Formal Laparoscopic Skills Training: Evaluation by Surgical Specialists in a Health Maintenance Organization

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The rapidly expanding field of laparoscopic surgery has required surgeons to adapt to a new operating environment. New procedures and techniques test the surgeon's skill and confidence. Supporting laparoscopic advances has required redesign of equipment and training. The latter often is presented in a step-by-step format related to a particular surgical procedure (e.g., laparoscopic cholecystectomy, laparoscopically assisted vaginal hysterectomy, etc.). The problems with this approach are the assumptions that the surgeon already possesses the necessary skills to perform fundamental surgical techniques in the new modality and that most participants enrolled in any given course will have a similar level of skill.

Laparoscopy relates to a route of entry into the abdomen and is not an all-encompassing skill. Within this category of surgery, the basic skills of dissection, hemostasis, tissue approximation, and organ reconstruction reside. The nature of surgery requires a basic repertoire of skills which are applied as the situation demands; *therefore, a formal training course focusing on skills rather than on procedures could be of significant benefit to the surgeon* (Table 1). This paper will detail the evaluation of a skills-based course in laparoscopic surgery and its impact on the practice of physicians based in the Kaiser Permanente Medical Centers of the Northern California Region.

MATERIALS AND METHODS

During the period from July 1993 through August 1994, 15 surgeons completed a 40-hour laboratory course on microsurgical and operative laparoscopic technique (Table 2).[1] All surgeons received training in groups of three or four at the Microsurgical and Operative Endoscopy Training Institute (San Francisco, Calif.). Included were 5 reproductive (infertility) surgeons, 2 gynecologic oncologists, 7 obstetrics and gynecology generalists (already performing advanced laparoscopic

Table 1. Curriculum

- Exercises of graduated difficulty
- Intracorporeal technique
- Precision dissection, suturing, knotting
- Microsurgical and laparoscopic environments

and/or urogynecologic procedures), and 1 general surgeon. Seven additional gynecologists and one colorectal surgeon have received training since the time of this report. All surgeons were salaried staff members of a prepaid health maintenance organization with no direct reimbursement for the surgical procedures they perform.

The course emphasized intracorporeal suturing and knot tying[2]; however, dissection and, in some sessions, lymphadenectomy practice was included.

Table 2.

Forty-hour advanced microsurgical/ laparoscopic suturing tutorial

Day 1

- Evaluation of current skills
- Review basic principles
- Microsurgical inanimate exercises
- Laparoscopic inanimate exercises

Day 2

- Microvascular anastomosis (animal)
- Basic laparoscopic linear repair (extirpated animal tissue)

Day 3

- Laparoscopic seromyotomy repair
- Laparoscopic anastomotic techniques
- Decreasing gauge sutures
- Suspension techniques

Day 4

- Large animal laboratory
- Simulated clinical procedures
- Set-up, instrumentation
- Port placement, access

Day 5

- Review
- Practice
- View clinical videos

Figure 1. Microsurgical training laboratory equipped with individual teaching stations.

Didactic sessions presented aspects of laparoscopic surgical strategy as well as focused discussions of visual perception, eye-hand coordination, economy of motion, and fluently choreographed movements related to needle driving, suturing, and knotting techniques. Training included exercises of graduated difficulty using inanimate material, extirpated, non-perfused animal tissue, and live animal models in the microsurgical and laparoscopic training environments. Training sessions isolated specific movements and eye-hand coordination to allow facile intracorporeal handling of fine needles and sutures.[3] Students performed planar and anastomotic suturing in both the stereoscopic microsurgical (Figs. 1, 2) and two-dimensional video-laparoscopic environments (Figs. 3, 4). Participants practiced components of basic techniques and simulated surgical problems until these could be performed efficiently and with confidence. Discussion of port placement, techniques of introducing sutures with needles, and tissue manipulation by assistants took place during the animal laboratory sessions (Figs. 5, 6).

Evaluation questionnaires were given immediately following the course and at an interval of 4 to 16 months depending upon the date of completion by that surgeon.

