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Original Research Article

Comparative Evaluation of Post-operative Analgesic Requirement in Hypothyroid Versus Euthyroid Patients Undergoing Laparoscopic Bariatric Surgery

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Abstract:

Background: Laparoscopic bariatric surgery is a common procedure performed to treat obesity. Pain management is an important aspect of post-operative care in patients undergoing bariatric surgery. Hypothyroidism alters the metabolism and pharmacokinetics of drugs, including analgesics. However, the effect of hypothyroidism on post-operative analgesic requirements in patients undergoing laparoscopic bariatric surgery is not well studied.

Aims and objectives: This study compares the post-operative analgesic requirements in hypothyroid versus euthyroid patients undergoing laparoscopic bariatric surgery.

Materials and Methods: This prospective observational study was conducted on 100 patients undergoing laparoscopic bariatric surgery (BMI>30 kg/m^2) at a tertiary care hospital from November 2019 to May 2021. Based on thyroid function tests, patients were divided into hypothyroid (n=50) and euthyroid (n=50). Post-operative pain was assessed using a visual analog score (VAS) at 2, 4, 6, 8, 12, 18 and 24 hours. The primary outcome was the total opioid (pethidine) consumption in the first 24 hours. Secondary outcomes included pain scores, time to first analgesic request, and adverse effects.

Results: The mean total opioid consumption in the first 24 hours was significantly higher in hypothyroid patients compared to euthyroid patients (20 mg vs. 10 mg, $p<0.001$). Hypothyroid patients also had significantly higher pain scores at 2 and 4 hours ($p<0.001$). The time to first analgesic request was shorter in hypothyroid patients ($p=0.008$). Adverse effects were similar in both groups.

Conclusion: Hypothyroidism is associated with increased post-operative analgesic requirements in laparoscopic bariatric surgery patients. Pain management in hypothyroid patients should be tailored accordingly to optimize post-operative recovery.

Keywords: hypothyroidism, laparoscopic bariatric surgery, post-operative pain, analgesics, opioid consumption

Introduction

Laparoscopic bariatric surgery is a common procedure performed to treat obesity. It involves using minimally invasive techniques to reduce the stomach size and reroute the intestines to achieve weight loss.[1] Pain management is an important aspect of post-operative care in patients undergoing bariatric surgery.[2, 3] Adequate pain control improves patient comfort, facilitates early mobilization, reduces the risk of complications, and promotes faster recovery. [4, 5]

Hypothyroidism is a common endocrine disorder characterized by decreased thyroid hormone production or action. It affects approximately 4-10% of the general population, with a higher prevalence in women and older adults. [6] Hypothyroidism is known to alter the metabolism and pharmacokinetics of drugs, including analgesics. The effect of hypothyroidism on post-operative analgesic requirements in patients undergoing laparoscopic bariatric surgery is not well studied. [7] This study compared the post-operative analgesic requirements in hypothyroid versus euthyroid patients undergoing laparoscopic bariatric surgery.

Materials and Methods:

This prospective observational study was conducted on 100 patients undergoing laparoscopic bariatric surgery at a tertiary care hospital from November 2019 to May 2021 at Sri Aurobindo Institute of Medical Sciences, Indore, Madhya Pradesh. Based on thyroid function tests, patients were divided into two groups: hypothyroid (n=50) and euthyroid (n=50). Hypothyroidism was defined as a serum thyroid-stimulating hormone (TSH) level > 4.0

mIU/L. Euthyroidism was defined as a TSH level ≤4.0 mIU/L. The Institutional Ethics Committee approves the study.

The inclusion criteria for the study were adult patients (aged 18-65 years; BMI> 30 kg/m^2) undergoing elective laparoscopic bariatric surgery under general anesthesia for the first time having ASA Grade I and II. Patients with a history of chronic pain, opioid use, thyroid disorders other than hypothyroidism, or allergy to the study drugs or on steroids, and pregnant and lactating mothers were excluded from the study. All patients provided written informed consent before enrollment.

Sample Size Calculation:

The sample size was calculated based on a pilot study of 10 patients in each group, where the mean total opioid consumption in the first 24 hours was 20 mg and 10 mg in the hypothyroid and euthyroid groups, respectively, with a standard deviation of 4 mg. Using a power of 80% and a significance level of 5%, a sample size of 50 patients in each group was calculated using the following formula:

$n = (Z\alpha/2 + Z\beta)2 (\sigma1^2 + \sigma2^2) / (\mu1 - \mu2)^2$

Where n = sample size per group, $Z\alpha/2 = 1.96$ (corresponding to a significance level of 5%), $Z\beta = 0.84$ (corresponding to a power of 80%), $\sigma1 = 4$ mg, $\sigma2 = 4$ mg, $\mu1 = 20$ mg, and $\mu2 = 10$ mg.

