Case Report

# Transversus abdominus blocks instead of general anesthesia in a child


**ABSTRACT**

The transversus abdominis plane (TAP) block is a peripheral nerve block that was originally described in 2001. Considering the sensory distribution of the TAP block, which does not provide visceral anesthesia, it has been used primarily for postoperative analgesia. We present the use of a TAP block as the sole anesthetic for placement of a cutaneous vesicostomy in a 4-year-old child with multiple comorbid conditions. The basic principles of the TAP block are presented, and its previous use instead of general in various clinical scenarios is reviewed.



**Key words:** Regional anesthesia; transversus abdominis block; vesicostomy


## Introduction

The transversus abdominis plane (TAP) block is a peripheral nerve block that is used primarily to provide postoperative analgesia. The technique, originally described by Rafi in 2001, involves the injection of a local anesthetic agent into the plane between the internal oblique and the transversus abdominis muscles muscle layers, with an injection via the triangle of Petit.[1] The nerve supply to anterolateral abdominal wall, which originates from anterior rami of spinal nerves T6–L1, travels in this plane.[2] Although originally described using a double loss of resistance technique as the two layers of muscle (external and internal oblique) are penetrated the current standard involves the use of ultrasound technology to visualize the muscle layers and ensure correct placement.[3] Since its initial description, there has been significant clinical experience with the use of the TAP block to provide analgesia following abdominal surgery including Cesarean section, hysterectomy, cholecystectomy, colectomy, and hernia repair.[4-6] Given the sensory coverage of the TAP block, it does not provide visceral analgesia and therefore has been used primarily for postoperative analgesia. We present the use of TAP block as the sole anesthetic for placement of a cutaneous vesicostomy in a 4-year-old child with multiple comorbid conditions. The basic principles behind the TAP block are reviewed and its use as the sole anesthetic in various clinical scenarios is discussed.


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## Case Report

Institutional Review Board approval is not required for single case reports at Nationwide Children's Hospital (Columbus, OH). The patient was a 4-year-old, 10.5-kg girl who presented for creation of an organ-saving cutaneous vesicostomy. Comorbid conditions included a history of




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lumbar myelomeningocele, shunted hydrocephalus, recent upper respiratory tract infection, BiPAP-dependent central sleep apnea, and hydronephrosis with compromised renal function due to neurogenic bladder and vesicoureteral reflux. Several surgical procedures in the past had been complicated by a prolonged postoperative hospital stay secondary to failure to wean from positive pressure ventilation. During this admission, the patient was on BIPAP with an $FiO_2$ of 35%, inspiratory pressure of 12 $cmH_2O$, and expiratory pressure of 6 $cmH_2O$ at night. Given the multiple comorbid conditions and past postoperative issues, the decision was made to proceed with a TAP block with sedation as the sole anesthesia. The plan was discussed with the parents and informed consent obtained. On the day of surgery, the patient was held *nil per os* for 6 h and an intravenous infusion was started to provide maintenance fluids. The patient was transported to the operating room and standard American Society of Anesthesiologists monitors were placed. BiPAP was continued during the procedure with pressures of 12/6 $cmH_2O$. Dexmedetomidine 4 μg and ketamine 3 mg were used for sedation before placement of the TAP block. Bilateral TAP blocks were placed under ultrasound guidance with the patient in the supine position using a 22-gauge, 2" Stimuplex® block needle. About 10 mL of 0.25% bupivacaine with 1:200,000 epinephrine and 2 mg dexamethasone were administered as 5 mL on each side. Following this, cutaneous vesicostomy was performed without difficulty and the patient exhibited no signs of distress or change in vital signs during the whole procedure.

## Discussion

The thoracolumbar nerves of the spinal cord divide into anterior and posterior primary rami after exiting intervertebral foramen as the spinal nerves. The anterolateral abdominal wall is mainly innervated by the anterior rami of the spinal nerves (T6–L1). These rami branch into lateral and anterior cutaneous nerves becoming the intercostal (T6–T11), subcostal (T12), and ilioinguinal/iliohypogastric nerves (L1). Spread of the local anesthetic agents in the plane between the internal oblique and transversus abdominis muscles provides analgesia of the anterolateral abdominal wall. As it provides limited visceral analgesia, the TAP block has been used primarily for postoperative analgesia.

Although previous reports have described similar success in the adult population, to our knowledge, we report for the first time the use of a TAP block instead of general anesthesia in a child [Table 1].[7-12] Together, these reports include a total of eight patients. All are anecdotal involving single case reports except one that included three patients. As with our patient, all of the patients had significant comorbid conditions which would increase significantly the risks of general anesthesia. In addition to these anecdotal reports, Henshaw *et al*. reported successful use of a TAP block with intravenous sedation in 21 of 24 high-risk adult patients, in whom a peritoneal catheter was inserted or removed.[13] Although the majority of these anecdotal reports involve superficial procedures such as ileostomy, insertion of a gastrostomy tube, placement of a peritoneal catheter or drain, and appendectomy, others have reported more involved procedures including large bowel resection. In some cases, systemic opioids (intravenous fentanyl or a remifentanil infusion) were administered to provide analgesia for visceral pain.

