

TRANSVERSUS ABDOMINIS PLANE BLOCK: A COMPLEMENTARY TECHNIQUE FOR POST OPERATIVE ANALGESIA IN LOWER ABDOMINAL GYNECOLOGICAL CANCER SURGERIESArathi B. H¹, Ramamani P. V², Gowda V. B³, Namrata R⁴**HOW TO CITE THIS ARTICLE:**

Arathi B. H, Ramamani P. V, Gowda V. B, Namrata R. "Transversus Abdominis Plane Block: A Complementary Technique for Post-Operative Analgesia in Lower Abdominal Gynecological Cancer Surgeries". Journal of Evolution of Medical and Dental Sciences 2015; Vol. 4, Issue 49, June 18; Page: 8582-8594, DOI: 10.14260/jemds/2015/1242

ABSTRACT: BACKGROUND: Gynecological cancer surgeries differ from non-cancer surgeries as the former involves extensive dissection, and tissue handling, which contributes to increased nociception perioperatively. Radical hysterectomy with pelvic lymph node dissection is one of the most commonly performed surgeries in gynecological oncological set up. Transversus abdominis plane (TAP) block is one of the new promising regional anesthesia technique complementing multi modal analgesic regimen. This is a prospective randomized controlled trial. We evaluated the role of the TAP block in Radical hysterectomy with pelvic lymph node dissection for perioperative analgesia and reducing the requirement of opioid consumption. **METHODS:** 100 patients of ASA grade 1 and 2 undergoing radical hysterectomy and pelvic lymph node dissection with below umbilical incision 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. Block was performed before surgical incision bilaterally by using blind double pop technique in patients who were randomized to the block group. Intra operative analgesic regimen was with inj fentanyl 1.5 mic/kg, repeated with 0.5mic/kg depending on the requirement as assessed by the anaesthetologist 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 0.5mic/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, 50 patients in block group and 50 patients in non-block group. The block group had significantly less pain scores compared to non-block group, 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. There were no complications attributable to the block. **CONCLUSION:** TAP block as a complementary technique to the multimodal analgesia protocol, provided improved quality of analgesia with reduced opioid requirement and their side effects in block group compared to non-block group for radical hysterectomy and pelvic lymph node dissection with incision below the umbilicus

KEYWORDS: Post-operative pain, regional anaesthesia technique.

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INTRODUCTION: Gynecological cancer surgeries differ from non-cancer surgeries as the former involves extensive dissection, and tissue handling, hence contributes to increased nociception perioperatively. Radical hysterectomy with pelvic lymph node dissection is one of the most commonly performed surgeries in gynecologic oncological set up.¹ This type of surgery causes substantial pain and discomfort which requires multimodal analgesic regimen to provide effective pain control with minimal side effects.² Opioids remain the main stay of post-operative analgesic regimen. However use of opioids is associated with adverse effects like nausea vomiting and sedation. To minimize these side effects of opioids, and to attain optimal analgesia various regional analgesia techniques have evolved. Transversus abdominis plane (TAP) block is one of the new regional analgesic technique where the local anaesthetic is deposited in between the internal oblique and transversus abdominis muscle by passing the needle through the lumbar petit triangle bilaterally.

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.^{3,4} 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.⁵ Various prospective randomized trials have shown that the block is effective in reducing opioid requirement and improving the post-operative pain relief with minimal side effects and improved outcome in non-oncological surgeries.⁶ Griffith et al reported a prospective double blind randomized trial for gynecological cancer surgeries. They included simple to complicated surgeries with both horizontal and vertical incisions extending above the umbilicus which demonstrated that TAP block conferred no benefit in addition to multimodal analgesia in patients undergoing major gynecological surgeries. This study was undertaken to assess the efficacy of TAP block 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. Written informed consent was obtained. All the patients were posted for radical hysterectomy with pelvic lymph node dissection with pfannenstiell or vertical incision below the umbilicus. 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 pre-medicated with inj. glycopyrrolate 0.02mg/kg and inj. midazolam 0.03mg/kg 30mins before the surgery. Standard monitoring included electrocardiogram, non-invasive blood pressure arterial oxygen saturation and end tidal carbon dioxide monitoring. General Anesthesia was induced with inj. fentanyl 1.5mic/kg, thiopentone 3-5mg/kg and succinylcholine 1mg/kg. And maintained with oxygen and nitrous oxide 50:50 ratio. Isoflurane 0.8-1.2 volume percent throughout the surgery. Block was performed in the block group after induction of anaesthesia by using blind double pop technique by one of the investigators with the patient in supine position.

