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ORIGINAL ARTICLE

The Effect of Intraperitoneal Administration of Dexamethasone on Abdominal Pain and Shoulder Pain after Selected Cholecystectomy by Laparoscopic Method

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ABSTRACT

Introduction: Laparoscopic cholecystectomy is the standard treatment of cholecystitis. In comparison to open surgery, it has advantages such as a shorter recovery period and a shorter hospital stay. One of the side effects of this treatment is abdominal and shoulder pain after surgery. The purpose of this study was to see how intraperitoneal dexamethasone affects abdominal and shoulder pain following laparoscopic cholecystectomy.

Methods and materials: This study included 70 patients aged 18-70 years who were candidate for laparoscopic elective cholecystectomy. Using a random number table, patients were separated into two equal groups. In the first group, after laparoscopy and before trocar removal, 20 cc of ringer serum containing 8 mg dexamethasone was sprayed in the diaphragm and peritoneal cavity, and in the second group, 20 cc ringer was sprayed. Visual analog scale (VAS) pain score was used to assess post operation pain.

Results: From 6 o'clock on, there was a substantial difference in abdominal pain between the two groups, with the control group experiencing higher pain. From 12 o'clock onwards, there was a strong association between shoulder discomfort in the two groups, and patients in the control group experienced more pain. Furthermore, the control group received more opioids. Patients in the control group experienced higher nausea and vomiting starting 12 hours after surgery.

Conclusion: After laparoscopic surgery, dexamethasone can relieve abdominal and shoulder discomfort, as well as nausea and vomiting, and it can also reduce the need for opioids. Dexamethasone appears to be effective in minimizing postoperative complications.

Keywords: Postoperative Pain, Intraperitoneal, Dexamethasone, Laparoscopy

INTRODUCTION

Nowadays, laparoscopy is one of the most common diagnostic and therapeutic methods in the world. This surgical procedure has many advantages, including that, not only the time to return to work is fast, but also the length of hospital stay is short (1).

Laparoscopic cholecystectomy is the standard treatment of cholecystitis (2).

As we know in the laparoscopic method, pain after surgery is slighter and the need for analgesics is also less than open surgeries (3). These pains, which are often visceral pains, can be severe and there are several treatment methods to improve them (4).

There are various studies related to the mechanism of causing these pains. Most of them agree that this kind of pain is caused by diaphragm inflammation which is produced by carbon dioxide inserted inside of the peritoneum during the procedure (5).

On the other hand, we know that reducing postoperative complications and improving the quality of surgical outcomes is the main goal of surgeons and the health care system, and one of the postoperative complications which has always worried patients is postoperative pain (6).

Other common complications after laparoscopic cholecystectomy include nausea and vomiting, which their prevalence is reported between 44% and 83%. Postoperative nausea and vomiting can cause sweating, tachycardia, abdominal pain, prolonged recovery, and increase the risk of aspiration (7).

Since the weakness in the quality of return to normal life increases hospital stay time, delay in recovery, and decreases patient satisfaction, surgeons are always thinking about controlling postoperative complications apart from the tendency to less invasive procedures such as laparoscopic surgeries (8).

Numerous studies have been conducted in the world regarding postoperative pain control and different methods have been suggested for post-operation pain control. One of the new methods for controlling postoperative pain is the use of local anesthetics that are used in different ways, including the use of opioids alone or with opioids in the neuraxial space, the use of local anesthetics such as dexamethasone, and intra incisional injection of anesthetics, as well as intraperitoneal injection of local anesthetics (9-12).

Therefore, in this study, we aimed to investigate the effect of intraperitoneal dexamethasone administration on abdominal pain and shoulder pain after laparoscopic cholecystectomy.

MATERIALS AND METHODS

This study, which was a double-blind clinical trial, was performed after obtaining the relevant ethical licenses with a sample size of 70 patients, according to similar studies and statistical expert theory. In this study, 70 patients aged 18-70 years who were candidate for laparoscopic elective cholecystectomy in Shahid Sadoughi Hospital of Yazd, with American Society of Anesthesiologists (ASA) classes I and II were included after completing the written consent form. After transferring the patient to the operating room, patient monitoring including electrocardiography, pulse oximetry, ETCO2, and non-invasive blood pressure measurements were performed. Anesthesia was performed in all patients with the same method and laparoscopic procedures were performed with the same method. Patients were divided into two equal groups using random numbers table. In the first group, after laparoscopy and before trocar removal, 20 cc of ringer serum containing 8 mg dexamethasone was sprayed in the diaphragm and peritoneal cavity, and in the second group, 20 cc ringer was sprayed. After spraying the solution, at least 10 minutes the patient was kept in trendelenburg position.

