

Reduction in consumption of opioid analgesia post operatively after transversus abdominis plane block in patients undergoing radical hysterectomy

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Abstract

Background: Radical hysterectomy involves extensive dissection, which contributes to moderate to severe pain post operatively. Effective post operative pain management will result in better recovery. At the same time increased use of opioids for analgesia can cause side effects of opioids like drowsiness, nausea, vomiting, and respiratory depression. Transversus abdominis plane (TAP) block complements the multi-modal analgesic regimen, so that the requirement of opioids is reduced. This is a prospective randomized controlled trial. To evaluate the role of TAP block in reducing the opioid consumption. **Methods:** 100 patients of ASA grade 1 and 2 undergoing Radical hysterectomy were randomized as block group to undergo TAP block with bupivacaine 0.25% 20ml on each side (n=50), versus non-block group (n=50). All patients received general anesthesia. Ultra-sound guided block was performed before surgical incision bilaterally in patients who were randomized to the block group. Intra-operative analgesic regimen was with inj fentanyl 1.5 mcg/kg, repeated with 0.5 mcg/kg depending on the requirement as assessed by the anaesthesiologist based on haemodynamic parameters and post-operatively by pain scores on numeric visual analogue scale with inj paracetamol 1gm followed by tramadol 2mg/kg and fentanyl 0.5 mcg/kg. Each patient was assessed post-operatively at 0, 2, 4, 6, 8, 12, 16, 20, 24 hours for pain, nausea, vomiting, and sedation. The data recorded. Descriptive and inferential statistical analysis has been carried out using student t test, chi square/ Fisher exact test in the present study. **Results:** We studied 100 patients. The block group (n=50) had significantly less pain scores compared to non-block group (n=50) p value being < 0.001. Total requirement of opioids in 24 hours was reduced in the block group, p<0.001. Time to first request for analgesia was delayed in the block group where only 22% patients needed analgesic at 0 hours compared to 72% in non-block group. Incidence of nausea and vomiting was reduced after 4 hours in block group. The non-block group patients were less sedated at 0 and 2 hours probably due to pain. **Conclusion:** TAP block, provides improved quality of analgesia post-operatively with reduced consumption of opioid there by avoiding their side effects for radical hysterectomy

Key Words: post operative pain, regional anaesthesia technique, opioids

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INTRODUCTION

Radical hysterectomy is the surgical procedure. Indication being conditions like endometriosis or leiomyosarcoma and malignant conditions of the uterus, ovary, and endometrium. Surgical procedure involves removal of uterus, parametrium, upper one-third to half of vagina, and bilateral pelvic lymph node dissection. Which is extensive and necessitates a lot of tissue handling. This extensive dissection leads to substantial pain which is moderate to severe and causes discomfort to the patient. Effective post-operative pain management is very crucial for early mobilization and better recovery. Multimodal

analgesia is an approach where patient is administered combination of opioid, non opioid drugs, nerve blocks, and non pharmacological approach that act at different sites within the central and peripheral nervous system. The advantage of multimodal analgesia being reduced consumption of opioids thereby minimizing the adverse effects of opioids like nausea vomiting sedation delirium and respiratory depression. Transversus abdominis plane (TAP) block are widely used regional anaesthesia technique that introduces local anaesthetic in to neuro vascular plane via triangle of petit, an area on the abdominal wall, iliac crest being the inferior border. laterally bordered by medial edge of external abdominal muscle, medially bordered by latissimus dorsi. This block provides analgesia to parietal peritoneum as well as skin and muscles of anterior abdominal wall by blocking the sensory nerves of the anterior abdominal wall.^{1,2} Cadaveric studies involving the ultrasound guided injection of 20 ml aniline dye in to the unembalmed specimen have suggested that the T10-L1 nerve roots can be reliably blocked by using this technique.⁸ Various prospective randomized trials have shown that TAP block is effective in reducing opioid consumption and improving the post operative pain relief with minimal side effects and improved outcome in gynecological surgeries.³ Hence This study was undertaken to assess the efficacy of TAP block in reducing the consumption of opioids in patients undergoing radical hysterectomy with pelvic lymph node dissection where the incision was below the umbilicus.

