
GYNAECOLOGY

Simple Clinical Maneuver for Reducing Shoulder Pain Following Gynecologic Laparoscopic Surgery at Maharat Nakhonratchasima Hospital: A Randomized Controlled Trial

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ABSTRACT

Objective: To assess the efficacy of simple clinical maneuver to reduce shoulder pain after gynecologic laparoscopic surgery.

Study design: Randomized controlled trial.

Materials and Methods: One hundred and four patients who were scheduled for elective gynecologic laparoscopic surgery were randomly allocated into 2 groups. Fifty-four patients in control group, CO₂ was removed by passive deflation of the abdominal cavity through the cannula. Fifty patients in the intervention group, CO₂ was removed using Trendelenburg position (30 degrees) and a pulmonary recruitment maneuver consisting of 5 manual lung inflations. Postoperative shoulder pain was recorded on a verbal rating scale (VRS 1-6) at 24 and 48 hours after the operation.

Result: There was no significant difference in age, time of surgery, type of surgery, body mass index between 2 groups. Postoperative hospital stay (mean±SD) was 2.5 ± 0.57 days in the control group compared to 2.1 ± 0.47 days in the intervention group ($p < 0.001$). The significant pain is found in 11 in 50 patients (22%) in the intervention group compared with 34 in 54 patients (63%) in the control group ($p < 0.001$). More patients in the control group had significant pain compare to the intervention group (22% vs 63%, $p < 0.001$).

Conclusion: This simple clinical maneuver significantly reduced shoulder pain after Gynecologic laparoscopic surgery.

Keywords: laparoscopic surgery, reducing shoulder pain, gynecologic

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Introduction

Laparoscopic surgery is becoming a major procedure, owing to smaller incision, shorter hospitalization, and less post-operative pain as compared with traditional laparotomy⁽¹⁻⁴⁾.

In Maharat Nakhonratchasima Hospital, there were 314 cases of gynecologic laparoscopic surgery in 2011 and 369 cases in 2012. Laparoscopic procedures are often associated with shoulder pain that may cause more discomfort to the patients than the pain at the

incision site. There is marked inter individual variability of post-operative shoulder pain following laparoscopic surgery. The incidence of shoulder pain in previous studies varies from 35% to 80% and ranges from mild to severe^(5-7,12).

The hypothesis of post-operative shoulder pain is that intra-abdominal CO₂ retention and rapid distension of the abdomen may overstretch the diaphragm and cause phrenic nerve irritation which has referred pain to C4^(8,9,18,19). Therefore, reduction of CO₂ retention in the pelvic cavity should decrease postoperative shoulder pain.

The aim of this study was to evaluate the efficacy of a simple clinical maneuver at the end of the surgery to remove residual CO₂ from the peritoneal cavity to reduce the incidence and intensity of shoulder pain after gynecologic laparoscopy.

Materials and Methods

The patients undergoing gynecologic laparoscopic surgery at Maharat Nakhonratchasima Hospital from February 2013 to July 2013 were recruited after the approval of Maharat Nakhonratchasima Hospital ethic committee. All the patients provided informed written consents. Inclusion criteria were female, age 15-60 years, no previous laparotomy, American Society of Anesthesiologists status classification I-II. Exclusion criterion was the procedure required conversion to laparotomy.

The design of the study was a randomized, double-blind clinical trial. The patients and the investigator obtaining postoperative pain scores were blinded to the patient's group allocation. The patients were randomized by using simple random sampling without replacement. We prepared sealed envelopes which were inserted number into envelopes placed in the box. (NO.1 = control group 60 pieces, NO. 2 = intervention group 60 pieces). A single envelope was opened directly prior to the operation by surgeon. Patients were asked to fill out questionnaires up to 48 hours after surgery to determine the incidence and severity of their shoulder pain by the nurse at ward.

All procedures were performed under general anesthesia following a standardized anesthetic regimen.

Laparoscope was performed using CO₂ gas. Either a 5 or 10 mm. trocar was placed and a 0 degree laparoscope was inserted through the cannula. The other 5 mm. trocar incisions were made (2-4 ports) and the trocars were inserted under direct visualization. The flow rate and intra-abdominal pressure were adjusted to sustain a maximum pressure at 14 mmHg. After the surgical procedure, hemostasis, irrigation with normal saline at pelvic cavity and removal of residual normal saline from the peritoneal cavity were performed.

