

Epidural Nerve Blocks Increase Intraoperative Vasopressor Consumption and Delay Surgical Start Time in Deep Inferior Epigastric Perforator Free Flap Breast Reconstruction

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Background: Epidural nerve blocks (EA) have been widely used in abdominal and thoracic surgery as an adjunct to general anesthesia (GA). The role for EA in microsurgical free flap breast reconstruction remains unclear with concerns regarding its impact on flap survival and operating room efficiency. The purpose of this study was to examine the effectiveness of epidural blocks in patients undergoing deep inferior epigastric perforator (DIEP) flap breast reconstruction.

Methods: A retrospective analysis of patients undergoing DIEP breast reconstruction under GA alone was compared with those receiving EA/GA. Electronic records were analyzed for patient demographics, intraoperative data, and postoperative outcomes. The primary outcome was 48-hour narcotic usage and secondary outcomes were intraoperative vasopressor consumption, surgical delay, and safety profile.

Results: Sixty-one patients underwent DIEP reconstruction, 46 (75%) underwent EA/GA and 15 (25%) underwent GA alone. Epidural blocks were associated with a significant delay in operating room start time (67.8 min versus 45.6 min; $P=0.0004$.) Patients in the EA/GA group also had a significant increase in vasopressor use ($n=38$ versus $n=8$; $P=0.037$); however, there was no difference in flap complication rate [1 (2%) versus 2 (13%); $P=0.15$]. Postoperatively, patients who received an epidural block had a reduced average pain score (1.1 versus 2.2; $P=0.0235$), but there was no difference in 48-hour narcotic usage.

Conclusions: Although epidural blocks reduce postoperative pain following DIEP flap breast reconstruction, they increase intraoperative vasopressor use and delay the start time of the case. Further studies are required to elucidate whether the benefits of improved pain control outweigh the potential risk for increased surgical complications and increased health care costs. (*Plast Reconstr Surg Glob Open* 2019; 7:e2105; doi: 10.1097/GOX.0000000000002105; Published online 15 January 2019.)

INTRODUCTION

Postoperative pain remains a significant challenge following breast reconstruction surgery, resulting in slower recovery, longer hospital admission, increased resource utilization,

and poor patient satisfaction.¹⁻⁸ Furthermore, postoperative narcotic usage and prolonged general anesthesia leads to nausea and vomiting, which predisposes patients to bleeding, hematoma formation, dehydration, aspiration, and delayed mobilization.⁹⁻¹⁶ There has been increasing focus on optimizing postoperative pain following breast reconstruction, particularly with regional nerve blocks.

Epidural nerve blocks are commonly employed in abdominal and thoracic surgeries and have been shown to reduce postoperative pain and limit opioid consumption. They have also been shown to reduce postoperative pulmonary, thromboembolic, and cardiac complications.¹⁷ Their role in microsurgical free flap breast reconstruction is unclear, as their purported benefits of reduced pain and narcotic usage is met with concerns with respect to intraoperative hypotension leading to increased vasopressor use.

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The objective of this study was to examine the effectiveness of epidural nerve blocks in patients undergoing breast reconstruction with the deep inferior epigastric perforator (DIEP) free flap.

MATERIALS AND METHODS

A retrospective review (OHSN-REB #20170925-01H) of patients undergoing DIEP free flap breast reconstruction by a single surgeon was performed from 2015 to 2017. Patients were included if they underwent immediate or delayed DIEP flap breast reconstruction under general anesthesia, with or without an epidural nerve block. Patients were excluded if they received intraoperative local anesthesia or an alternative regional nerve block. All patients receiving an epidural nerve block received a standardized dose of bupivacaine preoperatively by an anesthesiologist trained in regional anesthesia.

Patient electronic medical records were examined for patient demographics (age, body mass index, tobacco use, prior chemotherapy, prior radiotherapy, American Society of Anesthesiologists classification, reconstruction stage, and laterality); intraoperative data (duration of surgery, vasopressor use, surgical delay time, time in postanesthetic care unit, complications), and postoperative data (48-hour opioid consumption, average pain score, antiemetic use, antipruritic use).

