Clinical Experience with an Optical Access Trocar in Gynecological Laparoscopy-Pelviscopy

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ABSTRACT

Background and Objectives: Development in surgical technology must demand not only improved efficacy and risk reduction but also a reduction in costs and efficient use of human resources. For 25 years we have discussed the development of optical access trocars and their probable benefits. They are now available in the form of the OPTIVIEW by Ethicon and the SURGIVIEW by US Surgical.

Methods: Between December 1996 and March 1997, we utilized the optic obturator trocar, OPTIVIEW, in 104 cases of gynecological operative laparoscopy. The instrument was equipped with an axial grip to facilitate ergonomic handling.

Results: The optical trocar was used with a Z-incision technique in 46 cases; a vertical incision was used in 58 cases. In all of the gynecological procedures, the optical trocar was more advantageous than classic trocars placed without direct vision. Our estimation was that separation of tissue layers was very good in 71 cases, good in 26 cases and problematic in 5 cases. No complications occurred with the use of this trocar. The Z-incision was preferable to the vertical incision although it required a longer time of insertion of up to 5 seconds. Altogether, the OPTIVIEW presented an easy way of avoiding intestinal and vascular injury during initial trocar entry.

Conclusions: The application of this new tool is practical, safe and handy. However, it requires training in its appropriate use. Vertical incisions should be sutured after removal of the instrument. Additional trocars need not be optical trocars as they can be placed under direct vision and laparoscopic control. It is our opinion that a combination of sophisticated new technologies such as the OPTIVIEW trocar, robotic arm, harmonic scalpel and 3-D vision would provide safe and efficient means to accomplish gynecologic laparoscopic surgical procedures.

Key Words: Optical access trocar, Gynecologic endoscopic surgery.

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INTRODUCTION

Obstetric and gynecological pelviscopic-laparoscopic surgery has recently made great progress due to improvements in optics, energy sources, mechanical instrumentation and training of surgeons.[1,2] Improvements in efficiency and safety have been achieved in robotics, computer systems and optics through an interchange of ideas and technology by colleagues performing laparoscopic surgery in different surgical specialties. Examples include 3-D optics, the robotic arm, harmonic scalpel and head-mounted display.[3-5] Another such sophisticated technology is the optical access trocar, OPTIVIEW (Ethicon GmbH & Co. KG, Hummelsbütteler Steindamm 71, 22851 Norderstedt, Germany). This instrument allows entry into the abdominal cavity under direct vision. In 1994, Semm recommended entry under direct vision and suggested a "Z"-entry into the abdominal cavity using a 5 mm optic and conical 5 mm trocar. This combination of instruments and technique permitted trocar insertion under vision at an appropriate spot where there were no adherent intestinal loops. The OPTIVIEW optical trocar utilizes an optic obturator with integeral blade which allows an incision to be made through the abdominal layers under direct vision. After the initial trocar has been placed, the remaining trocars can be inserted under direct laparoscopic control.

MATERIALS AND METHODS

Optiview:

The transparent, rounded tip of the Optiview permits visualization through the trocar obturator and allows a controlled incision to be made. After a 10 mm longitudinal skin incision is made in the lower umbilical area, the individual tissue layers are divided and traversed utilizing Optiview dissection. The design of the coned obturator tip gives the surgeon a clear view while piercing the abdominal layers **(Figure 1)**. Lateral separators enable the surgeon to view the tissue prior to and during penetration of the optical trocar. The risk of tearing or lacerating blood vessels or bowel is largely excluded by this precise method of entry. Accurate separation of tissue in this manner allows for fixation of the obturator shaft in the abdominal wall. After introduction of the optic into the obturator, the obturator is continuously advanced downward, to the right and to the

Table 1.
Optiview

General Data
Initials of patient:
Date of Birth:

Indication			
Age of patient			
Pre-operated	Yes	No	
	Upper abdomen	Lower abdomen	
Adipositas	< 80 kg	> 80 kg	>100 kg

