

# DIEP Flap for Breast Reconstruction Using Epidural Anesthesia with the Patient Awake

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**Background:** Many articles have been published about breast reconstruction using the deep inferior epigastric perforator (DIEP) flap; however, few articles have been published in plastic/reconstructive surgery journals describing the difference between anesthetic techniques and recovery in microsurgical patients.

**Methods:** We analyzed 16 patients who underwent DIEP flap for breast reconstruction. Patients were divided into 2 groups: group 1: general anesthesia (n = 9); group 2: epidural block with the patient awake (n = 7). In group 2, the peridural block was done at 2 levels: thoracic (T2–T3) and lumbar (L2–L3).

**Results:** The success rate was 100% with no partial or total loss of the flap. There was no difference between groups in regard to postoperative pain in the first 5 days (Visual Analog Scale). Analgesia used in group 1 was buprenorphine and ketorolac, and in group 2, only ketorolac without opioid derivatives. Immediate postoperative recovery was better in the peridural group than in the group administered general anesthesia ( $P = 0.0001$ ).

**Conclusions:** DIEP flap with peridural block and the patient awake during surgery is a feasible technique with better recovery in the immediate postoperative period, achieving good analgesia level with minimal intravenous medication. (*Plast Reconstr Surg Glob Open* 2016;4:e724; doi: 10.1097/GOX.0000000000000737; Published online 26 May 2016.)

**B**reast reconstruction is a key point for complementary treatment in breast cancer and has long been the ideal end choice in patients after mastectomy. Autologous tissue has been recognized as the gold standard for this purpose, giving patients a new soft and natural ptotic breast that mimics the original shape, resulting in a better cor-

poral image. The deep inferior epigastric perforator (DIEP) flap is, undoubtedly, the first choice in unilateral or bilateral breast reconstruction.<sup>1</sup>

A success rate of 95% to 100% has been reported in specialized microsurgical centers.<sup>2–5</sup> It is also well known that anesthesia may be an important factor in the survival rate of the flap because of hemodynamic management and changes in the circulating volume. Use of vasoactive medication and regional anesthesia may influence the distribution of direct blood flow to the microcirculation. Some articles suggest that local anesthetics could offer additional benefits in postoperative patients, attenuating the stress response and hypercoagulation.<sup>6</sup>

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In addition, vasodilatation is a well-known effect of local anesthetics with better oxygenation of the tissues, especially in hypotensive patients. When used together with general anesthesia, the epidural block causes vasodilatation, which increases perfusion and regulates flap microcirculation. An increase has been shown in vein flow, preventing blood stasis preoperatively or postoperatively and promoting blood flow in cases of venous insufficiency. Regional anesthesia also helps to decrease postoperative pain.<sup>7–10</sup>

## MATERIALS AND METHODS

By using a nonprobabilistic sample of consecutive cases and based on a prospective cohort study, all patients undergoing DIEP flap for a delayed breast reconstruction after mastectomy from January 2015 to July 2015, at the High Specialty Medical Unit, No. 21 of the Mexican Institute of Social Security (IMSS), Monterrey, Nuevo León, México, were included. A total of 16 patients were divided into 2 groups as follows: group 1—patients under general anesthesia ( $n = 9$ ) and group 2—patients under epidural block with the patient awake only using superficial sedation ( $n = 7$ ).

Results were processed using the statistical package SPSS 10.0 (IBM, Armonk, N.Y.) for analysis. We used the Visual Analog Scale (VAS) for pain from the first 5 postoperative days, beginning from the day of surgery, using a score from 0 to 10 depending on the level of pain on the above-mentioned scale.

Results between both groups were compared with the Mann–Whitney U test and results in each group with the Wilcoxon test;  $P$  value  $\leq 0.05$  was considered statistically significant.

### Epidural Block Technique

We used a 2-level block: thoracic (T2–T3) and lumbar (L2–L3). In the operating room and with standard monitoring (electrocardiography, noninvasive arterial blood pressure, and pulse oximetry) with the patient in a left lateral position, oxygen (3 l/min) was delivered by face mask, and medication administration was continued as follows: midazolam [3 mg intravenously (IV)] for anxiolysis and fentanyl citrate (75  $\mu$ g IV) for sedation complementation.