At the end of the surgery, in the control group, CO₂ was removed by passive deflation through the port site with gentle abdominal pressure to evacuate the gas as much as possible. In the intervention group, the patients were placed in the 30 degree Trendelenburg position and pulmonary recruitment maneuver consisting of five manual pulmonary inflation was performed. The anesthesiologist held the 5th positive pressure inflation for approximately 5 seconds. During these maneuvers, the surgeon was instructed to ensure that the trocar sleeve valves were fully open to allow the CO₂ gas to escape through the ports. The patients were then placed back in the normal position, the trocars were removed and the abdominal incision was closed.

In the recovery room, postoperative pain control was provided with morphine as needed. Non-steroidal anti-inflammatory agents were not used. Patients were discharged from the recovery room according to standard clinical practice.

The pain scores were assessed at 24 and 48 hours after surgery. The patients were instructed to only report pain scores regarding their shoulder pain. The scores were rated using a Verbal rating scale (VRS), pain intensity score of 1 represented no pain, 2 mild pain, 3 discomforting, 4 distress pain, 5 horrible pain, 6 excruciating pain⁽¹⁴⁾. All additional opiate and non opiate drug was recorded.

Sample size

From the prior study, Oliver C. Radke et al⁽¹²⁾ showed that this simple clinical maneuver reduced postoperative shoulder pain from 63% to 32% (P < 0.05). We used a 95% of confidence interval and

needed 80% power under these condition, 30 female in each group would be needed to demonstrate a significant difference.

Statistical Methods

Sample variables including demographic data (age, type of surgery, time of operation, hospital stay, body mass index) were recorded prospectively.

Differences between the groups were analyzed by using unpaired two-tailed T-test for continuous variables and chi-square test for binominal outcomes (STATA version 11). The level of significance was defined as $p < 0.05$.

Results

The demographic characteristics (age, type of surgery, time of operation, hospital stay, body mass index) of patients in each group were matched (Table 1) and 110 patients provided informed consents to participate in the study. Of those, 6 patients were

excluded from were converted to laparotomy (Fig. 1).

This resulted in 104 randomized patients with analyzable data, 54 patients in the control group and 50 patients in the intervention group. There was no significant difference in age, time of surgery, type of surgery and body mass index. Postoperative hospital stay (mean, SD) was 2.5 ± 0.57 days in the control group, compared to 2.1 ± 0.47 days in the intervention group ($p < 0.001$) (Table 1).

Forty-five patients reported of postoperative shoulder pain (VRS 2-6) during the first 48 hours after operation, 34 of 54 patients (63%) in the control group, compare to 11 in 50 patients (22%) in the intervention group ($p < 0.001$) (Table 2). Among the patients who reported postoperative shoulder pain in the first 24 hours, there was no difference in the onset of pain in both groups (Table 3). Analgesic requirement for shoulder pain was not significantly different in both groups, (Table 4).

There were no complications as a result of the maneuver.

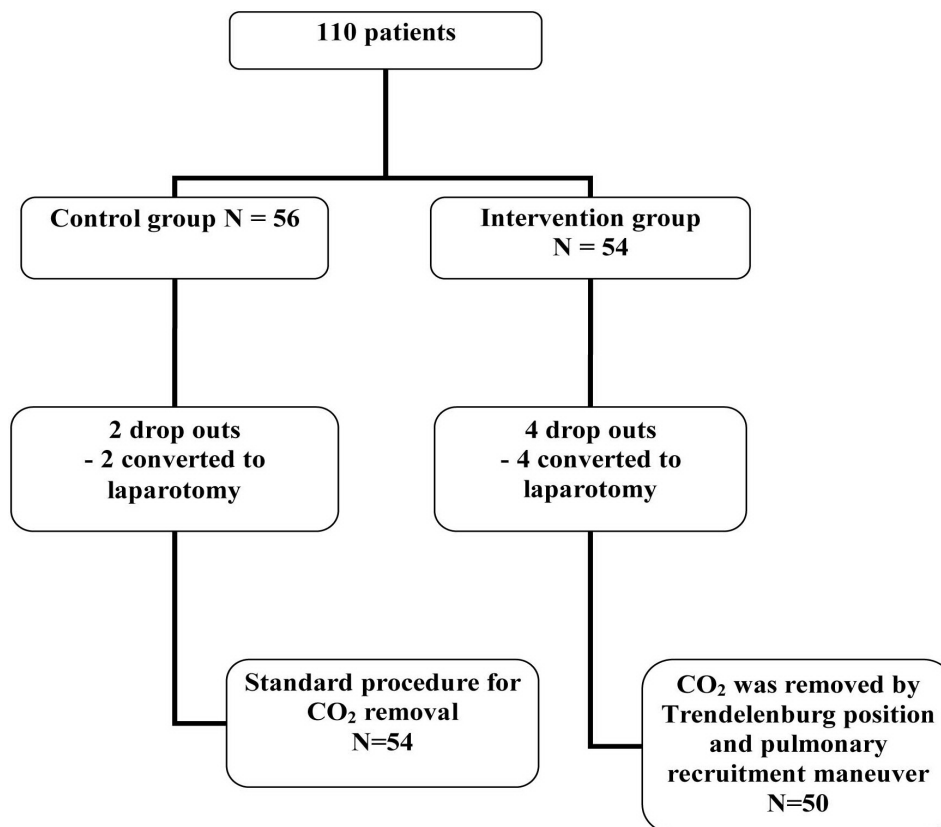


Fig. 1. Flowchart of randomization and group allocation

Table 1. Demographic characteristics and operative variables.