The primary outcome of interest was 48-hour narcotic usage measured in oral morphine equivalents, calculated by standardized tables. Secondary outcomes were intraoperative vasopressor consumption of phenylephrine and/or ephedrine, average postoperative pain score, surgical delay time, postoperative antiemetic/antipruritic consumption, and procedure-related complication rates. The surgical delay time was calculated by the difference between surgical cut time and planned operating room start time.

Statistical analysis was performed using SAS Version 9.3 software.¹⁸ Descriptive statistics were calculated using Fisher’s exact and chi-square tests for categorical variables and *t* tests for continuous variables. Cox proportional hazard ratios and logistic regression were used for multivariate analyses to control for confounding variables. Demographic and clinical characteristics were compared using ANOVA. *P* values of 0.05 or less were considered statistically significant.

RESULTS

Sixty-one patients who underwent DIEP flap breast reconstruction were included in the study, of which 46 (75%) patients underwent EA in addition to general anesthesia (EA/GA), and 15 (25%) who underwent GA alone (Fig. 1). There was no statistically significant difference between groups with respect to age, body mass index, laterality of reconstruction, ASA score, smoking history, and rates of chemotherapy or radiation (Table 1).

There was no difference in duration of surgery or flap complication rate (Table 2); however, there was a statistically significant delay in operating room start time in the EA/GA group (67.8 min versus 45.6 min; *P* = 0.0004). Furthermore, patients in the EA/GA group

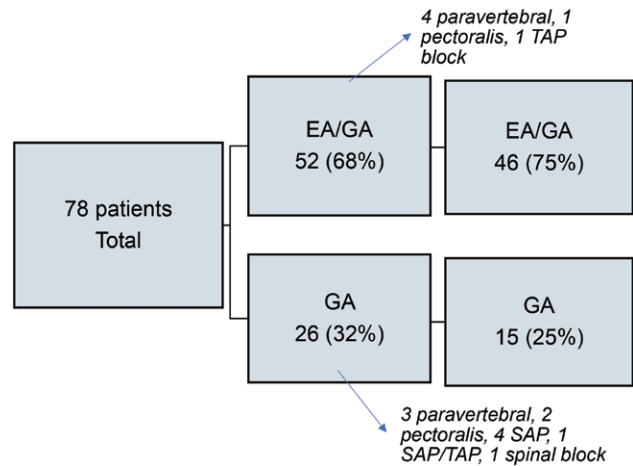


Fig. 1. Patient cohort sixty-one patients were included in the study after excluding patients who underwent any other regional block. Six patients were excluded from the EA/GA group [4 patients had paravertebral blocks, 1 patient had a pectoralis block, and 1 patient had a transverse abdominis plane (TAP) block]; and 11 patients were excluded from the GA alone group [3 paravertebral, 2 pectoralis, 4 serratus anterior plane (SAP) block, 1 SAP/TAP, 1 spinal block].

Table 1. Patient Demographics

Variable	EA/GA (N = 46)	GA (N = 15)	<i>P</i>
Age (years)	51 ± 7.2	52.8 ± 7.6	0.4039
BMI, kg/m ²	26.3 ± 3	26.4 ± 2.8	0.9213
ASA score:			1.0
I	4 (8.7)	1 (6.7)	
II	31 (6.73)	10 (66.7)	
III	11 (23.9)	4 (26.6)	
Smoking history	0 (0)	0 (0)	1.0
Hypertension	4 (8.7)	1 (6.7)	1.0
Previous adjuvant radiotherapy	17 (36.9)	6 (40)	0.8327
Previous adjuvant chemotherapy	17 (36.9)	8 (53.3)	0.2627
Reconstruction stage:			0.5832
Immediate	19 (41.3)	5 (33.3)	
Delayed	27 (58.7)	10 (66.7)	
Reconstruction laterality:			0.4261
Unilateral	37 (80.4)	14 (93.3)	
Bilateral	9 (19.6)	1 (6.7)	

ASA, American Society of Anesthesiologists classification of Physical Health; BMI, body mass index.

had a statistically significant increase in intraoperative vasopressor consumption (n = 38 versus n = 8; *P* = 0.0367). Postoperatively, patients who received an epidural block had reduced average pain score (1.1 versus 2.2; *P* = 0.0235); however, there was no difference in 48-hour narcotic consumption (Table 3).

