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TAP Blocks: A Recent Review of Anesthetic Combinations

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Abstract

Multimodal analgesia is an approach to optimize pain relief by treating pain through several mechanisms along multiple sites of the nociceptive pathway. This approach not only improves pain, but also patient satisfaction. It also decreases use of narcotic pain medications, and provides faster recovery and mobilization. Transversus abdominis plane (TAP) blocks are a vital part of this approach. Different techniques have been documented with combination of local anesthetics incorporating different adjuvants for abdominal surgeries; however, a formulary regimen has not been cited. An independent literature review was performed. Articles reporting TAP blocks for abdominal surgical procedures, mainly in combination with another adjuvant and comparing the outcomes. TAP blocks are safe procedures for abdominal surgeries for postoperative multimodal approach pain control. It is best achieved with the combination of long-acting local anesthetics, such as ropivicaine or bupivacaine, with an adjuvant, such as alpha-2 agonists, steroids or morphine, *vs.* using only local anesthetic. Minimal to no side effects has been reported regarding toxicity of local anesthetic when performing TAP blocks. This provides the opportunity to identify a particular regimen to obtain more effective results.

Keywords: TAP blocks; Postoperative analgesia; Regional anesthesia; Acute pain control

Introduction

The Transversus Abdominis Plane (TAP) block was first described in 2001 by Rafi AN. By utilizing anatomic landmarks to determine the needle insertion site within the lumbar triangle of Petit, a single “pop” sensation served as an endpoint for appropriate needle depth to provide analgesia to the parietal peritoneum as well as the skin and muscles of the anterior abdominal wall [1]. Later, O’Donnell described the “double pop” technique, which resulted from the blunt needle passing through the fascial of external and internal oblique muscles within the floor of the triangle of Petit [2]. Recently, ultrasound-guided approach was first described in 2007 by Hebbard et al. which provides direct needle visualization as it approaches and reaches the target fascial plane, as well as a hypoechoic image, created by injection of local anesthetic [3].

Innervation of the anterolateral abdominal wall arises from the anterior rami of spinal nerves T7 to L1, including intercostal nerves (T7-T11), subcostal nerve (T12) and iliohypogastric and ilioinguinal nerves (L1). The target of the TAP block is the space between internal oblique and transverse abdominis muscle where the nerves are located. The innervation to abdominal skin, muscles and parietal peritoneum are blocked, but dull visceral pain from spasm or inflammation following surgical procedure will still be experienced [4].

In regards to abdominal procedures, TAP blocks have been demonstrated to decrease the use of postoperative opioids, increase the time to first request for further analgesia, and provide more effective pain relief, while decreasing opioid related side effects such as sedation and postoperative nausea and vomiting. Earlier mobilization faster recovery was also reported [5,6]. Different local anesthetics alone and in combination with other medications have been described in the literature for better anesthesia and longer duration of effect. Our aim is to review current literature to evaluate the efficacy in combinations of different approaches and determine which one provides the best outcomes to patients.

Discussion

Bupivicaine *vs.* Moprhine+Bupivicaine

With the aid of ultrasound Sherif et al. studied the effect of morphine in combination with bupivacaine in TAP block for postoperative analgesia following lower abdominal cancer surgery in a randomized controlled study. Sixty patients were enrolled and divided in two groups (30 each). One group had 20 ml 0.5% bupivacaine diluted in 20 ml saline, and the Morphine group with 20 ml 0.5% bupivacaine+10 mg morphine sulphate diluted in 20 ml saline. Results demonstrated that when morphine was added to bupivacaine, when compared to bupivacaine alone, there was reduced total morphine consumption as well as prolonged time to request for analgesics. Also, there was a decrease in Visual Analog Scale (VAS) for pain in the combination group over the course of 12 hours postoperatively. No significant differences in hemodynamics, respiratory rate, oxygen saturation, sedation score, and side effects except for nausea were observed ($p>0.05$) [7].

Bupivicaine *vs.* Bupivicaine+Clonidine

Singh et al. evaluated Addition of clonidine to bupivacaine after cesarean section also using US guidance. One hundred patients, American Society of Anesthesiologists grade I and II were evaluated. These subjects underwent low segment cesarean section under spinal anesthesia and were randomly divided in half to receive either 20 ml bupivacaine 0.25 or 20 ml bupivacaine+1 μg/kg clonidine bilaterally *via* TAP block in a double-blind fashion. Duration of analgesia, satisfaction score, requirement of analgesics in the first 24 h, and the side effects of clonidine (sedation, dryness of mouth, hypotension, and bradycardia) were observed. Duration of analgesia was significantly longer in the second group receiving bupivacaine and clonidine compared to the group receiving just bupivicaine (P<0.01). Additionally the combination with clonidine prolonged analgesia by 10-12 h and reduced overall postoperative analgesic requirements. For those who received the combination with clonidine, none of the patients experienced hypotension or bradycardia [8].