Characteristic	Intervention (n=50)	Control (n=54)	P
	Mean (SD)	Mean (SD)	
Age (years)	36.5 (10.06)	37.3 (10.56)	0.69
Operative time (minute)	62.2 (32.81)	69.6 (34.32)	0.26
Body mass index	24.61 (1.99)	24.53 (2.09)	0.85
Post operative hospital stay (days)	2.1 (0.47)	2.5 (0.57)	< 0.001*
Type of surgery: n(%)			
- Diagnostic laparoscopic	2 (4.0)	6 (11.1)	0.24
- Ovarian cystectomy	27 (54.0)	28 (51.9)	
- Lap-assisting vaginal hysterectomy (LAVH)	12 (24.0)	12 (22.2)	
- Tubal ligation, salpingectomy	6 (12.0)	2 (3.7)	
- Myomectomy	1 (2.0)	5 (9.3)	
- LAVH + BSO + omentectomy + pelvic lymphadenectomy	2 (4.0)	1 (1.9)	

Table 2. Verbal rating scale of postoperative shoulder pain (within 48 hours after surgery).

	Intervention (n=50)	Control (n=54)	P
	n (%)	n (%)	
Shoulder pain: (VRS 2-6)	11 (22.0)	34 (63.0)	< 0.001*
Pain scores (VRS1-6)			
1=no pain	39 (78.0)	20 (37.0)	
2=mild pain	2 (4.0)	4 (7.4)	
3=discomforting pain	3 (6.0)	8 (14.8)	
4=distress pain	3 (6.0)	12 (22.2)	
5=horrible pain	2 (4.0)	6 (11.1)	
6=excruciating pain	1 (2.0)	4 (7.4)	

Table 3. Timing of postoperative shoulder pain.

Time after surgery (hours)	Intervention (n=11)	control (n=34)	P
	n (%)	n (%)	
24 hrs	10 (90.9)	32 (94.1)	0.48
48 hrs	1 (9.1)	2 (5)	

Table 4. Analgesic usage in patients with shoulder pain

Analgesic usage:	Intervention (n=11)	Control (n=34)	P
	n (%)	n (%)	
Oral analgesic (paracetamol)	4(36.3)	13 (38.2)	0.56
IV analgesic (mepethidine)	3(27.3)	9 (26.5)	
Total	6 (63.6)	22 (64.7)	

Discussion

Laparoscopic procedures are often associated with shoulder pain that causes more discomfort to the patients than the pain at the incision site itself. The exact mechanism of shoulder pain remains unclear.

Most authors believe it is the irritation of phrenic nerve that cause referred pain of C4 projecting to the shoulder. The rapid distension of the peritoneum may be associated with overstretching of the diaphragmatic muscle fiber, tearing of blood vessel, traumatic traction of nerves, local acidosis, CO₂ remaining in the abdomen^(9,10,18,19). There is significant correlation between the width of gas bubble and shoulder pain⁽⁸⁾.

In this study, we used simple clinical maneuver to reduce the remaining amount of CO₂ between the diaphragm and liver by placing the patient in a 30-degree Trendelenburg position and pulmonary inflation. During these maneuvers, CO₂ was removed by passive deflation through the port site in intervention group. There are three commonly used pain rating scales such as the Numerical Rating Scales (NRS), Verbal Rating Scales (VRS), Visual Analogue Scales (VAS)⁽²⁸⁾. For simplicity, patients prefer the Verbal Rating Scales⁽²⁹⁾. The Verbal Rating scales (VRS) are applicable for assessment of pain intensity in our settings.

This simple clinical maneuver can effectively prevent and reduce shoulder pain after gynecologic laparoscopic surgery. Number of the patients experiencing shoulder pain in the intervention group was significantly lower than the control group (63% VS 22%, $p < 0.001$). These results were comparable to previous studies^(12,21). However, the previous authors did not mention the pain control medication taken by the patients after the surgery. The incidence of postoperative shoulder pain in the control group in our study was comparable to previous studies⁽⁵⁻⁷⁾.