Data for instrument application

1. Application	with pneumoperitoneum ☐	without peritoneum ☐	
2. Application as	optic trocar ☐	working trocar ☐	
3. Kind of incision	vertical ☐	Z-incision ☐	
4. Identification of tissue layers	very good ☐	good ☐	problematic ☐
5. Power used	low ☐	middle ☐	high ☐
6. Bleeding in the incision canal		yes ☐	no ☐
7. Hematoma		yes ☐	no ☐
8. Location in the abdominal layers	good fit ☐	trocar sheath is sliding ☐	
9. Time required for insertion	with insufflation _____	without insufflation _____	
10. Was the optic changed?	yes ☐	no ☐	
11. Adhesions	yes ☐	no ☐	
12. Cosmetic results:			
13. Other remarks:			

left, after the initial skin incision. The new axial grip facilitates manipulation of the obturator as it can be turned up to 360 degrees. Insertion of the obturator is also easier using the new hand grip **(Figure 2)**. Introduction of the optical trocar can be performed using a Z-incision or a straight perforation of the upper abdominal wall. In 58 patients chosen at random, the incision was performed vertically (Group A) and in 46 patients also chosen at random, a Z-incision (Group B) was performed.

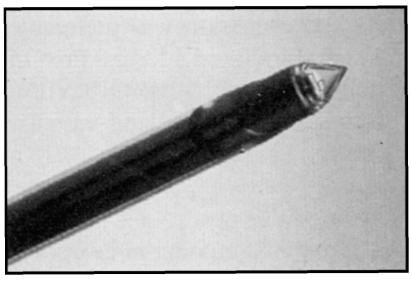

Figure 1. Optical trocar.

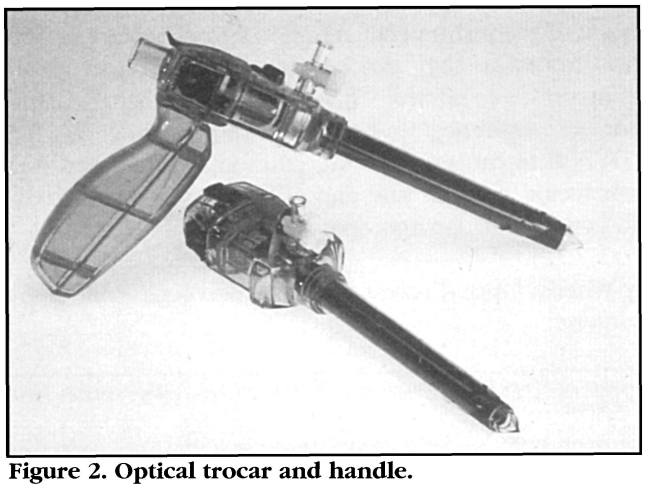

Figure 2. Optical trocar and handle.

Patients:

The OPTIVIEW was utilized for optical trocar incision in 104 patients between December 1996 and March 1997 at the Department of Obstetrics & Gynecology, University of Kiel. The patients underwent one of the following operative endoscopic procedures:

1) ectopic pregnancy treatment.
2) myoma enucleation.
3) ovarian cyst enucleation.
4) adnexectomies, tubectomies.
5) endoscopic hysterectomies (CISH and LAVH).
6) adhesiolysis.

Patient and instrument data are as listed in **Table 1.**

Table 2.
Catalogue of indications for gynecologic pelviscopic surgery.

Indication	Number
Ovarian cyst enucleation	30
Myoma enucleation	28
Pain and adhesions	13
Sterility	11
Adnexectomy	7
Ectopic Pregnancy	5
Endometriosis	5
Sterilization	2
Appendectomy	2
Hysterectomy	2

Table 3.
Power required to introduce the OPTIVIEW in 104 cases during gynecological laparoscopy.

Low power	Middle power	High power	Number of cases
71	28	17	104

RESULTS

In 104 cases in which the OPTIVIEW was used as an optical trocar, a Z-incision was fashioned 46 times (Group B) and a vertical incision 58 times (Group A). The age of the patients, in years, was as follows: <20 = 3, 20 - 29 = 15, 30 - 39 = 50, 40 - 49 = 20, 50 - 59 = 9, 60 - 69 = 6, >70 = 1. The catalogue of operative indications is detailed in **(Table 2)**. Forty-seven patients had no previous abdominal operations; 13 had a history of upper abdominal surgery. With regard to weight, 82 patients were under 80 kg, 20 between 80 and 100 kg and four over 100 kg. An opinion on the visualization and separation of tissue layers was as follows: very good = 71, good = 28, problematic = 5.