METHODS

This is a prospective randomized controlled study. After obtaining approval by institutional ethical committee 100 patients of ASA grade 1 and 2 were enrolled to the study 2017 to 2018. All the patients were posted for radical hysterectomy with pelvic lymph node dissection with Pfannenstiel or vertical incision below the umbilicus were included in the study. Written informed consent was obtained. Patients refusing the block, history of any relevant drug allergy, history of chronic pain, blood coagulation pathology local sepsis and any deviation from the proposed surgery were excluded. Patients were randomly allocated to TAP block group and non block group. Randomization was done by computer generated table n=50. All patients were premedicated with inj glycopyrrolate 0.02mg/kg and inj midazolam 0.03mg/kg 30 mins before the surgery. Standard monitoring were included like electrocardiogram, non-invasive blood pressure arterial oxygen saturation and end tidal carbon dioxide monitoring. General Anesthesia was induced with inj fentanyl 1.5 mic/kg, propofol 1-2mg/kg and rocuronium 0.6 to 0.9 mg/kg. and maintained with oxygen and nitrous oxide and relaxant technique. Isoflurane 0.8-

1.2 volume percent throughout the surgery was used. Ultrasound guided TAP Block was performed in the block group after induction of anaesthesia by one of the investigators. Asepsis precaution was taken. Ultrasound probe was placed transversely on the anterolateral abdominal wall. Three muscles of anterior abdominal wall (external oblique, internal oblique, transversus abdominis) identified. After identifying the neuro facial plane between internal oblique and transversus abdominis. 23 g needle is introduced anteriorly in the plane of ultrasound beam. on entering the plane. 20 ml of 0.25% bupivacaine injected in to the plane on each side maximum dose being 2mg/kg. The block was performed on the opposite side using the same technique.⁴ After the recovery from anesthesia, As soon as the patients were adequately oriented in post anaesthesia care unit (considered as zero hour) pain was assessed at rest and on movement using numeric visual analogue scale every 2 hours till 8 hours then every 4 hours till 24 hours. We followed standardized post operative analgesia regimen. (refer table no-1) Nausea and vomiting were assessed simultaneously using categorical scale (none=0, mild=1, moderate=2 severe=3) for 24 hrs. Patients with score more than 0 were given rescue antiemetics irrespective of the score. Sedation was assessed using sedation scale (awake and alert=0, quietly awake=1, asleep but easily roused=2, deep sedation=3)⁴ We estimated our sample size on the basis of 24hrs VAS pain scores, we calculated that 20 patients per group are required for experimental design incorporating two equal size groups using $\alpha=0.05$ and $\beta=0.2$. To minimize any effect of data loss and to increase power we elected to recruit 50 samples for each group, hence the power test became $(1-\beta)^{0.926}$. The primary outcome measure in the study is total opioid consumption in 24 hours and time to first request of analgesia. The secondary outcomes assessed were side effects of opioids like nausea and vomiting and sedation.

STATISTICAL ANALYSIS STATISTICAL METHODS

Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean \pm SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5% level of significance. The following assumptions on data is made, Assumptions: 1. Dependent variables should be normally distributed, 2. Samples drawn from the population should be random, Cases of the samples should be independent. Student t test (two tailed, independent) has been used to find the significance of study parameters on continuous scale between two groups (Inter group analysis) on metric parameters. Chi-square/ Fisher Exact test has been used to

find the significance of study parameters on categorical scale between two or more groups.

RESULTS

Hundred and two patients were enrolled in to the study. Two patients, one from each group were excluded from the study as the surgical plan changed intra operatively. Of the remaining 100 patients ,50 patients were randomized for TAP block and 50 patients were randomized for non block group. The groups were comparable in terms of age and weight. Surgical interval was not comparable. Post operatively VAS scores were significantly less in block group at rest and on movement at zero and 2 hours(picture no1and2)As per our protocol time to first request of analgesia was recorded. In the block group 22% patients requested at 0 hours. 52% patients requested analgesic between 2-4hours. 26% of patients requested for analgesics later than 4 hours. Where as in non block group74% patients requested at 0 hours, and 26% patients requested later than 4 hours .(picture no3) Total requirement of analgesics for 24hours were measured. Block group patients consumed less opioid compared to

