TransversusAbdominis Plane Block versus Caudal Epidural for Lower Abdominal Surgery in Pediatrics

Thesis

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Yassmin Hassan Abd El-Sattar

حقن العضلة المستعرضة مقارنة بالتخدير الذنبي في عمليات الجزء الأسفل من البطن

رســـــــالة

توطئة للحصول على درجة الدكتوراه في التخدير

مقدمةمن

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List of Abbreviations

(II/IH)	ilioinguinal/iliohypogastric
CA	caudal anesthesia
COX	cyclo-oxygenase
CRIES	cry, requires oxygen, increased vital signs, expression, sleeplessness
CT	Computed tomography
DAN	DouleurAiguë du Nouveau-né
ECG	Electrocardiogram
EO muscle	external oblique muscle
FLACC scale	Face, legs, activity, crying, and consolability (FLACC) scale.
HR	Heart rate
IO muscle	internal oblique muscle
LA	local anesthetic
LD muscle	Latissimus dorsi muscle
MAP	mean arterial blood pressure
MRI	Magnetic resonance imaging
NFC	neonatal facial coding system
NICU	neonatal intensive care unit
N-PASS	neonatal pain, agitation and sedation scale
NSAID	Non-steroidal anti-inflammatory
P.O	post operative
PACU	post anesthesia care unit
PIPP	premature infant pain profile
TA muscle	transversusabdominis muscle
TAP	TransversusAbdominis Plane
U/S	ultra sound
VAS scale	Visual Analogue Scale

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INTRODUCTION

Regional anesthesia is a cornerstone of modern pediatric anesthesia, with a large number of pediatric anesthetists combining general and regional anesthesia to provide superior and long-lasting analgesia without risk of respiratory depression ***(Bosenberg, 2004).***

Although caudal epidural blockade remains the most commonly employed regional block in the pediatric-aged patient, there is a trend toward the use of peripheral nerve blockade when applicable given the lower incidence of adverse effects when compared with neuraxial techniques. Furthermore, there may be specific anatomic variations or abnormalities, which preclude the use of caudal epidural blockade including bleeding disorders and coagulopathy, spinal dysraphism, bony anatomical abnormalities (VACTERL association) and those with altered intracranial compliance ***(Giaufre et al., 1996).***

The transverses abdominis plane (TAP) block is increasingly being used to provide analgesia after surgery involving the abdominal wall. Rafi introduced this block technique in 2001 as a landmark technique ***(Rafi, 2001).***

In a recent meta-analysis, the TAP block was shown to reduce the need for postoperative opioid use, 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 ***(Siddiqui et al., 2011).***

The TAP block had been used previously with a nonguided or “blind double-pop” technique that relies on tactile sensation to

determine the appropriate level of local anesthetic infiltration ***(Reid, 2007)***

Cadaver studies have established the Petit triangle, defined medially by the latissimusdorsi muscle, laterally by the external oblique muscle, and inferiorly by the iliac crest. These superficial landmarks, when combined with knowledge of the path of the thoracolumbar nerves, have allowed clinicians to perform blind TAP blocks with varying degrees of success ***(McDonnell, 2007)***.

Yet there are two potential pitfalls with a blind TAP block. First, the final needle tip position may be superficial to the transverses abdominis fascial plane, resulting in intramuscular or subcutaneous deposition of the injectate. Second, the final needle tip position may be deep to the intended target, resulting in an intraperitoneal injection. Both of these aberrant injections would produce a failed block that results in pain, requiring rescue pain management because of liver laceration or bowel injury, to name just a few complications ***(McDermott, 2012).***

With the advent of ultrasound guidance, the transverses abdominis fascial plane in which the thoracolumbar nerves reside can be identified and accurately injected with the intended medication ***(Hebbard et al., 2010).***

AIM OF THE WORK

The purpose of this study is to evaluate the effectiveness of transverses abdominis plane (TAP) block in reducing opioid requirements and pain during and after lower abdominal surgeries in pediatrics.

