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A STUDY OF EVALUATION OF POSTOPERATIVE ANALGESIC EFFICACY OF TRANSVERSUS ABDOMINIS PLANE BLOCK AFTER ABDOMINAL SURGERY

Anesthesiology

Priya Sharma Assistant Professor, Department of Anaesthesiology , FH Medical College and Hospital, Tundla Uttar Pradesh, India.

Mihir Gupta* Assistant Professor, Department of Anaesthesiology , FH Medical College and Hospital, Tundla Uttar Pradesh, India. *Corresponding Author

Dr. Trilok Chand Professor and Head , Department of Anesthesiology, SN Medical College, Agra, U.P.

ABSTRACT

Introduction: Patients undergoing major abdominal surgeries have postoperative pain and discomfort. TAP block can be used for any surgery involving the lower abdominal wall. This includes bowel surgery, caesarean section, appendicectomy, hernia repair, umbilical surgery and gynaecological surgery.

Aims and objectives: To evaluate the postoperative analgesic efficacy of transversus abdominis plane block following abdominal surgeries by assessing differences in pain experienced by participants having a TAP block compared with no TAP block.

Material and methods: Sixty patients of either sex of ASA grade 1 and 2 who underwent major gynecological or surgical operations were enrolled for this study. Patients with hepatic and renal abnormalities, hypersensitive to the drug, if they were receiving medical therapies considered to result intolerance to opiates and uncooperative patients were *excluded* from the study. All the patients received a standard general anaesthetic with standard monitoring and assessed for VAS, sedation and nausea scores.

Results: p value of < 0.05 for all three (VAS, sedation and nausea) scores were obtained for TAP group patients meaning results were statistically significant.

Conclusion: TAP block holds considerable promise as part of a multimodal analgesic regimen after abdominal surgeries. The TAP block was easy to perform, and provided reliable and effective analgesia in this study, and no complications due to TAP block were detected.

KEYWORDS

INTRODUCTION

Patients undergoing major abdominal surgeries have postoperative pain and discomfort. A substantial component of the pain experienced by patients after abdominal surgery is derived from the abdominal wall incision. A promising approach to the provision of postoperative analgesia after abdominal incision is to block the sensory nerve supply to the anterior abdominal wall. However, the clinical utility of current approaches to the blockade of these nerve afferents, such as abdominal field blocks, is limited and the degree of block achieved can be unpredictable. A major reason for the relative lack of efficacy of these blocks is the lack of clearly defined anatomic landmarks, leading to uncertainty regarding the exact needle positioning and the lack of a clear indication that the local anesthetic is being deposited in the correct anatomical plane. An alternative, reliable approach to the blockade of the neural afferents to the anterior abdominal wall had been sought. These neural afferents course through the neurofascial plane between the internal oblique and the transversus abdominis muscles. On the basis of anatomic studies, the lumbar triangle of Petit as a potential access point to this neurofascial plane was identified. This triangle is bounded posteriorly by the latissimus dorsi muscle and anteriorly by the external oblique, with the iliac crest forming the base of the triangle, and is a fixed and easily palpable landmark. By introducing local anesthetics into the transversus abdominis plane via the triangle of Petit, it is possible to block the sensory nerves of the anterior abdominal wall before they pierce the musculature to innervate the abdomen. This novel block is known as the "*transversus abdominis plane*" (TAP) block.

Preliminary cadaveric studies, followed by volunteer studies, have demonstrated the potential for TAP block to produce a dermatomal sensory block of the lower six thoracic and upper lumbar abdominal afferents. First described just two decades ago, it has undergone several modifications, which have highlighted its potential utility for an increasing array of surgical procedures. Despite a relatively low risk of complications and a high success rate using modern techniques, TAP blocks remain overwhelmingly underutilized. Although the block is technically straightforward, there is inertia regarding its adoption into clinical practice. In part, this may be related to limited sources for Anesthesiologists to develop a comprehensive understanding of the transversus abdominis plane.

TAP block can be used for any surgery involving the lower abdominal wall. This includes bowel surgery, caesarean section, appendicectomy, hernia repair, umbilical surgery and gynaecological surgery. A single injection can achieve sensory block over a wide area of the abdominal wall. The block has been shown to be useful in upper abdominal surgery, but the upper extent of the block and its use in upper abdominal surgery are controversial. TAP block is particularly useful for cases when an epidural is contraindicated or refused. The block can be performed unilaterally (eg. appendicectomy), or bilaterally when the incision crosses the midline eg. Pfannenstiel incision. A single injection can be used, or a catheter inserted for several days of analgesic benefit. TAP block also has a role as rescue analgesia on awakened postoperative patients who did not receive blocks prior to abdominal surgery. The principal of the block is to deposit local anaesthetic into the tissue plane between the internal oblique and the transversus abdominis. The two methods used include a blind technique, based on surface anatomy landmarks, and an ultrasound guided technique performed under direct vision.

