



ANTICIPATION OF PAIN AFTER SURGERY USING PERIPHERAL VENOUS CANNULATION PAIN EVALUATION BEFORE SURGERY IN LAPAROSCOPIC SURGERY

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ABSTRACT

Background: Pain after surgery is the most important issue in surgical participants. Peripheral venous cannulation-caused pain potentially anticipated pain after surgery in laparoscopic cholecystectomy during the first 1.5 hrs. in the post-anesthesia care unit. **Aim:** To determine the potential of peripheral venous cannulation pain before surgery in anticipating pain after laparoscopic surgery within the first day. **Methods:** Our retrospective and double blind investigation enrolled 221 subjects, of both sexes, aged 23-71 yrs. and assigned for laparoscopic surgery at KHH, KHMC, Amman, JORDAN, during the period 15 Jan 2010-01 Feb 2021. A peripheral superficial vein on the back of the hand was cannulated before surgery with a peripheral venous catheter 20G by a nurse. The nurse registered the subjects score of verbal analogue scale correlated with cannulation, as low reaction group (VASS scores less than 3.0) and high reaction group (Verbal analogue scale scores more than 3.0). Postoperatively, the verbal analogue scale scores at rest and on coughing at 3, 6, 9, 15, 21 and 48 hrs. intervals and the number of required analgesics during the first postoperative 2 days after surgery were registered. Pain severity was evaluated with VAS at rest and on coughing. The primary outcome was maximum pain scores after surgery at rest and on coughing during the first 2 days. The secondary outcome was extra use of analgesics, satisfaction index and the number of analgesia demand during the first 2 days. Logistic regression was used to determine the anticipation power of cannulation-caused pain severity. **Results:** The median of peripheral venous cannulation-caused pain score, maximum pain score after surgery at rest and maximum pain score after surgery on coughing were 1.3, 2.9 and 5.3. Peripheral venous cannulation-caused pain scores were remarkably associated with pain severity after surgery at rest and on coughing. Subjects with peripheral venous cannulation-caused pain severity score more than 3.0 on verbal analogue scale experienced increased pain severity after surgery at rest ($P < 0.05$) and on coughing ($P < 0.05$) and had more pain relief ($P < 0.05$) within the first 2 days. The risk for medium or intense pain after surgery was remarkably more in subjects with peripheral venous cannulation-caused pain severity score more than 3.0 on verbal analogue scale in comparison to subjects with less than score of 3.0 on verbal analogue scale. In high reaction group, 34.8% had medium or intense pain after surgery. In low reaction group, 12.9% had medium or intense pain. **Conclusions:** Peripheral venous cannulation caused pain evaluation before surgery may anticipate pain severity after surgery within the first day post laparoscopic surgery.

KEYWORDS: Before surgery: Peripheral venous cannulation, Pain; After surgery: pain; Laparoscopic surgery.

INTRODUCTION

Pain after surgery is the main distressing problem in surgical subjects. If pain is not properly managed, it will influence adversely quality of life or it may progress to continuous pain after surgery.^[1] Recent pain after surgery regimen is standardized for all patients. This regimen is not optimum due to the remarkable discrepancy in patient's pain causing inadequate pain relief in subjects with increased analgesic requirements or extraordinary pain relief, which is associated with higher pain relief-induced adverse effects. The possibility to anticipate before surgery patients at risk for medium or intense pain

after surgery could permit optimizing pain control by personalizing pain relief management using pain anticipators before surgery.

Recognition patients before surgery at risk for pain after surgery and investigating the psychological factors and using experimental pain or quantitative sensory investigations is very demanding.^[2] Those anticipators have not been used because of expensive tools, time and effort consuming.

Peripheral venous cannulation before surgery may cause pain severity and this might be used for evaluation. Peripheral venous cannulation-caused pain severity might be used to anticipate the risk of pain after surgery. Subjects with venous cannulation pain score more than 2.0 on verbal analogue scale had more acute pain severity after surgery and more medium or intense pain after surgery during the first 1.5 hrs. in the post anesthesia care unit.^[3] The potential in anticipating pain after surgery in surgical subjects is crucial.

The goal of our investigation was to determine if peripheral venous cannulation pain severity might be used to anticipate the risk for pain after surgery during the first day after laparoscopic surgery.

METHODS

Our retrospective and double blind investigation enrolled 221 subjects, of both sexes, aged 23-71 yrs., ranked I physical status according to the American Society of Anesthesiologists, body mass index 20 - 25 kg/m² and assigned for laparoscopic surgery under general anesthesia at KHH, KHMC, Amman, JORDAN, during the period 15 Jan 2020-01 Feb 2021, after obtaining written informed consent from all participants and approval from our local ethical and research board review committee of the Jordanian Royal medical services. Subjects with pain before surgery, long-term administration of analgesics, failed venous cannulation, modification in operative technique from laparoscopic to open and surgical duration more than 2 h.

