



Intraoperative superior hypogastric plexus block for postoperative pain following gynecological laparotomies

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ABSTRACT

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Background & Objectives: The superior hypogastric plexus block (SHPB) has been extensively used for treating pelvic cancer pain and chronic pelvic pain, but not as a modality of postoperative analgesia. Currently, postoperative analgesia following gynecological laparotomies is managed mainly by parenteral NSAIDs, opioids or by epidural block. We propose that the intraoperative superior hypogastric plexus block could be a safe and an effective method for managing postoperative pain in patients undergoing gynecological laparotomies.

Methodology: It was a prospective randomized case control study. Sixty female patients of ages 18-60 y belonging to ASA grade 1 and 2 undergoing gynecological laparotomies were allocated equally into two groups, study and control group. Both groups received general anesthesia. At the end of surgery, the Study Group received. Postoperative pain was assessed with VAS score, patient's vital parameters and amount of morphine consumed by patient controlled analgesia at 0, 2, 6, 12, 24 and 48 h.

Results: The VAS score for pain showed significant difference between Study Group and Control Group at 0 h ($p = 0.033$), 2 h ($p < 0.0001$), 6 h ($p < 0.0001$), 12 h ($p < 0.0001$) and 24 h ($p = 0.003$) but not at 48 h ($p = 0.085$). This showed that the block was more effective up to 24 h. There was significant difference of 33.6% ($p < 0.0001$) in morphine consumption between study (36.03 mg) and control (54.33 mg) groups.

Conclusions: We conclude that superior hypogastric plexus block is a simple, safe and effective without any major complications and has a short learning curve. It has a high success rate for majority of gynecological laparotomies.

Key words: Superior hypogastric plexus block; Gynaecological laparotomies; Postoperative pain: VAS: Morphine

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INTRODUCTION

The superior hypogastric plexus block (SHPB) has been extensively used for treating pelvic cancer pain and chronic pelvic pain due to endometriosis and other causes of pelvic diseases, but not explored as a modality for management of postoperative pain. Currently, postoperative analgesia following

gynecological laparotomies is managed mainly by parenteral NSAIDs, opioids or by epidural block.¹⁻³ We propose that the intraoperative superior hypogastric plexus block may be a safe and an effective method for managing postoperative pain in patients undergoing gynecological laparotomies.

The superior hypogastric plexus is located anterior to the vertebral bodies of L5 and S1 posterior to

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the psoas fascia and peritoneum and bounded laterally by the iliac vessels. This plexus innervates the pelvic viscera through the hypogastric nerves and inferior hypogastric plexus and continues caudally to form the ganglion impar.^{4,5} The anatomic location of the superior hypogastric plexus, the sympathetic predominance of this plexus and its role in transmission of majority of pain signals from the pelvic viscera (uterus, cervix, fallopian tubes, vagina, urinary bladder, prostate, testes, urethra, descending colon and rectum) has a potential to make this structure an ideal target for neural blockade for pelvic pain.^{6,7,8}

Major abdominal surgery is known to produce significant stress response by increasing cortisol and various catecholamines, blood glucose and interleukin-6. These are known to delay healing and recovery and can be minimized by neural blockade.^{9,10} In this study, we also propose to evaluate the effect of intraoperative superior hypogastric plexus block on surgical stress response.

METHODOLOGY

This is a prospective randomized case control study. The study was carried out in the Department of Anesthesiology and Intensive Care in association with the Department of Obstetrics and Gynecology at Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi, after the clearance from the institutional ethical committee. Sixty female patients of ages 18-60 years, ASA grade I and II undergoing gynecological laparotomies were included in the study and were randomized into two groups, study and control groups by the sealed envelope method.

Patients with coagulopathies or anticoagulant therapy, sepsis at the proposed site of block and patients in whom access to the block site was difficult due to distorted anatomy or adhesions were excluded.