AIMS AND OBJECTIVES

To evaluate the postoperative analgesic efficacy of transversus abdominis plane block following abdominal surgeries by assessing differences in pain experienced by participants having a TAP block compared with no TAP block.

To determine the opioid consumption during first 48 hours using patient controlled analgesia.

To determine the safety of TAP blocks, by assessing the incidence and type of any adverse effects

REVIEW OF LITERATURE

A major contributor to the pain experienced after abdominal surgery is pain from the incision made in the abdominal wall (Wall 1999), with the remainder resulting from internal visceral trauma. The transversus abdominis plane (TAP) block is a peripheral nerve block which anaesthetises the abdominal wall. Although this technique was first specifically described in 2004, variations have been used by anaesthetists for decades without becoming widely adopted (McDonnell 2004). As there is currently no evidence to guide selection of the type, concentration or volume of local anaesthetic agent used specifically for TAP blocks, most studies to date have used quantities of local anaesthetic that maximise the dose while maintaining a safe upper limit of dose for the patient's weight (Hebbard 2008; McDonnell 2007; Shibata 2007).

Rafi first described the TAP block in 2001. He portrayed it as a refined abdominal field block, with a targeted single shot anesthetic delivery into the TAP, a site traversed by relevant nerve branches. This was a

significant advance from earlier strategies that required multiple injections. In 2004, McDonnell et al. presented preliminary work on TAP blocks in cadavers and in healthy volunteers at the scientific meeting of the American Society of Anesthesiologists. Although referred to as the regional abdominal field infiltration (RAFI) technique, the authors brought forward preliminary evidence to support the anatomical basis for TAP blocks and demonstrated sensory loss spanning the xiphoid to the pubic symphysis following delivery of local anesthetic to the TAP via the triangle of Petit. By the time the study was completed and published in 2007, McDonnell and his colleagues had already adopted the term TAP block and had demonstrated its analgesic utility in patients undergoing open retropubic prostatectomy.

McDonnell team in 2008 examined TAP block efficacy after caesarean section delivery. Fifty elective patients for caesarean section (via spinal anaesthetic and Pfannenstiel incision) were randomised to receive TAP block (landmark method) versus placebo in addition to standard anaesthesia (paracetamol, diclofenac and intravenous morphine). Results showed TAP block reduced visual analogue pain scores and mean total morphine requirements in the first 48 hours (18mg versus 66mg in the placebo group). There were no complications from the blocks.

A second publication on use of TAP blocks after caesarean section describes placement of TAP catheters under ultrasound guidance in three case reports. Continuous infusions of 0.2% ropivacaine at 4ml/h was used for 72 hours.

MATERIAL AND METHODS

Sample size – During the 1 year period of June 2010 to May 2011, patients undergoing abdominal surgeries at S.N.Medical college and hospital, Agra were considered for study *inclusion.* Sixty patients of either sex of ASA grade 1 and 2 who underwent major gynecological or surgical operation were enrolled for this study. Informed consent was obtained from all who agreed to participate in this study. A total of 60 patients were studied and randomly assigned them to two groups. Each group had equal number of patients.

- **Group 1 :** TEST GROUP: Patients received TAP BLOCK.
- **Group 2:**CONTROL GROUP: Patients received NO TAP BLOCK.

Patients with hepatic and renal abnormalities, hypersensitive to the drug, if they were receiving medical therapies considered to result intolerance to opiates and uncooperative patients were *excluded* from the study.

All the patients received a standard general anaesthetic with standard monitoring. Anaesthesia was induced by rapid sequence induction using thiopental 5 mg /kg and succinylcholine 1–2 mg/ kg. Atracurium /vecuronium was used for muscle relaxation. Anaesthesia was maintained with oxygen, nitrous, and isoflurane. All patients also received fentanyl 1-2 mg/ kg and paracetamol 1 g i.v. At the end of operation patients were extubated after the reversal with Nesotigmine and atropine. During preoperative visit patients received a Visual analogue scale for pain (VAS) which was explained to them. The presence and severity of pain, nausea, and sedation were assessed systematically. These assessments were performed in the PACU and at 2, 4, 6, 24 and 48 h postoperatively.