Reported adverse effects of the TAP block and its placement have been relatively limited including anecdotal reports of inadvertent needle puncture of underlying structures (liver or bowel), transient femoral nerve palsy, intraperitoneal injection, and the potential for local anesthetic systemic toxicity given the large volume of local anesthetic that is used.[14-21] The potential for such events should be decreased by the use of ultrasound guidance. Absolute contraindications to the technique include patient refusal, soft tissue infection, or anatomic abnormalities of the abdominal wall and skin at the needle insertion site. The overall safety of the TAP block in children is demonstrated by a review of 1949 children from the Pediatric Regional Anesthesia Network.[22] Only two complications were reported including vascular aspiration of blood before local anesthetic injection and a peritoneal puncture resulting in an overall incidence of complications of 0.1%. Neither of these complications resulted in additional interventions or sequelae. Their data also suggest the need for close attention to recommended dosing guidelines for local anesthetic agents. The authors reported that 135 of 1944 patients (6.9%) subjects received doses that could be potentially toxic. Subjects who received potentially toxic doses were generally younger. These data clearly demonstrate the need to strictly adhere to dosing recommendations for local anesthetic agents.

In summary, we present the use of a TAP block instead of general anesthesia in an infant with multiple comorbid conditions. When compared with other regional anesthetic techniques, the TAP block may offer an alternative to neuraxial (spinal or caudal epidural) anesthesia especially when such techniques are specifically contraindicated such as increased intracranial pressure, anatomical abnormalities, or coagulation disturbances. The TAP block can be expected to provide superficial cutaneous anesthesia and not visceral coverage. Especially in the pediatric population, attention

**Table 1: Reports of the use of the TAP block instead of general anesthesia**

| Author and reference | Demographic information | Outcome |
|---|---|---|
| Kitaba *et al*.[7] | 33-year-old, 84-kg woman with complex CHD and failing Fontan physiology for placement of a paracentesis catheter to remove ascites | Sedation with midazolam and ketamine sedation were followed by placement of a right-sided TAP with 10 mL of 0.5% ropivacaine with 1:200,000 epinephrine. A paracentesis catheter was placed and tunneled subcutaneously without complaints or response to surgical manipulation. |
| Mishra *et al*.[8] | 67-year-old, 55-kg woman with COPD, respiratory failure and peritonitis for laparotomy | Sedation with dexmedetomidine was followed by placement of bilateral TAP blocks. Laparotomy revealed an ileal perforation, which was sealed with omentum without complications. |
| Vuong *et al*.[9] | Case series of three adult patients with comorbid conditions:<br>92-year-old, 64-kg woman with HTN, carotid and CAD, and CVA or extensive stoma revision for large bowel resection<br>66-year-old, 115-kg man with UC, CAD, severe HF, ICD for loop ileostomy<br>91-year-old, 70-kg woman with CAD, valvular heart disease, pacemaker, CKD, HTN, GERD, and Parkinson's disease for resection of a cecal adenocarcinoma | Sedation with midazolam and fentanyl followed by placement of bilateral TAP blocks prior to intra-abdominal procedures in the three patients. |
| Lee *et al*.[10] | 80-year-old man with aspiration pneumonia, HTN, DM, ischemic heart disease, spinal stenosis, and a history of cerebral infarction for open gastrostomy | Local infiltration of the skin was followed by placement of a left TAP block with 20 mL of 0.25% levo-bupivacaine. Fentanyl was required in the middle of the surgery due to patient discomfort. A gastrostomy tube inserted without complication. |
| Ali and Shehata[11] | 19-year-old, 63-kg man with appendicitis and no comorbid conditions for appendectomy | Sedation with midazolam and fentanyl followed by placement of right-side TAP with 30 mL of 0.5% bupivacaine. Appendectomy performed without complication |
| O'Connor and Renfrew[12] | Frail, elderly (age not specified) patient with limited physiological reserve for ileostomy placement | Subcostal TAP block with 20 ml of 0.5% levo-bupivacaine. Remifentanil infusion was used to provide visceral analgesia |

CHD: Congenital heart disease; TAP: Transversus abdominis plane block; CAD: Coronary artery disease; HTN: Hypertension; UC: Ulcerative colitis; ICD: Implantable cardiac defibrillator; DM: Diabetes mellitus; CKD: Chronic kidney disease; GERD: Gastroesophageal reflux disease

to local anesthetic dosing guidelines is recommended. The use of ultrasound may not only improve the accuracy of the technique but also limit the potential for inadvertent damage to underlying structures.

