Intraperitoneal lignocaine application effect on analgesic outcome post- laparoscopic cholecystectomy

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ABSTRACT

Objectives: To assess the effect of intraperitoneal lignocaine application on pain relief post-laparoscopic cholecystectomy.

Methods: Our prospective, randomized and double-blind investigation included 115 patients, of both sexes, aged 32-54 years, classed I-II by the American society of anesthesiologists and scheduled for laparoscopic cholecystectomy during the years 2015 - 2016, at Prince Hashem bin Abdullah II, Aqaba, Jordan. Patients were divided into two groups. Group I (n=55) patients received intraperitoneal lignocaine application [1.75 ml/kg of 0.2% lignocaine (total dose of 3.5 mg/kg)] and group II (n=60) patients received intraperitoneal saline application {the same volume of normal saline as the lignocaine solution} by the same surgical team and with the same technical procedure. A 10-point visual analogue scale (VAS) score of pain intensity was used to evaluate postoperative pain. If the VAS score was more than 3, an analgesic (morphine sulphate 2 mg, intravenously) was used at intervals of 10 min. The primary parameters of the investigation were total postoperative pain intensity evaluated at 1, 3, 6, 12, 24 and 48 h postoperatively using the VAS score. The frequency of analgesic administration was scored at the same previous intervals and compared between groups. Postoperative pain control satisfaction scores were assessed using a numerical rating scale on discharge. Descriptive parameters were subjected to chi-square test. P-values less than 0.05 were considered statistically significant.

Results: Total postoperative pain intensity and frequency of analgesic administration scores were remarkably decreased in group I in comparison with group II ($P<0.05$). Pain control satisfaction score was more in group I than in group II. At 1 h interval after surgery, total postoperative pain intensity score was remarkably less in group I than in group II ($P<0.05$). At 1 h interval after surgery, frequency of analgesic administration was less in group I than in group II.

Conclusions: The application of lignocaine significantly decreased pain after laparoscopic cholecystectomy in comparison with saline. Lignocaine application may be used for pain control after laparoscopic cholecystectomy but with extra job on the surgeon.

Key words: Intraperitoneal , laparoscopic cholecystectomy, lignocaine, postoperative pain.

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Introduction

Laparoscopic techniques(minimally invasive) modernized operations with many benefits to the patient and hospital including more cosmetic surgical wound, decreased bleeding, less recovery time, less hospital admission and

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less pain after surgery, all leading to reduced hospital charge. The first Laparoscopic cholecystectomy was done in 1987. Laparoscopic cholecystectomy was the indicated surgical technique for the management of symptomatic cholelithiasis with results superior to those of traditional open surgical techniques. Patients who had laparoscopic cholecystectomy still complain of pain after surgery mainly in the abdomen, back and shoulder area with maximum severity during the first hours after surgery; the pain has different participants; this pain may be superficial incisional pain(parietal pain of the operative wound which is less in severity due to small size), deep visceral pain(due to stretching of the intra-abdominal cavity and peritoneal inflammation, peaking in severity in the first hour and increased by cough-respiration and movements) and laparoscopy referred shoulder pain after surgery (due to phrenic nerve irritation because of the remaining carbon dioxide in the peritoneal cavity), all need systemic opioid analgesia with delayed hospital discharge .Post-laparoscopic cholecystectomy is affected by a number of factors including: patient demographics, underlying disease, surgical factors, residual Carbon Dioxide (CO2) ,gas used for pneumoperitoneum and pressure for pneumoperitoneum. Attaining optimum pain relief after laparoscopic surgery while discharging the patient during an optimum period is an important issue. Different management techniques were used to control pain after laparoscopic cholecystectomy , including nonsteroidal anti-inflammatory drugs(targeting peritoneal inflammation after pneumoperitoneum), opioids (but with risk of emesis and excessive sedation),local incision infiltration(for scapular pain), intraperitoneal saline and local anesthetics, but none has achieved excellent potency [(1)].Peripheral administration of local anesthetics for analgesia after surgery is used in laparoscopic procedures. Intraperitoneal local anesthetic administered as visceral blockades since 1950 to decrease shoulder tip pain, overall pain and emesis. Intraperitoneal application of a local anesthetic was demonstrated to decrease pain after surgery and analgesic use after laparoscopic surgery [(2)]. Spraying lignocaine during a laparoscopic surgical technique to decrease pain after surgery puts an extra job on the surgeon, mainly when the surgery is complicated [(3)]. The objective of the investigation was to evaluate the pain relief effect of intraperitoneal lignocaine application in patients who underwent laparoscopic cholecystectomy.