A pneumoperitoneum was established after placement of the Veress needle. In Group A (58 patients), the incision was performed as a straight, vertical, transection of all abdominal layers. In Group B (46 patients), a Z-incision, as first described by Semm in 1974, was applied. Even after an adequate skin incision, some force is required to introduce the optical trocar through the abdominal layers **(Table 3)**. In three cases, bleeding in the trocar introduction channel was observed, and there occurred a postoperative hematoma in one case. Slight bleeding noted during trocar introduction was managed with a swab placed around the trocar. In 94 cases a very tight fit through the abdominal layers was observed; in only 10 cases was the trocar sheath easily moved. A loose fit occurred only in patients where the straight-vertical trocar introduction technique had been performed. The Z-incision provided the OPTIVIEW with a tight fit.

Table 4 details trocar introduction times noted in this study. In the majority of cases, less than two seconds was needed for this maneuver. Introduction time for the OPTIVIEW employing a straight incision was definitely faster than fashioning a Z-type incision. A change of optic was required three times in cases of straight incisions. Adhesions were found in the lower abdomen in 24 cases, in the middle abdomen in two cases, and, in both areas, in five cases.

Cosmetic results at the point of trocar introduction were described as very good in 54 cases and as good in 50 cases. In all 104 patients we used clip application as a closure technique, fitting two clips into the lower umbilical margin to straighten up the wound edges. This technique gave satisfactory results in all patients of Group B where we used the OPTIVIEW with a Z-incision. In four patients of Group A, where a straight incision was used, we noted an omental prolapse on the first or second postoperative day. In these cases, the trocar incision was subsequently secured with suture using local anaesthesia. These findings caused us to conclude that it was better to close the wound with sutures when applying the OPTIVIEW via a straight vertical incision.

Table 4.
Time for introduction of the OPTIVIEW.

Time in seconds	Group A	Group B	Total
1	38	10	48
2	11	13	24
3	7	5	12
4		6	6
5	2	5	7
>5		7	7
Number	58	46	104

DISCUSSION

The application of an optical access trocar allows entry into the abdominal cavity under direct vision. The long-standing recommendation of Kurt Semm to enter under sight using the conical 5 mm trocar sheath with CO_2 connection has been made possible by the development of the OPTIVIEW optic trocar. Together with the now available optical Veress cannula, there is little risk of lacerating adherent tissue in the umbilical area if one chooses that entry point. A straight-vertical entry does not seem to be as efficient as the Z-incision. The Z-incision allows entry into each abdominal layer at a different vertical plane resulting in an oblique passage and tight seal. As a result, neither the peritoneum nor fascia needs to be secured in order to avoid subsequent hernia defects. Our three cases of omental prolapse all occurred after using a straight-vertical incision for the OPTIVIEW. We, therefore, advise fascial and skin closure in cases where a straight-vertical incision is used for the optic trocars. One particular advantage of the OPTIVIEW lies in the new handle which allows controlled application of force while turning and introducing the OPTIVIEW. Pull-back lateral separators give the surgeon the ability to see how tissue separates prior to and during penetration. In this way adhesions can be recognized and bowel lacerations avoided. Separation of tissues with this device lead to a tight fit about the obturator trocar. After introducing an optic into the obturator, the obturator is turned continuously from left to right pursuing either a vertical or Z-incision.

In our study, the advantage of using a Z-incision became evident as it facilitated a tighter fit, seemed to have less bleeding, and resulted in no hematoma formation. Additionally, there was no necessity for changing the optic during trocar insertion. Cosmetic results seemed to be better with the Z technique; however, identification of the different tissue layers was similar. Introduction time with a Z technique is longer, and in obese patients the same difficulties arise in placing the OPTIVIEW as with other trocars. The advantages of optical trocar placement seemed to be identical for all types of gynecological procedures. This study did not examine the use of optical trocars as secondary trocars as these trocar introductions are always performed under direct laparoscopic vision. By applying sophisticated new technologies, such as the harmonic scalpel, robotic arm and the OPTIVIEW, work in the operating room can become more efficient. As always, however, an experienced surgeon is required to perform the procedure. Each of the new technologies has its own training process and learning curve. It became evident that with increasing experience, placement of the OPTIVIEW was easier and faster. Our leaning curve was short. The skin and tissue incision needs to be large enough to avoid the use of excessive force to transect the remaining abdominal layers. The 3-D ZEISS system could not be used with the OPTIVIEW as the 3-D optic seemed to be slightly larger than that allowed by the OPTIVIEW trocar.

This study details the experience of three experienced laparoscopic gynecologic surgeons in applying one of the new technologies now available on the market.

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