Thai Journal of Obstetrics and Gynaecology
June 1996, Vol. 8, pp. 119-125

GYNAECOLOGY

A Study into the Efficiency of an Ordinary Videocamera and Television when used with a Laparoscope

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ABSTRACT

Objective To develop less expensive equipment as a substitute for the standard videolaparoscope and evaluate its efficiency.

Design Prospective, nonrandomized study.

Setting Department of Obstetrics and Gynaecology, Songkhla Hospital.

Subjects Fifty-three women (experimental) and thirty-three women (control) with the diagnosis of non-malignant ovarian cyst, chronic pelvic pain with dyspareunia, multiparity, unexplained infertility were compared.

Main outcome measures Operating time, amount of analgesics, admission days, and recovery time at home.

Results The equipment was made up from an ordinary home video system (videocamera, television and videorecorder) together with the relevant surgical instruments (laparoscope, air insufflator, light source, trocar and uterine elevator). All this was connected in such a way as to duplicate the functions of the standard videolaparoscope. The experimental group had (1) decreased operating time compared with conventional laparoscopy, (2) decreased use of intramuscular analgesic drugs, (3) decreased number of admission days and (4) required a shorter recovery time at home.

Conclusion The experimental videolaparoscope can be used more comfortably than the conventional laparoscope, it allows the patient to benefit from of minimal invasive surgery as efficiently as the more costly standard videolaparoscope.

Key words : videocamera, laparoscope, pelviscopic surgery

The recent introduction of the videolaparoscope has led to much more efficient investigation and treatment. However, provincial and urban hospitals in Thailand, and may be in other developing countries, have a major problem in that they are often without this equipment because of

its high cost.

Therefore, the author has tried to develop less expensive equipment as a substitute for the much more costly standard videolaparoscope. This equipment was made up from an ordinary home video system (videocamera, television and videorecorder) together with the relevant surgical instruments (laparoscope, air insufflator, light source, trocar and uterine elevator). All this was connected in such a way as to duplicate the functions of the standard videolaparoscope : however, the cost is much less because equipment which is readily available in hospital is used. The efficiency of this experimental videolaparoscope was then evaluated by studying its use in one group of patients and comparing the results with those of another group with which the conventional procedure was used.

Objectives

1. To develop less expensive equipment as a substitute for the standard videolaparoscope.

2. To evaluate the efficiency of this equipment by comparing the operating time, the use of intramuscular analgesic drug, the admission time and the recovery time at home involved in the two procedures.

Materials and Methods

The experimental videolaparoscope was assembled from :

1. A home video system consisting of : a videocamera (Panasonic NV-S8E) ; 14" AV television and VHS videorecorder. Total cost about 40,000 baht.

2. The surgical instrument consisting of : KLI standard diagnostic laparoscope or KLI laprocator, air insufflator, light source, trocar and uterine elevator. All of these elements are readily available in most hospitals although probably used for other purposes.

Both were joined together by a plastic frame specially designed for each type of laparoscope. This frame was made from one-eighth-of-an-inch-thick plastic and glued with ordinary plastic glue. The videocamera was fixed to the frame with a screw and the laparoscope was held in the frame with a rubber "O" ring (Figures 1A and 1B). All equipment was connected as shown in Figure 2 : a videocamera was attached to the eyepiece of the laparoscope, the magnified image projected onto a television screen and the visual documentation recorded on video cassettes.

Its use was studied in fifty-three patients attending the Department of Obstetrics and Gynaecology at Songkhla Hospital from October 1, 1993 to December 30, 1994. The age range was 29-36 (mean 33.87) as shown in Table 1. They were diagnosed for non-malignant ovarian cyst, chronic pelvic pain with dyspareunia, multiparity in need of interval sterilization, unexplained infertility or after non-diagnosis were in need of laparoscopic investigation.

The patients were evaluated to ensure that they were free from any contraindicated conditions for the procedure. After giving their informed consent, they were then diagnosed or

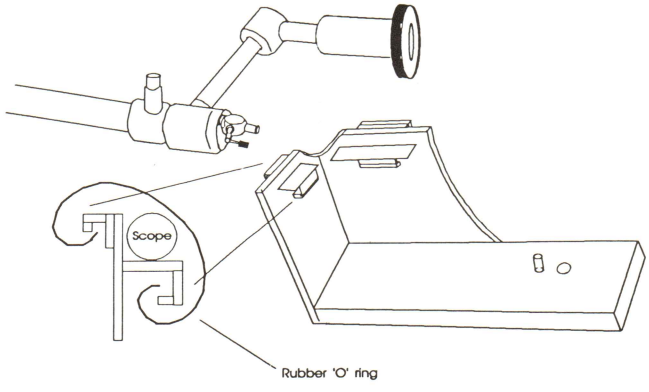

Fig. 1 A. The plastic frame designed for the standard diagnostic laparoscope.

