International Journal of Medical and Health Research
ISSN: 2454-9142
www.medicalsciencejournal.com
Volume 4; Issue 6; June 2018; Page No. 92-95

To evaluate the analgesic efficacy of local anaesthetic agent in ultrasound guided Transversus Abdominis Plane (TAP) block versus wound infiltration with local infiltration with in abdominal surgeries

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Abstract
The aim of our study is to evaluate the efficacy of TAP block as a part of multimodal analgesia regimen in lower abdominal surgery.
The enrolled 50 patients were divided in 2 groups. The Group-A patients includes the 25 patients & Group-B patients includes the 25 patients. The patients in group A received TAP block with 20 ml of ropivacaine bilaterally while those in group B received 20 ml of 0.25% ropivacaine as local wound infiltration.
From the present study it can be concludes that TAP block provides effective post-operative analgesia of prolonged duration along with reduced opioid consumption and opioid related side effects when instituted as a component of multimodal analgesia regimen in paediatric patients undergoing lower abdominal surgeries.

Keywords: abdominal surgeries, local wound infiltration, Transversus Abdominis Plane (TAP) block, ultrasound guided

1. Introduction
Pain is an unpleasant subjective experience that is the net effect of a complex interaction of the ascending and descending nervous system, involving biochemical, physiological, psychological and neocortical processes [1]. Uncontrolled post-operative pain may produce detrimental effects, both acute effects (i.e., adverse physiological responses) and chronic effects (i..e, delayed long term recovery and chronic pain) [2].
A substantial component of pain experienced by patients after abdominal surgeryis derived from the abdominal wall incision [3]. Attenuation of post-operative painespecially with certain types of analgesic regimens may decrease pre-operative morbidity and mortality [4]. Anaesthesiologists are responsible not only for pre-operative evaluation and intra-operative care but also for pre-operative pain relief of the patient. The analgesic regimen needs to meet the goals of providing safe and effective analgesia with minimal side effects for the patient [5].
Opioid analgesics and Non-steroidal Anti Inflammatory Drugs (NSAIDs) are often used in the treatment of many painful conditions. A revolution in the management of acute post-operative pain has occurred during the past three decades.
The TAP block is a peripheral nerve block used to provide analgesia to anterior and lateral abdominal wall [6]. By introducing local anaesthetic to Transversus Abdominisplane via the Triangle of Petit, it is possible to block the sensory nerves of the anterior abdominal wall before they leave this plane and pierce the musculature to innervate the entire anterior abdominal wall [7]. TAP block provides excellent pain relief especially in lower abdominal surgeries as proved by Tran *et al.* [8]. This study was undertaken to compare the analgesic effect of TAP block with traditional parenteral analgesia.
The abdominal wall most commonly refers to skin, subcutaneous tissue and fascia, has three layers of muscles [9]. (Fig 1, Fig 2).
1. The External Oblique muscle
2. The Internal Oblique Muscle
3. The Transversus Abdominis Muscle [10]

