

Ropivacaine in Breast Augmentation Surgery

Héctor César Durán-Vega, MD*

Arturo Ramírez-Montañana,
MD†

Octavio Gonzalez Galindo, MD‡

Andrés Medina Gutierrez, MD§

Adriana Zapata González, MD¶

Evangelina Gonzalez Galindo,
MD||

Iván Arturo Arellano Silva, MD**

Background: Breast augmentation surgery is still 1 of the most popular procedures in plastic surgery. Like other surgical procedures, it has been traditionally handled with nonsteroidal anti-inflammatory drugs and narcotics, which had many adverse effects; therefore, alternatives with the same effectiveness are being researched. The aim of this study was to investigate the efficacy of ropivacaine breast pocket irrigation during primary breast augmentation surgery to control pain during the first postoperative hours.

Methods: A multicenter, prospective, double-blind, randomized trial was performed on 52 primary breast augmentation procedures in which patients served as their own control: One breast received ropivacaine pocket irrigation and the other placebo. All patients received an oral analgesic. Pain was evaluated with a visual analogue scale at 30, 60, 90, and 120 minutes postoperatively.

Results: Pain was significantly less in ropivacaine breast at 90 and 120 minutes postoperatively ($P = 0.027$ and 0.022 , respectively). There was no statistical significance when the type of anesthesia used, general or epidural, was compared ($P = 0.33$ and $P = 0.37$ at 90 and 120 minutes, respectively).

Conclusions: Ropivacaine irrigation in breast pocket is able to diminish early postoperative pain safely, being an alternative to other analgesic methods. (*Plast Reconstr Surg Glob Open* 2018;6:e1745; doi: 10.1097/GOX.0000000000001745; Published online 2 May 2018.)

Breast augmentation surgery is still 1 of the most popular procedures in plastic surgery. In 2014, the International Society of Aesthetic Plastic Surgery reported 1,348,197 surgeries around the world with 45,570 in Mexico alone, only being surpassed in popularity by liposuction.¹ In total, 290,467 breast augmentation surgeries were reported by the American Society of Plastic Surgeons in 2016 in the United States only.²

Even though breast augmentation is a relatively fast and straightforward surgery, it is not pain-free. Both dual

plane or submuscular techniques require pectoral muscle section, thus leading to significant postoperative pain, although fortunately, this is not the most common technique.³ But even in the subglandular technique requires large area dissected.

Postoperative pain in breast surgery has traditionally used nonsteroidal anti-inflammatory drugs (NSAIDs) and narcotics. However, this form of pain control is not always suitable. When opiates are used, adverse effects such as cephalgia, nausea, vomiting, constipation, mental disorders, sleep disturbances, and depression are produced. Although the search continues for an adequate analgesia, these adverse effects can cause displeasure and even delay recovery room discharge.⁴

Clearly, pain control is an important aspect that can affect a patient's morbidity and satisfaction, which in turn can have an influence on experience and, moreover, personal recommendation of this ambulatory cosmetic procedure and the surgeon themselves. This reason has led to search for different analgesic alternatives, including intraoperative local anesthesia.⁵

Local anesthesia has been employed as a favorite modality in aesthetic surgery in procedures such as liposuction, breast, and facial surgery. Huge volumes of irrigated diluted anesthetic are considered adequate, as long as administered correctly. Its benefits include decreased

From the *Cirujano Plástico Estético y Reconstructivo, Certificado por el AMCPER, ASAPS, ISAPS; FILACP; ASPS, Centro Médico de las Américas, Mérida, Yucatán, México; †Cirujano Plástico Estético y Reconstructivo, Certificado por el AMCPER, ASAPS, ISAPS, Práctica privada, Monterrey, Nuevo León, México; ‡González Galindo Octavio; §Medico Algólogo anesthesiologo, Centro Medico de las Américas, Mérida, Yucatán, México; ¶Médico Cirujano, Centro Medico de las Américas, Mérida, Yucatán, México; ||Médico general, Centro Médico de las Américas, Mérida, Yucatán, México; and **Silva Arellano Iván.

Received for publication January 10, 2018; accepted February 12, 2018.

Copyright © 2018 The Authors. Published by Wolters Kluwer Health, Inc. on behalf of The American Society of Plastic Surgeons. This is an open-access article distributed under the terms of the Creative Commons Attribution-Non Commercial-No Derivatives License 4.0 (CCBY-NC-ND), where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially without permission from the journal.

DOI: 10.1097/GOX.0000000000001745

Disclosure: The authors have no financial interest to declare in relation to the content of this article. The Article Processing Charge was paid for by the authors.

bleeding, oral and pain analgesic intake, and patient satisfaction.⁶

Although previous studies exist, they have focused on bupivacaine and lidocaine application through a catheter placed in the pocket after surgery. However, a main disadvantage is the concern about contamination and the potential infection because this catheter allows communication between external and internal media.⁷

The aim of the present study was to investigate locally irrigated ropivacaine efficiency as a safe and long lasting local anesthetic in breast pocket irrigation during breast implant placement, to control pain during the first postoperative hours.

