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The role of intraoperative superior hypogastric plexus blocks in pain management for total abdominal hysterectomy: a comparative study

Elif Cansu Gündoğdu, Tuğba Gül Yılmaz

Department of Obstetrics and Gynecology, University of Health Sciences, Istanbul Kartal Dr. Lütfi Kırdar City Hospital, Istanbul, Turkey

ABSTRACT

Objectives: This study aimed to investigate the efficacy of intraoperative Superior Hypogastric Plexus Blocks (SHPBs) in managing postoperative pain following total abdominal hysterectomy, comparing pain scores and analgesic requirements between patients who received SHPBs and those who did not.

Methods: A prospective, randomized, controlled trial was conducted on 70 female patients undergoing elective total abdominal hysterectomy. Patients were randomly assigned to either the SHPB group or the non-SHPB group. In the SHPB group, intraoperative SHPBs were administered after uterine removal. Postoperative pain scores were assessed using the Visual Analogue Scale (VAS) at various time points. Analgesic consumption and adverse effects were also recorded.

Results: Patients in the SHPB group consistently exhibited lower pain scores compared to the non-SHPB group at various postoperative time intervals ($p < 0.05$). Initial analgesic requirements were significantly higher in the non-SHPB group, as was total analgesic consumption during the hospital stay ($p < 0.05$). No significant complications related to SHPB administration were observed.

Conclusions: Intraoperative Superior Hypogastric Plexus Blocks demonstrated a potential benefit in reducing postoperative pain scores and analgesic consumption in patients undergoing total abdominal hysterectomy. These findings highlight the potential of SHPBs as an effective approach to enhance pain management in this surgical population, warranting further investigation and refinement of administration protocols.

Keywords: Pain management, gynecological surgical procedures, analgesia, laparotomy, hysterectomy, elective surgical procedures

Postoperative pain management following total abdominal hysterectomy is a crucial aspect of patient care, as it influences recovery, psychological well-being, and overall surgical outcomes. Current strategies, such as epidural blocks, offer effective pain relief but can involve invasive procedures and potential complications. In light of these challenges, exploring alternative pain management approaches becomes paramount [1].

The pelvic region and its neural innervation play a pivotal role in pain perception, encompassing sympathetic, parasympathetic, and somatic nerves. Anatomically, spinal nerves originating from thoracolumbar and sacral segments contribute to this intri-

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Address for correspondence: *Elif Cansu Gündoğdu, MD., University of Health Sciences, Istanbul Kartal Dr. Lütfi Kırdar City Hospital, Department of Obstetrics and Gynecology, D-100 Güney Yanyol, Cevizli Mevkii, No:47, 34865 Kartal, Istanbul, Turkey. E-mail: e-jansu@hotmail.com, Phone: +90 216 458 30 00*

cate network. Among the potential strategies, the use of superior hypogastric block (SHPB) emerges as an intriguing possibility [2]. Superior hypogastric plexus (SHP), originating from L3-L4 sympathetic ganglia, contains sympathetic, sacral parasympathetic, and somatic afferent fibers [3]. Its division into the right and left hypogastric nerves culminates in the formation of the inferior hypogastric plexus, which serves as a central hub for neuronal integration within the pelvis.

Superior hypogastric block, initially described by Plancarte, has gained attention as a method for managing pelvic pain [3]. Performed through percutaneous techniques guided by ultrasound, fluoroscopy, or computed tomography, SHP blocks offer a promising avenue for pain relief [4]. However, their proximity to major vascular structures and sensitive anatomical components poses inherent challenges, leading to potential complications. In the context of total abdominal hysterectomy, the opportunity to explore intraabdominal anatomy presents a unique advantage, potentially minimizing complications associated with percutaneous SHP blocks [5].

This study takes inspiration from previous research involving SHP blocks and extends its application to the specific context of total abdominal hysterectomy [6]. While previous studies have focused on diverse patient groups, our investigation centers on patients undergoing total abdominal hysterectomy. By implementing the SHP block technique, we aim to assess its efficacy in postoperative pain reduction and analgesic consumption, thereby contributing to the optimization of pain management strategies in this surgical population.