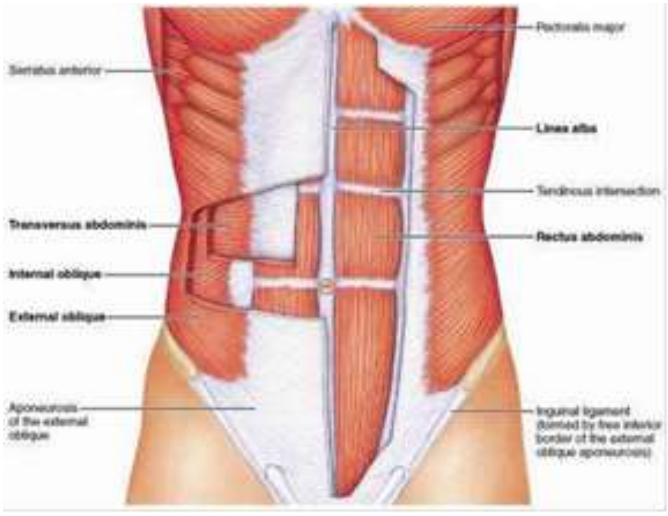

Fig 1: Anterior Abdominal Wall Muscles

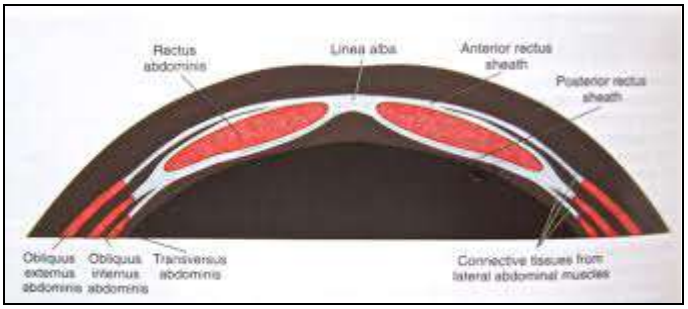

Fig 2: Cross Section of Anterior Abdominal Wall

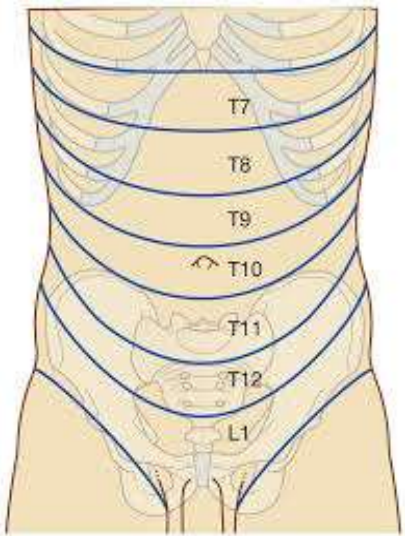

Fig 3: Sensory Supply of Anterior Abdominal Wall [10, 11]

- **Thoracic nerves T7-T11:** The anterior divisions of nerves from T7-T11 travel along their relevant intercostal space to enter abdominal wall between Internal oblique and Tranversus Abdominis muscle till they reach the Rectus Abdominis muscle where they pierce and supply sensation to skin of the anterior abdominal wall. Midway in their course, they pierce external oblique muscle and gives off lateral cutaneous branches which travel posteriorly and supply sensation to skin of lateral abdomen and back.
- **Thoracic nerve (T12):** The anterior division of the nerve from T12 gives a communicating branch tothe L1 which forms the upper part of the lumbar plexus. The lateral cutaneous branchof T12 supplies the skin over upper gluteal region.
- **The Ilioinguinal and Iliohypogastric Nerves (T12/L1):** The Iliohypogastric nerve (L1) divides between internal oblique and transversus abdominis near the iliac crest into lateral and anterior cutaneous branches, the former supplying part of skin of gluteal region and latter supplying hypogastricregion. The nerve communicates with the Iliohypogastric nerve near the anterior part of the iliac cres It supplies upper and medial part of thigh and skin covering the genitalia.

The point of entry for the blind TAP block (Landmark technique) is the lumbar Triangle of Petit which lies above the pelvic rim in the mid-axillary line (Fig.4). The anterior border of the triangle is formed by the lateral edge of the external oblique muscle. The posterior border of the triangle is formed by the lateral edge of the latissimus dorsi muscle. The triangle is tender to deep palpation in conscious patients. The puncture site is just above the iliac crest and just posterior to midaxillaryline within the Triangle of Petit [12].

TAP Block - Landmark Technique

The landmark for palpation is the "Triangle of Petit" which lies above the pelvic rim in the mid-axillary line. The puncture site is just above the iliac crest and just posterior to the mid-axillary line within the Triangle of Petit. A 23 Gauge blunt tipped spinal needle is inserted perpendicular to the skin, and a give or "pop" is felt when the needle passes through the facial extensions of the external oblique muscle. Further advancement with a second "pop" indicates that the needle has advanced into the facial plane above transverses abdominis muscle. After negative aspiration, 20ml of 0.25% Bupivacaine solution is injected. Triangle of Petit can be difficult to palpate especially in obese patients [7]. Rafi suggests a needle insertion point 2.5cm behind the highest point of iliac crest when the triangle is not clearly palpable [6].

A few complications have been reported with this technique. The most significant of which was a case report of intrahepatic injection. Other complications include intra peritoneal injection, bowel hematoma and transient femoral nerve palsy.

An ultrasound guided approach was first described in 2007 by Hebbard *et al.* [11]. The use of ultrasound allows for accurate deposition of the local anaesthetic in the correct neurovascular plane. In this technique, a high frequency ultrasound probe is placed transverse to the abdominal wall between the costal margin and iliac crest. The needle is introduced directly under the probe and advanced until it reaches the plane between internal oblique and transverses abdominis muscle.

The aim of our study is to evaluate the efficacy of TAP block as a part of multimodal analgesia regimen in lower abdominal surgery.

