The effect of Intra-peritoneal Instillation of Lidocaine versus intra-peritoneal drain on post-operative pain relief in Gynecological Laparoscopic Procedures

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Abstract

Objective

The main purpose of this study was to compare the efficacy of intraperitoneal instillation of lidocaine versus intraperitoneal drain on postoperative pain relief in patients undergoing gynecological laparoscopic procedures.

Study design

A prospective study was conducted among patients who underwent elective laparoscopic surgery. This study was conducted in the Department of Obstetrics and Gynecology, Cairo University, during the period from June 2013 until May 2014.

Patients and methods

A total of 100 healthy women were equally divided into two groups: group I (the lidocaine group; n=50) and group II (the drain group; n=50). For all patients, general anesthesia was administered. During the procedure, an intra-abdominal pressure was automatically maintained at a maximum of 16mmHg and flow at a maximum of 3 l/min. At the end of the procedure, those patients who were allocated to the lidocaine group received a total dose of 120mg lidocaine (6ml of lidocaine 20 mg/ml diluted to 20 ml with normal saline) that was injected into the peritoneal cavity at the end of surgery. Women in the drain group had a single bore; a nonsuction Yeates drain (45mm width) was inserted into either of the accessory port sites. Intraperitoneal placement was confirmed by direct visualization.

Results

Results did not show any difference between the two groups as regards demographic data and duration of surgery. As regards shoulder pain, the mean visual analog scale was significantly lower in the lidocaine group when compared with the gas drain group at 12 and 24 h postoperatively (P = 0.046 and 0.006, respectively), with no significant difference noticed immediately postoperative and at 15 min, 1, 2, and 4 h. As regards abdominal pain, the mean visual analog scale was significantly lower in the lidocaine group when compared with the gas drain group at all times postoperatively. As regards the need for additional analgesia, it was reported in 28 cases (28.0%), and there was a significant increase in the gas drain group when compared with the lidocaine group (40.0 vs. 16.0%, respectively).

Conclusion

Intraperitoneal instillation of local anesthetic lidocaine was found to be superior to gas drain in reducing postoperative pain in gynecological laparoscopy.

Keywords:

drain, gynecological laparoscopy, intra-peritoneal lidocaine, post-operative pain

Contents

List of abbreviations

BRCA	Breast cancer antigen
COX-2	Cyclo-oxygenase 2
FEMD	Flexible endoscopic medical devices
FPS	Faces Pain Scale
GABA	Gamma-aminobutyric acid
hCG	Human chorionic gonadotropins
IL	Interleukin
IP	Infundibulopelvic
IPLA	Intraperitoneal local anesthetic
IVF	In vitro fertilization
LAVH	Laparoscopic assisted vaginal hysterectomy
LESS	Laparoendoscopic single-site surgery
LH	Laparoscopic hysterectomy
MAGS	The transabdominal magnetic anchoring system
NMDA	N-methyl-D-aspartate
NRS	Numeric Rating Scale
NSAIDS	Non-steroid anti-inflammatory drugs
PCA	Patient-controlled analgesia
POISE	Perioperative Ischemic Evaluation
PONV	Postoperative nausea and vomiting
SILS	Single incision laparoscopic surgery
SPA	Single-port access
TENS	Transcutaneous electrical stimulation
TNFα	Tumor necrosis factor alpha
UK	United Kingdom
VAS	Visual analogue scale
VRS	Verbal Rating Scale
WBFS	Wong-Baker Faces Pain Rating Scale

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Introduction

Laparoscopy was first performed about a century ago, but came to a more routine practice 50 years ago. Laparoscopic procedures are termed invasive; however, they must be considered less invasive when compared with their open counterparts with regard to the amount of peritoneal injury and tissue trauma, which are the main determinants of the extent to which surgery is radical **[Mouton et al., 1999].**

Gynecological laparoscopic procedures have become increasingly popular mainly due to lower perioperative morbidity, less postoperative pain and shorter hospitalizations when compared to laparotomy. But despite the reduction in postoperative pain, it may be moderate to severe for some patients with up to 80% of patients still requiring opioid analgesia following laparoscopy **[Joris et al., 1992].**