The injector did not know the type of solution used and the solution was prepared by the surgical assistant and given to the surgical team. Abdominal pain was measured based on the visual analog scale (VAS) pain score at 1, 2, 4, 6, 12, 24 hours after the surgery. Also, during these hours, the shoulder pain score was determined using the following method:

1 without pain
2 Unpleasant feeling without pain
3 Mild pain without the need for drugs
4 Moderate pain and need for drugs
5 Severe pain requiring analgesics or narcotics

If the patient had a grade of abdominal pain of 6 or more in scoring with a pain ruler (VAS) or shoulder pain with a score of 4 or more, 25 mg of intravenous pethidine was prescribed. Patients' nausea and vomiting were also recorded in 1,2,4,6,12,18 and 24 hours after surgery and in data collection, we did not distinguish between retching and vomiting (retching was also considered as vomiting).The information received was recorded in the relevant questionnaire and then analyzed by SPSS software, version 26. **Ethical Considerations**: All patients in this study had informed consent to participate in the project. Also, except for maintaining the secrets of the patient in accordance with the Helsinki Treaty, it is assured to patients that their information will be confidential and will be used only for the purposes of the research. In addition, no additional costs were imposed on patients. The proposal is approved by ethics committee of Yazd Shahid Sadoughi University of Medical Sciences.

RESULTS

The mean age of the subjects was 46.65 ± 12.76 in the intervention group and 37.85 ± 13.54 in the control group (placebo). There was no significant difference between the frequency distribution of gender in the two groups based on Fisher Exact test and P. Value = 1.00 (Table N.1).

Table 1:Distribution of gender frequency according to the two groups of study

Sex	Male	Female
Interventional group	4(11.42)	31(88.58)
Placebo group	5(14.28)	31(88.58)

Table2: Determining and comparing the mean score of abdominal pain in the studied times according to the two groups of study

Abdominal pain	1st hour after surg	2nd hour after surg	4th hour after surg	6th hour after surg	12th hour after surg	18th hour after surg	24th hour after surg
Intervention al group	7.49± 1.41	7.20± 1.20	6.80 ± 1.20	5.82± 0.74	5.54 ± 0.85	4.00± 0.00	4.00 ± 0.00
Placebo group	8.45± 1.37	7.60 ± 1.16	7.14 ± 1.21	6.74 ± 1.19	6.17 ± 0.89	5.37 ± 0.94	4.45 ± 0.85
P.value	0.12	0.16	0.24	< 0.001	0.004	< 0.001	0.002

Table 3: Determining and comparing the mean score of shoulder pain in the studied times according to the two groups of study

Shoulder pain	12th hour after surg	18th hour after surg	24th hour after surg
Interventional group	1.22± 0.42	1.91± 0.74	2.20 ± 0.75
Placebo group	2.00± 0.42	3.05 ± 0.68	3.25 ± 0.65
P.value	< 0.001	< 0.001	< 0.001

Table 4: Determining and comparing the average dose of opioid drugs prescribed in the studied times according to the two groups of study

Opioid consumption in mg	1st hour after surg	6th hour after surg	12th hour after surg	18th hour after surg	24th hour after surg
Interventional group	25.00 ± 0.00	22.14± 8.07	19.28 ± 10.65	0.00± 0.00	2.14 ± 12.6
Placebo group	25.00 ± 0.00	24.28 ± 4.22	23.57 ± 5.88	18.57 ± 11.08	9.28 ± 12.25
P.value	1.00	0.16	0.04	< 0.001	0.001

Based on the results obtained from repeated measure test and P-value <0.001, there was a significant difference in the process of pain reduction over time between the two groups. Also, based on the T-Test and P. Values presented at 6, 12, 18 and 24 hours after surgery, there is a significant difference between the mean scores of abdominal pain in the two groups (Table N.2). Based on the results obtained from repeated measure test and P-value <0.001, there was a significant difference in the process of pain reduction over time between the two groups. Also, based on the T-Test and P. Values presented at 12, 18 and 24 hours after surgery, there is a significant difference between the mean scores of shoulder pain in the two groups (Table N.3). Based on the results of Friedman test and P-value <0.001, there was a significant difference in the process of reducing the dose of drug prescribed over time between the two groups. Also based on the Mann-Whitney test and P. Values presented in 12, 18, and 24 hours postoperatively, there was a significant difference between the mean dose of the drug administered in the two groups (Table N.4). Based on the results of Fisher's Exact Test and P. Values presented at times 18 and 24 hours after surgery (<0.001), there is a significant difference between the frequency distribution of nausea in the two groups (Table N.5).