OBSERVATIONS AND RESULTS

Parameters	TAP block (Group-1)	No TAP block (Group-2)	p value
VAS score			<0.001
PACU	2(0.5-2)	4(3-6.75)	<0.001
2 hr	2(0.5-2)	5(3.25-6)	<0.001
4 hr	2(0.5-2)	4(2-5)	<0.01
6 hr	2(0-3.5)	3(2-4.75)	<0.01
12 hr	2(0-3)	3(2-4)	<0.05
24 hr	1(0-2)	3(2-4)	
48 hr	0(0-2)	0(0-2)	
Sedation scores			<0.01
PACU	1 (1, 1.5)	1 (1, 1.5)	<0.01
2 hr	0.5 (0, 1)	1 (1, 1.5)	<0.01
4 hr	0 (0, 0.5)	1 (1, 1.5)	
6 hr	0 (0, 0)	1 (1, 1.5)	
12 hr	0 (0, 0)	0 (0, 0)	
24 hr	0 (0, 0)	0 (0, 0)	
48 hr	0 (0, 0)	0 (0, 0)	
Nausea scores			<0.05
PACU	0 (0, 0.5)	0 (0, 1)	
2 hr	0 (0, 0)	1 (0, 1)	
4 hr	0 (0, 0)	0 (0, 0)	
6 hr	0 (0, 0)	0 (0, 0)	
12 hr	0 (0, 0)	0 (0, 0)	
24 hr	0 (0, 0)	0 (0, 0)	
48 hr	0 (0, 0)	0 (0, 0)	

DISCUSSION

The benefits of adequate postoperative analgesia are clear and include a reduction in the postoperative stress response, reduction in postoperative morbidity and in certain types of surgery, improved surgical outcome. Effective pain control also facilitates rehabilitation and accelerates recovery from surgery. Other benefits of effective regional analgesic techniques include reduced pain intensity, decrease incidence of side effects from analgesics, and improved patient comfort.

Direct blockade of the neural afferent supply of the abdominal wall, such as abdominal field blocks, ilioinguinal and hypogastric nerve blocks have long been recognized as capable of providing significant postoperative analgesia in patients undergoing abdominal surgical procedures such as cesarean delivery and inguinal herniorrhaphy. However, the lack of clearly defined anatomic landmarks had meant that the full potential of abdominal wall blockade in patients undergoing major abdominal procedures remains to be realized. An alternative, simple, reliable and effective regional analgesic technique is required. The skin, muscles, and parietal peritoneum of the anterior abdominal wall are innervated by the lower six thoracic nerves and the first lumbar nerve. The anterior primary rami of these nerves leave their respective intervertebral foramina and course over the vertebral transverse process. They then pierce the musculature of the lateral abdominal wall to course through a neuro-fascial plane between the internal oblique and transversus abdominis muscles. The sensory nerves branch first in the mid-axillary line sending out a lateral cutaneous branch, and continue within the plane to perforate anteriorly supplying the skin as far as the midline. The *transversus abdominis plane* thus provides a space into which local anesthetic can be deposited to achieve myocutaneous sensory blockade. Deposition of the local anesthetic dorsal to the mid-axillary line also blocks the lateral cutaneous afferents, thus facilitating blockade of the entire anterior abdominal wall. The lumbar triangle of Petit offers an easily identifiable, fixed and palpable landmark and is located dorsal to the mid-axillary line. The transversus abdominis neuro-fascial plane can easily be accessed via this triangle, and local anesthetic deposited into this plane, using the loss of resistance technique as we have described.

In our present study, the TAP block produced effective and prolonged postoperative analgesia, when compared with standard therapy, in patients undergoing surgery via a midline abdominal wall incision. The TAP block reduced *postoperative pain scores*, both at rest and on movement and reduced postoperative *opioid requirements*. Overall, during the first 24 postoperative hours, the TAP block reduced mean IV tramadol requirements by more than 70%. This reduction in opioid requirement resulted in fewer *opioid-mediated side effects*. The incidence of *post operative nausea and vomiting* was reduced by more than half in the TAP block group. *Sedation scores* were also modestly reduced in the patients who underwent TAP blockade.

CONCLUSION

We concluded that TAP block holds considerable promise as part of a multimodal analgesic regimen after abdominal surgeries. The TAP block was easy to perform, and provided reliable and effective analgesia in this study, and no complications due to the TAP block were detected.

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