Bupivicaine *vs.* Bupivicaine+Dexmedetomidine

The effect of bupivacaine and dexmedetomidine added to bupivacaine used in TAP block by US guidance on postoperative pain was evaluated by Aksu et al. Sixty three patient enrolled, divided in 3 groups. Group C (Control) had TAP block with 21 mL 0.9% saline, Group B had 20 mL 0.5% bupivacaine+1 mL saline, Group BD and 20 mL 0.5% bupivacaine+1 mL 100 µg dexmedetomidine. Results demonstrated that with the addition of dexmedetomidine, the treatment of postoperative pain compared to control group and group B was significant. VAS was lower at 10-24 hours, morphine consumption was lower and higher patient satisfaction for group BD. No difference was found on nausea and vomiting score, neither in the requirement of antiemetics [9].

Ropivicaine *vs.* Ropivicaine+Dexmedetomidine

In a double blind study by Manjaree Mishra et al. the effect of dexmedetomidina with ropivacaine was studied using 40 patients. Patients were divided into two groups: Group R (n=20) where patients received bilateral TAP block using 20 ml of ropivacaine 0.2% and 2 ml of normal saline, and Group RD (n=20) who received dexmedetomidine 0.5 mcg/kg dissolved in 2 ml of normal saline and added to 20 ml of ropivacaine 0.2%. Blocks were performed in the operating room after intubation. Age and gender were taken in consideration in this study, showing no significant different between those variables, as well as nausea and vomiting. The results of this study showed that the group receiving combination of ropivacaine and dexmedetomidine has significantly lower pain scores postoperatively that the group receiving only ropivacaine [10].

Ropivicaine *vs.* Ropivicaine+Dexamethsaone

The adjuvant effect of dexamethasone added to ropivacaine was also evaluated by Wegner et al. for inguinal hernia repair and spermatocelectomy. Eighty-two patients were selected, with forty one receiving a TAP block with ropivacaine 0.2% combined with saline and the other forty one receiving ropivacaine 0.2% combined with 8 mg of dexamethasone. Preoperative and postoperative pain evaluations were recorded. Improvement was noted with in both groups, but with significant difference in VAS at 12, 24 nor 48 hours [11].

Ropivicaine *vs.* Bupivicaine

One study compared TAP block with the use of bupivacaine *vs* ropivacaine in patients undergoing laparoscopic cholecystectomies. Sixty adults were randomized to receive ultrasound-guided TAP block with either 0.25% bupivacaine (Group I, n=30) or 0.375% ropivacaine (Group II, n=30). All patients were assessed for post-operative pain and rescue analgesic consumption at 10 min, 30 min, 1 h, 4 h, 8 h, 12 h and 24 h time points. Analgesia was significantly better at 10 min, 30 min and 1 h for patients receiving ropivacaine, but interestingly there was no difference at 24 h. [12].

Conclusion

Many combinations have been described to achieve the effective pain relief in patients undergoing abdominal surgery. First, we can established that an adequate techniques needs to be used for injection of local anesthetic. Ultrasound technique is the most accurate and provides visualization of the muscle plains, needle and administration of medication in the correct space. Second, the combination of local anesthetics with other adjuvant (alpha-2 agonist, morphine, steroids), definitely improves pain control in patient undergoing lower abdominal surgery and patient satisfaction. Thirdly, the side effects of local anesthetics and complication from TAP blocks are very low, with no reported literature of serious side effects such as, seizure or cardiac instability [13].

Limitations that is that not all studies evaluated the use of intraoperative opioids [11], NSAIDs or Acetaminophen which would affect the pain scale postoperatively, as well as the history and rick factors for PONV. Also, comparison was between different abdominal surgeries in the same studies [7,10], this includes different incisions and port placement in the abdomen, making it less accurate to assess. Another major limitation in many studies is the small sample, which can be not representative population [10]. Evaluation of pain during mobilization was not taken in consideration or not reported in any of the studies reviewed for this paper.

Further well designed studies are needed to assess the best combination of local anesthetic and an adjuvant to prolong analgesia, patient satisfaction and faster mobilization and recovery. A prospective, randomized study, comparing same local anesthetic alone and in combination, taking in consideration the limitations previously discussed.

Many long acting anesthetics such as tetra Caine had fallen out of favor clinically because of the potential adverse effects of toxicity with the long acting properties. Because of the low adverse effects documented in recent literature, it opens the opportunity for these agents to be used clinically again.

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Conflict of Interest Statement

No conflicts of interest

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