The triangle of petit was identified by palpating the highest point of iliac crest and lower border of thoracic cage anterior to latissimus dorsi and posterior to external oblique muscle. Skin was pierced with 23g quincke spinal needle between the latissimus dorsi and external oblique muscle at right angle to the skin. As the needle was advanced in the same direction slight resistance was felt,

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gentle advancement of the needle further a POP sensation was felt indicating piercing of the external oblique aponeurosis and entering the plane between internal oblique and external oblique layer.^{7,8}

Further gentle advancement of the needle results in second POP which indicates entry in to transverus abdomen is muscle plane. Aspiration was done to exclude the vascular puncture. 20ml of 0.25% bupivacaine injected in to the plane maximum dose being 2mg/kg. The block was performed on the opposite side using the same technique.⁹

Intraoperatively hemodynamic parameters were monitored and recorded every 15 minutes. Repeat bolus of I.V. fentanyl 0.5mcg gm/kg was given as rescue when any of these parameters increased more than 15% from the base line values after ruling out the other causes of hemodynamic instability.¹⁰

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 2hours till 8hours then every 4 hours till 24hours. 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 24hrs⁹ 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).⁹

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 $(1-\beta) 0.9$ ¹¹

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.^{12,13,14}

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. Intra operatively in the block group 8% of the patients received repeat analgesics at 45

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mins and 4% of patients at 60 minutes where as in non-block group 22 % of the patients received repeat analgesia at 45 minutes and 24% at 60 minutes (picture number 1, 2, 3, 4)

Post operatively VAS scores were significantly less in block group at rest and on movement at zero and 2 hours (Picture no. 5 & 6). 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 group 74% patients requested at 0 hours, and 26% patients requested later than 4 hours. (Picture no. 7)

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. 36% required 100 mg 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, 8hours, 12 hours. p value being 0.001.(picture number 8).

We compared sedation using sedation score⁹ between 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).

DISCUSSION: Gynecological oncology surgeries results in more acute pain post operatively compare to other non-cancer 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 outcome. Data available indicate that afferent neural blockade with local anaesthetics is most effective analgesic technique.

There are a very few studies on TAP block as a part of multimodal analgesia in oncological surgeries. Griffith et al² 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 requirement with TAP blockade¹⁰

In our prospective randomized control trial on the efficacy of TAP block in gynecological oncological surgeries, demonstrated that complementing the standard multimodal analgesic regimen with TAP block resulted in statistically significant reduction in analgesics consumption intra operatively and post operatively. Total requirement of opioids for 24hrs was significantly less in block group. There was delay in time to first request for analgesia in block group compared to non-block group.^{15,16}

Radical hysterectomy with pelvic lymph node dissection is the treatment of choice for women with stage 1A2 1B1 and selected cases of stage 2 endometrial carcinoma.¹

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

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comprises of inj. fentanyl 1.5 to 2 mcg/kg 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/kg. which may be supplemented with inj fentanyl 0.5mcg/kg depending on the pain scores (ref table no 1) Though the currant regimen provides optimal analgesia it is associated with side effects like nausea vomiting and sedation.

In our study patients requiring identical surgical procedure where incision is below the umbilicus either pfannenstiell or vertical were included, So that there is homogeneity in the patient population and surgical insult.

Pain caused by the intra-abdominal surgery is 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.^{6,17,18}

Regional analgesia techniques are beneficial as a part of multimodal analgesia for decreasing the intensity of pain and incidence of side effects, thereby improving the patient comfort and surgical outcome.^{19,20,21}

TAP block is one of the regional anesthesia technique which can be complimentary to multimodal analgesia^{22,23}

“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 respectively.²⁴

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^{17,25}

The dose of the drug used was bupivacaine 0.25% 20ml on each side, maximum dose being 2mg/kg. 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.^{26,23}

LIMITATION OF THE STUDY: In this study blind double pop technique was followed. It was performed by one of the 3 investigators., though we had comparable efficacy but the skills were

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variable. We were not able to assess the failure rate and the quality, as block was performed after inducing general anesthesia. Accuracy of the block will be much better if it is performed under ultrasound guidance which is the current practice

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 other cancer surgeries.

