

Ultrasound-guided Transversus Abdominis Plane (US-TAP) Block

Post-operative Analgesia after Laparoscopic Cholecystectomy

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INTRODUCTION

- **TAP block**
 - Primary indication is to provide analgesia for major surgical procedures of the anterolateral abdominal wall¹
 - An alternative strategy or adjuvant to reduce intra-operative opioid consumption and post-operative pain after laparoscopic cholecystectomy¹⁻⁴
 - Ultrasound-guided TAP block increases margin of safety and block quality by allowing direct visualization to to:^{1,3,5}
 - identify abdominal wall muscle and fascial layers (Figure 2)
 - precisely advance the needle to the correct plane for injection of local anesthetic solution
- Ultrasound anatomy of the three abdominal wall muscle layers⁵
 - External oblique muscle (EO) - most superficial
 - Internal oblique muscle (IO)
 - Transversus abdominis muscle (TA)
- **Goal:**
 - Deposition of local anesthetics within the transversus abdominis plane, which is situated between the IO and TA (Figure 3)
 - Blockade of intercostal nerves T7 – L1 that provide sensory innervation to the skin, muscles and parietal peritoneum of the anterolateral abdominal wall²

METHOD

- Search for relevant literature comprised of:
 - PubMed, EBSCO, Cochrane databases for peer-reviewed journals, meta-analyses, systemic reviews, randomized controlled trials, review articles
 - Key search words include combinations of 'ultrasound-guided', 'transversus abdominis plane block', 'laparoscopy', and 'laparoscopic cholecystectomy'
 - Primary articles within last 5 years
- **Technique^{2,3,5}**
 - Patient position: Supine
 - Transducer position: Transverse (horizontal) on the skin, above the iliac crest in the anterior mid-axillary line
 - Needle position: In-plane technique, insert perpendicular to skin



Figure 1. Positioning of ultrasound transducer and in-plane needle technique for mid-axillary TAP block. Copyright © 2014 AANA



Figure 2. Transverse ultrasound view of abdominal wall muscle layers. Copyright © 2015 Courtesy of Dr. David Rosenbaum



Figure 3. Sonogram of needle tip positioned into the transversus abdominis plane prior to injection. Copyright © 2007 Anaesth Intensive Care

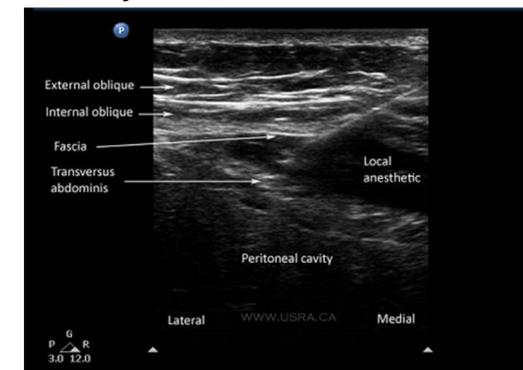


Figure 4. Visualization of local anesthetic spread after it has been injected into the TAP. Copyright © 2013 Saudi J Anaesth

Randomized Controlled Trials						
Evidence Source	Evidence Type	Operation Performed	n	Groups	Treatment Protocol	Primary Outcome
Ra et al. (2010) ²	Randomized controlled trials	Laparoscopic cholecystectomy	54	Group B _{0.5} : TAP block with 0.5% solution (n=18) Group B _{0.25} : TAP block with 0.25% solution (n=18) Control Group: Systemic analgesia (n=18)	TAP group: Ultrasound guided Non TAP group: No US-TAP performed	Intraoperative use of remifentanyl for US-TAP block with 0.25% or 0.5% levobupivacaine groups were significantly lower than that for the Control Group
El-Dawlatley et al. (2009) ³	Randomized controlled trials	Laparoscopic cholecystectomy	42	Group A: TAP block (n=21) Group B: Non TAP group (systemic analgesia) (n=21)	TAP group: Ultrasound guided Non TAP group: Placebo 0.9% saline	Overall reduction in the intraoperative use of sufentanil requirements in patients with TAP block as compared to those without.

RESULTS

- Utilizing ultrasound guidance for TAP block administration
 - Intra-operative analgesia requirement:
 - Remifentanyl mean use for Group B_{0.25} and Group B_{0.5} was significantly lower than that for Group Control²
 - Group B_{0.25} 469.8 mcg, Group B_{0.5} 435.1 mcg, Control Group 685.5 mcg
 - Sufentanil mean use significantly reduced in the TAP group³
 - TAP group mean 8.6 mcg ± 3.5 mcg
 - Non TAP group mean 23.0 mcg ± 4.8 mcg
 - Post-operative analgesia demand:
 - Number of patients whom fentanyl was administered
 - 0 in Group B_{0.25} and Group B_{0.5}, 4 in Group Control²
 - Demand for morphine via PCA device³
 - TAP group mean 0.9 mg ± 0.7 mg
 - Non TAP group mean 2.3 mg ± 1.0 mg

DISCUSSION/CONCLUSION

- Better pain relief, less opioid requirements during operation and post-operative analgesics, resulting in proportionally less opioid-mediated adverse effects⁴
- Enhanced patient recovery, earlier mobilization promoted, shorter hospital stay, and ultimately increased patient satisfaction²

KEY REFERENCES

1. Abrahams MS, Horn JL, Noles LM, Aziz MF. Evidence-based medicine: Ultrasound guidance for truncal blocks. *Reg Anesth Pain Med.* 2010;35(2 Suppl):S36-S42.
2. Ra YS, Kim CH, Lee GY, Han JI. The analgesic effect of the ultrasound-guided transversus abdominis plane block after laparoscopic cholecystectomy. *Korean J Anesthesiol.* 2010;58(4):362-368.
3. El-Dawlatly AA, Turkistani A, Kettner SC, et al. Ultrasound-guided transversus abdominis plane block: Description of a new technique and comparison with conventional systemic analgesia during laparoscopic cholecystectomy. *Br J Anaesth.* 2009;102(6):763-767.
4. Zhao X, Tong Y, Ren H, et al. Transversus abdominis plane block for post-operative analgesia after laparoscopic surgery: A systematic review and meta-analysis. *Int J Clin Exp Med.* 2014;7(9):2966-2975.
5. Urigel S, Molter J. Transversus abdominis plane (TAP) blocks. *AANA J.* 2014;82(1):73-79.
6. Hebbard P, Fujiwara Y, Shibata Y, Royse C. Ultrasound-guided transversus abdominis plane (TAP) block. *Anaesth Intensive Care.* 2007;35(4):616-617.