

Laparoscopy-Induced Shoulder Pain after Cholecystectomy; May Pulmonary Recruitment Manoeuvre Help?

HABIBULLAH ISHAQUI¹, SHABAB HUSSAIN², MUHAMMAD TANVIR IQBAL³, MUHAMMAD NASIR⁴, UMAR FAROOQ DAR⁵

ABSTRACT

Background: Pulmonary recruitment manoeuvre (PRM) may reduce shoulder pain after laparoscopic surgery but it has not been studied for cholecystectomy.

Aim: To determine the effectiveness of PRM in reducing laparoscopy-induced shoulder pain after laparoscopic cholecystectomy.

Methods: This randomised control trial was carried out at Department of Surgery, Sheikh Zaid Hospital Quetta from 1st January 2014 to 30th June 2014. Sixty patients having indication for cholecystectomy were offered to be enrolled in the study. Patients were randomly and equally assigned to treatment (PRM) and placebo (no PRM) groups. Mean laparoscopy-induced shoulder pain score was measured and compared using visual analogue scale (VAS) at 12 and 24 hours post operatively.

Results: Sixty patients with mean age of 37.33±9.837 years were included. 43 (71.7%) were female while 17 (28.3%) were male. When mean pain scores were compared to determine the difference between groups, there was a significant difference in pain score at 12 hours ($p < 0.05$) but the difference was non-significant at 24 hours ($p > 0.05$). There was no difference between treatment and placebo regarding mean age, gender, mean duration of operation and body mass index.

Conclusion: It may be concluded that pulmonary recruitment manoeuvre may help reduce early shoulder pain in patients undergoing laparoscopic cholecystectomy. This effectiveness does not persist long as the difference in pain score was non-significant after 24 hours.

Key words: Keywords: Laparoscopy-induced shoulder pain, Laparoscopic cholecystectomy,

INTRODUCTION

Laparoscopic procedures like cholecystectomy, hernia repair have become the standard of care all over the world because of lesser postoperative pain, smaller incisions, shorter hospitalizations, and earlier return to normal activity.¹⁻⁵ Many patients (35–80%) have so far reported shoulder and upper abdominal pain after laparoscopic procedures^{6,7,8}.

Although the mechanism is not well understood, but proposed mechanism regarding shoulder pain says it is mainly derived from carbon dioxide retention within the abdomen, subsequently irritating the phrenic nerve and causing referred pain in the C4 dermatome. Moreover, carbon dioxide trapped between the liver and the right diaphragm, irritating the diaphragm, also causes upper abdominal pain. All make the patient uncomfortable after laparoscopic surgery^{3,9}.

Pulmonary recruitment maneuver (PRM) has been proposed to reduce shoulder and upper

abdominal pain as it assists the expulsion of abdominal residual carbon dioxide by mechanically increasing intraperitoneal pressure to facilitate the removal of residual carbon dioxide immediately after operation.⁹ The rationale of this study is that there is scarcity of data regarding effectiveness of pulmonary recruitment maneuver in reducing laparoscopy induced shoulder pain after cholecystectomy. Laparoscopic cholecystectomy is the most common procedure in our hospitals. PRM is both cost and time effective.

PATIENTS AND METHODS

This randomised control trial was carried out at Department of Surgery, Sheikh Zaid Hospital Quetta from 1st January 2014 to 30th June 2014. Sixty patients of either sex with age ranging from 16 to 60 years with diagnosis of chronic cholecystitis were offered to be enrolled in the study. A consultant surgeon evaluated the patients for indication of laparoscopic cholecystectomy. Patients with history of respiratory diseases (determined by history, clinical examination and chest x ray), laparotomy, diabetes, antidepressants or antipsychotics and body mass index (BMI)>40 kg/m² were excluded. Patients were also excluded from the study if intra-abdominal

¹Department of Surgery, Sheikh Zaid Hospital, Quetta,

²Dept of General Surgery, Lady Reading Hospital Peshawar,

³Specialist General Surgeon University Hospital Najran KSA,

^{4,5}Department of Community Medicine, Gujranwala Medical College Gujranwala

Correspondence to Dr. Umar Farooq Dar Email: umardar84@gmail.com

pressure exceeded 15mmHg during the operation. The patients with complications of surgery leading to laparotomy or required conversion to open cholecystectomy were also excluded. Thirty patients were randomly assigned to treatment group receiving manual pulmonary inflations and 30 patients were given no treatment. Concealment to treatment group was achieved by the allocation being placed in opaque envelopes only known to anaesthetist. Pain Score on Visual Analogue Scale was measured subjectively on a scale of 1 to 10 by a registered staff nurse on the structured questionnaire after 12 and 24 hours post operatively. All patients were given standard post-operative care with similar doses of analgesia. The data was analyzed using SPSS-17. ANOVA was applied to determine statistical difference in pain score at 12 and 24 hours in both groups. A value of $p \leq 0.05$ was considered as significant.

