Background: Though minimally invasive techniques now are routine world over, there is need to develop facilities for training surgeons. Laparoscopy performed on anesthetized animals is an established model but is costly and is not easily available. We report on human cadaver as a training modality for surgeons participating in a laparoscopic training course.

Methods: Unembalmed cadavers were used for training surgeons to appreciate anatomy, practice laparoscopic techniques, and deploy equipment and instruments during a laparoscopic training course. Trainees carried out procedures such as cholecystectomy, appendicectomy, splenectomy, intestinal explorations, mesenteric lymph node biopsy, and varicocele-vein occlusion. We analyzed the trainees’ perspective regarding cadaver as a model using the 5-point Likert scale. Results: Thirty-two trainees from five consecutive training courses held at our institution expressed general satisfaction over cadaver as a training model, and 96.9% (31/32) rated the training model as highly satisfactory. The trainees ranked as highly satisfactory their understanding of surgical anatomy (29/32; 90.6%), understanding of laparoscopic technique (29/32; 90.6%) and use of instruments (32/32; 100%). The trainees thought such an approach improved spatial perception of anatomy and they perceived it as a valuable educational experience. Conclusions: Human cadaveric laparoscopy may offer an ideal surgical environment for laparoscopy training courses, allowing dissection and performance of complicated procedures.

Original Article

Cadaver as a model for laparoscopic training

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Background: Though minimally invasive techniques now are routine world over, there is need to develop facilities for training surgeons. Laparoscopy performed on anesthetized animals is an established model but is costly and is not easily available. We report on human cadaver as a training modality for surgeons participating in a laparoscopic training course. We relate our experience with this training model and the trainees’ perception.

Methods: A clinical skills training center has been established at our institution in the Department of Anatomy for training post-graduates students in specialized surgical and other procedural skills such as sinus endoscopy, temporal bone surgery, micro-neuro surgery and arthroscopy. The center was inaugurated in August 2003 and nine workshops in different medical specialities have been conducted since; five of these workshops dealt with laparoscopy training. The center is equipped for performing laparoscopic surgeries, along with facilities simulating an operation theater. This clinical skills laboratory project has been approved by the ethics committee of our institution.

We have been conducting laparoscopy training courses for practicing surgeons, defined as surgeons with more than 5 years of practice. These courses include live demonstration of surgical procedures, hands-on assistance, and supervised training sessions on the endo-trainers. We added cadaveric training as a training model to this course. Unembalmed human cadavers that were lying unclaimed in municipal hospitals mortuaries and were preserved within one hour of death in low-temperature (0-4 degrees Celsius) walk-in coolers were used for this purpose. On the day of laparoscopic training session, these bodies were thawed for one hour in the operating room.

Three participants along with a guide worked on each cadaver for each procedure. The trocar was introduced by the open technique taking universal precautions and was secured by an encircling stitch. The abdominal cavity was inflated with air; the pressure required was 12-14 mmHg. A zero-degree telescope was used along with standard equipment for laparoscopic training. Trainees carried out operations such as cholecystectomy, appendicectomy, splenectomy, intestinal explorations, mesenteric lymph node biopsy, and varicocele-vein occlusion (4-6 procedures...
on each cadaver). The cadaver was disposed off by incineration as per rules in force.

To study the trainees' perception on the use of cadaver as a model for laparoscopic surgical training, a questionnaire was prepared in consultation with experienced laparoscopic surgeons and educationists. The questionnaire evaluated perceptions regarding understanding of surgical anatomy, understanding laparoscopic technique, and use of laparoscopic instruments. Each item was scaled on the five-point Likert scale as highly satisfactory, satisfactory, average, unsatisfactory, and highly unsatisfactory. Thirty-six surgeons participated in five laparoscopy workshops; four of them did not take part in the cadaveric dissection. Hence 32 surgeons participated in the study.

Results

All 32 trainees in the workshops were practicing surgeons. One participant had been performing laparoscopic procedures with assistance and eight others had been assisting other surgeons. Four had previously received laparoscopic training using animal models. Nine cadavers were used for these five workshops. A total of 42 operations were carried out by the 32 trainees; these included cholecystectomy (9), appendicectomy (9), laparoscopic varicocelectomy (14; both sides), intestinal exploration (3), mesenteric lymph node biopsy (6) and splenectomy (1). Distension of the cadaveric abdomen was adequate and all operations could be performed comfortably by the participants under guidance of the faculty. The time spent on each cadaver was mean 3.5 (range 2.5 to 4.5) hours. Four to six procedures were carried out on each cadaver. As expected, there was no active bleeding.

All 32 trainees expressed satisfaction with cadaver as training model, and 31 of 32 (96.9%) rated the training model as highly satisfactory and one graded the satisfaction as average. The trainees indicated that the cadaver model provided a highly satisfactory understanding of surgical anatomy (29/32; 90.6%), understanding of laparoscopic technique (29/32; 90.6%), and use of instruments (32/32; 100%). Understanding of surgical anatomy and understanding of laparoscopic technique were scored as unsatisfactory by 2 participants each, and as average by one participant each.

The trainees thought it improved spatial perception of anatomy, and they perceived it as a valuable educational experience.

In the trainees’ opinion, limitations of the model were the absence of active bleeding, the absence of breathing perception, and limited hours of working as the cadavers tend to become malodorous after 6-8 hours. Overall experience was rated as excellent by all.

Discussion

Performing laparoscopic surgery demands specific capabilities in a surgeon, which can only be gained with extensive training. Currently, the basic optical and manipulative skills can be learned by using inexpensive, traditional endo-training devices. The various techniques used for this purpose are didactic lectures, video sessions, endo-trainer models, live demonstrations, hands-on apprenticeships, and animal laboratories. In all endo-training programs the trainee learns navigating under monoscopic visual feedback where real-life effect is lost. Experiments on animals are sometimes used for testing new surgical techniques but practical as well as ethical reasons strongly restrict their use in everyday surgical training.

We have explored the human cadaver as a training model for laparoscopic training and have found it feasible and useful, as was perceived by other surgical training centers. The cadaver has also been used to teach clinical anatomy to students and residents. Trainees preferred cadaveric laparoscopy to porcine laparoscopy. The cadaveric model has the advantages of human anatomy and real-size experience and is much closer to live patient in handling instruments and tissues. Most importantly, surgeons gain valuable experience in operative laparoscopic surgery in an environment free of the limitations of the operating room. The handicaps of this approach are absence of active bleeding and limited period of the use of the cadaver. There is initial moderate cost of developing these facilities, but these can be shared by many departments in an institution.

In a well-developed center, the cost of cadaver training is moderate and affordable in developing countries. In a large metro city like Mumbai, obtaining unclaimed cadavers or cadavers donated for anatomical dissection is quite easy. Medical colleges in India attached to public hospitals have similar access to human cadavers for dissection, and it is legal.

In conclusion, cadaveric laparoscopy may offer an ideal surgical environment allowing dissection and
performance of complete procedures. It may be added to laparoscopy training courses. Jean Fernel’s aphorism that the old adage “Dead men tell no tales” does not hold in the dissection hall has extended applicability in the training for laparoscopy.

References

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