In this article, we present the results of our study, which aims to compare postoperative pain scores and analgesic requirements between patients who received intraoperative SHP block and those who did not. By shedding light on the potential benefits and challenges associated with this novel approach, we hope to offer valuable insights into improving postoperative pain management for individuals undergoing total abdominal hysterectomy.

METHODS

Study Design and Patient Selection

This prospective, randomized, and controlled trial aimed to investigate the efficacy of superior hypogastric plexus block (SHPB) in reducing postoperative analgesic requirements and pain scores following total abdominal hysterectomy. The study was conducted in accordance with the ethical standards of the institutional review board (Istanbul Kartal Dr. Lütfi Kırdar City Hospital) and complied with the principles outlined in the Helsinki Declaration (Ethical approval Number: 2022/514/236/28). Prior to participation, patients were fully informed about the study's purpose, procedures, and potential risks. Written informed consent was obtained from all participants.

A total of 70 female patients, aged 18 years and above, with American Society of Anesthesiologists (ASA) physical status I or II, who underwent elective total abdominal hysterectomy or total abdominal hysterectomy with salpingo-oophorectomy for benign conditions such as uterine fibroids, ovarian cysts, dysfunctional uterine bleeding, between 01 November 2022 and 01 January 2023, were included in the study. Patients who had a history of continuous analgesic drug usage for reasons other than the surgical indication, patients under 18 years of age, and those scheduled for surgery due to malignancy were excluded from the study. Patients meeting the inclusion criteria were assigned randomly to either the study group (SHPB group) or the control group (non-SHPB group) in a 1:1 ratio. The randomization process was carried out using a closed-envelope method.

Anesthesia

All patients underwent standardized general anesthesia induction, which included the administration of propofol, fentanyl, and rocuronium. Anesthesia was maintained using inhaled sevoflurane, an oxygen and air mixture, and intravenous remifentanil. Dexketoprofen trometamol and tramadol were routinely administered intraoperatively ~30 minutes before skin closure. Bladder catheterization was performed for all patients and was removed the day after surgery.

Surgery and Superior Hypogastric Plexus Block

Total abdominal hysterectomy procedures were performed through a Pfannenstiel incision. The duration of surgery was recorded from the time of the initial incision to skin closure. Subsequent to uterine removal and closure of the vaginal cuff, administration of SHP blocks was initiated. Identification of the promontorium and aortic bifurcation was accomplished. The posterior peritoneum covering the promontorium was gently lifted using toothless tissue forceps, creating a tent-like elevation. A needle was then introduced at the apex of the tent and advanced approximately 1 cm inward, ensuring minimal contact with bony tissue. Following a negative aspiration, a retroperitoneal injection of 30 mL of 0.25% bupivacaine was administered.

Postoperative Pain Assessment

Patients were evaluated in the post-anesthesia care unit (PACU) for about 1 hour after surgery, and then transferred to the gynecology ward when their modified Aldrete scores reached ≥9. Postoperative pain was evaluated using a 10 cm Visual Analogue Scale (VAS) at predefined time points: 0, 15, 30, and 45 minutes, and 1, 2, 6, 12, and 24 hours (VAS0, VAS15, VAS30, VAS45, VAS-1, VAS-2, VAS-6, VAS-12, VAS-24) after surgery. Patients with VAS scores of 4 or higher received diclofenac sodium 75 mg/3mL intramuscularly as the first-line analgesic. Possible adverse effects of SHPB, such as bradycardia and hypotension, were monitored in the ward for 2 hours. The total number of analgesic doses administered during the postoperative period was recorded.

Statistical Analysis

Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS) version 22.0. The demographic characteristics, VAS scores, initial analgesic requirement, and total analgesic intakes were assessed by scrutinizing the median, minimum, and maximum values. Non-parametric data were analyzed using the Mann-Whitney U test. A *p* -value of < 0.05 was considered statistically significant. Primary outcome measures included the comparison of VAS scores and analgesic requirements between the SHPB and No-SHPB groups. Secondary outcomes included the duration of the first analgesic effect, demographic characteristics, and surgical indication. We utilized the G*Power software to conduct a power analysis and determine the optimal sample size for our research investigating the effect of intraoperative superior hypogastric plexus blocks on categorical outcomes. Extending insights from a previous study that assessed the impact of SHPB on pain intensity in cesarean section patients, we initially calculated a total sample size of 54, with 27 patients allocated to each group [7]. While employing 27 participants per group would have resulted in a power of 0.95, our objective was to enhance the study's statistical robustness while accounting for potential data variations. As a result, we included 35 individuals in each group. Subsequent post hoc analysis unveiled an elevated study power of 0.98.