A peripheral superficial vein on the back of the hand was cannulated before surgery with a peripheral venous catheter 20G by a nurse. The nurse registered the subject's maximum score of verbal analogue scale correlated with cannulation, as low reaction group (VAS scores less than 3.0) and high reaction group (Verbal analogue scale scores more than 3.0). Analgesia during induction was performed using fentanyl 3 mcg/g. Postoperatively, the verbal analogue scale scores at rest and on coughing at 3, 6, 9, 15, 21 and 48 hrs. intervals and the number of required analgesics during the first postoperative 2 days after surgery were registered. If patients experienced pain or the VAS scores are more than 4, extra intravenous analgesics were used.

Analgesic use and the number of analgesia demand were registered. Total satisfaction index of the patients was recorded at the end of the first 2 days after surgery. Pain severity was evaluated with VAS at rest and on coughing. The primary outcome was maximum pain scores after surgery at rest and on coughing during the first 2 days. The secondary outcome was extra use of analgesics, satisfaction index and the number of analgesia demand during the first 2 days.

Statistics

The normality of the continuous parameters was investigated using the Shapiro-Wilk test. Normally

continuous parameters were compared between groups using Student t-test. If the distribution was not normal, a Mann-Whitney U-test was used. Categorical parameters were investigated using the chi-square or Fisher's exact test. Associations between parameters were evaluated using Spearman's rank coefficients. Logistic regression was used to determine the anticipation power of cannulation-caused pain severity. P values less than 0.05 were considered statistically significant.

RESULTS

The median of peripheral venous cannulation-caused pain score, maximum pain score after surgery at rest and maximum pain score after surgery on coughing were 1.3, 2.9 and 5.3 mcg. The margin of scoring based on peripheral venous cannulation pain score (3.0 VAS) was near by the median of peripheral venous-induced pain score. Table I.

Maximum pain score after surgery at rest ($P < 0.05$) and maximum pain score after surgery on coughing ($P < 0.05$) were statistically significantly associated with peripheral venous cannulation-caused pain score, respectively.

There were no remarkable discrepancies according to age, sex, BMI, ASA, type of operation, methods of operation and period of operation between the two groups. Subjects with venous cannulation-caused pain severity more than 3.0 VAS had more pain severity after surgery at rest (3.6 vs. 3.1 VAS; $P < 0.05$) and on coughing (6.1 vs. 5.5 VAS; $P < 0.05$) and required more demand analgesics (34.8% vs. 12.9%; $P < 0.05$) within the first 2 days after surgery, while the satisfaction index was remarkably less (2 vs. 5; $P < 0.05$). Table II.

The number of patients with maximum pain (at rest) more than 4.0 VAS within the first 2 days between high reaction group and low reaction group were demonstrated in Table III. In high reaction group, 34.8% had medium or intense pain after surgery. In low reaction group, 12.9% had medium or intense pain. There was a statistical significance in the risk for medium or intense pain between the two groups ($P < 0.05$).

After controlling factors influencing pain after surgery (sex, age, type of operation and approaches of operation), the risk for medium or intense pain after surgery was remarkably more in subjects with venous cannulation-caused pain severity more than 3.0 VAS in comparison to those less than 3.0 VAS.

Table I: Patients' demographic characteristics and perioperative data.

Parameter	value
No.	221
Age (yrs.)mean	55
Gender (no.) M	115
F	106
ASA(no.) I	221
BMI (kg/m ²)mean	23.2
Peripheral venous cannulation-caused pain score(mean)	1.3
maximum pain score after surgery at rest(mean)	2.9
maximum pain score after surgery on coughing(mean)	5.3

Table II: Patients characteristics and based on peripheral venous cannulation-caused pain score.

	venous cannulation-induced pain score (VAS)		P
	<3.0	>3.0	
Total number of patients	132	89	
Sex M	77	38	>0.05
F	55	51	
Age(yrs.)mean	56	54	>0.05
BMI (kg/m ²)mean	23.4	24.6	>0.05
ASA I	132	89	>0.05
Type of operation Partial	44	29	>0.05
Radical	88	60	
Operation approach retroperitoneal	33	19	>0.05
trans peritoneal	99	70	
Period of operation (hrs.)mean	1.18	1.19	>0.05
maximum pain score after surgery at rest(mean)	3.1	3.6	<0.05
maximum pain score after surgery on coughing(mean)	5.5	6.1	<0.05
Analgesic demand	17(12.9%)	31(34.8%)	<0.05
Satisfaction index(mean)	5	2	<0.05

Table III: Anticipation of maximum pain after surgery based on peripheral venous cannulation-caused pain score.