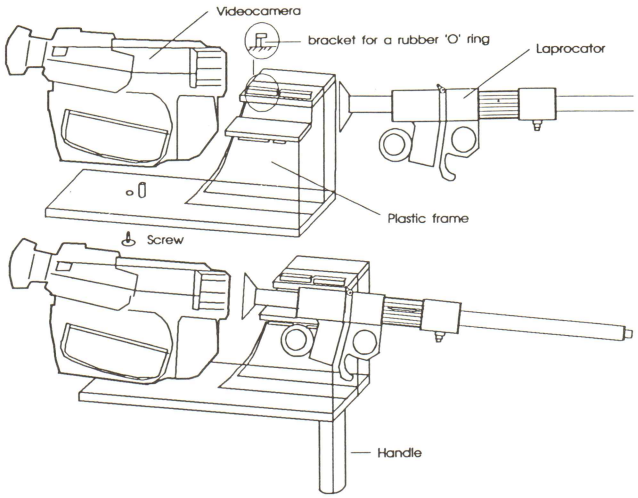

Fig. 1 B. The plastic frame designed for the KLI laprocator.™

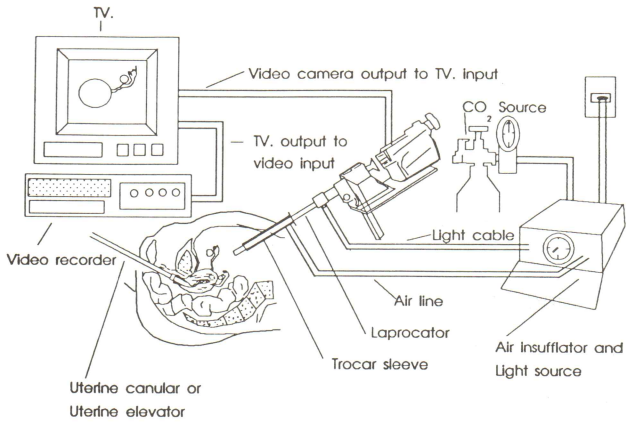

Fig. 2. Video-endoscopic system : interconnection diagram.

Table 1. Mean age (years) for each type of procedure

Procedure	Experimental	Conventional
Salpingo-oophorectomy	36.22 (N=9)	31.82 (N=11)
Uterine suspension	36.40 (N=5)	37.50 (N=3)
Interval sterilization	29.85 (N=13)	31.00 (N=15)
Laparoscopic examination	33.00 (N=26)	27.75 (N=4)
Mean age (Total)	33.87 (N=53)	32.02 (N=33)

treated by using the experimental videolaparoscope. The operating time, the use of intramuscular analgesic drugs, the admission time and the recovery time at home were recorded. The results were compared to those of another thirty-three patients with the conventional procedure.

Results

The comparisons of the operating time, the use of intramuscular analgesia, the admission time and the recovery time at home for each group are shown in Table 2.

Additional advantages resulted, when using the experimental equipment, including benefits for the surgeon as well as the patient, and also the procedure was found to be improved.

Table 3 gives a comparison between the effects of conventional laparoscopy and experimental videolaparoscopy on the user (surgeon) and on the patient : it further shows the differences in the two procedures (both as a technique and as documentation) as well as in instrumentation.

Table 2. Mean operating time, use of analgesia, admission time and recovery time at home

Procedure	Operating time (min.) Exp./Con.	Intramuscular analgesia (dose) Exp./Con.	Admission time (days) Exp./Con.	Recovery time at home (days) Exp./Con.
Salpingo-oophorectomy	90.22 / 47.55	1.10 / 1.82	2.00 / 4.27	20.00 / 30.00
Uterine suspension	62.00 / 60.00	1.60 / 2.50	1.80 / 5.00	16.80 / 23.54
Interval sterilization	14.46 / 19.06	None / None	None / None	5.00 / 5.00
Laparoscopic exam.	18.52 / 27.50	None / None	None / None	8.46 /15.68

Notes
1. All patients, both under the experimental and the conventional groups, were treated by the author.
2. Recovery time at home : the days spent between discharge from hospital to the return to work.
3. The figures in this table are given simply as average value.

Exp. - experimental, Con. - conventional

Table 3. A comparison of conventional laparoscopy and experimental laparoscopy

Conventional laparoscopy (Without monitor)	Experimental videolaparoscopy (With monitor)
User (surgeon)	
1. The surgeon has to work in an uncomfortable position, causing his back and neck to become easily fatigued.	1. The surgeon is able to work in a more comfortable standing position, so that the strain on his back and neck is reduced, facilitating longer procedures.
Patients	
2. It is restrictly used for diagnosis and interval sterilization. When a pathological condition is found, the surgeon must resort to laparotomy.	2. When the final diagnosis has been carried out, the surgeon can proceed to the definite operation through the scope. Thus the patients get benefit from minimally invasive surgery such as reduced intraoperative or postoperative pain, less damage to the abdominal wall, reduced blood loss and shorter hospitalization time.