RESULTS

In this study, we conducted a comprehensive analysis to investigate the impact of administering Superior Hypogastric Blocks (SHPB) on postoperative pain and the requirement for analgesics following total abdominal hysterectomy. A total of 70 patients who underwent elective total abdominal hysterectomy for benign indications were included in the study. Detailed patient exclusion criteria were applied, resulting in a final evaluation of 70 patients, with 35 patients in each group (SHPB and No-SHPB).

Table 1. Demographic characteristics

	SHPB group (n = 35)	No-SHPB group (n = 35)
Gravida	3 (1-8)	3 (0-12)
Age (years)	48 (43-69]	50 (40-78)
BMI (kg/m^2)	28.37 (19.03-36.45)	30.04 (18.67-46.75)
Lenght of hospital stay (days)	2 (1-7)	2 (1-5)
Duration of surgery (min)	80 (40-130)	90 (30-180)

Data are shown as median (minimum-maximum). SHBP = Superior Hypogastric Plexus Block

Demographic attributes, surgical durations, and hospital lengths of stay were comparable between the two groups (Table 1), ensuring a balanced baseline for subsequent analyses. The study revealed significant differences in analgesic consumption and pain scores between the two groups.

Table 2 offers a detailed comparison of Visual Analog Scale (VAS) scores across different groups, along with pertinent statistical data. VAS scores, serving as a quantifiable measure of pain intensity on a scale of 0 to 10, were juxtaposed between the SHPB and No-SHPB groups. The table illustrates VAS scores at various postoperative time intervals: 0, 15, 30, and 45 minutes, 1 hour, 2 hours, 6 hours, 12 hours, and 24 hours. Additionally, we examined the time of initial analgesic administration and the cumulative analgesic intake over a 24-hour period.

Consistently, VAS scores favored the SHPB group across different time points, including VAS0, VAS15, VAS30, VAS45, VAS1, VAS2, VAS6, and VAS24 ($p < 0.05$) (Table 2). It's noteworthy that a p-value of 0.053 for VAS at 12 hours indicates a potential difference between the groups, even though statistical significance wasn't firmly established.

Initial analgesic requirements were notably higher in the No-SHPB group ($p < 0.05$), implying a potential benefit of SHPB administration in reducing analgesic consumption. Furthermore, total analgesic usage dur-

Table 2. Comparison of VAS scores among SHPB groups

		Median (minimum-maximum)	U	*p*value
VAS 0 minute	SHPB group	3 (0-7)	138,00	**0.001***
	No-SHPB group	6 (0-10)		
VAS 15 minute	SHPB group	3 (0-7)	138.000	**0.001***
	No-SHPB group	6 (0-10)		
VAS 30 minute	SHPB group	3 (0-7)	138.000	**0.001***
	No-SHPB group	6 (0-10)		
VAS 45 minute	SHPB group	3 (0-7)	136.000	**0.001***
	No-SHPB group	6 (0-10)		
VAS 1 hour	SHPB group	3 (0-8)	151.000	**0.001***
	No-SHPB group	7 (3-10)		
VAS 2 hour	SHPB group	3 (0-7)	84.000	**0.001***
	No-SHPB group	7 (4-10)		
VAS 6 hour	SHPB group	3 (0-8)	266.000	**0.001***
	No-SHPB group	5 (2-8)		
VAS 12 hour	SHPB group	3 (0-7)	454.000	0.053
	No-SHPB group	4 (2-8)		
VAS 24 hour	SHPB group	2 (0-7)	349.500	**0.002***
	No-SHPB group	3 (2-8)		
Initial analgesic requirements	SHPB group	2 (0-30)	360.000	**0.001***
	No-SHPB group	1 (1-2)		
Total analgesic intakes	SHPB group	2 (0-5)	127.000	**0.001***
	No-SHPB group	4 (2-5)		