PATIENTS AND METHODS

A multicentric, prospective, double-blind, randomized trial was performed. Eighteen- to 65-year-old female patients, candidates for primary breast augmentation surgery by pocket technique or any kind of incision, under general anesthesia, epidural or subdural blockade, were selected. Patients undergoing other surgical procedures, suffering fibromyalgia or different anesthetic applications or had given narcotics or infusion pump placements were excluded. Fifty-two patients went into primary breast implant from December 2016 to April 2017. Patients themselves were they own control.

Procedure

Randomization in both groups was carried out with “research randomizer” software. The instrumentalist opened an envelope assigning, which breast was to receive analgesia or placebo. In each case, two 5 mL syringes were prepared and given to the surgeon, previous to implant placement; one with 0.75% ropivacaine (75 mg per mL), other with saline solution; the surgeon was not aware of their content, both breast pockets were irrigated and the implant was placed afterward, closing by planes. The instrumentalist registered this on patient’s record.

All patients received paracetamol 1 g intravenous at the end of the surgery. In the recovery room, a nurse or physician, unrelated to the study, evaluated pain with a visual analogue scale (VAS), every 30 minutes during the first 2 postoperative hours. None of the patients received narcotics for pain control.

Statistical Analysis

VAS scores for both irrigation types in correspondent breasts at 30, 60, 90, and 120 minutes postoperatively were

statistically analyzed using paired samples Student’s *t* test. Differences between kinds of anesthetic employed during surgeries in postoperative moments with statistical significance were calculated using *t* test for independent samples, with $P = 0.05$ and 95% confidence value. Statistical program SPSS (IBM) was used.

Ethical Considerations

The present study was performed according to the Declaration of Helsinki; all participants were advised about the research and signed an informed consent.

RESULTS

Fifty-two patients were included in the trial. All of them underwent a bilateral breast augmentation surgery, performed by 3 certified plastic surgeons living in 3 different cities in México: Monterrey, Mexico City, and Mérida.

Mean age of patients was 33.4 years. Mean implant volume was 312 mL (range, 145–510 mL). Seventy-eight percentage implants were placed through inframammary incision and the remaining through periareolar incision. In 51.9% of the cases, pocket site was dual plane; in 40.3% subglandular, and 4.6% submuscular. Mean surgery length was 81 minutes, 31 of them were done with general and 21 with regional anesthesia. With regard to the pain scale that was evaluated postoperatively, mean was significantly less in ropivacaine irrigated breast in comparison with placebo at 90 and 120 minutes after surgery ($P = 0.027$ and 0.022 , respectively). Within 30 and 60 minutes postoperative, no significant difference was found (Table 1 and Fig. 1).

Secondarily, the patients were divided into 2 groups according to the type of anesthesia used, regional or general, to find out whether this influenced in the VAS score, without finding statistical difference, resulting in a P of 0.33 and P of 0.37 at 90 and 120 minutes, respectively (Table 2).

DISCUSSION

As breast augmentation surgery gains popularity, the need for a reliable method for postoperative pain becomes more important. This surgery is commonly an ambulatory procedure, where pain control requirements are different to hospital stay patients. Ideally, ambulatory patients should arrive in recovery room with no pain and without the need for subsequent narcotics.⁸

Results in the present study suggest that 0.75% ropivacaine irrigation in breast pocket, before implant place-

Table 1. VAS; Mean Punctuations and Postoperative Time According to Infiltration Type

Columna 1	Columna 2				Columna 3		Columna 4		Columna 5	
	Infiltration									
	Ropivacaine			Saline Solution						
Time	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
30	2.5	1.40713	2.5	1.40713	2.5	1.40713	2.5	1.40713	2.5	1.40713
60	3.11	1.60692	3.11	1.60692	3.2	1.6054	3.2	1.6054	3.2	1.6054
90	3.75	1.71179	3.75	1.71179	3.98	1.76301	3.98	1.76301	3.98	1.76301
120	4.33	1.64542	4.33	1.64542	4.59	1.56508	4.59	1.56508	4.59	1.56508

VAS; mean punctuations and postoperative time according to infiltration type.

