



CASE REPORT

Analgesic efficacy of transversus abdominis plane block in neonates and early infants for colostomy and reversal of colostomy

Yenidoğanlar ve küçük çocuklarda kolostomi ve kolostominin kapatılması sırasında uygulanan transversus abdominis plan bloğun analjezik etkinliği

Chee Kean CHEN,¹ Shu Ching TEO,² Vui Eng PHUI,³ Mat Ariffin SAMAN²

Summary

The application of ultrasound-guided transversus abdominis plane (TAP) block in paediatric population is gaining popularity among anaesthetists. We present a case series of ultrasound-guided TAP block in ten neonate and infants undergoing colostomy and reversal of stoma. Classical TAP as described by Hebbard was carried out and a maximum dosage of 1 ml/kg of 0.25% levobupivacaine was injected. Pain score was assessed using Neonatal Infant Pain Scale for 24 hours. In all patients, the block was successful with minimal hemodynamic changes intraoperatively and no additional systemic analgesia was needed intraoperative and immediate postoperatively. Ultrasound-guided TAP block has an important role in providing safe and effective analgesia for colostomy creation and reversal of stoma surgeries in paediatric population.

Keywords: Colostomy; paediatric surgery; transversus abdominis plane block.

Özet

Pediyatrik hastalarda ultrason eşliğinde transversus abdominis plan (TAP) bloğu anestezi uzmanları arasında popülerite kazanmaktadır. Kolostomi ve stomanın kapatılması sırasında 10 yenidoğan ve bebekte ultrason eşliğinde TAP bloğu olgu çalışmasını sunuyoruz. Hebbard tarafından tanımlanan klasik TAP uygulandı ve maksimum 1 ml/kg dozda %0.25 levobupivakain enjekte edildi. Yenidoğan Ağrı Ölçeği kullanılarak 24 saat boyunca ağrı skorları değerlendirildi. Hastaların hepsinde minimal hemodinamik değişikliklerle blok başarılı oldu, ameliyat sırasında ve erken ameliyat sonrası dönemde ilave sistemik analjeziğe gerek duyulmadı. Kolostomi oluşturma ve stomayı kapatma için ultrason eşliğinde TAP bölümeği güvenli ve etkili analjezi sağlama da önemli bir role sahiptir.

Anahtar Kelimeler: Kolostomi; pediyatrik cerrahi; transversus abdominis plan bloğu.

Introduction

Post-surgical anterior abdominal pain is very common and it causes significant morbidity among patients undergoing abdominal surgery.^[1,2] Even most recently, providing adequate pain relief for postoperative pain remains a challenge for both surgeons and anaesthetists, especially in paediatric patients, where postoperative apnoea is a major concern when opioids are

administered.^[3] Inadequate postoperative pain relief on the other hand will cause significant hardship to children, parents and nurses during postoperative recovery.^[4] Recent advancement in ultrasound-guided regional anaesthesia (USRA) has led to a safer and more precise practice in providing analgesia. This is especially true for the management of postoperative abdominal pain when transversus abdominis plane (TAP) block was introduced a few years ago.^[5]

¹Department of Anesthesiology, Kuching Specialist Hospital, Kuching, Malaysia

²Department of Anesthesiology, Sarawak General Hospital, Kuching, Malaysia

³Department of Internal Medicine, Sarawak General Hospital, Kuching, Malaysia

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Correspondence: Dr. Chee Kean Chen. Lot 10420, Block 11, Tabuan Stutong Commercial Centre 93856 Kuching, Malaysia.

Tel: +60 - 125255262 **e-mail:** chenck@hotmail.my

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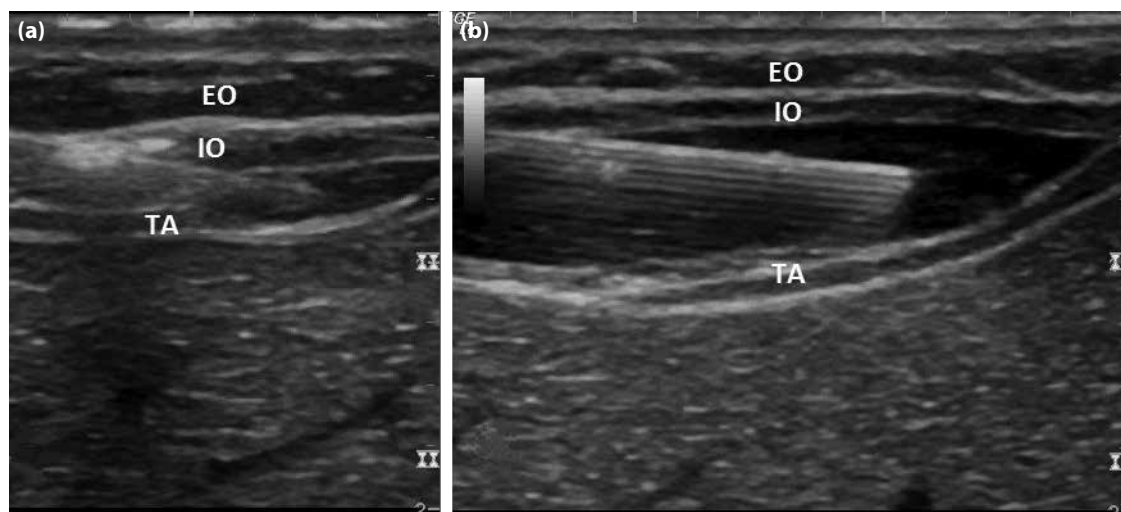