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

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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

Table 1: Post-operative analgesia regimen

Inj=injection, mic=micrograms VAS=visual analogue score

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

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

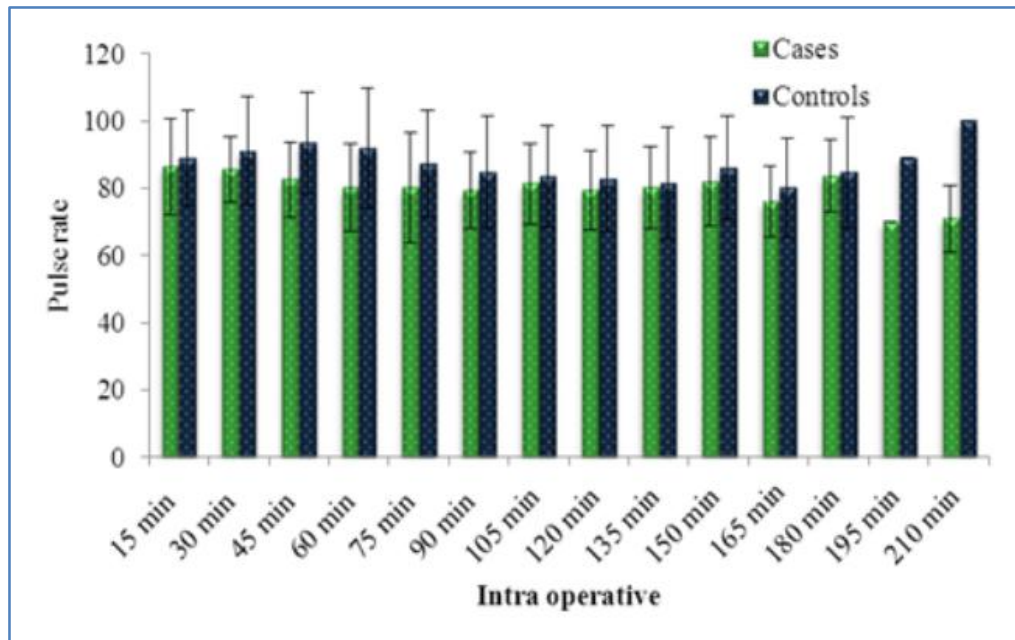
Sedation	cases						Control						P-value
	1		2		3		1		2		3		
	#	%	#	%	#	%	#	%	#	%	#	%	
sed_0 hrs	0	0	19	38	31	62	2	4	38	76	10	20	<0.001
sed_2 hrs	0	0	31	62	19	38	0	0	43	86	7	14	0.006
sed_4 hrs	30	60	20	40	0	0	18	36	31	62	1	2	0.01
sed_6hrs	24	48	25	50	1	2	15	30	32	64	3	6	0.006
sed_8hrs	22	44	28	56	0	0	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
sed_24hrs	21	42	28	56	1	2	20	40	30	60	0	0	0.838