RESULTS

Eleven surgeons responded to the initial post-course questionnaire. The initial questionnaire dealt primarily with course format and the learning experience. All participants believed the course was of adequate length. They thought that exercises were properly explained and that adequate time was allotted to specific tasks. Areas listed as of special interest included bowel and bladder suturing, tubal surgery, port placement, instrument maneuvers, microsurgical exercises, and simulated urethropexy. Subjects desired to be covered in greater detail were physics and technical aspects of video systems, additional live animal lab exercises, ureteral repair, and ambidextrous technique. All graduates thought that the course increased their clinical skills upon completion.

Fourteen responded to the interval questionnaire (Table 3). Topics here related to the surgeon's clinical experi-

ences following return to their practices. All 14 reporting graduates indicated that the course increased their scope or comfort in performing endoscopic surgery. Thirteen (93%) were using suturing techniques learned in the course. Eight (57%) were performing more procedures endoscopically which they had previously done by laparotomy. Eight (57%) reported a decrease in hospital utilization as a result. This decrease was represented by 1 to 2 days per patient in some cases to as much as 7 to 8 days per patient, with some surgeons reporting as many as 2 to 3 patients per month. Six surgeons (43%) reported no decrease (although no increase) in hospital utilization as a result of the course. Twelve (86%) were more satisfied with their technical results. Eight (57%) reported no change in their operating time. Two (14%) reported a decrease in operating time and four (29%) reported an increase. Additional comments were solicited.

DISCUSSION

The author's (JEL) desire to organize an endosuturing course stemmed from a personal interest in laparoscopically performed fertility-enhancing surgery. Recognition of possible applications to other areas of abdominal surgery expanded the pool of surgeons for training to include those from other disciplines. The course was designed to minimize the cost of training and provide skill acquisition that could be immediately used clinically.

Table 3. Results

Interval questionnaire (n=14)	
Increased confidence/ scope	100%
Using suturing technique	93%
Replaced open procedures	57%
Decreased in patient days	57%
Greater technical satisfaction	83%
Operating time	
No change	57%
Less	14%
Greater	29%

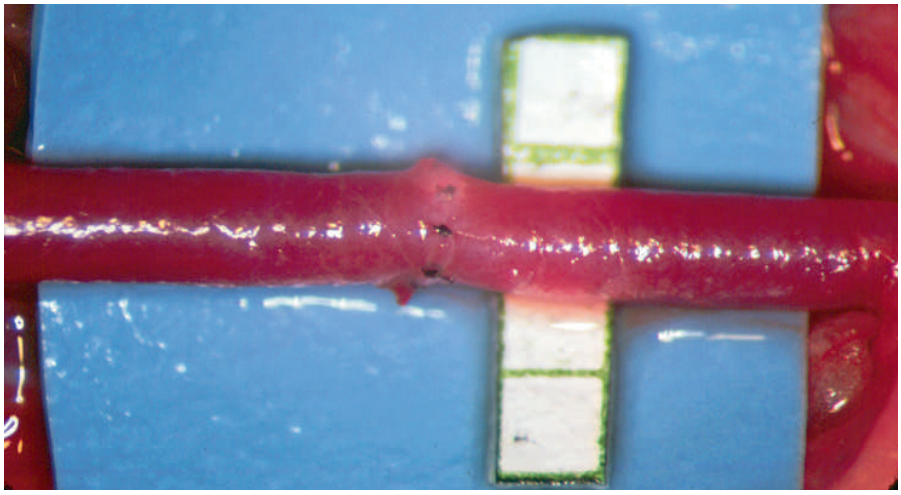

Figure 2. A 1-mm diameter rat femoral artery is used for a critical microanastomosis exercise.

Figure 3. Laparoscopic training laboratory with individual practice stations using equipment identical to the clinical setup.