non block group. 38% patients of block group had satisfactory analgesia with non opioids (i.v.paracetamol) and did not require any opioids at all.. 36% required 100 mg(2mg /kg)of tramadol only .14% patients had good pain relief with 100mg of tramadol and fentanyl less than 50 mic.g .8% patients needed tramadol 100 mg with fentanyl >50 mic.g. In the non block group 68%patients consumed tramadol 200mg and fentanyl <50micg. 28% patients required tramadol 200 mg and fentanyl>50 mic.g . and 4% patients were comfortable with 150mg of tramadol and fentanyl< 50mg.(table number 2) Incidence of nausea and vomiting were assessed using categorical scoring method. It was comparable between the two groups at zero and 2 hours. but it became significantly lower in block group at 4 hours, 8 hours, 12hours. p value being 0.001.(picture number 4). We compared sedation using sedation score 4between the two groups. At 0and 2 hours non block group patients were less sedated probably due to pain. At 4 hours in the block group patients were less sedated as they required less dose of opioids for effective pain control.(table no 3).

Table 1: Post operative analgesia regimen

Vas score	Analgesics regimen
Vas<3	No analgesia
VAS>4	Inj paracetamol 1gram, reassessed after 30 mins
VAS> 4	Inj tramadol 2mg /kg reassessed after 30 mins if no change in VAS inj fentanyl 0.5 mic/kg inj=injection, mic=micrograms VAS=visual analogue score

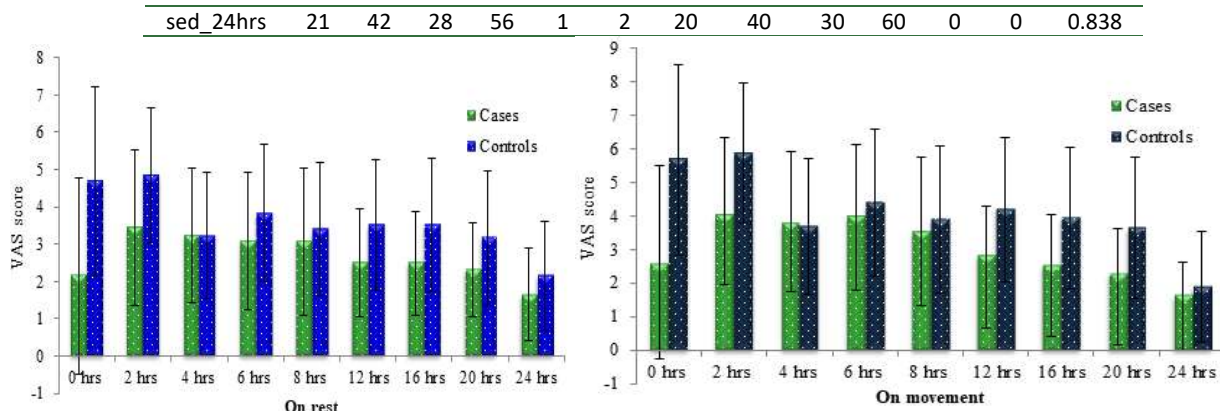
Table 2: Total requirement of opioids in 24 hours in two study groups

Total requirement of opioids in 24 hours	Block (n=50)		Control (n=50)	
	No	%	No	%
Nil opioid	19	38.0	0	0.0
Tramadol.100mg	18	36.0	0	0.0
Tramadol 100mg +fentanyl<50micg	7	14.0	0	0.0
Tramadol 100mg +fentanyl>50micg	4	8.0	0	0.0
Tramadol 100mg	2	4.0	0	0.0
Tramadol 200mg+fentanyl<50micg	0	0.0	34	68.0
Tramadol 200mg+fentanyl>50micg	0	0.0	14	28.0
Tramadol150+fentanyl <50micg	0	0.0	2	4.0

Control is more sedated compared to cases with grade 2 (76%) at 0hrs and(86%) at 2hrs where as in block group it is less(38% and 62%) at 0 and 2 hours-- (*SED= sedation, #=number, awake and alert=0, quietly awake=1 , asleep but easily roused =2, deep sedation =3*)⁴