VAS = Visual Analogue Scale, SHPB = Superior Hypogastric Block ing the hospital stay was also significantly higher in the No-SHPB group ($p < 0.05$) (Table 2). These findings underscore the potential analgesic efficacy of SHPB administration in managing postoperative pain. Importantly, we observed no complications related to SHPB blocks, indicating the safety and feasibility of this intervention in the context of total abdominal hysterectomy.

DISCUSSION

In this study, we examine the effectiveness of intraoperative Superior Hypogastric Plexus Blocks (SHPB) as a promising approach for managing pain after surgery. In this context, our study embarks upon an exhaustive exploration into the integral role played by intraoperative Superior Hypogastric Blocks (SHPBs), with a particular focus on the dynamics surrounding total abdominal hysterectomy. Our aim is to underscore the potential benefits of SHPB in terms of reducing analgesic consumption and alleviating pain scores, ultimately enhancing the overall postoperative recovery experience for patients.

Aligned with the outcomes elucidated in the study of Aytuluk *et al*. [8], our study accentuates the pivotal role of SHPBs in promoting opioid-sparing effects and effective multimodal analgesia. The noticeable reduction in both analgesic consumption and pain scores corroborates the observations detailed in the study of Rapp *et al*. [9], thereby providing additional support for the effectiveness of this intervention.

Considering the intricate realm of sympathetic innervation, as discussed in the study of Aytuluk *et al*. [8], we gain insight into the complex landscape of visceral pain management, characterized by the interplay of multifaceted nociceptive mechanisms. While plexus blocks, such as the celiac plexus blocks have found utility in the realm of chronic pain management, their potential application in postoperative pain relief warrants further exploration [10].

The multifaceted nature of acute postoperative pain encompasses a diverse array of nociceptive structures, neuroendocrine pathways, and autonomic nervous systems [11]. The administration of SHPBs, leading to the blockade of excitatory sympathetic activation and nociception relayed through the superior hypogastric plexus, provides compelling evidence for the reduction in pain levels and analgesic utilization, thereby potentially mitigating the risk of chronic pain development [12].

The versatility of SHPBs is underscored by their applicability across various surgical scenarios. The convergence of our findings with those presented in the study of McDonell *et al*. [12] and Dooley *et al*. [13] underscores the promising potential of SHPBs as a valuable adjunct for both intraoperative anesthesia and postoperative pain relief.

The paramount consideration of safety in any therapeutic intervention remains paramount. The administration of intraoperative SHPBs attests to their safety profile, characterized by minimal complications such as vascular or bowel puncture. While concerns may arise regarding potential adverse effects such as bradycardia and hypotension, our empirical data indicates an overall hemodynamically stable trajectory post-SHPB administration.

Additionally, the theoretical concern of bladder dysfunction arising from SHPBs lacks substantial empirical support [14]. Our study signifies a notable absence of early-presenting bladder dysfunction among patients who underwent SHPBs.

Limitations

The inherent limitations of our study warrant acknowledgment. The delayed onset of SHPB effects underscores the importance of meticulous temporal planning to maximize pain relief. Moreover, the applicability of SHPB efficacy in surgical procedures involving retroperitoneal intervention necessitates further exploration.

CONCLUSION

In conclusion, our study sheds light on the potential advantages of intraoperative SHPBs in enhancing postoperative pain management. Future research endeavors should delve into refining administration protocols and exploring potential synergies with existing pain management modalities to optimize patient outcomes.

Authors' Contribution

Study Conception: ECG, TGY; Study Design: ECG, TGY; Supervision: ECG; Funding: ECG; Materials: ECG; Data Collection and Processing: ECG, TGY; Statistical Analysis and Data Interpretation: ECG; Literature Review: ECG, TGY; Manuscript Preparation: ECG, TGY and Critical Review: ECG.

Conflict of interest

The authors disclosed no conflict of interest during the preparation or publication of this manuscript.

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