

COMPARISON OF TWO PAIN POSTOPERATIVE TREATMENT METHODS IN PATIENTS WITH RECTAL CARCINOMA

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Summary

Adequate postoperative analgesia is a fundamental human right. The goal of this study was to determine benefits in the treatment of acute postoperative pain by additionally placing a wound catheter at the end of the operation.

We have analyzed the effectiveness of postoperative pain therapy of patients who had surgery for rectal carcinoma at the University Hospital for Tumours from 1st April to 30th November 2018. Patients were divided into two groups according to pain therapy protocol. Each group had 30 patients. The first group of patients received intravenous multimodal analgesia. The second group received both the intravenous multimodal analgesia and additional local anesthesia through the wound catheter. We measured the pain intensity with the Numerical rating scale and the amount of opioid analgesic fentanyl given to the patients. We recorded these data: when the patient came out of the operation theatre (time zero), six hours, twenty-four hours, and forty-eight hours after the surgery. Furthermore, we took registered the timing of the first postoperative bowel movements. Results showed a slightly better pain control in the second group but without statistical significance.

KEYWORDS: *multimodal analgesia, wound catheter, numerical rating scale, fentanyl, peristalsis*

INTRODUCTION

Internal organs contain nociceptors on their surface, and they conduct painful stimulation in

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cases of mechanical, thermal, and chemical stimulus or inflammatory reaction or through inflammatory mediators (1). The inflammatory mediators such as bradykinin, serotonin, histamine, somatostatin, leukotrienes, ions K^+ , H^+ , and Cl^- activate nociceptors, which can lead to the formation of painful occurrences or hypersensitivity of pain in the inflamed area. The pain in visceral organs is diffuse and dull. Acute pain can affect the functions of all organs and make a significant impact

on morbidity and mortality. Pain lowers tissue perfusion and raises the risk of deep vein thrombosis incidents. The raising of catecholamine concentration leads to tachycardia, hypertension, increased contractility, and the need for more oxygen for the heart muscle. Following this, tachypnoea, hyperventilation, there is a possibility of small respiratory pathways collapse, reduction of coughing reflexes, and fall in functional residual capacity. The effects of pain on the CNS can also cause anxiety, depression, and sleep disorders. Pain can also cause an increase in the frequency and tone of the sphincter muscle, slowing of the total motility of bowels, dilatation of the stomach, and paralytic ileus. Increased secretion of renin, aldosterone, cortisol, antidiuretic hormone brings on hypokalaemia, hyponatremia, and water retention. Catabolism increases and a resistance to insulin occurs (2). Pain has subjective character, so the best estimation of pain can be provided by the person who is experiencing it. Various analog scales are in use for subjective pain evaluation. Mostly, patients choose a number that expresses the intensity of the pain.

Effective treatment of acute pain leads to shorter hospitalization of the patients, fewer complications, quicker discharge from the Intensive Care Unit (ICU), fewer days of physical incapability, lesser risk of chronic pain, proficient use of working hours of medical staff and rational use of expensive hospital resources (3). At the same time, if not adequately managed, the pain causes unnecessary suffering and compromises the quality of life (4). The best treatment outcome includes postoperative pain control by using multimodal analgesia, as soon as feasible mobilization of patients and earlier start of enteral feeding. A planned combination of analgesics is administered before the end of a surgical procedure so that they can be absorbed, distributed, and in effect just in time after the operation. Multimodal analgesia is used as an optimal combination of smaller doses of two or more analgesics with different mechanisms of actions which can be applied in different ways. Amongst the most common are opioids, local anesthetics, non-steroid anti-inflammatory drugs (NSAID), antipyretics, and drugs with an influence on the central nervous system (CNS). The goal is to optimize analgesia, lower the side effects of their use, and the overall consumption of opioids. The methods of regional analgesia and anes-

thesia, blockade of only those nerves that are innervating the operation field, have a crucial role in the treatment of postoperative pain (5). The wound catheter placement and administration of local analgesia complement the multimodal intravenous analgesia. A surgeon places the spiral perforated catheter directly to the wound at the end of the operation. The catheter must cover the complete length of the wound, and this will dictate the concentration and volume of local anesthetic, which will be applied (6,7,8). The potential risk of wound infection and systemic toxicity with local anesthetics are potential complications of this approach.

AIM OF STUDY

This research aimed to compare the two treatments of postoperative pain by applying intravenous multimodal analgesia and intravenous multimodal analgesia plus the wound catheter in patients after the rectal cancer resection.

MATERIALS AND METHODS

We recruited patients from 1st April to 30th November 2018 who underwent rectal cancer resection. The surgical procedure was anterior restorative rectal resection at University Hospital for Tumours, Sestre milosrdnice University Hospital Center in Zagreb (table 1).

The study included two groups of patients; each contained 30 patients. The postoperative pain

Table 1.