Pain following laparoscopic gynecological surgery has two components: 1) visceral component (owing to surgical handling and diaphragmatic irritation by dissolved carbon dioxide); 2) somatic in origin (owing to the holes made in the abdominal wall for the trocars). The scapular pain which is associated with peritoneal insufflation, especially when shoulder-holders and an exaggerated Trendelenburg position have been used, tends to increase after the eighth postoperative hour, appears during the night after surgery and hinders sleep. Infiltration of local anesthetics decreases scapular pain **[Pasqualucci et al., 1996; Chundrigar et al., 1993].**

Visceral pain has its maximal intensity during the first postoperative hour and is exacerbated by coughing, respiratory movements and mobilization. The fact that the pain comprises several components accounts for the necessity for multimodal analgesic techniques for provision of effective postoperative analgesia **[Goldstein et al., 2000].**

Currently, the efficacy of pain relief via the intraperitoneal route is controversial. Intraperitoneal administration of medication has been shown to be effective in some studies **[Goldstein et al., 2000; Sharon et al., 2006; Ahmed et al., 2008].**

The rationale for intraperitoneal administration of drugs for treatment of the pain which follows laparoscopic surgery is that the small incisions at the abdominal wall cause the visceral component of the pain to be more prominent. With this in mind, many authors have tried to diminish pain via the peritoneal route. The intraperitoneal technique is deemed to be safe, improve patient comfort, and shorten the length of stay in the postoperative care unit. However, early studies reported that intraperitoneal local anesthetic injection did not provide adequate postoperative analgesia **[Paech et al., 2008; Mraovic et al., 1997].**

In contrast, **Rademaker et al. (1994)** used 10ml lidocaine 2% intra-peritoneally and it was reported that this too provided effective analgesia.

Also **Mraovic et al. (1997)** used 15ml 0.5% bupivacaine intra-peritoneally for postoperative analgesia after laparoscopic cholecystectomy. They reported that intraperitoneal bupivacaine injection was an effective and easy method. Some other studies have shown similar results **[Pasqualucci et al., 1994]**

All of these studies showed that local anesthetic administration was effective in pain prevention, but there was a lack of consensus regarding dose, concentration, site and manner of administration. In gynecological studies, lower postoperative pain scores after local anesthetic administration have been reported. However, some investigators have not been able to confirm the analgesic efficacy of intraperitoneal local anesthetics **[Alkhamesi et al., 2007, Newcomb et al., 2007].**

It has been suggested that the retention of gas in the peritoneal cavity plays a role in the production of postoperative pain after laparoscopy. Some

authors have reported a reduction in pain after gas removal by drainage in the postoperative period in both gynecologic **[Alexander et al., 1987],** and general surgery settings **[Jorgensen et al., 1995].**

Aim of the work

The aim of this study is to compare the efficacy of Intra-peritoneal Instillation of Lidocaine versus intra-peritoneal drain on post-operative pain relief in Gynecological Laparoscopic Procedures

Gynecologic laparoscopy

Laparoscopy for the gynecologist began in earnest in the 1980s. In the previous decade, laparoscopy was used mainly for diagnostic procedures in the female pelvis. Physician acceptance and a rapid evolution of instrumentation have enabled laparoscopy to flourish in recent years. The shorter recovery time and aesthetic advantages also have fueled patient advocacy. The first widely accepted gynecologic laparoscopy procedure was the tubal ligation. The small incisions and rapid recovery were appealing to the patient, and surgeons preferred the magnified optics. By the mid 1970s, many women were choosing sterilization, and the number of laparoscopic tubal ligations was on the rise. Gynecologic surgeons began to explore other applications, including diagnostic procedures for pelvic pain, ectopic pregnancies, and appendicitis. In the early 1980s, additional operative procedures were introduced including adnexal surgery, uterine myomectomy, and hysterectomy. In the following decade, advanced operations for pelvic organ prolapse, urinary incontinence, and gynecologic cancers were performed. From simple beginnings, laparoscopy now is integrated completely into the field of gynecologic surgery **(DeSimone and Ueland, 2008).**