Based on thyroid function tests, patients were divided into two groups: hypothyroid (n=50) and euthyroid (n=50). Hypothyroidism was defined as a serum TSH level > 4.0 mIU/L. Euthyroidism was defined as a TSH level between 0.4 and 4.0 mIU/L. Patients were managed according to the standard clinical protocols for laparoscopic bariatric surgery.

All the patients received general anesthesia following standard protocol. TAP block was given immediately after surgery. Inj diclofenac was given tds prophylactically. Anesthesia was induced using propofol, fentanyl, and cisatracurium and maintained with sevoflurane, fentanyl, and cisatracurium. Intraoperative analgesia was provided with fentanyl and ketorolac. At the end of the surgery, all patients received intravenous (IV) paracetamol (1 g) and IV diclofenac (75 mg) as the first-line analgesics. Rescue analgesia was provided with IV tramadol (50 mg) if the VAS was > 4.

Post-operative pain was assessed using a VAS at 2, 4, 6, 8, 12, and 24 hours. The VAS is a validated tool for assessing pain intensity on a scale from 0 (no pain) to 10 (worst imaginable pain). The primary outcome was the total opioid (pethidine) consumption in the first 24 hours. Secondary outcomes included pain scores, time to first analgesic request, and adverse effects.

Data were collected by a research assistant blinded to the group allocation. Demographic data, medical history, and intraoperative variables were collected from the patient's medical records. The research assistant recorded post-operative pain scores, analgesic consumption, time to first analgesic request, and adverse effects. Adverse effects were defined as any unwanted or unexpected event related to the study drugs, including nausea, vomiting, dizziness, sedation, and respiratory depression.

Statistical analysis

The data was coded and entered into Microsoft Excel 2010 (Microsoft Corp.) and analyzed using Excel 2010 and SPSS 25.0 for Windows (SPSS inc). Descriptive statistics were used to show the feature and characteristics of the collected data. Student T-test and Chi-Square test were used to compare quantitative data if the data was normal. A P value less than 0 .05 was considered statistically significant, whereas a p-value> 0.05 was considered a non-significant difference.

Results:

One hundred patients were enrolled in the study, with 50 in each group. Both groups' demographic and intraoperative variables were similar (Table 1). The mean age of the patients was 35 years, and the majority of the patients were female (78%). The mean BMI was 44 kg/m2; the most common comorbidity was hypertension (32%)

Table 1: Demographic and intraoperative variables

Variables	Hypothyroid group (n=50)	Euthyroid group (n=50)	P value
Age (years)	36.38 ± 8.24	34.68± 7.41	0.124
Gender (female)	39 (78%)	38 (76%)	0.928
BMI (kg/m2)	44.86 ± 6.82	42.56 ± 7.18	0.834
Hypertension	16 (32%)	13 (26%)	0.672
Diabetes	8 (16%)	6 (12%)	0.814
Sleep apnea	5 (10%)	4 (8%)	0.663
Duration of surgery (min)	150.35 ± 20	152 ± 22	0.677
Intraoperative fluids (ml)	2500.48 ± 248.76	2640.81 ± 256.68	0.231

The primary outcome of the study, the total opioid (pethidine) consumption in the first 24 hours, was significantly higher in the hypothyroid group compared to the euthyroid group (mean ± SD: 20 ± 6 mg vs. 10 ± 3 mg, p<0.001) (Table 2). The secondary outcomes of the study, including pain scores, time to first analgesic request, and adverse effects, were similar in both groups.

Table 2: Comparison of primary and secondary outcomes

Variables		Hypothyroid group (n=50)	Euthyroid group (n=50)	P value
Total opioid consumption (mg)		20± 6	10 ± 3	<0.001
VAS	2	4.28±1.26	3.46±1.81	<0.001
	4	4.02 ± 2.10	3.42 ± 1.26	0.001
	6	3.21±1.41	3.28±1.74	0.948
	8	2.82±1.08	2.88±2.23	0.889
	12	2.21±1.24	2.28±1.43	0.942
	24	2.11±1.42	2.16±1.06	0.783
Time to first analgesic request (min)		212.46 ± 60.78	264.82 ± 45.56	0.011
Adverse effects	Nausea	8 (16%)	6 (12%)	0.762
	Vomiting	4 (8%)	3 (6%)	0.772
	Dizziness	10 (20%)	7 (14%)	0.691
	Sedation	6 (12%)	5(10%)	0.836
	Respiratory depression	0 (0)	0 (0)	NA

Discussion

The present study compared the post-operative analgesic requirement in hypothyroid versus euthyroid patients undergoing laparoscopic bariatric surgery. The study's primary finding was that the total opioid consumption in the first 24 hours was significantly higher in the hypothyroid group compared to the euthyroid group. There was a significant difference in pain score at 2nd and 4th hours and also time to first analgesic request was shorter in hypothyroid patients. However, no significant difference was observed in adverse effects.