DISCUSSION

The role of epidural anesthesia in DIEP free flap breast reconstruction remains unclear. Lou et al¹⁹ demonstrated that epidural anesthesia improved postoperative pain, nausea/vomiting, and decreased opioid consumption without increasing the risk of flap thrombosis. Furthermore, other authors argue that epidural blocks induce vasodilation and therefore improve flap perfusion and oxygenation.²⁰

Table 2. Intraoperative Data

Outcome	EA/GA (N = 46)	GA (N = 15)	P
Duration of surgery (min)	439±109	437±120	0.7887
Surgical delay time (min)	67.8±21.8	45.6±13.9	0.0004
Time in PACU (hr)	5.5±4.8	4.7±1.5	0.5682
Flap complication	1 (2.17)	2 (13.3)	0.1468
Pulmonary embolism	0 (0)	0 (0)	
Flap compromise	1 (2.17)	0 (0)	1.0
Arterial thrombosis	0 (0)	1 (6.67)	0.2459
Venous thrombosis	0 (0)	0(0)	
Flap salvage	0 (0)	1 (6.67)	0.2459
Flap failure	0 (0)	0(0)	
Patient received vasopressor	38 (82.6)	8 (53.3)	0.0367
Ephedrine administration	36 (78.3)	8 (53.3)	0.0958
Phenylephrine administration	19 (41.3)	2 (13.3)	0.0631
Norepinephrine administration	2 (4.35)	0 (0)	1.0
Intravenous fluid administered (cc)	2,480±1,508	2,865±1,975	0.4311

PACU, postanesthetic care unit.

Table 3. Postoperative Data

Outcome	EA/GA (N = 46)	GA (N = 15)	P
Average pain score (/10)	1.1±1.3	2.2±1.7	0.0235
48-hr Narcotic usage (Oral morphine equivalent, mg)	41.3±48.1	87.9±140	0.3463
Antiemetic requirement in PACU (no. patients)	17 (37.0)	4 (26.7)	0.4664
Antipruritic requirement in PACU (no. patients)	5 (10.8)	0(0)	0.3206

PACU, postanesthetic care unit.

The purported benefits, however, are balanced by a reasonable concern that compensatory vasopressor utilization may increase the incidence of vasospasm and flap thrombosis.

The results of the present study demonstrate that there is a modest improvement in postoperative pain scores with EA/GA in DIEP autologous breast reconstruction. Though there was a decrease in the 48-hour narcotic requirements between the two groups, the difference was not statistically significant, nor was there a significant difference in postoperative nausea and vomiting. Moreover, epidural blocks were associated with a delay in the surgical start time and led to increased vasopressor consumption, with 83% of the patients who received the epidural block relying on intraoperative vasopressor consumption to maintain their blood pressure. In our study, 53% of patients who received GA alone still required intraoperative vasopressor support, which is consistent with previous literature.²¹ Notably, there was no statistically significant difference in the intraoperative total volume of crystalloid administered between the EA/GA and GA groups, with or without vasopressor use. Although the flap complication rate was not statistically higher in the EA/GA group, it is conceivable that the present study was underpowered to appreciate such an effect.

To the best of our knowledge, this study is the first to evaluate whether epidural nerve blocks decreased operating room efficiency. Operating rooms have limited

treatment capacity, so optimal usage of resources is imperative. Delaying the start time of the case can have important financial implications, as an already lengthy surgery may run overtime leading to increased direct and indirect operative costs.²²

Although the present study is limited by its power and retrospective design, these early results will hopefully inform larger randomized control trials to further investigate whether the pain improvement gained from epidural blocks outweighs the potential risk for complications secondary to increased vasopressor use. Furthermore, a cost effectiveness analysis must be performed to determine the impact of the surgical delay associated with epidural nerve blocks in DIEP breast reconstruction.

CONCLUSIONS

The use of epidural nerve blocks in DIEP flap breast reconstruction is associated with a modest improvement in postoperative pain score, while contributing to operative delays and increasing intraoperative vasopressor requirements.

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