Methods

This prospective, randomized and double-blind investigation included 115 patients, of both sexes, aged 32-54 years, classed I-II by the American society of anesthesiologists and scheduled for laparoscopic cholecystectomy during the years 2015 - 2016, at Prince Hashem bin Abdullah II, Aqaba, Jordan, after obtaining approval from the research and Ethics review board Committee of the Royal Jordanian medical services, Amman, Jordan and written informed consent from each patient. Patients were divided into two groups. Group I (n=55) patients received intraperitoneal lignocaine application [1.75 ml/kg of 0.2% lignocaine (total dose of 3.5 mg/kg)] and group II (n=60) patients received intraperitoneal saline application {the same volume of normal saline as the lignocaine solution}, administered by the same surgical team and with the same technical procedure. Patients receiving analgesics 24 h preoperatively, with a chronic pain disease other than gallbladder pathology or with allergy to lignocaine were excluded from the investigation. Anesthesia was induced and maintained using a balanced general endotracheal with the administration of fentanyl 3mcg/kg before induction. The intraperitoneal application was performed immediately after starting the pneumoperitoneum, 25% of the total solution (lignocaine or saline) was delivered on the upper area of the liver under the right sub diaphragmatic space and another 25% of the total solution was delivered under the left sub diaphragmatic space. To allow the solution to disperse under the diaphragmatic

space, the Trendelenberg position was maintained for short period. During the neutral position, 50% of the total solution was delivered around the cholecystectomy location. At the end of surgery, CO_2 was evacuated by manual compression of the abdomen with open trocars. A 10-point visual analogue scale (VAS) score of pain intensity was used to evaluate postoperative pain, with 0 indicating no pain and 10 indicating very severe pain. If the VAS score was more than 3, an analgesic (morphine sulphate 2 mg, intravenously) was used at intervals of 10 min. until the pain was below a VAS score of 3. The primary parameters of the investigation were total postoperative pain intensity (superficial incisional pain and deep visceral pain and post-laparoscopy shoulder pain), evaluated at 1, 3, 6, 12, 24 and 48 h postoperatively using the VAS. The frequency of analgesic administration was scored at the same previous intervals and compared between groups. Postoperative pain control satisfaction scores were assessed using a numerical rating scale (0 indicating very dissatisfaction and 10 indicating very satisfaction) on discharge. Patient discharge according to postoperative pain was based on: optimum pain relief at rest (VAS < 4 with oral analgesic use only).

Statistics

For intergroup comparisons, the distribution of the data was first assessed. Normally distributed data were compared using an analysis of variance. Non-normally distributed data were analyzed. Descriptive parameters were subjected to chi-square test. P-values less than 0.05 were considered statistically significant. Correlation coefficient was used to measure the correlation between VAS pain scores and postoperative pain control satisfaction scores.

