anesthesiology clinic and the anesthesia risk assessment sheets were filled up for every individual patient.

The patients were divided into three groups according to the protocol of the study. The study protocol was approved by the ethics committee of the Surgery Department of the university. Group 1 consisted of the patients who were planned for small breast surgeries such as lumpectomy. The patients in this group had low anesthesia risks (ASA I). Patients with intermediate risk of anesthesia (ASA II) and those who underwent breast cancer and axillary surgery, except for sentinel LN biopsy, and needed overnight admission (whether ASA I or II) were considered as group 2. Group 3 was comprised of patients who had a high risk of anesthesia (ASA III) or were going to receive advanced and prolonged surgeries such as autologous breast reconstruction regardless ASA classification (I, II, or III).

Anesthesia was induced by intravenous infusion of propofol 1% and remifentanil (total intravenous anesthesia) in 70 cases, and 95 patients were anesthetized with inhaled anesthetics sevoflurane and isoflurane with intermittent inhalation of fentanyl and sufentanil. In all the cases, muscle relaxation was induced by atracurium besilate or cisatracurium. Optimal ventilation and oxygenation along with the monitoring of blood gases, acid-base balance, and metabolic balance, i.e., blood sugar and osmolality, temperature monitoring, and avoidance of hypothermia in both groups were monitored. Depth of anesthesia was controlled using a bispectral index (BIS) monitoring system. Because of the particular importance of proper perfusion of the flaps and their vascular anastomosis, inotropic drugs and crystalloid fluids were used in some cases as required. Postoperative care including hemodynamic monitoring, urinary output record, and postoperative pain management with opiate and non-opiate drugs were done.

Results

Two hundred sixty-eight surgical interventions were done in 260 patients. Age distribution of the patients is presented in Table1. The most frequent operation was breast-conserving therapy with axillary staging. Table 2 shows the distribution of patients in different study groups and the different types of surgeries.

There were 106, 107, and 47 patients in groups 1, 2, and 3 respectively. In group 1, five patients out of 106 stayed in the hospital for the next 24 hours after surgery, and the remaining 101 patients were discharged from the hospital within a few hours after the operation when they were fully conscious and could tolerate the PO diet completely. All the 107 patients in group 2 were admitted to the hospital for a few days after the operation, though the vast majority of them (98 patients) were discharged from the hospital the day after surgery. Three patients were hospitalized more than 1 day because of insurance and administrative issues, and the remaining 6 patients stayed at the hospital for more prolonged monitoring and analgesic medications. There were no anesthesia complications in group 1 or 2.

In the last group, 6 out of 47 patients showed signs

Table 1. Distribution of breast cancer patients by age

age	N (%)
<20	12 (4.8%)
20-30	27 (10.8%)
31-40	46 (18.5%)
41-50	81 (32.6%)
51-60	51 (20.5%)
61-70	19 (7.6%)
>70	12 (4.8%)
total	248 (100.0%)

Table 2. Surgery type and study classification

Type of Surgery	Number of interventions (N = 268)	Study group 1* (N = 106)	Study group 2* (N = 107)	Study group 3* (N = 47)
Lumpectomy	66	61	5	0
BCS** ± OBS*** ± ASLNB	50	15	29	6
BCS ± OBS + ALND	26	0	22	4
Mastectomy ± ALND/SLNB	40	0	27	13
Nipple-areola complex reconstruction	7	7	0	0
Revision of the previous breast reconstruction	9	6	3	0
Mastectomy and early reconstruction with implant/expander	28	0	25	3
Autologous breast reconstruction ± mastectomy	17	0	0	17
Bilateral Mastectomy ± implant reconstruction	9	0	4	5
Other	17	17	0	0