Pelvic anatomy

A systematic, anatomic approach is recommended for laparoscopic surgery in the female pelvis. The examination should begin with a survey of the midline structures (uterus, bladder, and rectum) and progress to the right and left adnexa. A normal uterus has a smooth, homogenous appearance and ranges in size from 4 to 8 cm in the longitudinal dimension. At the lateral fundus of the uterus are the utero-ovarian ligaments and fallopian tubes. The utero-ovarian ligament contains a rich anastomotic network of veins and arterioles from both the uterine and ovarian arteries. Posteriorly, the uterine fundus tapers to the cervix and upper vagina **(Chang et al., 2010).**

A thoughtful inspection of the posterior uterus is important early in the evaluation to identify any rectosigmoid attachment, particularly in patients who

have endometriosis, previous pelvic surgery, pelvic inflammatory disease, or a history of sigmoid diverticular disease. The rectovaginal space can be entered by incising the peritoneum between the uterosacral ligaments adjacent to the posterior cervix and vagina. This incision helps to mobilize the rectum and allows visualization of the rectovaginal fascia, the endopelvic fascia between the rectum and vagina. Anteriorly, the bladder extends midway up the uterine fundus and covers the vagina and anterior cervix. The vesicouterine space can be entered by incising the vesicouterine serosa in the midline just below its point of reflection on the uterus. The point of peritoneal reflection typically is 2 to 3 cm above the actual dome of the bladder. This approach allows a visualized dissection of the bladder and identification of the pubocervical fascia, the endopelvic fascia between the bladder and cervix. Opening either the vesicouterine and/or rectovaginal spaces may help the laparoscopic surgeon perform pelvic operations safely by restoring pelvic anatomy **(Chen and Falcone, 2009).**

The uterine artery is the primary blood supply to the uterus. It originates as a branch of the anterior division of the internal iliac artery. The uterine artery travels through the cardinal ligament and spirals up the cervix to its anastomosis with the ovarian artery in the utero-ovarian ligament. There are small arteriole branches to the uterus throughout its course. The fallopian tubes originate at the lateral fundus of the uterus. The tubes extend laterally along the broad ligament toward the ovary. The tube terminates at the fimbria. Common tubal pathology (infection, endometriosis, previous ectopic pregnancy) can lead to luminal occlusion and pyo- or hydrosalpinx. Both can be a source of chronic pelvic pain. The ovaries normally rest on the pelvic sidewall, suspended medially by the utero-ovarian ligament and laterally by the infundibulopelvic (IP) or suspensory ligament. A normal, premenopausal ovary ranges from 2 to 4 cm in greatest dimension with a volume (length x width x height =0.523) not exceeding 20 mL^3 **(Pavlik et al., 2000).**

A normal postmenopausal ovary is 1 to 3 cm in greatest dimension with a volume not exceeding 10 mL^3. The ovary receives its blood supply from the ovarian artery, which originates from the abdominal aorta. The ovarian veins often are multiple and drain into the inferior vena cava on the right and the

renal vein on the left. The ovary should be free of adhesions, mobile on its pedicle, and easily visualized on all surfaces **(Chang et al., 2010).**

Operations in the pelvis are best performed with an understanding of the retroperitoneal space, with specific attention to the blood vessels and the course of the pelvic ureter. The peritoneum is draped over the IP ligament, forming part of the broad ligament. The cardinal ligament is at the base of the broad ligament, adjacent to the uterine cervix. The uterine artery courses through the cardinal ligament. Safe access to the retroperitoneal space is achieved by elevating and incising the peritoneum near the round ligament and lateral to the ovarian vessels. When this incision is extended parallel to the IP ligament toward the pelvic brim, the psoas muscle, external and internal iliac vessels, and ureter can be identified. Visualizing the course of the ureter is essential for the laparoscopic pelvic surgeon. The ureter courses through the retroperitoneum over the common iliac artery at the pelvic brim and continues along the medial leaf of the broad ligament. It travels under the uterine artery approximately 1.2 cm lateral to the cervix and inserts into the posterior bladder base at the trigone. It often is possible to visualize the ureter indirectly through the peritoneum without entering the retroperitoneal space; however, direct visualization is preferred, especially when the pelvic anatomy is distorted **(DeSimone and Ueland, 2008).**

In subsequent chapters we will speak about single site laparoscopy as an advanced model of laparoscopy in the field of surgery.