Table 3: Sedation frequencies between cases and controls

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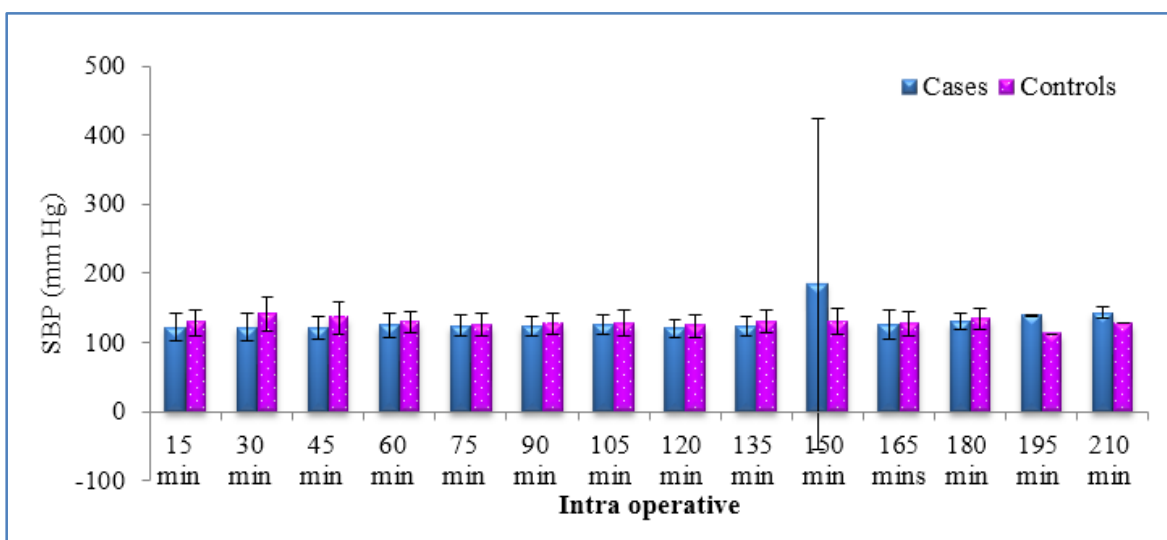
Control is more sedated compared to cases with grade 2(76%) at 0hrs and (86%) at 2hrs where as in block group it is less (38% and 62%) at 0 and 2 hours (SED= sedation, #=number, awake and alert=0, quietly awake=1, asleep but easily roused =2, deep sedation =3)⁴

Picture number 1: Intraoperative pulse rate. Significantly high in control group at 45 and 60 minutes $p<0.001$.



Picture No. 1

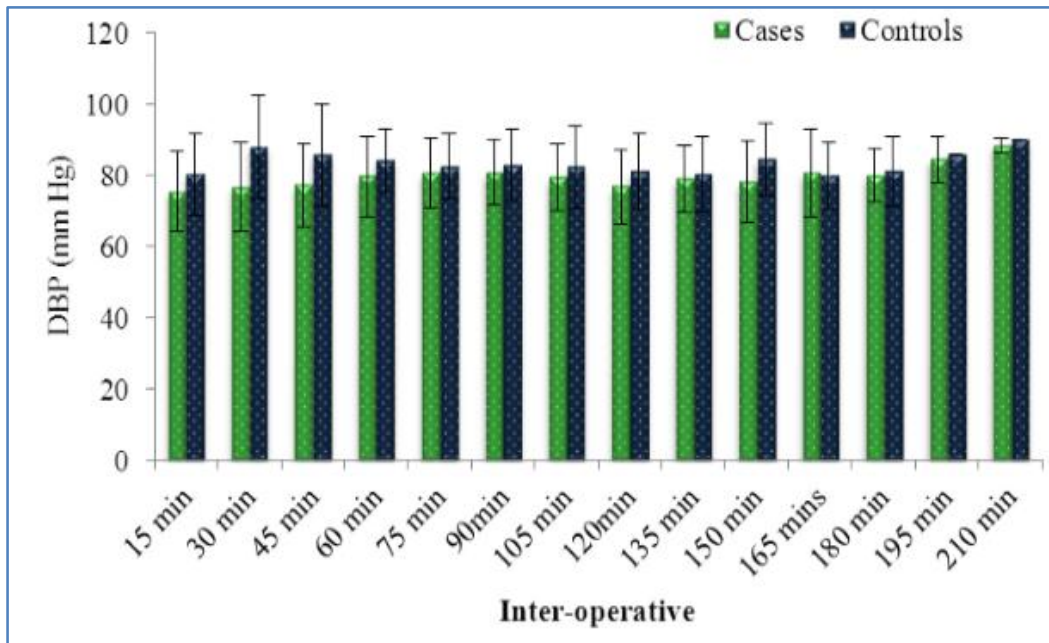
Picture number 2: Intraoperative SBP. SBP is significantly high in at 30 & 45 minutes in control group ($p<0.001$) (SBP-systolic blood pressure).