* Number of patients

** Breast-conserving surgery

*** Oncoplastic breast surgery

of surgical complications such as partial flap ischemia in the postoperative period mostly after TRAM or DIEP flap breast reconstruction surgery. Although 4 patients recovered with conservative management, two patients were reoperated and discharged after 8 to 10 days of intensive medical and anesthesia care. There was one mortality in the third group due to comorbidity in a patient who underwent mastectomy without axillary lymph node dissection. She suffered from recurrent ulcerative breast cancer lesions that were not responsive to systemic chemotherapy. She has been diagnosed with breast cancer 4 years before and treated with surgery followed by chemotherapy, radiotherapy, and hormonal therapy in 2013. Despite the use of appropriate anticoagulation in the preoperative period, the patient showed the signs of diffuse pulmonary thromboembolism, confirmed with CT angiography, which resulted in cardiac arrest. The patient was not responsive to cardiopulmonary resuscitation. Another patient had progressive respiratory distress and tachycardia on the first day after surgery. She was rechecked for flap perfusion and vascular grafts circulation, and perfusion scan was done in order to rule out diffuse emboli. The result was diffuse thromboembolism and arterial gas disturbance. The patient immediately received respiratory support treatment using anticoagulants so that her life, as well as the flap, would be saved. However, the revascularization for DIEP flap failed, and the second operation ended up with flap resection. the other cases had skin color changes and coldness due to hypoperfusion but were restored with conservative treatment.

Discussion

Preoperative evaluation and risk assessment are essential to anesthesia management.[6-8] In this study, we categorized the patients who were candidates for any kind of breast surgery into three groups. While there was no complication in group 1 and 2, group 3 had a different outcome because the patients in this group were at a greater risk of morbidity and mortality compared with group 1 and 2. The patients were categorized in this group according to one or more of the following conditions: 1. suffering from an underlying disease which made comorbidity; 2. undergoing more complex and longer surgeries, which cause higher physiologic stress during the surgery; and 3. receiving chemotherapy before treatment. One mortality in the study group occurred in a patient with severe morbidity, although all other morbidities were in the subgroup of TRAM or DIEP flap reconstructions. For example, DIEP flap, which is used for breast reconstruction in a selected number of patients, is a prolonged procedure involving microvascular anastomoses. Furthermore, the extent of the dissection in this operation causes hypothermia in the patient. These patients are at greater risk, especially when the blood flow of the flap is questionable. The ischemia in the flap induces

cytotoxic products in the ischemic tissue, which then enter the systemic circulation and negatively affect the cardiovascular function of the patients who are already under considerable physiologic stress after a long surgery.[9] On the other hand, the tissue perfusion is crucial in these patients in the postoperative period. The mean arterial pressure should be maintained within ±20 to ±30 mm Hg of the baseline. Sufficient fluid therapy, electrolyte balance, normothermia, and correction of anemia with blood transfusion are the basic strategies to maintain the physiologic status of the patient in a stable condition and to establish flap perfusion.

In the recent decade, the indications and use of preoperative chemotherapy have been developed considerably. Because of vascular toxicity, chemotherapy leads to endothelial dysfunction, with loss of vasodilatation effects and suppressed anti-inflammatory and vascular reparative functions. Those changes exacerbate ischemia, and hypothermia worsens the situation of the patients.[10]

The extent of surgical dissection also plays an important role in increasing postoperative complications and morbidity. Dissection of the extensive surface areas of the trunk, including chest, abdomen, and -in some situations- thighs, would increase insensible loss and lead to hypothermia during surgery as well as in the postoperative period. These factors increase the risk of thrombosis in vascular grafts and diffuse thromboembolism in some cases. Sufficient oxygenation, perfect ventilation with acid-base balance during surgery, and monitoring the electrolytes are necessary.[11-14] We had two thromboembolic events in our series, and one of them led to mortality. Prophylactic anticoagulant therapy should be considered in the surgical and anesthetic plan.[15,16] There were one morbidity and one mortality in this study. These complications happened despite risk assessment and appropriate preparation of the patients. It should be always taken into consideration that these kinds of complications can be life-threatening. We recommend considering ICU care for the patients at higher risk of complications, especially when the operation is long and complex with extensive dissection.

There were no complications in groups 1 and 2. Taking enough care of the hemodynamic function and tight monitoring of ideal oxygenation helped us to avoid further complications. Six patients remained hospitalized for more than one day in group 2 because of severe pain in the site of operation. It seems that enough analgesic medication can also prevent the hospitalization of patients. Opiate and non-opiate medications should be advised meticulously in the early postoperative period.[17-19]

It seems that most breast surgeries can be done in an ambulatory situation with no considerable risk. In contrast, all medical and anesthetic considerations should be taken into account in more complex surgeries, especially when they are performed on high-risk patients

Conflict of Interest

The authors have none to disclose.

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