Figure 1. (a) Ultrasonography of anterior abdominal wall during initial needle insertion. (b) Ultrasonography of anterior abdominal wall when injectate separates internal oblique and transversus abdominis muscle. EO: External oblique muscle; IO: Internal oblique muscle; TA: Transversus abdominis muscle.

TAP block was routinely performed in our institution for certain short surgeries in adult patients, e.g.: appendicectomy, cholecystectomy, colostomy and reversal of colostomy. After obtaining favourable postoperative outcomes in adult patients, we extended the application of ultrasound-guided TAP block to paediatric patients undergoing short surgical procedures. Reports on the application of TAP block among paediatric patients are still not widely available, especially among neonates and young infants. This case series is a review of analgesic efficacy of TAP block in 5 neonates and 5 infants below 10 months-old. Procedures included were colostomy (n=7), reversal of colostomy (n=2) and revision of colostomy (n=1).

Case Report

The present study with its included procedures was approved by Institutional Ethic Committee. This study evaluated the analgesic efficacy of ultrasound-guided TAP block for neonates and infants undergoing colostomy and reversal of colostomy was carried out from January 2011 to December 2012. After fulfilling the inclusion criteria, patient's parents were informed about risk and benefit of TAP, a part from risk of general anaesthesia. The informed risk of TAP block included inadvertent puncture of intra-abdominal organ, bleeding, infection, inadequate postoperative pain relief and failure of block. Written informed consents were obtained from patients' parents. Exclusion criteria were patients allergic to amino-amide local anaesthetics, presence of coagulopathy, local skin in-

fection at the needle puncture sites, and conversion of the above 2 procedures to major laparotomy.

Patient 1 to 4 was term neonates with the diagnoses of imperforated anus. Right transverse colostomy was carried out within 24 hours post-delivery. Patient 5 and 6 were diagnosed to have Hirschsprung's disease and colostomy was done during early infancy. Patient 7 to 9 had correction anorectal surgery previously and reversal of colostomy was done. Patient 10 with the diagnosis of imperforated anus had collapsed and malfunctioning stoma and revision of colostomy was done.

TAP blocks were placed after induction of general anaesthesia, either with sevoflurane or propofol induction, followed by atracurium for intubation. Under aseptic technique, either linear array probe (GE 12L-RS 5-13.0 MHz, GE LOGIQ e[®], GE Healthcare, UK) or 'hockey stick' ultrasound probe (GE i12L-RS 4-10 MHz, GE LOGIQ e[®], GE Healthcare, UK) was placed on the area between costal margin and iliac crest, along anterior axillary line to identify all layers of abdominal muscles. With 'in-plane' technique by using short bevel 24-gauge 1 inch Plexufix (B. Braun, Melsungen AG, Germany) was introduced from lateral side of ultrasound probe. Once the anatomy was ascertained, the needle was advanced under ultrasound guidance with the needle tip visualised at all times (Figure 1). With the tip observed in the TAP, a maximum amount 1 ml/kg of 0.25% levobupivacaine (Abbott, Elverum, Norway) was injected.

The primary endpoints were pain scores using Neonatal Infant Pain Scale (NIPS) at immediately postoperative, and at 12 hours. NIPS is a pain assessment tool which encompasses six parameters (facial expression, cry, breathing patterns, arms, legs and state of arousal), as summarized in Table 1.^[6] Each parameter comprised of a scoring system, which sum up to either a minimum score of 0 or maximum score of 7. No complications attributed to the block were noted. All hemodynamic parameters were stable intraoperatively and all the patients were extubated at surgery cessation. No opioid was administered intra- and postoperatively. Patients' characteristics, diagnosis, surgery performed and NIPS were summarized in Table 2.