Table 3: Sedation frequencies between cases and controls

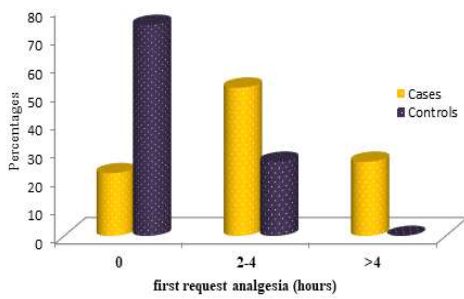
Sedation	cases						Control						P-value
	1		2		3		1		2		3		
	#	%	#	%	#	%	#	%	#	%	#	%	
sed_0 hrs	0	0	19	38	31	62	2	4	38	76	10	20	<0.001
sed_2 hrs	0	0	31	62	19	38	0	0	43	86	7	14	0.006
sed_4 hrs	30	60	20	40	0	0	18	36	31	62	1	2	0.01
sed_6hrs	24	48	25	50	1	2	15	30	32	64	3	6	0.006
sed_8hrs	22	44	28	56	0	0	28	56	22	44	0	0	0.234
sed_12 hrs	11	22	37	74	2	4	35	70	14	28	1	2	0.528
sed_16hrs	12	24	34	68	4	8	14	28	31	62	5	10	0.648
sed_20 hrs	17	34	31	62	2	4	29	58	21	42	0	0	0.001



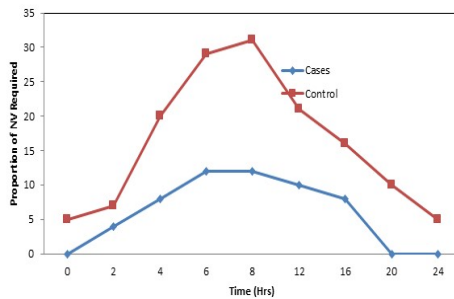
Picture 1: VAS score at rest to 24 hours

Picture 2: VAS score on movement from 0 to 24 hours

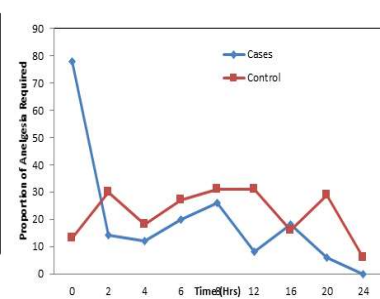
stastically analysed with continuous measurements and are presented on Mean ± SD (Min-Max) VAS is more in control group ($p < 0.001$ at 0 hours, $p = 0.001$ at 2hrs, $p = 0.46$ at 6hrs, at 12 and 16hours 0.002) VAS=visual analogue score



Picture 3: 74% pts of control group requested analgesia at 0 hours



Picture 4: NV is more associated with control at between 4 to 8 hours (NV= nausea vomiting)



Picture 5: opioid requirement

DISCUSSION

Radical hysterectomy among the Gyenecological surgeries results in more acute pain post operatively compare to other surgeries due to extensive dissection and tissue handling. Effective post operative pain control is crucial for reduction in stress response which results in lesser morbidity and better surgical out come. Data available indicate that afferent neural blockade with local anaesthetics is most effective analgesic technique. There are various studies on TAP block as a part of multimodal analgesia. The efficacy of the TAP block in reducing opioid consumption in radical hysterectomy is not widely studied. Griffith *et al.*⁷ conducted study on benefits of TAP block in women undergoing major gynecological cancer surgeries where they concluded that the block conferred no benefit in addition to multimodal analgesia. They also concluded that the lack of benefit may be due to heterogeneity of patient population receiving multimodal analgesia for midline laporotomy. Recent evidence in literature shows reduction in pain scores and opioids consumption with TAP blockade¹⁰ In our prospective randomized control trial on the efficacy of TAP block in radical hysterectomy in reducing opioid consumption ,