History of minimally invasive surgery

The shift from open surgery to operative laparoscopy brought on one of the greatest transformations in the history of surgery. Now, video-endoscopy is one of the most common surgical procedures performed today, used in various surgical disciplines. While the gynecologic laparoscopists were some of the earliest surgeons to use laparoscopy, its use is expanding exponentially **(Phillips, 1977).**

Hippocrates described the first example of an endoscope, an early rectal speculum, in Greece between 460 BC and 375 BC. The ruins of Pompeii, Italy (70AD) provided the next example, a three-bladed vaginal speculum, similar to a modern day speculum. Next, Philipp Bozzini in Germany (1773–1809) developed a light conductor that he called "Lichtleiter", which directed light into the patient's body and then reflected the image back to the eye of the surgeon. John D. Fisher (1798–1850) described an endoscope to inspect the vagina, and he later modified it to examine the bladder and urethra **(Gunning, 1974).**

In 1853, Antoine Jean Desormeaux pioneered the first functional endoscope, which was mainly used for urologic cases. This instrument had mirrors and a lens with a lamp flame as the light source, which burned a mixture of alcohol and turpentine. In 1901, George Kelling used a cystoscope to examine the abdominal cavity of dogs. He used filtered air through sterile cotton to create a pneumoperitoneum with the goal of stopping intra-abdominal bleeding and expanding the abdominal cavity to avoid hitting any internal organs **(Berci, 1977).**

In the 1970s, groups of European and American surgeons used video camera with a monitor, allowing them to perform advanced procedures laparoscopically that demonstrated the possibility of treating a wide variety of gynecologic problems through laparoscopic surgery **(Nezhat et al., 1986).**

Endoscopic surgery is characterized by a number of small access ports and requires specialized instruments capable of performing various tasks inside the body. Endoscopic procedures are associated with minimized pain and trauma from access with the same or even better success rates compared to open surgery. For laparoscopy, surgeons require instruments that combine multi-functionality with small size and ease of use. In addition to avoiding large painful access wounds, the instruments used for dissection should be small and fine in order to reduce tissue trauma that results from surgical dissection **(Swanstrom, 2006).**

These instruments offer the flexibility needed to perform complex procedures in a limited surgical field. The multiple degrees of freedom make fine dissection and cutting more feasible with the articulating instruments. Also, disposable, plastic instruments are starting to have a role in laparoscopic surgery; however, they do not provide the effectiveness of steel instruments. Advances in optical engineering and imaging technology make it possible to visualize the manipulation of tissue in vivo. These optics are designed to maximize triangulation of laparoscopic instruments. A recent and important development of the camera system is the flexible tip laparoscope. The EndoEye laparoscope allows a panoramic view of the surgical field with minimal movements by the surgeon **(Bessler et al., 2007).**

Today, laparoendoscopic single-site surgery (LESS) has developed, which further improves the outcomes of endoscopic procedures. In the field of gynecology, LESS is used in the settings of benign and malignant adnexal disease, unexplained infertility, ectopic pregnancy, hysterectomy, and combined with the da Vinci robotic system. The potential benefits of using LESS in these settings include enhanced cosmesis, reduced morbidity associated with multiple incisions, shortened hospital stay, quicker recovery, and reduced post-operative pain. The limitations of LESS are instrument crowding, loss of depth perception and force distribution, and reduced triangulation. It is important to note LESS goes by many names, depending on the journal, the institution it is used at, and the equipment used. It may be called laparoendoscopic single site surgery, single-port laparoscopy, single port access surgery, or single incision laparoscopic surgery **(Bedaiwy et al., 2013).**

Optics, ports, and instrumentation

1. Optics

Laparoscopic surgery requires a camera to provide visualization of the body cavity, which is displayed on an external monitor. For LESS, the optics used are specially designed to minimize the technical problems associated