In the patients who reported shoulder pain, the requirement of pain control analgesia, either oral or injection, were the same in both groups (63.6% in intervention vs 64.7% in control group, $p = 0.56$). There were 6 patients that the procedures were converted to laparotomy. In this group, 2 in 6 patients (33%) still reported postoperative shoulder pain after laparotomy. The remaining intra-abdominal CO₂ may not be the only mechanism of shoulder pain. The other hypothesis was the rapid distention and high intra-abdominal

pressure may cause phrenic nerve injury or irritation diaphragm by carbonic acid resulting in shoulder pain. Many trials showed that low pressure pneumoperitoneum in laparoscopic surgery significantly reduced shoulder pain⁽²²⁻²⁵⁾.

Various techniques have been investigated to reduce shoulder pain, for example, intraperitoneal bupivacaine^(13,26,27), intraperitoneal normal saline infusion⁽¹⁴⁾ or intraperitoneal gas drain by an aspiration cannula^(16,17). Sammour T, et al. showed that warmed humidified insufflation could reduce shoulder pain after laparoscopic surgery⁽²⁰⁾.

Most of these studies relied on additional drugs and devices which have not only costly but also have risk of side effects or need for follow up. The maneuver we proposed does not need any additional resource and requires minimal time.

Further study is recommended under hypothesis that remaining CO₂ is not a cause of postoperative shoulder pain alone. The combination of low pressure pneumoperitoneum and simple clinical maneuver technique may reduce shoulder pain after laparoscopic surgery better than simple clinical maneuver alone.

There are some limitations in our study. First, the literature suggests that an alveolar recruitment maneuver of 40 cm H₂O is safe. In the intervention group, the patients were placed in the Trendelenburg position and a pulmonary recruitment maneuver. We did not record airway pressure from recruitment maneuver. However, there was no cardiovascular or pulmonary complication as a result of the maneuver.

Conclusion

This study describes a simple clinical maneuver that significantly reduces shoulder pain after gynecologic laparoscopic surgery. The maneuver we propose does not need any additional resource, requires only minimal time and safe.

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การศึกษาทดลองแบบสุ่ม วิธีการใช้หัตถการอย่างง่ายเพื่อลดอาการปวดไหล่หลังการผ่าตัดผ่านกล้องทางนรีเวชวิทยาที่ โรงพยาบาลมหาราชนครราชสีมา

ฉัตรชัย จันทร์วิทิพย์

วัตถุประสงค์: เพื่อศึกษาประสิทธิภาพของวิธีการใช้หัตถการลดอาการปวดไหล่หลังการผ่าตัดผ่านกล้องทางนรีเวช

วิธีการศึกษา: ผู้ป่วยหญิง 104 ราย ที่นัดมาเพื่อผ่าตัดผ่านกล้องทางนรีเวช ได้รับการสุ่มและสมัครใจเข้าร่วมการศึกษา โดย 54 รายในกลุ่มควบคุมได้รับการระบายก๊าซ CO₂ ออกจากช่องท้องตามวิธีมาตรฐานหลังการผ่าตัดผ่านกล้อง และอีก 50 รายในกลุ่มทดลองได้รับการระบายก๊าซ CO₂ ออกจากช่องท้องหลังการผ่าตัดผ่านกล้องโดยการปรับศีรษะให้ต่ำ 30 องศา (Trendelenburg position) ร่วมกับการขยายปอดให้เต็มที่ (manual pulmonary inflation) 5 รอบ ประเมินอาการปวดไหล่หลังการผ่าตัดที่ 24 และ 48 ชั่วโมง โดยใช้ verbal rating scale (VRS 1-6)

ผลการศึกษา: ไม่มีความแตกต่างอย่างมีนัยสำคัญของ อายุ ระยะเวลาในการผ่าตัด ชนิดการผ่าตัด น้ำหนักของทั้งสองกลุ่ม ระยะเวลาการนอนที่โรงพยาบาลแตกต่างกันอย่างมีนัยสำคัญทางสถิติ โดยกลุ่มควบคุมใช้เวลา 2.5 (+0.57) วัน กลุ่มทดลองใช้เวลา 2.1 (+0.47) วัน ($p < 0.001$) พบอาการปวดไหล่หลังการผ่าตัดผ่านกล้อง (VRS 2-6) ในกลุ่มทดลอง 11 รายใน 50 ราย (22%) และ กลุ่มควบคุม 34 รายใน 54 ราย (63%) ($P < 0.001$)

สรุป: วิธีการดังกล่าวสามารถลดอาการปวดไหล่หลังการผ่าตัดผ่านกล้องทางนรีเวชอย่างมีนัยสำคัญทางสถิติ