demonstrated that complementing the standard multimodal analgesic regimen with TAP block resulted in statistically significant reduction in opioid consumption post operatively. Total requirement for 24 hours as well as first request of opioids was significantly less in block group. In our institute on an average 130 to 150 radical hysterectomies with pelvic lymph node dissection are being performed per year. Our institutional currant multimodal analgesic regimen comprises epidural analgesia and of inj fentanyl 1.5to2 mcg/k.g i.v. intraoperatively at time of induction and intermittent bolus doses of 0.5 mcg /kg as assessed by the anaesthesiologist. Postoperatively inj paracetamol 1gm followed by inj tramadol 2mg/k.g. which may be supplemented with inj fentanyl 0.5mcg/k.g depending on the pain scores (ref table no 1) .some times epidural catheter placement will be deferred because of contraindicatond, pt refusal or difficulty in placing, then only opioids become the main source of analgesia .Though the currant regimen provides optimal analgesia it is associated with side effects like nausea vomiting and sedation. delirium . In our study patients requiring identical surgical procedure where incision is below the umbilicus either pffannenstiell or vertical were included, So that there is homogeneity in the

patient population and surgical insult. Intra abdominal surgery causes moderate to severe pain due to incision (parietal pain) and by the trauma to the intra abdominal structures (visceral pain). therefore a multimodal approach is required to block the nociceptive transmission from both the abdominal wall incision and from pelvic abdominal visceral structures.^{3,14,12} Regional analgesia techniques are beneficial as a part of multimodal analgesia for decreasing the intensity of pain and incidence of side effects, there by improving the patient comfort and surgical out come. TAP block has been demonstrated to provide excellent analgesia to the skin and anterior abdominal wall musculature. which can be part of multimodal analgesia^{17,20}. "As described by Mukhtar .K in his article on TAP BLOCK in the journal of New York school of regional anesthesia Antero lateral abdominal wall is innervated by the anterior rami of spinal nerves T7 to L1. These include the intercostal nerves (T7-T11), the subcostal nerve (T12), and the iliohypogastric and ilioinguinal nerves (L1). The anterior divisions of T7-T11 continue from the intercostal space to enter the abdominal wall between the internal oblique and transversus abdominis muscles until they reach the rectus abdominis, which they perforate and supply, ending as anterior cutaneous branches supplying the skin of the front of the abdomen. In their course they pierce the external oblique muscle giving off the lateral cutaneous branch which divides into anterior and posterior branches that supply the external oblique muscle and latissimus dorsi respectively⁵. The anterior branch of T12 communicates with the iliohypogastric nerve and gives a branch to the pyramidalis. Its lateral cutaneous branch perforates the internal and external oblique muscles and descends over the iliac crest and supplies sensation to the front part of the gluteal region. The iliohypogastric nerve (L1) divides between the internal oblique and transversus abdominis near the iliac crest into lateral and anterior cutaneous branches, the former supplying part of the skin of the gluteal region while the latter supplies the hypogastric region. The ilioinguinal nerve (L1) communicates with the iliohypogastric nerve between the internal oblique and transversus abdominis near the anterior part of the iliac crest. It supplies the upper and medial part of the thigh and part of the skin covering the genitalia.(3)The transversus abdominis plane thus provides a space in to which local anesthetic can be deposited to achieve myocutaneous sensory blockade^{14,15}" The dose of the drug used was bupivacaine 0.25% 20ml on each side, maximum dose being 2mg/k.g. higher recommended dose of bupivacaine was used to provide prolonged analgesia with single shot technique. Though the dose is within the recommended range, potential for systemic toxicity has to be borne in mind.^{6,20}

LIMITATION OF THE STUDY

We had limited our analysis to 24 hours although block has been demonstrated to clinically useful levels for up to 48 hrs post operatively as reported in the literature. Local anaesthetic large volume between 30 to 40 ml are administered though we did not come across any complications related to the volume of local anesthetic. Further studies are required to evaluate the optimum volume. We have evaluated in only one type of surgical procedure. Further evaluation is required in cancer surgeries.

CONCLUSION

In conclusion TAP block can be a useful complementary modality to multimodal analgesic regimen in radical hysterectomy in gynecology surgeries where the incision is below the umbilicus. Further evaluation of the usefulness of the block is needed in of cancer surgeries.

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