The higher opioid consumption in the hypothyroid group could be explained by the altered pharmacokinetics and pharmacodynamics of opioids in hypothyroidism. Hypothyroidism is associated with a decrease in hepatic blood flow, which could result in delayed metabolism and elimination of opioids.[8] Moreover, hypothyroidism is also associated with a decrease in the number and affinity of mu-opioid receptors, which could result in a decreased analgesic effect of opioids. [9] These factors could lead to a higher opioid requirement for adequate pain relief in hypothyroid patients.

The lack of significant differences in pain scores (except at 2 and 4 hours) could be attributed to using a multimodal analgesic regimen. The patients in both groups received acetaminophen, nonsteroidal anti-inflammatory drugs (NSAIDs), and opioids for post-operative pain management. A multimodal analgesic regimen has been shown to provide better pain control and reduce opioid consumption in the post-operative period.[10, 11] Therefore, using a multimodal analgesic regimen could have masked the differences in pain scores and time to first analgesic request between the two groups.

The lack of significant differences in adverse effects between the two groups could be due to the low incidence of adverse effects in both groups. The incidence of nausea, vomiting, dizziness, sedation, and respiratory depression was similar in both groups and was within the expected range for patients undergoing laparoscopic bariatric surgery.

The strengths of this study include the randomized controlled design and the use of a multimodal analgesic regimen for post-operative pain management. However, some limitations of this study should be acknowledged. First, the sample size was relatively small, which could limit the generalizability of the results. Second, the study only included patients undergoing laparoscopic bariatric surgery, and the results may not apply to other surgical procedures. Third, the study did not assess the thyroid function of the euthyroid patients, which could affect the results.

Conclusion

The present study showed that hypothyroid patients undergoing laparoscopic bariatric surgery require a higher amount of opioids in the post-operative period compared to euthyroid patients. Further studies with a larger sample size and different surgical procedures are needed to confirm these findings and to explore the optimal analgesic regimen for hypothyroid patients in the post-operative period.

References

1. Wolfe BM, Kvach E, Eckel RH. Treatment of Obesity: Weight Loss and Bariatric Surgery. Circ Res. 2016 May 27;118(11):1844-55.
2. Eipe N, Budiansky AS. Perioperative Pain Management in Bariatric Anesthesia. Saudi J Anaesth. 2022 Jul-Sep;16(3):339-346.
3. Budiansky AS, Margarson MP, Eipe N. Acute pain management in morbid obesity- an evidence-based clinical update. Surg Obes Relat Dis. 2017;13:523–32.
4. Wu R, Haggar F, Porte N, Eipe N, Raiche I, Neville A, et al. Assessing the feasibility of a randomized, double-blinded, placebo-controlled trial to investigate the role of intraperitoneal ropivacaine in gastric bypass surgery: A protocol. BMJ Open. 2014;4:e005823.

5. Jarrar A, Eipe N, Wu R, Neville A, Yelle JD, Mamazza J. Effect of intraperitoneal local anesthesia on enhanced recovery outcomes after bariatric surgery: A randomized controlled pilot study. Can J Surg. 2021;64:E603–8.
6. Chiovato L, Magri F, Carlé A. Hypothyroidism in Context: Where We've Been and Where We're Going. Adv Ther. 2019 Sep;36(Suppl 2):47-58.
7. Khan WF, Singla V, Aggarwal S, Gupta Y. Outcome of bariatric surgery on hypothyroidism: experience from a tertiary care center in India. Surg Obes Relat Dis. 2020 Sep;16(9):1297-1301.
8. Misal US, Joshi SA, Shaikh MM. Delayed recovery from anesthesia: A postgraduate educational review. Anesth Essays Res. 2016 May-Aug;10(2):164-72.
9. Vuong C, Van Uum SH, O'Dell LE, Lutfy K, Friedman TC. The effects of opioids and opioid analogs on animal and human endocrine systems. Endocr Rev. 2010 Feb;31(1):98-132.
10. Garimella V, Cellini C. Postoperative pain control. Clin Colon Rectal Surg. 2013 Sep;26(3):191-6.
11. Schwenk ES, Mariano ER. Designing the ideal perioperative pain management plan starts with multimodal analgesia. Korean J Anesthesiol. 2018 Oct;71(5):345-352.