Chapter (1):

PEDIATRIC PROCEDURAL PAIN MANAGEMENT

In the 1970s and 1980s postoperative pain in children to a large extent was either ignored or under treated as compared with adults. It has been documented that this may have (serious) implications for the children in the immediate postoperative period as well as in the longer perspective. The diagnosis, monitoring and treatment of pain in children are therefore very important. Fortunately, postoperative pain and other acute pain conditions in children have received increasing attention during the last two decades ***(Henneberg and Nilsson, 2007)***.

Assessment of pain

Pain assessment in the non-verbal child and neonate can be a very challenging task in an already subjective process. There are pain scales used to assess pain; however, there are variations in the methods and scales used, and there is no universal method to assess pain in this population. Objective measurements including heart rate, blood pressure, and salivary cortisol can be used, but most care providers usually rely on grimace, crying, and overall demeanor ***(Fein et al., 2012)***.

A- Neonates and infants

In addition to assessing pain by physiologic parameters in the neonatal population, there are multiple validated pain scales utilized by NICUs to assess pain (Table 1). The premature infant

pain profile (PIPP) is a validated pain scoring system for preterm neonates ***(Anandet al., 2006)***.

For infants, non-verbal young children, and in patients with cognitive impairment, the face, legs, activity, crying, and consolability (FLACC) scale or the revised FLACC scale can be used(See Table 1)***(Malviyaet al., 2006)***.

Table (1): Summary of neonatal pain scales ***(Lagoet al., 2009).***

Pain scale	What variables are included?	Type of pain	Notes
PIPP (premature infant pain profile)	Heart rate, oxygen saturation, facial actions	Procedural, postoperative	Reliable, valid, clinical utility is well established
NIPS (neonatal infant pain score)	Facial expression, crying, breathing patterns, arm and leg movements, arousal	Procedural	Reliable, valid
NFCS (neonatal facial coding system)	Facial actions	Procedural	Reliable, valid, clinical utility is well established, high degree of sensitivity to analgesia
N-PASS (neonatal pain, agitation and sedation scale)	Crying, irritability, facial expression, extremity tone, vital signs	Procedural, postoperative, mechanically ventilated patients	Reliable, valid. Includes sedation end of scale, does not distinguish pain from agitation
CRIES (cry, requires oxygen, increased vital signs, expression, sleeplessness)	Crying, facial expression, sleeplessness, requires oxygen to stay at >95 % saturation, increased vital signs	Postoperative	Reliable, valid
COMFORT scale	Movement, calmness, facial tension, alertness, respiration rate, muscle tone, heart rate, blood pressure	Postoperative, critical care	Reliable, valid, clinical utility well established
DAN (DouleurAiguë du Nouveau-né)	Facial expression, limb movements, vocal expression	Procedural	Reliable, valid

B- Toddlers

One of the important pain scale used in this age group is FLACC scale which is a behavioral scale and is validated by studies to be effective among the age group of 2 months to 7 years. It includes five behavior descriptions with a score given to each such behavior and is shown in table 2 ***(Lewis et al., 2010)***.

Table (2): FLACC behavioral Pain Score***(Lewis et al., 2010)***.

Categories	Score		
	0	**1**	**2**
Face	No particular expression Or smile	Occasional grimace or frown, Withdrawn, disinterested	Frequent to constant quivering chin, clenched jaw
Legs	Normal position or relaxed	Uneasy, restless or tense	Kicking or legs drawn up
Activity	Lying quietly, normal position, moves easily	Squirming, shifting back and forth, tense	Arched, rigid or jerking
Cry	No cry (awake or asleep)	Moans or whimpers: occasional complaint	Crying steadily, screams or sobs, frequent complaints
Consolability	Content, relaxed	Reassured by occasional touching, hugging or being talked to, distractible	Difficult to console or comfort

Total score between 0-10

C- Children between 3-8 years