Procedure	
As a technique	
3. The surgeon peers with one eye through the scope with no magnification, which limits visibility and thus unable to thorough examination of the pelvic organs.	3. The surgeon looks at the television screen. Anatomical structure of the pelvic organs is magnified on the television so that the surgeon is able to appreciate them in greater detail, even small lesions in difficult areas.
4. The assistants cannot see the operative field, so they have to follow the procedure blindly.	4. Both surgeon and assistants can view the operation, enabling the assistants to anticipate the surgeon's needs.
As documentation	
5. Documentation is recorded as a written operative report. It is quite subject to the recollection of the surgeon, or the memory of an assistant.	5. The visual documentation as recorded on video cassettes is easy to be gathered and played back. This promotes education of the surgeon and of other physicians and allows discussion, re-evaluation, and follow-up of disease processes.
Instrumentation	
6. Ordinary equipment and preparation techniques are used.	6. More preparation time is required. The surgeon must understand the laparoscope-video-television system and be able to handle system failure.
7. Standard sterilization techniques are carried out.	7. The techniques to keep the operative field sterile are more difficult. In this study, the author used double glove technique to fix a videocamera to the plastic frame which were then covered with a sterilized plastic bag. Nevertheless, the use of a videocamera could increases the risk of operative field contamination.

Discussion

Recently many studies have emphasized on the improvements of patient care when the videolaparoscope is used instead of the conventional laparotomy in various surgical procedures.[1-6] For example, Hershlag et al stated that laparoscopy should be the preferred surgical approach to the diagnosis and treatment of pelvic adhesions whenever possible because it is more convenient to the patient, less expensive, saves hospital beds and involves low morbidity.[1] Schwartz and Martin demonstrated that the advantages of operative laparoscopic salpingectomy were : decreased morbidity and surgical pain, lower costs, shorter hospitalization and convalescence and less disability, as well as a cosmetic scar.[2] Keye noted that although advances in operative laparoscopy had not yet led to improved pregnancy rates, they had decreased costs and morbidity of surgery for endometriosis.[3] Semm found that hospitalization was reduced by approximately three days and convalescence by approximately one week when laparoscopic techniques was used. He states that for some gynaecological procedures (such as operative treatment of ectopic pregnancy, operations to correct sterility, benign ovarian tumours and the enucleation of myomas of up to 400 grams in weight) laparotomy is now indicated only in rare cases.[4] Wood and Maher[5] and Camran et al[6] also supported these findings. Camran et al also demonstrated that some aspects of laparoscopic techniques can be used in gynaecologic and general surgery.[6]

Although in some parts of the world these techniques are now common by used, the situation is not the same in some developing countries. For example, in Thailand, well-trained surgeons are frequently not able to gain their experiences pass on their patients because of the high cost of the standard equipment (about 1,700,000 baht). This study, therefore, was an attempt to solve the problem by developing a less expensive equipment as a substitute for the standard videolaparoscope. The efficiency of this experimental videolaparoscope was then evaluated by studying its use. The benefits were obtained similarly to those studies using the standard videolaparoscope referred to earlier.[1-6] Comparing the average operating time it was found that the use of the experimental videolaparoscope required a shorter time than that of the conventional laparoscopy for interval sterilization and laparoscopic examination, but no operating time was saved in cases of open laparotomy for salpingo-oophorectomy and uterine suspension. The use of intramuscular analgesic drugs, the days spent in hospital and the recovery time at home were also considerably less. This was because the experimental procedure requires only a small incision and needs no abdominal retractor so there is less manipulation to the pelvic organs. Comparing with the conventional laparoscope was found to be the experimental videolaparoscope more effective because it showed a sharper and wider view of the pelvic organs so that more detailed information were obtained. The surgeon is able to work in a more comfortable standing position, so that the strain on his back and neck is reduced, facilitating longer procedures. Furthermore the assistants are also able to view the operation, so they can help in the precise way the surgeon needs.

Two factors that must be considered in this study were the image resolution and the weight of the equipment, which was approximately one kilogram. Both depend on the type and the quality of the videocamera and of the laparoscope being used. New developing

technology is hope fully leading towards smaller and lighter videocameras of higher quality.

In conclusion, the experimental videolaparoscope (1) can be used more comfortably than the conventional laparoscope, (2) allows the patient to benefit from minimal invasive surgery as efficiently as the more costly standard videolaparoscope, (3) can be used without postoperative complications. The author believes that the use of an ordinary videocamera and television with a laparoscope will increase the quality and efficiency of patient care in developing countries where the standard equipment is not fully available.

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