Picture No. 2

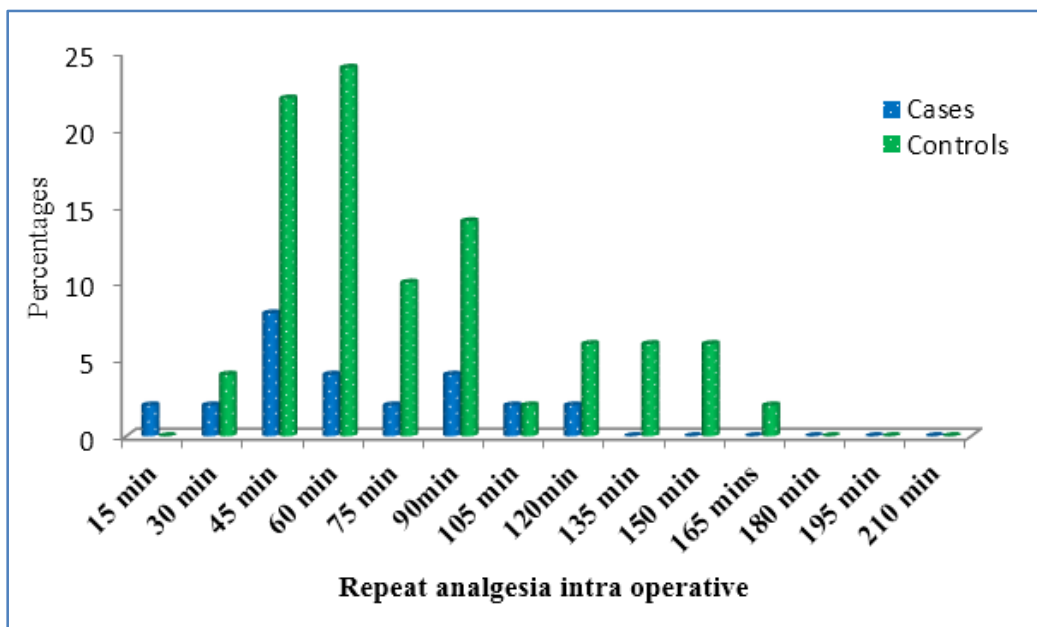
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Picture number 3: Intraoperative DBP. DBP is higher in control group at 30 & 45 minutes ($p < 0.001$, $p = 0.001$) (DBP=diastolic blood pressure).