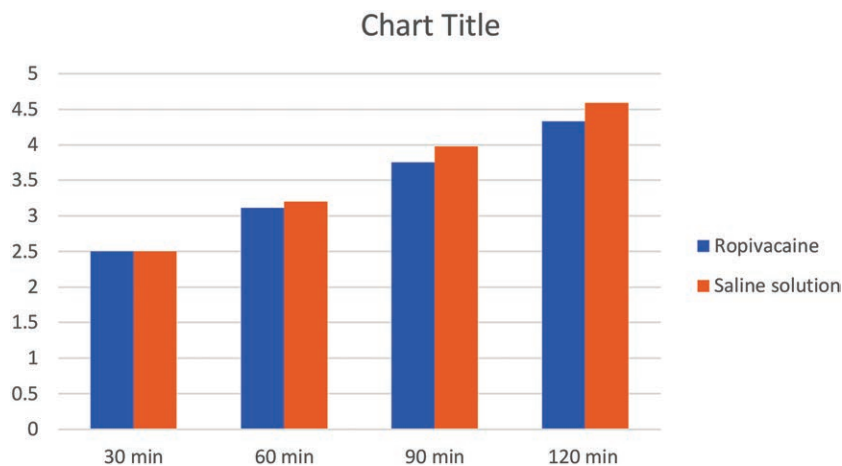


Fig. 1. Mean postoperative pain levels, assessed according to an intensity pain scale from 0–10 moments.

Table 2. Comparison of General and Regional Anesthesia

Postsurgical Time (min)	Anesthesia				P
	Regional Anesthesia		General Anesthesia		
	Mean	SD	Mean	SD	
90	1.85	2.4	1.3	0.9	0.338
120	1.57	2.1	6.76	25.9	0.37

Comparison of general and regional anesthesia.

ment, is significantly better than placebo to decrease 90 and 120 minutes postoperative pain. Similar to previous studies by Zhibo and Miaobo,⁹ which found irrigated lidocaine decreased pain compared with fibrin glue. Moreover, Mahabir et al.¹⁰ used bupivacaine for postoperative pain management, reporting it as more efficient than saline solution or ketorolac. Similarly, McCarthy et al.¹¹ compared ketorolac plus bupivacaine in breast pocket versus placebo, revealing that this combination decreased pain significantly, during the first 6 hours after surgery.

As clearly shown, different alternatives to NSAIDs or narcotics to postoperative pain management have been offered; however, ropivacaine is a local anesthetic with a short onset, approximately 15–30 minutes, and duration of 5–8 hours that, when locally administered, few or non-adverse effects were presented, so this makes it an ideal medication for this scenario.

We preferred to use ropivacaine over bupivacaine because it has been documented bupivacaine-induced cardiotoxicity through its cardiodepressant effect¹²; also ropivacaine offers a more selective neuromotor blockade. Other advantages are a long lasting activity, less painful when irrigated, and decreased bleeding on infiltration site. Evidence of this fact have already been reported in Germany with different facial and neck plastic surgeries.^{13,14}

In terms of costs, both are similar, so the less side effects mentioned above are the main support for our choice.

Even when not evaluated in the present trial, other authors have described the usage of different pain control

procedures apart from systemic NSAIDs, revealing a decreased use in narcotics, improving patient’s satisfaction and a shortening recovery time.¹⁵

The present study found analgesic effect not significantly different at 30 and 60 minutes postoperatively; this might be explained by general or epidural anesthesia after effects.

Although when statistically examined, no significant difference was found in both type of anesthesia, either general or epidural. This factor did not have an influence on the obtained results; however, for future researches, it is advised to standardize the same kind of anesthesia.

A longer follow-up for patients in this study could answer if ropivacaine is able to decrease pain in subsequent hours and at home, because this is a common complaint in 45% ambulatory surgery patients.¹⁶ For example, Mahabir et al. demonstrated less pain in the first 5 days after surgery with local bupivacaine.¹⁶ Even though it was mentioned by some patients in our study, this variable was not included due to a possible lack of control when recording data.

Accomplishments of this study include a strict randomness and “double blind” from patients and surgeons on treatment location. When ropivacaine breast was randomly assigned, the risk of systematic differences among patients was reduced to a minimum. When patients, nurses, surgeons, or physicians were blinded it is considered no bias existed on results. Moreover, patients undergoing a concomitant surgical procedure were excluded from the study as they were considered likely to present an increase in postoperative pain.

According to the present results, ropivacaine resulted safe and efficient for early pain relief, so it seems to be a convenient and inexpensive option for plastic surgeons in breast surgery.