Postoperative analgesia in Intensive Care Unit

Postoperative analgesia	
Group I.	Group II.
Intravenous multimodal analgesia	Intravenous multimodal analgesia plus wound catheter
Fentanyl 20 mL/40 mL 0,9 % NaCl 1mL/h	Fentanyl 20 mL/40 ml 0,9 % NaCl 1 mL/h
Fentanyl 2 mL bolus as needed if NRS is ≥ 4	Fentanyl 2 mL bolus as needed if NRS is ≥ 4
Ketoprofen 100 mg intravenous x 2	Ketoprofen 100 mg intravenous x 2
Paracetamol 1 g intravenous x 1	Paracetamol 1 g intravenous x 1
	Levobupivacaine 0,25% 6 mL/h per wound catheter

therapy in the first group (Group I) included intravenous multimodal analgesia: opioid analgesic Fentanyl 0.05 mg per hour continuously intravenous, plus boluses 0.1 mg intravenous as needed and ketoprofen as nonsteroidal anti-inflammatory agent every twelve hours. Paracetamol, a non-selective cyclooxygenase inhibitor, was also given once a day.

The second group received the same intravenous multimodal analgesia and an additional 0.25% local anesthetic levobupivacaine through the wound catheter during forty-eight hours of 6 ml per hour.

The numerical values collected from the Numeric pain scale were taken at the time when the patient came out from the operation theatre (zero time), six hours, twenty-four hours, and forty-eight hours after the surgery. Also, the final number of fentanyl boluses provided, and the starting moment of bowel moments were recorded and analyzed in each group. Data were analyzed retrospectively from the records: patient's age, gender, individual score on Numeric pain scale, total consumption of fentanyl, and the moment of first postoperative peristalsis.

All patients signed informed consent forms, and the Ethical Committee of Sestre milosrdnice University Hospital Center approved the research.

The data was recorded in absolute and relative frequencies. Numerical data were described with arithmetic mean and standard deviation. Student t-test, Mann-Whitney U test, and χ^2 -test was used to determine any significant statistical inconsistency and the differences between the parameters in these two groups. Spearman's rank correlation coefficient determined correlation and direction of connections between parameters. The value of $P < 0,05$ will be considered statistically significant. The data was statistically analyzed using MedCalc (v. 19.0.4. Copyright©1993-2019 MedCalc Software bvba, Ostend, Belgium).

RESULTS

The average age of male patients in Group I was 69.22 ± 8.82 , and females were 65.83 ± 8.86 ($p = 0,920$), in total 67.93 ± 8.85 . In group II. male average age were 69.50 ± 8.1 and female were 64.80 ± 15.06 ($p = 0,843$), in total 67.90 ± 10.9 . In both groups, older man prevailed, but without statistical significance.

Table 2.

Average age of patients

	Group I.	Group II.	P
	mean±SD	mean±SD	t-test
male	69.22±8.82	69.5±8.12	0.92
female	65.83±8.86	64.8±15.06	0.843
total	67.93±8.85	67.9±10.9	0.979

Table 3.

Numeric pain scale

Number of patients	Postoperative time (h)	Group I.	Group II.
		Mean±SD	Mean±SD
30	0	4.8±1.98	4.13±1.78
30	6	4.1±1.95	3.6±1.63
30	24	3±1.51	2.43±1.52
30	48	2.2±1.27	1.73±0.98

The numerical pain scale showed, for both groups of treated patients, that the peak on the pain scale is reached, immediately after the operation and at the six hours postoperatively. The lowest pain score was at the 48th hour after the surgical procedure. The results themselves are presented as an average measurement of values and as standard deviation. The results of the numerical pain scale between Group I. and Group II. who had intra-wound catheter were compared per previously mentioned postoperative hours and they showed no statistically significant score (Mann-Whitney U test: $P 0:0k = 0, 1637$; $P 6:6k = 0, 3071$; $P 24:24k = 0, 1482$; $P 48:48k = 0, 1394$).

The values of the numerical pain scale for Group I (T1) immediately after coming to the Intensive Care Unit was not different when compared to the one taken at T6 after the surgical procedure (no statistically significant difference). At the same time, there was a statistically significant difference between T0 versus T24 and T48. (Mann-Whitney U test: $P 0:6 = 0, 1834$; $P 0:24 = 0, 0003$; $P 0:48 = 0, 0001$). Identical results have been obtained for Group II. treated via intra-wound catheter (Mann-Whitney U test: $P 0k:6k = 0, 2273$; $P 0k:24k = 0, 003$; $P 0k:48k = 0, 001$).

The results of the numerical pain scale showed that the patients in Group I had a consistently higher score during the postoperatively observed period. This difference is not statistically

Table 4.

Number of Fentanyl boluses

Fentanyl boluses		Group I.	Group II.
Number of patients	Postoperative time	mean±SD	mean±SD
30	0	1.83±0.65	1.07±0.87
30	6	1.4±1.5	0.97±1.3
30	24	0.77±1.1	0.93±1.8
30	48	0.37±0.85	0.2±0.41

significant, but it is of great clinical value as it suggests that patients with the intra-wound catheter had better analgesic efficiency.