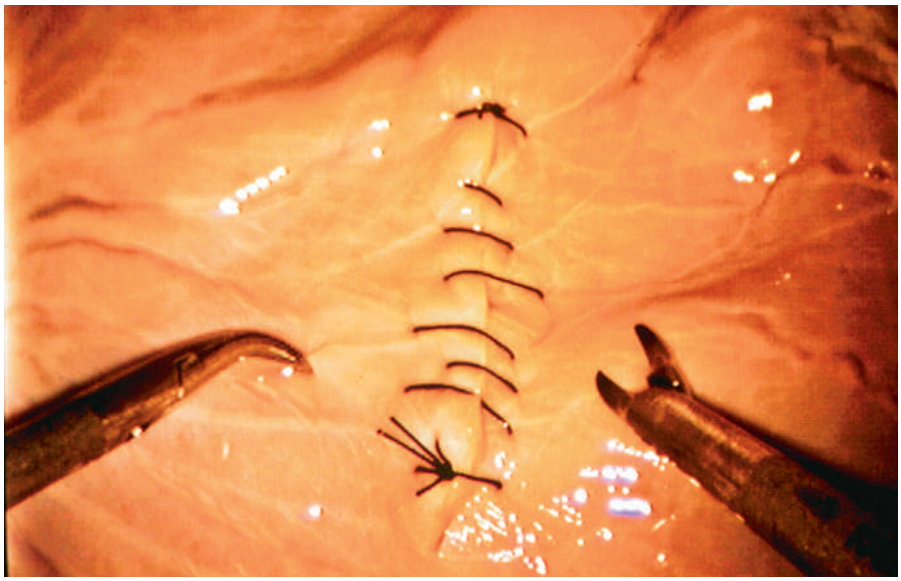

Figure 4. Laparoscopic suturing exercises based on microsurgical suturing techniques.

Previous laparoscopic surgical experience varied greatly among the course participants. Those with the least years of laparoscopic experience tended to have greater experience and training in a wider range of technical and anatomical areas. The interest, acceptance, and course evaluation by this diverse mix was completely conjectural at the time of course planning. Funding was provided so that the majority of surgeons incurred little out-of-pocket expense; however, time was not provided, and all surgeons had to use educational leave or accumulated vacation during the week-long session.

Course graduates indicated a uniformly higher level of confidence in performing endoscopic procedures following the course (Table 4). They believed they had more alternatives to use across a wide group of procedures including tuboplasty, lymphadenectomy, endometriosis resection, urethropexy, oophoropexy, salpingo-oophorectomy, cholecystectomy, herniorrhaphy as well as repair of unintended injuries (e.g., cystotomy and enterotomy). One hopes that the careful, graduated approach of technical skills training provided the basis for this improvement.

Operating time decreased or did not change for 71% of the graduates. Additional improvement might be expected with a longer interval from training and more clinical experience.[4]

Despite de-emphasizing the orientation of procedure-specific training in favor of skills-specific training, significant decreases in hospital utilization were achieved. This apparently occurred due to the replacement of open procedures by laparoscopic technique. *Exact reproduction of certain surgical procedures previously performed at laparotomy is possible if the operator possesses a full range of laparoscopic skills. Other techniques can be adapted to the laparoscopic environment, and at times, tissue effects actually improved.*[5,6]

Somewhat surprisingly, students were not critical of the intense and arguably time-consuming course format. Lack of direct human surgical contact (with the exception of a small amount of time devoted to videotaped procedures) produced no objections from course participants. The small-group atmosphere and close instructor-student (i.e., personal tutorial) relationships were highly valued; one student believed these should have been even further emphasized.

One surgeon believed this type of training should be a prerequisite to advanced laparoscopic surgical practice and credentialing. Several graduates indicated that they would value additional course time at six-month intervals to hone particular skills as required in their clinical practice.

As newer technologies and techniques evolve, a continuing need for appropriate training of surgeons will exist beyond the formal residency and fellowship years.[7] Although there are many courses offered worldwide, resources are frequently wasted.

Figure 5. Pig surgery for practicing previously learned suturing techniques under simulated clinical conditions.