Results

Within the 130 patients who participated in the investigation, 15 patients were excluded. There were no statistically significant discrepancies between the two groups regarding age, gender, Body Mass Index (BMI), ASA class, duration of anesthesia or surgical duration (Table I). The lignocaine adverse effects recorded were blurred vision, peripheral paresthesia, dizziness, convulsions, headache and itching. The total postoperative pain intensity score outcome is shown in Table 2. The VAS score in group II was more than 3 until 12 h postoperatively. The total postoperative pain intensity score was remarkably less between 1 and 24 h in group I in comparison with group II ($P < 0.05$). In both groups, the intensity of pain gradually decreased over 48h (Table II). At each time interval, frequency of analgesic administration was remarkably more in group II than in group I, until 24 h postoperatively($P<0.05$) (Table III). The frequency of analgesic administration was remarkably less in group I than group II at the 1h interval ($P<0.05$) (Table 3).There was a positive association between total postoperative pain intensity score and frequency of analgesic administration ($P<0.05$).

The pain control satisfaction scores were remarkably more in group I than in group II ($P<0.05$) (Table IV).

Table I. Patients characteristics.

characteristic	Group II(n=60)	Group I(n=55)
Age, years(mean+/-SD)	42(+/-9)	43(+/-8)
Gender(no)		
Male	30	25
Female	30	30
BMI(kg/m^2)(mean+/-SD)	21.3+/-1.4	22.5+/-1.8
ASA class		
I	40	35
II	20	20
Anesthesia duration(min)(mean+/-SD)	54.4(+/-7.5)	56.5 (+/-5.8)
Surgical duration(min)(mean+/-SD)	42.6+/-4.5	46.5+/-5.8
Total lignocaine dose(mg)(mean+/-SD)	0	211.5+/-12.6

Table II: Total postoperative pain intensity score (median).

VAS	Group II	Group I	P
1h	4	2	
3h	4	2	
6h	3	2	<0.05

12h	3	1
24h	3	1
48h	2	1
At discharge	1	0

Table III: Frequency of analgesic administration (median).

number	Group II	Group I	P
1h	5	1	
3h	2	0	
6h	2	0	<0.05
12h	1	0	
24h	1	0	
48h	1	0	

Table IV. Postoperative pain control satisfaction scores (median).

Group II	Group I	P
6(6-8)	9(7-9)	<0.05

Discussion

In this investigation, intraperitoneal lignocaine remarkably decreased pain after surgery in comparison with intraperitoneal saline in laparoscopic cholecystectomy subjects. There was a positive association between pain and frequency of analgesic use. Laparoscopic cholecystectomy has many benefits compared to traditional open cholecystectomy. Moderate pain post laparoscopic cholecystectomy may necissates opioid use and may prolong in-hospital stay period. In our investigation, with the administration of demand analgesia after surgery, the mean VAS pain score in the intraperitoneal saline group was equal to 3 at 12 h postoperatively, experiencing pain after surgery. There are three types of pain post-laparoscopic cholecystectomy. The parietal (somatic) pain is triggered by the trocars holes in the abdominal wall [(4)]. The visceral pain is triggered by diaphragmatic irritation of dissolved CO_2 [(5)]. Visceral pain is mainly during the first day after surgery, short-timed, untouched by mobilization and is increased by coughing. The shoulder tip pain is triggered by fast distension of the peritoneum and stimulation of the phrenic nerve [(6)]. Shoulder pain may occur in 35%- 63% of subjects [(7)], correlated with continuous pneumoperitoneum for 72hours [(6)].Shoulder pain can be decreased remarkably by emptying the residual intraperitoneal CO2 Pain in the post-laparoscopic cholecystectomy period is multifactorial and pain management after surgery has a multimodal setup. The benefescial effect of a topical wash (liver and gallbladder area wash) was demonstrated [(8)].Two different methods of intraperitoneal application of local anaesthetic during laparoscopic cholecystectomy were assessed. sub-diaphragmatic peritoneal administration of local anesthetic reduced pain after surgery and decreased recovery room admission. Administration of local anesthetic to the right hemidiaphragm was correlated with less pain scores for more time after laparoscopic cholecystectomy than with the wash method. Pain after laparoscopic cholecystectomy, transmitted through the somatic pain fibers of the diaphragm, results in a more percentage of pain than that transmitted through the autonomic visceral pain fibers from the liver capsule and gallbladder peritoneum[(9)]. In our investigation, local anesthetic was delivered on the upper area of the liver, below the right subdiaphragmatic space, below the left subdiaphragmatic space and around the cholecystectomy site. The peri trocal infiltration of local anesthetic and the intraperitoneal administration of local anesthetic remarkably reduced the severity of pain after surgery in synergistic manner[(10)]. Intraperitoneal lignocaine application,in a subperitoneal diaphragmatic use, can lead to complications (temporary loss of diaphragmatic function, pneumothorax or haematoma) [(9)]. Intraperitoneal lignocaine instillation is a useful choice for pain control after laparoscopic