Table 5: Determining and comparing the frequency distribution of postoperative nausea at different times according to the two groups of study

24th hour after surg	18th hour after surg	12th hour after surg	6th hour after surg	4th hour after surg	2nd hour after surg	1st hour after surg	Nausea
0(0.00)	0(0.00)	27(77.14)	31(88.57)	34(97.14)	34(97.14)	35(100)	Interventional group
7(20.00)	24(68.57)	33(94.28)	34(97.14)	34(97.14)	35(100)	35(100)	Placebo group
0.01	< 0.001	0.08	0.35	1.00	1.00	-	P.value

Table 6: Determining and comparing the frequency distribution of postoperative vomiting at different times according to the two groups of study

Vomiting	1st hour after surg	2nd hour after surg	4th hour after surg	6th hour after surg	12th hour after surg	18th hour after surg	24th hour after surg
Interventional group	19/54.28	23/65.71	23/65.71	2/5.71	1/2.85	0/0.00	0/0.00
Placebo group	19/54.28	24/68.57	23/65.71	14/40	2/5.71	0/0.00	0/0.00
P.value	-	1.00	-	0.001	1.00	-	-

Based on the results of Fisher's Exact Test and P. Values presented at 6 hours after surgery (<0.001) , there is a significant difference between the frequency distribution of vomiting in the two groups (Table N.6).

DISCUSSION

As discussed earlier, most patients undergoing laparoscopic surgery complain from abdominal and shoulder pain after surgery (13).

Joint injuries are an unusual cause of these pains, and and tissue damage that activates the pain pathway (14). We know that one of the methods used to Dexamethasone seems to be effective on pain through several mechanisms (15). On the one hand, dexamethasone reduces pain by affecting the immune system, and on the other hand, by inhibiting cyclooxygenase and phospholipase A2, it reduces the production of prostaglandins (16). Researches have shown that topical administration of dexamethasone can reduce pain by inhibiting the release of inflammatory mediators(17) .

In this study, 70 patients between the ages of 18-70 were studied in two groups.

Also, there was no significant difference between the two groups in terms of age, sex, BMI, and physical conditions.

In the first group, 20 cc of ringer serum containing 8 mg dexamethasone was sprayed in the diaphragm and peritoneal cavity, while in the second group, only 20 cc of ringer serum was sprayed.

Both groups were evaluated at 1, 2, 4, 6, 12, 24 hours after surgery in terms of having or not having pain. According to the results, abdominal pain was significant between the two groups from 6 o'clock onwards, and the control group experienced more pain. There was a significant relationship between shoulder pain between the two groups from 12 o'clock onwards and here also, patients in the control group had more pain.

Also in this study, it was found that there is a significant relationship between the two groups in terms of drug intake from 12 o'clock onwards, and patients in the control group received more opioids.

Accordingly, dexamethasone as a non-dependent factor can reduce shoulder and abdominal pain (P-value < 0.001).

Other results of this study include reducing nausea and vomiting in the intervention group. Patients in the control group had more nausea from 12 hours, and also more vomiting from 6 hours after surgery.

The mechanism of postoperative nausea and vomiting is not yet well understood but may be a multifactorial symptom. The presence of gas inside the abdominal cavity, which increases intraabdominal pressure, may be the cause of nausea and vomiting (7).

Dexamethasone is a potent corticosteroid that reduces postoperative nausea and vomiting (18-20).

The mechanism of action is not well understood but it seems it appears to reduce nausea synergistically with serotonin receptor antagonists (8).

Postoperative pain control improves general conditions faster (21), and non-opioid analgesics are the first line of treatment for postoperative pain control (22).

As mentioned earlier, the mechanism of post-laparoscopic pain is different from postoperative pain, and in open surgery the major pain is somatic, but in laparoscopic surgeries, it is usually visceral type (23).

In recent years, lidocaine and bupivacaine have been mainly used to improve postoperative pain (24, 25). In the Study of Bainchin et al., it was found that after laparoscopic cholecystectomy, the use of dexamethasone can improve the cases of pain and also nausea/vomiting after surgery. In the study of Asgari et al., which was about postoperative pain in laparoscopic cholecystectomy, it was found that a single dose of dexamethasone reduces postoperative pain and also reduces the need for opioids. In the study of Goldstone et al., which assessed postoperative pain in laparoscopic surgeries in women, it was found that in patients treated with bupivacaine, the need for opioids was lower and postoperative pain was much lower in both bupivacaine and ropivacaine groups compared to the control group (7).

In the study of Al-Khamisi et al., the comparison of local and aerosol bupivacaine injections during laparoscopic cholecystectomy and their comparison with placebo was performed and during this research, it was found that the pain level of patients was significantly lower in both groups than in the placebo group (26).

CONCLUSION

In this study, it was found that dexamethasone can reduce abdominal and shoulder pain as well as nausea and vomiting after laparoscopic surgery and it can also decrease the need for opioids after that. The amount of dexamethasone used in this study had no serious side effects, but higher doses may cause gastrointestinal bleeding, higher infection risk and wound healing disorders. According to the findings of this study and similar studies, it seems that dexamethasone can be useful in reducing postoperative complications and it is recommended to be used with controlled doses to control postoperative complications.

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Authors' contribution: MSH wrote primary draft, submission, statistical. SHT supervised study, MH helped for statistical and data collection, AGH helped for data collection. KR helped for writing proposal and SHZ did design study.

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