	Venous cannulation-induced pain score (VAS units)		Total number of patients
	Less than 3.0	More than 3.0	
maximum pain severity after surgery at rest (VAS)			
Less than 4	115(87.1%)	58(65.2%)	173
More than 4	17(12.9%)	31(34.8%)	48
Total number of patients	132	89	221

DISCUSSION

Our investigation found that peripheral venous cannulation-caused pain score is remarkably associated with maximum pain after surgery within the first 2 days' post laparoscopic surgery. Subjects with venous cannulation pain score more than 3.0 VAS have more increased pain scores after surgery. Subjects with venous cannulation pain score more than 3.0 VAS have a 4 times more risk of medium or intense pain after surgery. Peripheral venous cannulation done before surgery is painful. The pain severity is correlated with cannula location, cannula gauge, failure and duration.^[4] In our investigation, failure was ruled out and cannulation was achieved by professional health provider with same cannula gauge on the same location. The

mean pain severity correlated with venous cannulation on the hand was 1.3 VAS. The venous cannulation pain was 3.0 VAS in anticipating pain after surgery in other investigation.^[3] 3.0 VAS was appreciable of venous cannulation pain for anticipation of pain after surgery.^[5]

Venous cannulation pain score was remarkably associated with maximum pain score after surgery at rest during 1.5 hrs. post laparoscopic cholecystectomy.^[3] Subjects with venous cannulation pain score more than 3.0 VAS experienced increased pain after surgery and risk for medium or intense pain after surgery in the post anesthesia care unit. The percentage of medium or intense pain after surgery in subjects with venous

cannulation pain score more than 3.0 VAS and less than 3.0 VAS were more than our investigation. In this investigation, 34.8 and 12.9% of subjects had medium or intense pain after surgery between patients with venous cannulation pain score more than 3.0 VAS and less than 3.0 VAS, while these percentages were 77 and 35%.^[3] Venous cannulation pain score was used to anticipate labor pain in 50 females; pain severity of intravenous cannulation was associated with duration to epidural demand within induction of labor.^[6] Assessment of venous cannulation pain score in 4 groups of operation (hardly any pain, mild, medium and intense pain after surgery) showed that venous cannulation pain score was only statistically remarkable in the subjects exposed to operation with medium pain after surgery.^[5]

The pain severity of QST stimuli (pressure, electric and thermal) was associated with the severity of pain after surgery.^[7,8] QST evaluation could anticipate 54% of the variance in the pain after surgery.^[9] The anticipative power of the investigations is more than found for single-demographic or psychologic factor. There is big personal difference in reaction to opiates and the potential adverse effects. The power to recognize patients before surgery at high risk for medium or intense pain after surgery and with increased opiates needs is very useful. Peripheral venous cannulation pain severity usage as an anticipator of pain after surgery may permit health providers a more suitable method to control the dose of opiates and potentially enhance pain relief after surgery.

Known risk factors of pain after surgery are female sex, young age and pain before surgery.^[10] Psychological factors were associated with venous cannulation-caused pain score.^[11] The psychological factors may influence pain after surgery and venous cannulation-caused pain score.

IN CONCLUSIONS

Peripheral venous cannulation-caused pain score was correlated with pain after surgery within the first day postlaparoscopic surgery.

Subjects with venous cannulation pain score more than 3.0 VAS experienced more pain scores after surgery and risk for medium or intense pain after surgery. Peripheral venous cannulation-caused pain severity is a simple method to anticipate pain after surgery within the first day post laparoscopic surgery.

REFERENCES

1. Glare P, Aubrey KR, Myles PS. Transition from acute to chronic pain after surgery. *Lancet*, 2019; 393(10180): 1537–46.
2. Rehberg B, Mathivon S, Combescure C, et al. Prediction of acute postoperative pain following breast cancer surgery using the pain sensitivity questionnaire: a cohort study. *Clin J Pain*, 2017; 33(1): 57–66.
3. Persson AK, Pettersson FD, Dyrehag LE, et al. Prediction of postoperative pain from assessment of pain induced by venous cannulation and propofol infusion. *Acta Anaesthesiol Scand*, 2016; 60(2): 166–76.
4. Rüsç D, Koch T, Spies M, et al. Pain during venous cannulation. *DtschArztebl Int*, 2017; 114(37): 605–11. 10.3238/arztebl.2017.0605.
5. Persson AK, Åkeson J. Prediction of acute postoperative pain from assessment of pain associated with venous catheterization. *Pain Prac*, 2019; 19(2): 158–67.
6. Carvalho B, Zheng M, Aiono-Le TL. Evaluation of experimental pain tests to predict labour pain and epidural analgesic consumption. *Br J Anaesth*, 2013; 110(4): 600–6.
7. Gamez BH, Habib AS. Predicting severity of acute pain after cesarean delivery: a narrative review. *Anesth Analg*, 2018; 126(5): 1606–14.
8. Fei P, Yanshuang Li, Yanqiu A, et al. Application of preoperative assessment of pain induced by venous cannulation in predicting postoperative pain in patients under laparoscopic nephrectomy: a prospective observational study. *BMC Anesthesiol*, 2020; 20: 86.
9. Werner MU, Mjöbo HN, Nielsen PR, et al. Prediction of postoperative pain: a systematic review of predictive experimental pain studies. *Anesthesiology*, 2010; 112: 1494–502.
10. Horn-Hofmann C, Scheel J, Dimova V, et al. Prediction of persistent post-operative pain: pain-specific psychological variables compared with acute post-operative pain and general psychological variables. *Eur J Pain*, 2018; 22(1): 191–202.
11. Richebé P, Capdevila X, Rivat C. Persistent postsurgical pain: pathophysiology and preventative pharmacologic considerations. *Anesthesiology*, 2018; 129(3): 590–607.