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### Conflicts of interest
There are no conflicts of interest.

## References

1. Rafi AN. Abdominal field block: A new approach via the lumbar triangle. Anaesthesia 2001;56:1024-6.
2. Rozen WM, Tran TMN, Ashton MW, Barrington MJ, Ivanusic JJ, Taylor GI. Refining the course of the thoracolumbar nerves: A new understanding of the innervation of the anterior abdominal wall. Clin Anatomy 2008;21:325-33.
3. Bhalla T, Sawardekar A, Dewhirst E, Jagannathan N, Tobias JD. Ultrasound guided trunk and core blocks in infants and children. J Anesth 2013;27:109-123.
4. Brogi E, Kazan R, Cyr S, Giunta F, Hemmerling TM. Transversus abdominal plane block for postoperative analgesia: A systematic review and meta-analysis of randomized-controlled trials. Can J Anaesth 2016;63:1184-96.
5. Gao T, Zhang JJ, Xi FC, Shi JL, Lu Y, Tan SJ, *et al*. Evaluation of transversus abdominis plane (TAP) block in hernia surgery. Clin J Pain 2017;33:369-75.
6. Elkassabany N, Ahmed M, Malkowicz SB, Heitjan DF, Isserman JA, Ochroch EA. Comparison between the analgesic efficacy of transversus abdominis plane (TAP) block and placebo in open retropubic radical prostatectomy: A prospective, randomized, double-blinded study. J Clin Anesth 2013;25:459-65.
7. Kitaba A, Martin DP, Bhalla T, McKee C, Winch C, Tobias JD. Transversus abdominis plane (TAP) block for placement of a paracentesis catheter with failed Fontan physiology. Anaesth Pain Intensive Care 2012;16:179-182.
8. Mishra L, Pani N, Mishra D, Patel N. Bilateral transversus abdominis plane block as a sole anesthetic technique in emergency surgery for perforated peritonitis in a high risk patient. J Anaesthesiol Clin Pharmacol 2013;29:540-2.
9. Vuong JT, McQuillan PM, Messaris E, Adhikary SD. Transversus abdominis plane block as the primary anesthetic for laparotomy. J Anaesthesiol Clin Pharmacol 2014;30:419-21.
10. Lee AR, Choe YS. Anesthesia experience for open gastrostomy with ultrasound-guided unilateral subcostal transversus abdominis plane block in a high risk elderly patient: A case report. Anesth Pain Med 2015;5:e24890.
11. Ali HM, Shehata AH. Open appendectomy using ultrasound guided transversus abdominis plane block: A case report. Anesth Pain Med 2017;7:e38118.
12. O'Connor K, Renfrew C. Subcostal transversus abdominis plane block. Anaesthesia 2010;65:82-93.
13. Henshaw DS, Baker ML, Weller RS, Reynolds JW, Jaffe JD. Transversus abdominis plane block as the primary anesthetic for peritoneal dialysis catheter surgery. J Clin Anesth 2016;31:182-8.
14. Sforza M, Andjelkov K, Zaccheddu R, Nagi H, Colic M. Transversus abdominis plane block anesthesia in abdominoplasties. Plast Reconst Surg 2011;128:529-35.
15. Jankovic Z, Ahmad N, Ravishankar N, Archer F. Transversus abdominis plane block: How safe is it? Anesth Analg 2008;107:1758-9.
16. Lancaster P, Chadwick M. Liver trauma secondary to ultrasound-guided transversus abdominis plane block. Br J Anaesth 2010;104:509-10.
17. Frigon C, Mai R, Valois-Gomez T, Desparmet J. Bowel hematoma following an iliohypogastric-ilioinguinal nerve block. Paediatr Anaesth

2006;16:993-6.
18. Lancaster P, Chadwick M. Liver trauma secondary to ultrasound-guided transversus abdominis plane block. Br J Anaesth 2010;104:509-10.
19. Farooq M, Carey M. A case of liver trauma with a blunt regional anesthesia needle while performing transversus abdominis plane block. Reg Anesth Pain Med 2008;33:274-75.
20. Kato N, Fujiwara Y, Harato M, Kurokawa S, Shibata Y, Harada J, *et al*. Serum concentration of lidocaine after transversus abdominis plane block. J Anesth 2009;23:298-300.
21. Griffiths JD, Barron FA, Grant S, Bjorksten AR, Hebbard P, Royse CF. Plasma ropivacaine concentrations after ultrasound-guided transversus abdominis plane block. Br J Anaesth 2010;105:853-6.
22. Long JB, Birmingham PK, De Oliveira GS Jr, Schaldenbrand KM, Suresh S. Transversus abdominis plane block in children: A multicenter safety analysis of 1994 cases from the PRAN (Pediatric Regional Anesthesia Network) database. Anesth Analg 2014;119:395-9.