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Clinical Science

Efficacy of transversus abdominis plane block with liposomal bupivacaine during open abdominal wall reconstruction

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KEYWORDS:
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Liposomal bupivacaine;
Pain reduction;
Narcotic consumption;
Hernia repair;
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Abstract

BACKGROUND: Transversus abdominis plane block (TAPb) is an analgesic adjunct used for abdominal surgical procedures. Liposomal bupivacaine (LB) demonstrates prolonged analgesic effects, up to 72 hours. We evaluated the analgesic efficacy of TAPb using LB for patients undergoing open abdominal wall reconstruction (AWR).

METHODS: Fifty patients undergoing AWR with TAPb using LB (TAP-group) were compared with a matched historical cohort undergoing AWR without TAPb (control group). Outcome measures included postoperative utilization of morphine equivalents, numerical rating scale pain scores, time to oral narcotics, and length of stay (LOS).

RESULTS: Cohorts were matched demographically. No complications were associated with TAPb or LB. TAP-group evidenced significantly reduced narcotic requirements on operative day (9.5 mg vs 16.5 mg, $P = .004$), postoperative day (POD) 1 (26.7 mg vs 39.5 mg, $P = .01$) and POD2 (29.6 mg vs 40.7 mg, $P = .047$) and pain scores on operative day (5.1 vs 7.0, $P < .001$), POD1 (4.2 vs 5.5, $P = .002$), and POD2 (3.9 vs 4.8, $P = .04$). In addition, TAP-group demonstrated significantly shorter time to oral narcotics (2.7 days vs 4.0 days, $P < .001$) and median LOS (5.2 days vs 6.8 days, $P = .004$).

CONCLUSIONS: TAPb with LB demonstrated significant reductions in narcotic consumption and improved pain control. TAPb allowed for earlier discontinuation of intravenous narcotics and shorter LOS. Intraoperative TAPb with LB appears to be an effective adjunct for perioperative analgesia in patients undergoing open AWR.

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Reduction of postoperative pain remains an essential goal for all surgeons. Pain is not only associated with worsened quality of life measures but can also lead to increased costs associated with hospitalization and prolonged convalescence.[1–3] Recently, there has been a shift toward a multimodal approach to postoperative analgesia across many fields of surgery. The goal is not only a reduction of pain but also decreased narcotic usage, with minimization of associated side effects.[4–6] One modality used for

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general surgical procedures is the transversus abdominis plane (TAP) block, a regional anesthetic technique that blocks the neural afferents of the anterolateral abdominal wall. The efficacy of this technique is reliant on interrupting the nociceptive signals carried from the afferent neurovascular bundles derived from the ventral rami of T6-L1, which travel between the internal oblique and transversus abdominis muscles.[7] As traditionally described, a TAP block (TAPb) is performed with insertion of a needle into the triangle of Petit that is bounded by the latissimus dorsi muscle posteriorly, the external oblique muscle anteriorly, and the iliac crest inferiorly. The needle penetrates the abdominal wall until the TAP is accessed and a long-acting local anesthetic is delivered[8] (Fig. 1). More recently, ultrasound guidance has been used for further precision and delivery under radiographic visualization.[9] For midline abdominal procedures, TAPb has been performed under direct visualization bilaterally by the surgeon with reported clinical efficacy.[10]

Several studies have demonstrated the benefit of TAPb during abdominal surgery in regard to reduction of postoperative pain, narcotic consumption, and length of hospital stay. Petersen et al[11] reviewed 7 randomized clinical trials (n = 364), investigating the utility during of TAPb during abdominal surgery and found significant reductions in postoperative opioid requirements along with reported pain scores. Furthermore, reductions were also seen in rates of opioid-related side effects including sedation and postoperative nausea and vomiting. Specifically, in three of the trials, McDonnell et al[8,12,13] and Carney et al[12,13] demonstrated the efficacy of TAPb in reducing postoperative pain in the first 24 to 48 hours in patients undergoing large bowel resection, elective cesarean, and total abdominal hysterectomy.