RESULTS

Sixty patients with mean age 37.33 ± 9.837 years ranging from 24 to 59 years were included in the

study. 30 patients (50%) belonged to intervention group while 30(50%) were included in placebo group. Among all 60 patients 43(71.7%) were female while 17(28.3%) were male. We cross tabulated the groups with gender, age and body mass index of our sampled population, 30 patients of intervention group included 19 female and 11 male patients with mean age distribution 37.17 ± 9.833 and mean BMI value 32.995 ± 2.995 . However placebo group included 24 female and 6 male patients with mean age distribution 37.50 ± 10.006 and mean MBI value 32.63 ± 3.168 . All showed non-significant results on Pearson Chi Square test with p values 0.836, 0.61 and 0.802 respectively (Table 1). When ANOVA was applied to determine the mean difference in pain score at 12 and 24 hours, there was a significant difference at 12 hours ($p=0.000$) between groups and within groups however the difference was non-significant at 24 hours (Table 2).

Table 1: Distribution of baseline characteristics (gender, age and BMI) in either treatment groups

Characteristics	Female	Male	Age (years)	BMI (kg/m ²)
Treatment	19	11	37.1 ± 9.8	32.8 ± 2.9
Control	24	6	37.50 ± 10.1	32.6 ± 3.1
P value	0.836 (Non-significant)*		0.61 (Non-significant)**	0.802 (Non-Significant)**

BMI=body mass index,* Using chi square test, ** using independent sample test

Table 2: VAS score among Placebo & Intervention groups using ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
VAS at 12 hours	Between groups	25.350	1	25.350	14.65	0.000
	Within groups	100.300	58	1.729		
	Total	125.650	59			
VAS at 24 hours	Between groups	0.817	1	0.817	0.550	0.461
	Within groups	86.167	58	1.486		
	Total	86.983	59			

DISCUSSION

Many patients (35–80%) have so far reported shoulder and upper abdominal pain after laparoscopic procedures.^{7,8} Although the mechanism is not well understood, but proposed mechanism says it is mainly derived from carbon dioxide retention within the abdomen, subsequently irritating the phrenic nerve and causing referred pain in the C4 dermatome⁹.

Moreover, carbon dioxide trapped between the liver and the right diaphragm, irritating the diaphragm, also causes upper abdominal pain. All make the patient uncomfortable after laparoscopic surgery. Pulmonary recruitment maneuver (PRM) has been proposed to reduce shoulder and upper abdominal pain as it assists the expulsion of abdominal residual carbon dioxide by mechanically increasing

intraperitoneal pressure to facilitate the removal of residual carbon dioxide immediately after operation.

In our study to determine the mean difference in pain score at 12 and 24 hours, we found that there is a significant difference at 12 hours but the difference was non-significant at 24 hours. These results depict early reduction of pain in patients undergoing pulmonary recruitment maneuver secondary to increased washing of carbon dioxide. But at 24 hours when there is equal rate of loss of abdominal distension the mean pain score was equally distributed in either groups. We may suggest that at present sample size pulmonary recruitment maneuver is a cost effective technique to reduce post-operative pain.

In a study, seventy-six randomly assigned patients, 37 in the intervention group and 39 in the

control group, were recruited. Overall postoperative pain scores were significantly lower in the intervention group ($P = 0.001$)⁷. In a trial for efficacy of PRM in patients with minor gynecological procedure, VAS score came out 3.4 ± 2.9 vs 1.19 ± 1.7 and 2.6 ± 2.4 vs 0.89 ± 1.3 at 12 and 24 hours, respectively between control and treatment groups ($p < 0.001$).¹⁰

In the present study 43(71.7%) were female while 17(28.3%) were male showing that chronic cholecystitis affects female more commonly as discussed by other studies^{3,4,7}. Mean age was 37.33 ± 9.837 years, showing more women in their reproductive age group suffer from chronic cholecystitis.

CONCLUSION

It is concluded that the mean pain score at 12 hours is significantly different (less) in patients undergoing pulmonary recruitment maneuver after laparoscopic cholecystectomy. There is no significant reduction in laparoscopy-induced shoulder pain after 24 hours post operatively in patients undergoing pulmonary recruitment maneuver from those who had not undergone pulmonary recruitment maneuver after laparoscopic cholecystectomy. We hereby suggest use of pulmonary recruitment maneuver in all patients to reduce early pain and thence morbidity after laparoscopic cholecystectomy.

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