All patients underwent a detailed pre-anesthetic evaluation. The nature of the study was explained to the patients. An informed consent was obtained from all the patients participating in the study. The standard fasting guidelines were followed. The patients were premedicated with tab. alprazolam 0.25 mg orally the night before and two hours before the surgery. Preoperatively the patients were familiarized with the VAS score and use of patient controlled analgesia (PCA) pump. All the patients received general anesthesia as per the standard protocol for gynecological laparotomies. Intraoperative analgesia included inj. Fentanyl 2 µg/kg initially followed by hourly bolus of 1 µg/kg and also as and when required. After completion of the surgical procedure and before closure of the abdominal wall, study group received superior hypogastric plexus block. The highest part

of the sacral promontory overlying L5-S1 interspace was the selected site of the block. The peritoneum overlying the sacral promontory was lifted using an Allis forceps and 22G (B) bevelled needle was placed retroperitoneally and 20-25 ml of 0.25% bupivacaine with 1:2,00,000 adrenaline was injected slowly after repeated negative aspiration. The presacral region was then massaged to allow the adequate spread of the drug. The abdomen was then closed in layers and abdominal wound infiltrated with 20 ml of 0.25% bupivacaine in both the groups for somatic analgesia. It was ensured that the total dose of bupivacaine did not exceed 2 mg / kg. After emergence from anesthesia, all patients were observed in PACU for 2 h and then shifted to the High Dependency Unit for rest of the period of the study.

Postoperative pain was assessed both subjectively by visual analogue scale score (VAS) and objectively by the morphine consumption by PCA pump and vital parameters - pulse, blood pressure, respiratory rate. The observations were made at 0, 2, 6, 12, 24 and 48 h.

An initial bolus of 1-2 mg of morphine was administered by the anesthesiologist if the patient complained of pain immediately after emergence from anesthesia. The patient was then put on the PCA pump as soon as the patient was oriented enough to press the activation button. PCA syringe pump model (T34L-PCATM) was used with morphine sulphate solution in a concentration of 1 mg/ml. The initial PCA pump was set at a bolus of 1 ml, Lock out time of 8 min with no basal infusion. Patients were encouraged to use the PCA pump as and when required. The morphine consumption was assessed initially at ½ hourly interval and later hourly. If the patient has VAS score of more than 4, increment bolus doses of 0.5 mg were made maintaining a constant lockout time. All the patients were encouraged to maximally use PCA pumps to remain pain free.

Surgical stress response was assessed by monitoring three stress markers - blood glucose, serum cortisol and serum Interleukin-6. The baseline samples of the above were taken at induction of anesthesia and the follow up samples were taken 24 h postoperatively. The time of passage of urine voluntarily after removal of the urinary catheter at 24 h following surgery was also assessed. The time taken for the patient to sit up and walk voluntarily was noted. Any untoward effects of the procedure were noted and treated appropriately.

Categorical variables were presented in number and percentage (%) and continuous variables were presented as mean ± SD and median. Normality of data was tested by Kolmogorov-Smirnov test. If the normality was rejected then non parametric test was used. Quantitative variables were compared using unpaired t-test/Mann-Whitney test (when the data sets were not normally distributed) between the

two groups and paired t test/ Wilcoxon rank sum test within the group across follow up. Qualitative variables were correlated using Chi-Square test / Fisher’s exact test. A p-value of < 0.05 was considered statistically significant. The data was entered in MS EXCEL spreadsheet and analysis was done using Statistical Package for Social Sciences (SPSS) version 21.0.

RESULTS

Out of total 60 patients, 30 patients received superior hypogastric plexus block and 30 patients did not receive the block after randomization. The two groups did not show any statistically significant differences in age, weight, height and BMI (Table 1).

The VAS scores for pain were assessed postoperatively at 0, 2, 6, 12, 24 and 48 h. They showed significant difference between Study Group and Control Group up to 24 h (Table 2) (Figure 1).