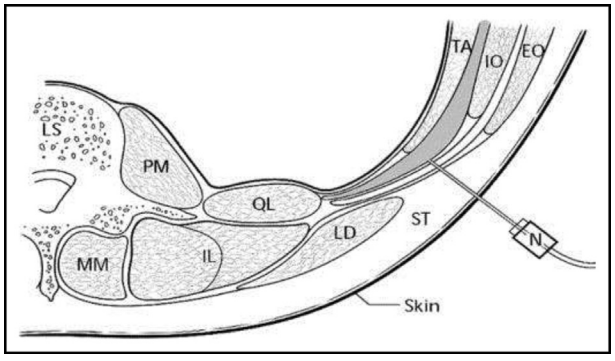

Figure 1 Traditional TAP block delivery—transverse section through the abdominal wall at the level of the lumbar triangle of Petit (TOP). The floor of the triangle is composed, from superficial to deep, of the fascial extensions of external oblique, internal oblique, and transversus abdominis, respectively, and the peritoneum. The needle is shown in the transversus abdominis plane, and the fascial layers have separated as a result of the injection of local anesthetic. EO = external oblique; IL = longissimus iliocostalis; IO = internal oblique; LD = latissimus dorsi; LS = lumbar spine; MM = multifidus muscle; PM = psoas major; QL = quadratus lumborum; ST = subcutaneous tissue; TA = transversus abdominis.

Similarly, in patients undergoing laparoscopic cholecystectomy, a review by Keir et al[14] recently concluded that TAPb in laparoscopic cholecystectomy leads to a reduction in pain scores and analgesic requirement. Finally, by adding TAPb to their postoperative recovery pathway, Delaney and Favuzza[15] reported a reduction in length of stay (LOS) in patients undergoing elective laparoscopic colectomy without an increase in complication or readmission rates.

Pain after major open ventral hernia repair (VHR)/abdominal wall reconstruction (AWR) is one of main issues encountered by surgeons postoperatively. Large incisions coupled with extensive tissue dissection combined with mesh placement and fixation have all contributed to the fact that hernia repairs are among the most painful surgical procedures performed. Although the use of TAPb in other abdominal procedures has been studied, its utilization in patients undergoing major open VHR/AWR has not been investigated to date. We used the TAPb technique by directly accessing the TAP plane through the cut edge of the transversus abdominis muscle (Fig. 2) and using a long-acting multivesicular liposomal formulation of bupivacaine; EXPAREL (Pacira Pharmaceuticals, Parsippany, NJ). In this study, we aimed to evaluate the effects of TAP block with EXPAREL (TAPb-E) on postoperative outcomes for patients undergoing major AWR. We hypothesized that the use of TAPb-E results in significant improvement in postoperative pain, reduction in opiate requirement, and shorter hospitalizations.

Methods

After obtaining appropriate institutional review board approval, we identified 50 consecutive patients undergoing open AWR who received TAPb-E. The data were collected prospectively as a part of a Continuous Quality Improvement project and then reviewed. Inclusion criteria included open VHR performed with posterior component separation via transversus abdominis muscle release[16] and sublay synthetic mesh placement without any concomitant procedures. We excluded patients with history of chronic pain or narcotic use. In addition, we excluded patients undergoing repairs with concomitant intestinal resection, along with those who

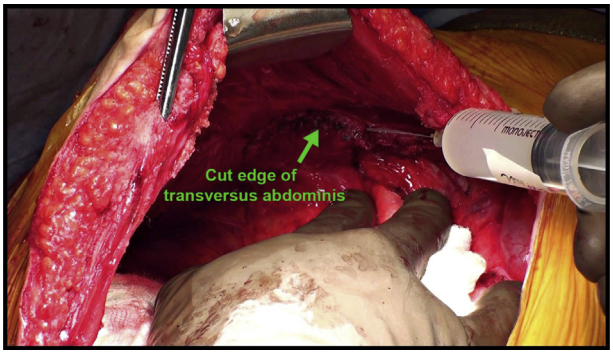

Figure 2 Intraoperative TAP block delivery—20 cc of liposomal bupivacaine (EXPAREL) is delivered using the cut edge of transversus abdominis to access the TAP under direct visualization.

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