After cleaning the area with sterile fields, skin and subcutaneous tissue were anesthetized with lidocaine injected at T2 to T3 and L2 to L3 of the planned block.

Using a Touhy 18 needle and reaching the epidural thoracic and lumbar space with the loss of resistance technique (Pitkin), we passed the needle through the epidural catheter in a cephalic direction and secured it with 2-0 silk. Later, using a Quincke

27 needle through the subarachnoid space between L2 and L3, we continued with the administration of 15 mg of hyperbaric bupivacaine and 250  $\mu$ g morphine. Then, with the patient in supine position and 30 degree Trendelenburg reaching a T2 to T3 spinal block, as complementation, we used a thoracic epidural catheter with 52.2 mg (7 ml) of ropivacaine 0.75% slowly over a period of 10 minutes, reaching a cervical block through C4 to C5. All the procedure takes 20 minutes for an experienced anesthetist. The following adjuvant drugs were then used for the anesthetic procedure: ondansetron (8 mg IV), ranitidine (50 mg IV), ketorolac (60 mg IV), and cephalexin (1 g IV).

Intraoperatively, we used 50 mg of fentanyl citrate and 1 mg midazolam (intermittent bolus every 45 minutes) for continuous sedation. The upper block was maintained using 15 mg (2 ml) ropivacaine 0.75% and intermittent bolus every 60 minutes, with an adequate motor and sensory block. (See video, Supplemental Digital Content 1, which demonstrates the moment of the anastomosis from the artery of the DIEP flap with the internal mammary artery with the patient awake. <http://links.lww.com/PRSGO/A205>.)

## RESULTS

Since January 2010, 120 DIEP flaps for unilateral and bilateral breast reconstruction were performed by the principal author. For the purpose of this study, we prospectively analyzed 16 patients operated from January to July 2015. Nine patients (56%) were included in group 1 (general anesthesia) and 7 patients (44%) in group 2 (epidural block). Patients in group 2 were awake throughout the entire procedure. The average time of surgery for unilateral DIEP flap in both groups was 4.5 hours ( $\pm 1.5$  h).

Median age was 48 years ( $\pm 7.56$ ; range, 37–65 years). Likewise, median weight was 67 kg. By using the Mann–Whitney U test, no statistically significant difference in age ( $P = 0.174$ ) and weight ( $P = 0.071$ ) was shown between groups.

By using Fisher exact test, no statistically significant differences were shown between groups in regard to mobilization from bed on the day after surgery. In group 1 who received general anesthesia, mobilization from bed was shown in a patient (10%), whereas in group 2 who received epidural block, there were 4 patients (40%;  $P = 0.077$ ). Mobilization from bed for the remainder of the patients occurred on the second postoperative day.

By using a comparison of the VAS on postoperative days 1, 2, 3, 4, and 5 between groups with the Mann–Whitney U test, there was no significant

difference from one day to the next. We analyzed the difference between the results of the VAS in each group from postoperative days 1–5 using the Wilcoxon test, resulting in  $P = 0.015$  in group 1 and  $P = 0.004$  for group 2.

We measured the time from the conclusion of the surgery to the exit time of the patients from the operating room to the recovery room. The mean time from group 1 was 29.59 minutes ( $\pm 9.51$ ) and for group 2 was 14.75 minutes ( $\pm 4.98$ ), obtaining a  $P = 0.0001$  with the Mann–Whitney U test. All flaps had a favorable postoperative outcome without vascular insufficiency or thrombosis.

## DISCUSSION

Many articles have been published about breast reconstruction with DIEP flap; however, only few articles have been published in plastic/reconstructive surgery journals with the mention of the difference between anesthetic techniques and postoperative recovery in the microsurgical patient. In our study, we analyzed the clinical advantage of the double epidural block with the patient awake versus the conventional general anesthesia technique in patients who undergo DIEP flap for breast reconstruction after mastectomy.