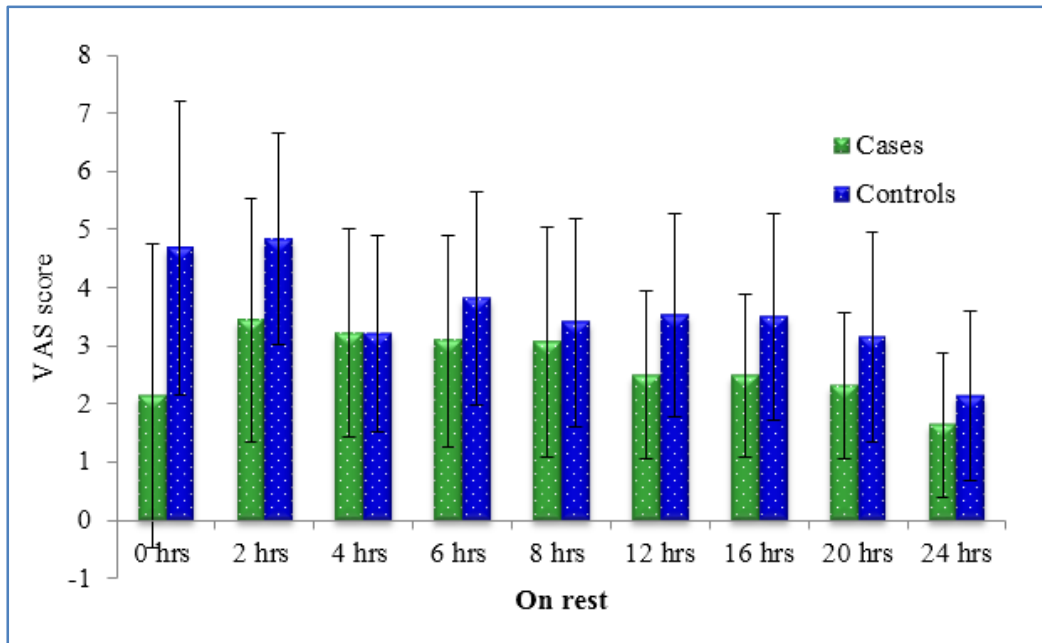


Picture No. 3

Picture number 4: Repeat analgesia given at 45 and 60 mins in control group (Analysed using categorical method).