Methodology

The study is conducted in Indira Gandhi Institute of Medical Sciences, Patna in Department of Anaesthesia. Total 50 patients having are group of 30-55 year were enrolled in to the study. As per the classification of the American Society of Anesthesiologists I and II physical conditions posted for lower abdominal surgeries were enrolled on to the study. All the patients are informed consents. All the patient's clinical history was collected.

The enrolled 50 patients were divided in 2 groups. The Group-A patients includes the 25 patients & Group-B patients includes the 25 patients. The patients in group A received TAP block with 20 ml of ropivacaine bilaterally while those in group B received 20 ml of 0.25% ropivacaine as local wound infiltration.

Patients of both groups were premeditated with oral midazolam syrup 0.5mg/kg 25 minutes prior to surgery. Base line parameters heart rate, NIBP, respiratory rate and SpO2 were recorded in both the groups. In the operating room, after pre-oxygenation for 5 minutes, standard general anaesthesia regimen was instituted in all the patients with glycopyrrolate 10µg/kg, fentanyl 2µg/kg, thiopentone sodium 5mg/kg and

intubated with succinylcholine 1.5mg/kg with appropriate sized portex cuffed endotracheal tube and maintained with Atracurium 0.5mg/kg and oxygen and nitrousoxide mixture of 50% and sevoflurane 1-1.5%.

Immediately after GA, in group A, TAP block was performed using the land mark technique with 23G or 24G 50mm needle and 0.5% ropivacaine 0.3ml/kg was injected on the ipsilateral side of the surgical procedure. The surgical procedures included in our trial were open appendectomies, inguinal hernias and pelvic colostomies.

TAP block was performed in Group A patients after identification of the lumbar triangle of petit. The puncture site is just above the iliac crest and just posterior to the midaxillary line with in the triangle of petit. The needle is inserted perpendicular to skin in the coronal plane and advanced slowly until two distinct pops were felt. First pop indicates that the needle is between external oblique and internal oblique muscles. Second pop indicates that the needle traverses the plane between internal oblique and transverses abdominis muscles. After careful negative aspiration the solution of ropivacaine 0.5% of 0.3ml/kg was injected slowly into the TAP.

Results & Discussion

The data from the 50 patients divided in two study groups were collected and presented as below.

Table 1: Peak pain scores

Time	Group A	Group B
0 hours	0.17 – 0.29	0.35-0.75
2 hours	0.21 - 0. 56	0.50 – 1.42
4 hours	1.17 - 2.26	4.56 - 5.92
6 hours	3.93 - 5.23	6.15 - 7.83

Table 2: Frequency of analgesia requirement

Time	Analgesia Requirement	Group A	Group B
0 Hours	Yes	0%	4%
	No	100%	96%
2 Hours	Yes	0%	30%
	No	100%	70%
4 Hours	Yes	4%	44%
	No	96%	56%
6 Hours	Yes	8%	64%
	No	92%	32%

Table 3: Time to first analgesia in hours

Group	Time in hrs
Group A	7.8 – 10.2
Group B	4.2 – 7.3

A variety of unwanted post-operative consequences following poorly controlled pain after abdominal surgery includes prolonged hospital stay besides patient suffering and distress. Transversus abdominis plane (TAP) block, first described by Kuppuvelumani et al in 1993 [12], and formally documented by Rafi in 2001 [13], is used for the management of post surgical abdominal pain by injecting local anaesthesia in to the plane between the internal oblique and transversus abdominis muscle [14, 15]. TAP block is a promising effective method for post-operative pain control after abdominal surgeries. Ultrasound guided transverses abdominis plane block provides excellent results in experienced hands with lesser complications [16]. TAP block is both effective and safe postoperative analgesic modality in a variety of procedures including general surgeries [17, 18]. It has proven to be effective in various pediatric surgeries also [19, 20]. Other procedures like urological [21], gynaecological [22] and plastic can also benefit from this. To enhance the recovery after lower abdominal surgeries, it is suggested as a part of multimodal anaesthetic approach 16. It is not only effective in reducing pain but also decreases morphine/opioid consumption after lower abdominal surgery [23].

Wound infiltration with local anaesthetic agent is also a commonly used method for reducing post-operative pain [24]. A single injection of local anaesthesia into skin and subcutaneous tissue layer at surgical incision sites could lower the pain scores postoperatively. It is a convenient post-operative analgesia procedure which is widely performed.

Conclusion

From the present study it can be concludes that TAP block provides effective post-operative analgesia of prolonged duration along with reduced opioid consumption and opioid related side effects when instituted as a component of multimodal analgesia regimen in paediatric patients undergoing lower abdominal surgeries.

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