cholecystectomy. In a patient with an intra-abdominal infection (such as panperitonitis or loculated peritoneal fluid collection), intraperitoneal application may transform a localized infection into generalized peritonitis. In our investigation, total VAS pain scores and frequency of analgesic administration were less in group I than in group II. Opioid demand is not only a meaning of pain severity, but is deeply affected by different psychological factors including anxiety, mood and recovery. The frequency of analgesic use is a meaning of total satisfaction of patients, rather than a meaning of pain intensity only. Satisfaction of patients in group I was more than in group II In our investigation, the total postoperative pain intensity scores were less in group I at 1 h and frequency of analgesic administration was less in group I at 1h interval [(3)]. This is because of discrepancies in pain patterns within different types of laparoscopic methods. The pain immediately after laparoscopic cholecystectomy was severe and as visceral pain. Another cause for these differences is the duration of lignocaine use. In our investigation, patients in group I received lignocaine before operation started. Total postoperative pain intensity scores and frequency of analgesic administration were less in group I than in group II. Postoperative pain control satisfaction scores were more in group I in relation with group II. Intraperitoneal lignocaine application is not easy in panperitonitis or intra-abdominal infection.The pattern of pain after laparoscopic cholecystectomy is multifactorial. No lignocaine acquired complications were recorded because of the relatively small investigation group. Serum levels of lignocaine were not recorded, as the minimal toxicity from lignocaine doses is known [(11)]. Intravenous lignocaine is superior in bringing out early return of bowel activity when compared to all groups and Intravenous lignocaine is superior compared to intraperitoneal lignocaine in pain relief [(12)].Intraperitoneal administration can block the visceral afferent signal changing the visceral nociception.The local anesthetic inhibits nociception by nerve membrane proteins and inhibiting the production of prostaglandins which potentiate the nociceptors leading to inflammation.Excessive peritoneal area systemic absorption may happen with decreased nociception . The intact peritoneum prevents the entry of hydrophilic molecules and blocks access to neural receptors.Inflammation disrupts the peritoneal barrier enhancing the passage to sensory neurons with pain relief in swollen tissue.Intraperitoneal local anesthetic use may modulate peritoneal and visceral signal to the brain reducing the metabolic effect of visceral operation,with block of free afferent nerves in the peritoneum. The local anesthetics possess anti-inflammatory effects by:prostaglandin antagonism, depression of leukocyte migration and lysosomal enzyme production.A pro-inflammatory cytokine cascade in the peritoneum with direct action on the visceral afferents and the vagus is a major cause of visceral pain perception .after surgery[(13)]. The pain after laparoscopic surgery may be severe and residual pain relief effect of fentanyl administered at the induction of anesthesia as in our study was not adequate for the close after surgery period.

laparoscopic cholecystectomy.This method is safe with good analgesia during the initial postoperative hours.

Conclusion

Intraperitoneal application of lignocaine decreased pain after laparoscopic cholecystectomy, in comparison with intraperitoneal saline application saline. Although intraperitoneal lignocaine administration is efficient,easy,cheap and non-invasive, more suitable techniques, easier to perform and with more safety aspect, should be sought. Intraperitoneal lignocaine application is a viable technique to ameliorate pain after

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