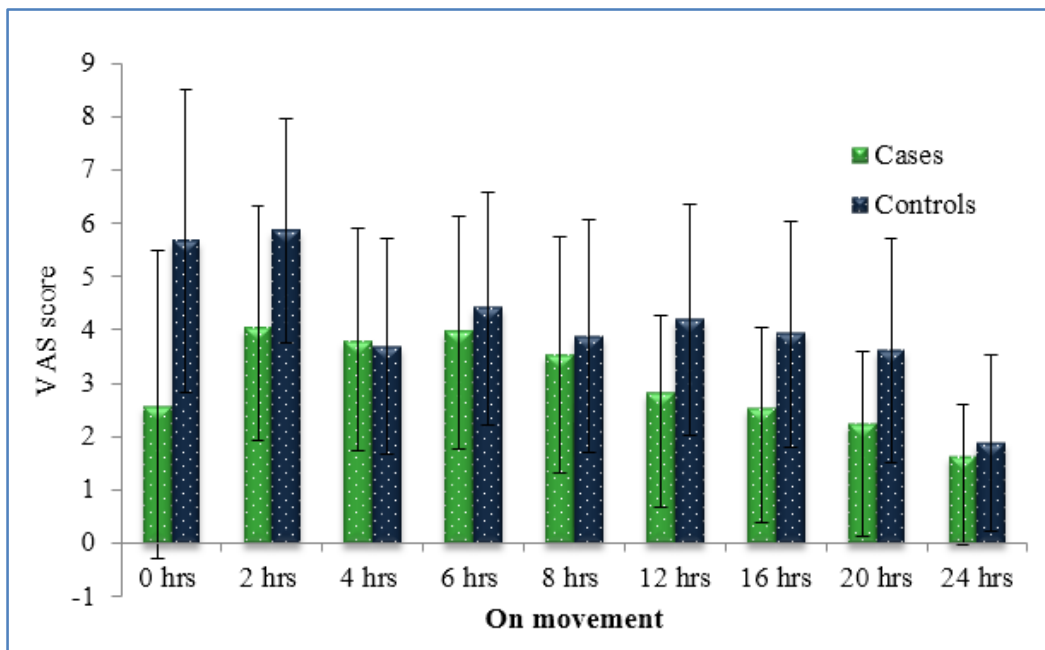


Picture No. 4



Picture No. 5

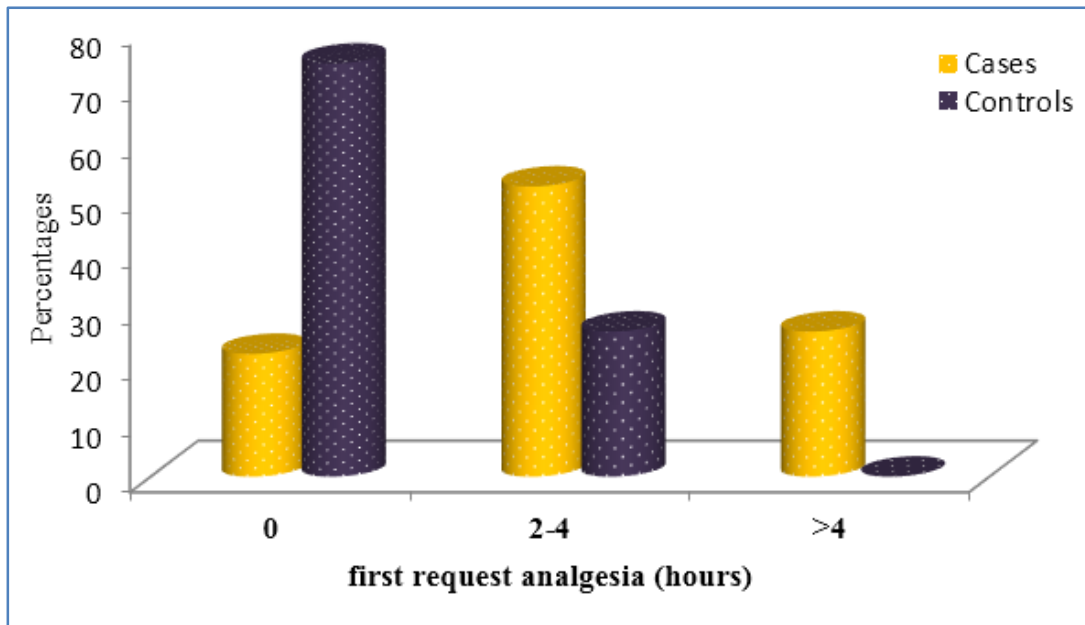
Picture number 6: Spastically analysed with continuous measurements and are presented on Mean \pm SD (Min-Max) VAS is more in control group ($p < 0.001$ at 0 hours, $p = 0.001$ at 2 hrs, $p = 0.46$ at 6 hrs, at 12 & 16 hours 0.002) VAS=visual analogue score.



Picture No. 6

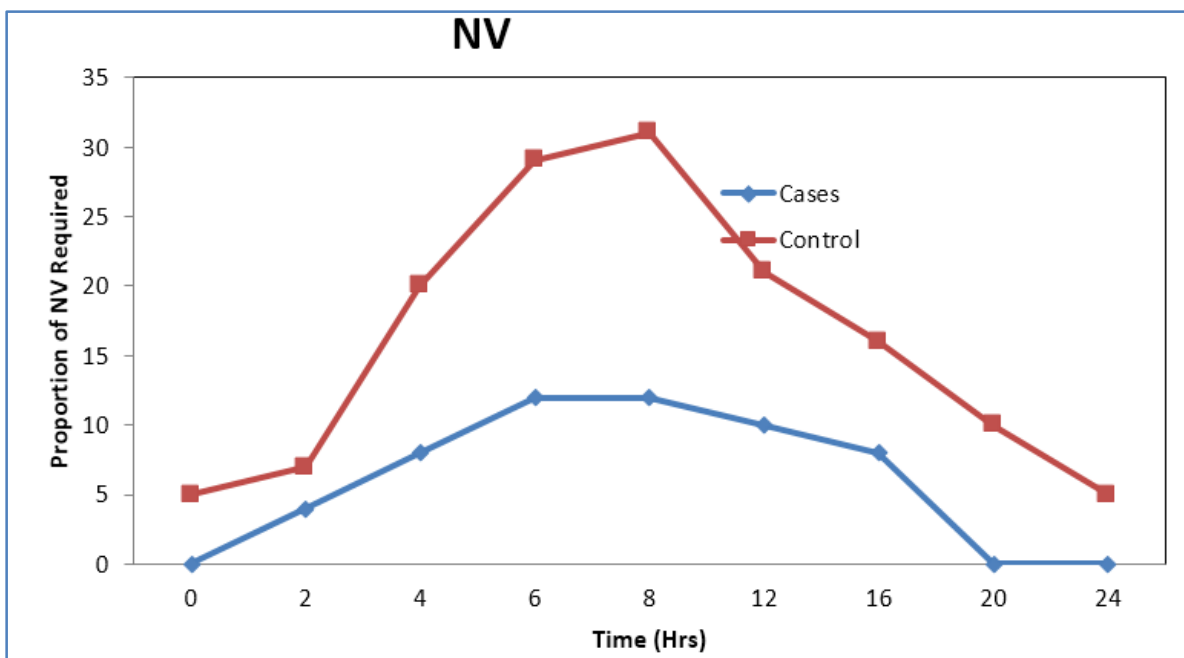
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Picture number 7: 74% pts of control group requested analgesia at 0 hours.



Picture No. 7

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



Picture No. 8

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