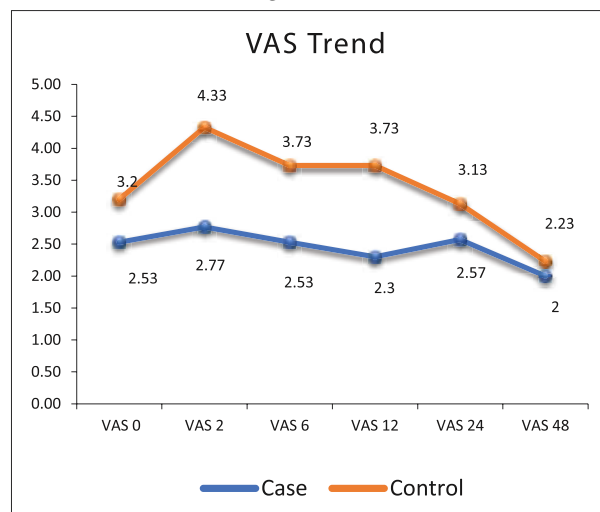


Figure 1: Trend of VAS scores postoperatively (n = 60)

Both the Study Group and Control Group were put on patient controlled analgesia (PCA) pump using morphine for 48 h postoperatively. The consumption of morphine was significantly less in the patients who received the block than in the Control Group throughout the observation period as shown in Table 3.

Whether superior hypogastric plexus block would affect surgical stress response was also assessed and blood glucose, serum cortisol and serum interleukin-6 levels were compared between Study Group and Control Group. Table 4 shows that there

Table 1: Demographic data of the patients (mean ± SD)

Variables	Study group (n = 30)	Control group (n = 30)	p value
Age (y)	40.47 ± 9.29	40.53 ± 7.25	0.750
Weight (kg)	53.9 ± 12	57.57 ± 6.18	0.055
Height (cm)	156.97 ± 6.92	157.23 ± 5.99	0.673
BMI	21.77 ± 4.02	23.39 ± 3.18	0.088

Table 2: Visual analogue score for pain in the postoperative period (n = 60)

VAS score at	Study Group (n = 30)	Control Group (n = 30)	p value
0 h	2.53 ± 1.14	3.2 ± 1.3	0.033
2 h	2.77 ± 1.01	4.33 ± 1.27	< 0.0001
6 h	2.53 ± 1.01	3.73 ± 0.87	< 0.0001
12 h	2.3 ± 0.7	3.73 ± 1.01	< 0.0001
24 h	2.57 ± 1.45	3.13 ± 0.82	0.003
48 h	2 ± 1.29	2.23 ± 0.86	0.085

Table 3: Consumption of morphine in the study subjects postoperatively. Data shown as mean ± SD (n = 60)

Time duration	M.C. in Study Group (mg)	M.C. in Control Group (mg)	p value
0-2 h	4.13 ± 2.42	5.87 ± 1.87	0.004
2-6 h	7.8 ± 4.22	12.1 ± 3.92	0.0003
6-12 h	7.97 ± 3.4	13.23 ± 3.65	< 0.0001
12-24 h	8.6 ± 3.38	12.27 ± 2.79	0.0001
24-48 h	7.53 ± 2.69	10.87 ± 3.19	0.0001
Total (0-48 h)	36.03 ± 12.42	54.33 ± 13.2	< 0.0001

was no statistically significant difference between Study Group and Control Group.

The time in hours for passage of urine after removal of urinary catheter at 24 h was also noted. There was no significant difference (p value 0.738) between Study Group (3.02 ± 1) and Control Group (3.05 ± 0.67).

The time of ambulation was also observed in both the groups postoperatively. According to our hospital guidelines, the patients were mobilized postoperatively and the time taken for the patients to

Table 4: Surgical stress response among study participants (n = 60)

Stress marker	Baseline	Post op	Mean difference	p value	Percentage rise
Blood glucose (mg/dl)	91.98	123.56	31.58	< 0.001	34.59
Serum cortisol (µg/dl)	13.20	25.64	12.44	< 0.001	142.65
Serum IL-6 (pg/ml)	8.07	35.42	27.34	0.017	315.87

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walk with support was noted. The values were 23.53 ± 1.0 h in Study Group and 25.03 ± 1.8 h in Control Group. So there was significant difference in the time of ambulation between the block group and the control group ($p < 0.001$).

There was no significant adverse event observed during the procedure and also in the postoperative period.

DISCUSSION

The superior hypogastric plexus neurolysis has been conventionally used for chronic pelvic pain due to malignancy^{13,16,20} and endometriosis.¹⁵ The neurolysis is done under the guidance of fluoroscopy^{12,13,16} from posterior approach or USG guided anterior approach²⁰. We used SHPB intraoperatively as a modality for postoperative analgesia following gynecological laparotomies. We found that SHPB decreased the consumption of morphine in the postoperative period and also decreased the VAS score for pain up to 24 h postoperatively.