The success rate in a DIEP flap for secondary breast reconstruction is actually about 95% to 100% in most microsurgical centers.<sup>2–5</sup> All patients in both groups had a successful outcome without ischemia or vascular insufficiency. We did not see any influence in flap success between anesthetic techniques and the success of the DIEP flap. However, the surgical technique is bit difficult because of the absence of muscle relaxants that inhibit the involuntary rectus abdominis muscle motion during the dissection. Also, during the anastomosis, the patient is breathing on her own, and when the sedation is deep, the thoracic motion is also deeper, so the patient may be awake only with superficial sedation during the anastomosis. Anyway, these 2 factors do not have substantial influence on the realization of the procedure.

It is well known that the most important factor for a successful microsurgical flap is the surgical technique. Avoidable technical errors are the principal cause of flap failure. Likewise, anesthetic technique without hesitation is a very important factor for successful microsurgery because of the influence on the tissue microcirculation with regional anesthesia, such as vascular volume changes, vasoactive drugs, and patient temperature.<sup>11–14</sup> Local anesthesia inhibits the action potentials via sodium channel blockade, obtaining a sympathetic blockade and secondarily causing arterial and venous dilatation. Other studies report a de-

creased incidence of thromboembolic events using regional anesthesia.<sup>6,9,15</sup> In addition, there is a protective activity of regional block over the free flaps. Adequate management of pain reduces postoperative stress and secondarily decreases free catecholamines in blood. Although our study does not show any significant statically differences in postoperative pain in both groups (general anesthesia vs epidural block) during the first 5 postoperative days (1:  $P = 0.299$ , 2:  $P = 0.408$ , 3:  $P = 0.210$ , 4:  $P = 0.174$ , and 5:  $P = 0.091$ ), the VAS was low on the first day in both groups with a decrease of pain from days 1 to 5, obtaining values in each separate group (group 1,  $P = 0.015$ ; group 2,  $P = 0.004$ ) with the Wilcoxon test. This points to a good analgesia effect in both patient groups, those receiving general anesthesia and those receiving epidural block. Therefore, regardless of the anesthetic technique used, management of postoperative pain must be adequate for patient requirements. In patients receiving general anesthesia, we used 2 analgesics postoperatively (buprenorphine and ketorolac), in contrast with the group receiving epidural anesthesia who received only one (ketorolac).

Postoperatively, we observed a significant difference in the immediate recovery time ( $P = 0.0001$ ). This difference is because of the absence of some anesthetic drugs as inductors (propofol), neuromuscular relaxant drugs (rocuronium bromide), and anesthetic gases (sevoflurane). In our patients, mean surgical time for unilateral DIEP was 4.5 hours ( $\pm 1.5$ h). It is well known that the duration of a surgical procedure is proportional to the risk of complications and increase in infection rates, pneumonia, atelectasis, urinary tract infections, deep venous thrombosis, hypothermia, neural compression, compartmental syndrome, rhabdomyolysis, number of transfusions, and prolonged hospital stay. It has also been reported that surgeries lasting  $>5$  hours increase risk of mortality, increasing the quantity of anesthetics as sedatives and neuromuscular relaxants often used in general anesthesia. This results in a longer elimination time for these drugs.<sup>16–18</sup> For this reason, avoiding general anesthesia and using only epidural block in breast reconstruction with an awake patient hypothetically decrease most of the related complications described in a prolonged surgery.

The risk of epidural hematoma and cord compression after anticoagulation with thoracic and lumbar catheters has been described,<sup>19,20</sup> and for this reason, we do not recommend this technique when the simultaneous anticoagulation is indicated. In our patients, we do not use any systemic anticoagulation, only local flushes with heparin (250 U per 1 ml of saline solution) in the lumen of the vessels at the moment of the anastomosis.

## CONCLUSIONS

Epidural block is an excellent anesthetic option for breast reconstruction with DIEP flap, avoiding the use of general anesthesia and, subsequently, neuromuscular relaxants, allowing by this way a more rapid postoperative recuperation than reported with general anesthesia. Regional anesthesia allows less analgesic medication to be used postoperatively.

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