Duran Vega Héctor César MD
 Calle 54 por 33. Av. Pérez Ponce
 Mérida, Yucatán, México
 CP 97000
 E-mail: hcdv@hotmail.com

REFERENCES

- International Society of Aesthetic Plastic Surgery. Procedures performed in 2014. 2015. Available at <https://www.isaps.org/Media/Default/global-statistics/2015%20ISAPS%20Results.pdf>.
- ASPS National Clearinghouse of Plastic Surgery Procedural Statistics. 2016 Plastic surgery statistics report. 2016. Available at: <https://www.plasticsurgery.org/documents/News/Statistics/2016/plastic-surgery-statistics-full-report-2016.pdf>.
- Jabs D, Richards BG, Richards FD. Quantitative effects of tumescent infiltration and bupivacaine injection in decreasing postoperative pain in submuscular breast augmentation. *Aesthet Surg J*. 2008;28:528–533. Available at <https://academic.oup.com/asj/article/28/5/528/202919>.
- Turan Z, Sandelin K. Local infiltration of anaesthesia with subpectoral indwelling catheters after immediate breast reconstruction with implants: a pilot study. *Scand J Plast Reconstr Surg Hand Surg*. 2009;40:136–139. Available at <http://www.tandfonline.com/doi/abs/10.1080/02844310500475784>.
- Stanley SS, Hoppe IC, Ciminello FS. Pain control following breast augmentation: a qualitative systematic review. *Aesthet Surg J*. 2012;32:964–972. Available at <https://academic.oup.com/asj/article/32/8/964/318316>.
- Fayman M, Beeton A, Pottgieter E, et al. Comparative analysis of bupivacaine and ropivacaine for infiltration analgesia for bilateral breast surgery. *Aesth Plast Surg*. 2003;27:100–103. Available at <https://link.springer.com/article/10.1007/s00266-003-0117-7>.
- Pacik PT. Pain management in augmentation mammoplasty: a randomized, comparative study of the use of a continuous infusion versus self-administration intermittent bolus of a local anesthetic. *Aesthetic Surg J*. 2004;24:523–530. Available at <https://academic.oup.com/asj/article/24/6/523/227446>.
- Chung F, Ritchie E, Su J. Postoperative pain in ambulatory surgery. *Anesth Analg*. 1997;85:808–816. Available at http://journals.lww.com/anesthesia-analgesia/Abstract/1997/10000/Postoperative_Pain_in_Ambulatory_Surgery.17.aspx.
- Zhibo X, Miaobo Z. Effect of sustained-release lidocaine on reduction of pain after subpectoral breast augmentation. *Aesthetic Surg J*. 2009;29:32–34. Available at <https://academic.oup.com/asj/article/29/1/32/295252>.
- Mahabir RC, Peterson BD, Scott Williamson J, et al. Locally administered ketorolac and bupivacaine for control of postoperative pain in breast augmentation patients. *Plast Reconstr Surg*. 2004;114:1910–1916. Available at http://journals.lww.com/plasreconsurg/Abstract/2004/12000/Locally_Administered_Ketorolac_and_Bupivacaine_for.34.aspx.
- McCarthy CM, Pusic AL, Hidalgo DA. Efficacy of pocket irrigation with bupivacaine and ketorolac in breast augmentation: a randomized controlled trial. *Ann Plast Surg*. 2009;62:15–17. Available at http://journals.lww.com/annalsplasticsurgery/Abstract/2009/01000/Efficacy_of_Pocket_Irrigation_With_Bupivacaine_and.6.aspx.
- Vijay BS, Mitra S, Jamil SN. Refractory cardiac arrest due to inadvertent intravenous injection of 0.25% bupivacaine used for local infiltration anesthesia. *Anesth Essays Res*. 2013;7:130–132. Available at <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4173496/?report=reader>.
- Koeppe T, Constantinescu MA, Schneider J, et al. Current trends in local anesthesia in cosmetic plastic surgery of the head and neck: results of a German national survey and observations on the use of ropivacaine. *Plast Reconstr Surg*. 2005;115:1723–1730.
- Koeppe T, Constantinescu M, Schneider J, et al. Current trends in local anesthesia in cosmetic plastic surgery of the head and neck: results of a German national survey and observations on the use of ropivacaine. *Plast Reconstr Surg*. 2005;115:1723–1730. Available at http://journals.lww.com/plasreconsurg/Abstract/2005/05000/Current_Trends_in_Local_Anesthesia_in_Cosmetic.37.aspx.
- Rawal N, Gupta A, Helsing M, et al. Pain relief following breast augmentation surgery: a comparison between incisional patient-controlled regional analgesia and traditional oral analgesia. *Eur J Anaesth*. 2006;23:1010–1017. Available at <https://www.cambridge.org/core/journals/european-journal-of-anaesthesiology/article/pain-relief-following-breast-augmentation-surgery-a-comparison-between-incisional-patient-controlled-regional-analgesia-and-traditional-oral-analgesia/74B3D2CEF7BBA1FDE68DA791A4114E1F>.
- Mahabir RC, Peterson BD, Williamson JS, et al. Locally administered ketorolac and bupivacaine for control of postoperative pain in breast augmentation patients, part II: 10-day follow-up. *Plast Reconstr Surg*. 2008;121:638–643. Available at http://journals.lww.com/plasreconsurg/Abstract/2008/02000/Locally_Administered_Ketorolac_and_Bupivacaine_for.35.aspx.