The total morphine consumption in our patients via the PCA pump who received the block in 0-48 h was 36.03 mg which was significantly lower than in patients who did not receive the block (54.33 mg). The superior hypogastric plexus block achieved a significant reduction of 33.6% in morphine consumption in the block group ($p < 0.0001$) [Table 3].

Coming to the vitals of the patients in our study, the pulse rate and respiratory rate showed no difference in both the groups in postoperative period. Both SBP and DBP were lower in Study Group versus control group at 0, 2, 6 and 48 h which was statistically significant ($p < .001$).

The VAS score for pain showed significant difference between Study Group and Control Group at 0 h ($p = 0.033$), 2 h ($p < 0.0001$), 6 h ($p < 0.0001$), 12 h ($p < 0.0001$) and 24 h ($p = 0.003$) but not at 48 h ($p = 0.085$). This showed that the block was more effective up to 24 h (Table 2).

The only other study which has used SHPB as a modality for postoperative analgesia is by Rapp et al.²¹ They used 20 ml of 0.75% ropivacaine for the block and saline in the placebo group. They also achieved a significant reduction of 23% in morphine equivalent use postoperatively in the block group (median values of morphine equivalents 55.8 mg and 72.4 mg in the block and placebo groups respectively). In their study, the proportion of women scoring VAS4 at 2 h after block was significantly higher in the ropivacaine group (63%) than in the placebo group (25%).

Surgery induces neuroendocrine, metabolic and inflammatory responses collectively called 'surgical

stress response' and the magnitude of the response is proportional to the severity of surgical trauma.⁹ Major abdominal surgery causes significant stress response.¹⁰ We studied the degree of surgical stress response in gynecological laparotomies by comparing stress markers pre and 24 h postoperatively. We measured blood glucose, serum cortisol and interleukin -6 as the stress markers. We also assessed whether superior hypogastric plexus block affects the surgical stress response. This was not done by the earlier study.²¹ Blood glucose values rose from 91.98 mg/dl to 123.56 mg/dl, serum cortisol rose from $13.20 \mu\text{g/dl}$ to $25.64 \mu\text{g/dl}$ and serum IL-6 rose from 8.07 pg/ml to 35.42 pg/ml 24 h postoperatively in the control group (Table 4) implying a significant stress response following gynecological laparotomies. Moreover, there was no significant difference between Study Group and Control Group implying that the SHPB did not attenuate surgical stress response in postoperative period. ($p > .05$ in all the three groups)

The time taken for voluntary micturition after removal of urinary catheter at 24 h was comparable in both the Study Group (3.02 h) and Control Group (3.05 h). The block did not delay the passage of urine which may be seen with neuraxial blocks.

We assessed whether SHPB allows early ambulation postoperatively and the time taken for patients to stand up with support was noted in both Study Group (23.53 h) and Control Group (25.03 h). There was significant difference of 1.5 h between the two groups ($p < 0.001$) and so SHPB promoted early ambulation.

We found intraoperative SHPB to be a simple technique with a short learning curve. Moreover the placement of block is accurate with easy access to site (sacral promontory) ensuring a higher rate of success. The block did not fail in any of the patients. Moreover we did not come across any significant sequel such as intravenous injection or hypotension.

Coming to the shortcomings of the study, we feel that it would have been better to compare it with a placebo injection with saline but our ethical committee had a strong objection. As a matter of future research an indwelling catheter in the retroperitoneal space could prolong the duration of block.

CONCLUSION

The intraoperative superior hypogastric plexus block is a simple, safe and effective method of postoperative analgesia following gynecological laparotomies. The block is easy to place under direct vision and we found it to be technically simple with short learning curve. It promoted early ambulation, did not cause urinary retention and may be used as an alternative to neuraxial block where the latter is contra indicated.

Conflict of interest: None declared by the authors.

Authors' contribution:

VS: Conduction of the study work and literature search

SA: Manuscript editor

SK: Concept, writer and manuscript editor

AHP: Guidance

AB: Manuscript editor

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