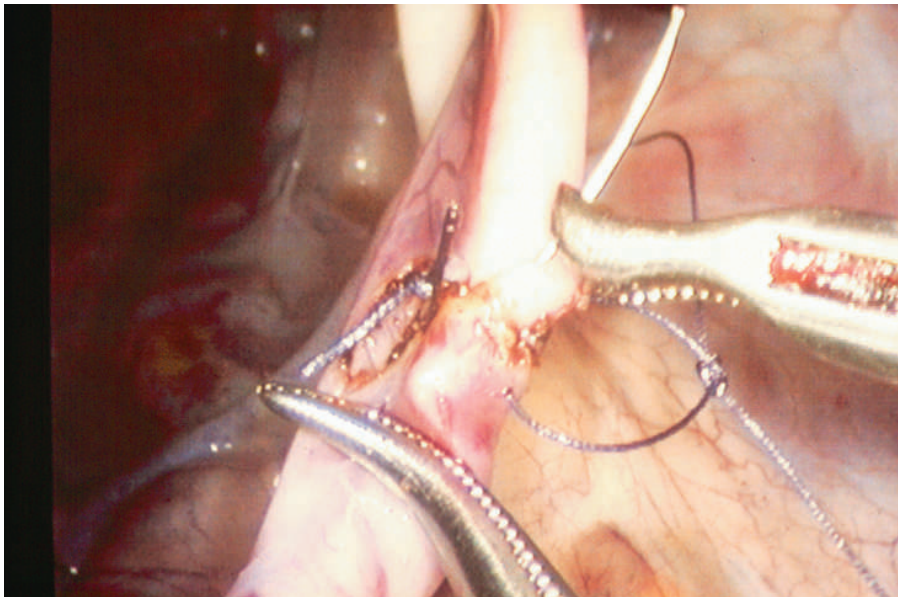

Figure 6. Precision suturing of ductal structures (porcine uterine horn).

Table 4. Discussion

- Increased confidence
- Increased technical alternatives
- Decreased hospital utilization
- Possible decreased complications/morbidity
- Possible decreased costs of care
- Possible increased patient satisfaction

Surgeons often leave either in frustration or with overly optimistic expectations. Evaluation of a particular skills-based laparoscopic surgery training program was carried out within a unique health-care team. The full risk-benefit and cost-effectiveness analysis of such a program is beyond the scope of this paper and must be considered individually in a given setting. Nonetheless, improvement in surgeons' confidence and a clear decrease in hospital utilization were reported. Minimal impact on operating time was noted. One hopes this will lead to further improvement in patient care through lower morbidity and the control of health-care costs. STI

REFERENCES

1. Szabó Z, Henderson S. Organizing training programs in laparoscopic microsurgery: set-up, curriculum, and standards. In: Hunt RB, Martin DC, Phillips JM, eds. Endoscopy in Gynecology. Proceedings of the 20th Annual Meeting of the American Association of Gynecologic Laparoscopists; 1992 Sept; Chicago. Sante Fe Springs, CA: American Assoc of Gynecol Laparoscopists; 1993. p 259-65.
2. Szabó Z, Berci G. Extra- and intracorporeal knotting and suturing technique. In: Berci G, ed. GI Endoscopy Clinics of North America. Philadelphia: W.B. Saunders; 1993. p 367-79.
3. Szabó Z. Laparoscopic suturing and tissue approximation. In: Hunter JG, Sackier JM, eds. Minimally invasive surgery. New York: McGraw-Hill; 1993. p 141-55.
4. Weber BM, Long CA, Cowan BD. Laparoscopically directed ovarian cystectomy in premenopausal women: impact of surgical experience on surgical time. J Reprod Med 1995;40:273-5.
5. Adamson GD, Subak LL, Pasta DJ, et al. Comparison of CO2 laser laparoscopy with laparotomy for treatment of endometrioma-ta. Fert Ster 1992;57:965-73.
6. Lundorff P, Hahlin M, Källfelt B, et al. Adhesion formation after laparoscopic surgery in tubal pregancy: a randomized trial versus laparotomy. Fert Ster 1991;55:911-15.
7. Leventhal J. Techniques. In: Sanfilippo JS, Levine RL, eds. Operative Gynecologic Endoscopy. New York: Springer-Verlag; 1989. p 39-56.