Discussion

Abdominal surgery for anorectal anomaly in neonate is a common procedure. Traditionally intraoperative analgesia involves systemic opioid or regional anaesthesia either as an epidural blockade or local wound infiltration.^[7] Due to the immaturity of central nervous system, neonates are susceptible to respiratory depressant effect of systemic opioids, which can lead to apnea and necessitate ventilation or high dependency care postoperatively.^[3] Local wound infiltration technique has its limitation at a relatively low dose of local anaesthetic that can be used and hence requires lower concentration to achieve higher volumes.^[8] The assessment of pain intensity in paediatric patients has been debated over years and various methods of pain measurement have been developed.^[9] In our case series, postoperative pain assessment was performed with NIPS which was the most suitable methods for our patient's age group.^[6]

The anterolateral abdominal wall receives its main nerve supply from the anterior rami of spinal nerves T7 to L1. Branches from the anterior rami include the intercostal nerves (T7-T11), the subcostal nerve (T12) and the iliohypogastric and ilioinguinal nerves (L1). All these branches subsequently give rise to lateral cutaneous and anterior cutaneous branches as they become more superficial.^[10] TAP block is a regional anaesthesia technique where local anaesthetic is injected into the neurovascular plane between the transversus abdominis and internal oblique muscles in the anterolateral abdominal wall. The classical or posterior TAP block which involves the injection of local anaesthetic at the anterior axillary line between

Table 1. Neonatal Infant Pain Scale (NIPS)

Parameter	Finding	Points
Facial expression	Relaxed	0
	Grimace	1
Cry	No cry	0
	Whimper	1
	Vigorous crying	2
Breathing patterns	Relaxed	0
	Change in breathing	1
Arms	Restrained	0
	Relaxed	0
	Flexed	1
	Extended	1
Legs	Restrained	0
	Relaxed	0
	Flexed	1
	Extended	1
State of arousal	Sleeping	0
	Awake	0
	Fussy	1

NIPS: Total points for the 6 parameters, where minimum score is 0 and maximum score is 7.

the lower costal margin and iliac crest, provides ipsilateral sensory blockade in the anterolateral abdominal wall.^[5] Various studies have demonstrated the efficacy of TAP block in providing effective postoperative analgesia in patients undergoing appendectomy,^[11] hernia repair,^[12] cholecystectomy^[13] and caesarean delivery.^[14]

The practice of TAP block in paediatric patients is still sparse. In 2009, both Tekin et al. and Jacobs et al. reported the application of TAP in a neonate in two separate case reports respectively.^[15,16] Subsequently, Jacobs et al. reported an audit finding of ten neonates and infants undergoing various surgeries with the application of TAP block.^[17] In current case series, which only involved patients undergoing colostomy and closure of colostomy, demonstrated that TAP block is effective and safe in neonates and

Table 2. Patient characteristics, diagnosis and NIPS

No	Age	Weight (kg)	Surgical procedure	Surgical diagnoses	NIPS Immediate post-operation	NIPS 24 hours
1	1 day	3.20	Right transverse colostomy	Anorectal malformation	0	0
2	1 day	2.95	Right transverse colostomy	Anorectal malformation	0	0
3	1 day	3.25	Right transverse colostomy	Anorectal malformation	0	0
4	1 day	3.40	Right transverse colostomy	Anorectal malformation	0	0
5	39 days	4.00	Right transverse colostomy and biopsy	Hirschsprung's disease	0	0
6	22 days	3.10	Right transverse colostomy and biopsy	Hirschsprung's disease	0	1
7	6 months	4.75	Reversal of colostomy	Corrected anorectal malformation	0	0
8	10 months	7.50	Reversal of colostomy	Corrected anorectal malformation	0	0
9	11 months	7.10	Reversal of colostomy	Corrected anorectal malformation	0	0
10	2 months	4.25	Revision of colostomy	Anorectal malformation	0	0

NIPS: Neonatal infant pain scale.

infants. Intra-operative haemodynamic parameters remained within acceptable limits and opioids were avoided. The advantages of this regional anaesthesia for paediatric patients include possible shorter extubation time, prevention of neuraxial blockade and complications and reduction or avoidance of opioids usage, subsequently preventing its side-effects. In the paediatric population, especially premature infants, postoperative apnea is always a major concern if opioid is administered.

TAP block in paediatric patients particularly, requires ultrasound imaging owing to thin tissue plane and close proximity of between skin and peritoneum. The needle-tip is within millimeters of the bowel and liver parenchyma. With real-time monitoring of needle-tip position, we can avoid unnecessary over puncture and inappropriate spread of local anaesthetic. Even though performing regional anaesthesia in paediatric patients is considered hazardous due to their small habitus by many anaesthetists, but under ultrasound guidance, the procedure is much safer and easier in paediatric patients where the tissue plane is thin, thus allowing better visual resolution of anatomy, compare to adult patients. Short bevel needles further enhanced precision of positioning of the needle-tip in TAP with 'fascial click'.^[18]

The limitations of this case series were the small sample size and non-placebo controlled study. Perhaps uniform procedures or surgeries would have added more value to this report. However, the encouraging results from this series merit a randomized placebo controlled trial to further validate this technique. We suggest that this practice should be encouraged with the presence of operators who are experienced in both neonatal and USRA to avoid unnecessary complications. In conclusion, TAP block provides a safe and effective analgesia for colostomy creation and reversal of stoma surgeries in the paediatric population.

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