Table 4. shows the frequency of fentanyl boluses provided to the patients in correlation to the end of the operation. The most boluses were given in the period 0-6 hours postoperatively in compare to the 24-48 hours postoperatively when there was the lowest need for them. The results of fentanyl consumptions between Group I and Group II classified per postoperative hours did show statistically significant change (Mann-Whitney U test: P 0:0k= 0, 3341; P (0-6):(0k-6k)= 0, 2395; P (6-24):(6k-24k)= 0, 8141; P(24-48):(24k-48k)= 0,6740).

The patients treated with intravenous multimodal analgesia in combination with a local anesthetic applied via intra-wound catheter needed fewer Fentanyl boluses, and a cumulative number of boluses show that this method is more efficient, even though χ^2 - the test does not confirm this conclusion. There is no statistically significant difference between the two tested groups ($\chi^2= 12$; free degrees= 9; P= 0, 213).

Table 5.

Peristalsis

The appearance of peristalsis					
		Group I.		Group II.	
Number of patients	Postoperative time (h)	mean±SD	Total	mean±SD	Total
30	0	0	0	0	0
30	6	0	0	0	0
30	24	0.43±0.5	13	0.6±0.5	18
30	48	0.73±0.45	22	0.83±0.38	25

We assessed the bowel movements at certain time points, which are presented as an average value of recorded hours scores of the thirty patients (including their standard deviation and sum values). In both groups with and without intra-wound catheter installation, the first bowel movement was recorded most frequently in the 24-48h postoperative period. The difference between these two groups was not statistically significant (Mann-Whitney U test: P (6-24): (6k-24k)= 0, 2074; P(24-48): (24k-48k)= 0, 3659). However, we noticed that the bowel movements started sooner in patients with the intra-wound catheter.

DISCUSSION

Treatment of postoperative pain is a significant factor for fast recovery and patient satisfaction.

Patients who received multimodal intravenous analgesia had more fentanyl boluses. Giving an opioid in the acute postoperative period has various side effects, especially for the respiratory tract and cardiac functions, changing the immune response and slowing down the motility of bowels. With a higher number of fentanyl boluses, there is a delay in bowel movement restoration and possible suppression of immune response.

Different modalities of regional analgesia lower the doses of opioids administered to the patients. Adding local anesthetic to analgesia via an intra-wound catheter or local neural blocks seem to have a systemic anti-inflammatory effect. Lidocaine derivates stabilize the cell membrane, which not only reduces the pain notion but also probably reduces inflammation and cell migration (9).

According to our in house protocol, we place intra-wound catheters and administer local anesthetics continuously during the first 48 hours after all abdominal surgeries. Intra-wound catheters, in combination with opioids and NSAIDs, provided adequate pain control and stimulated peristalses.

The study participants were 67.93 ± 9.92 years old. Aging affects the whole body and also influences the response of pain, which may also be a confounding factor in this study(10).

CONCLUSION

Both approaches to postoperative pain control function well in patients after the operation of rec-

tal cancer. The data collected in this study showed potential benefits of the application of intravenous multimodal analgesia in combination with a local anesthetic via the intra-wound catheter. The difference itself is not statistically significant but might signal a trend towards adding local analgesia.

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Sažetak

USPOREDBA DVIJE METODE POSLIJEOPERACIJSKE ANALGEZIJE KOD BOLESNIKA S REKTALNIM KARCINOMOM

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Učinkovito liječenje boli jedno je od temeljnih ljudskih prava. Cilj istraživanja bio je ustanoviti prednosti u liječenju akutne poslijeoperacijske boli postavljanjem ranskog katetera na kraju operacije.

Analizirali smo učinkovitost liječenja poslijeoperacijske boli kod bolesnika koji su operirani zbog rektalnog karcinoma u Klinici za tumore u periodu od 1. travnja do 30. studenog 2018. Bolesnici su podijeljeni u dvije grupe ovisno o protokolu za analgeziju. Svaka grupa je uključivala 30 bolesnika. Prva grupa je primala intravensku multimodalnu analgeziju. Druga grupa bolesnika dobivala je jednaku intravensku multimodalnu analgeziju i dodatno je postavljen ranski kateter u ranu na kraju operacije. Za mjerenje jačine boli primjenili smo Numeričku skalalu boli i ukupnu količinu opioidnog analgetika fentanylja koju su bolesnici primili, podatke smo bilježili po izlasku iz operacijske sale (nulto vrijeme), šest sati, dvadeset četiri sata te četrdeset osam sati nakon operacije. Nadalje, zapisivali smo vrijeme pojave prve peristaltike. Rezultati su pokazali da postoji izvjesna prednost u drugoj grupi, ali ona nije statistički značajna.

KLJUČNE RIJEČI: multimodalna analgezija, ranski kateter, brojčana ocjenjivačka ljestvica, fentanyl, peristaltika