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BRIEF COMMUNICATION

Laparoscopic Surgery Recording as an Adjunct to Conventional Modalities of Teaching Gross Anatomy

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تسجيل جراحة البطن بالمنظار كمكمل لطرق التدريس التقليدية في علم التشريح العِيانِيّ

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الملخص: الأهداف: تحتاج أساليب تدريس العلوم المورفولوجية – من أجل زيادة فعاليتها – إلى تنقيح لدمج التقدم التكنولوجي الحديث بميدان الطب فيها. تدريس التركيبة البشرية بالطرق التقليدية لوحدها بواسطة استخدام عينة من التَشْرِيحُ المُوَجَّه تفشل في كثير من الأحيان لإعداد الطلاب بشكل كاف لتدريبهم السريري. المطلوب استخدام أسلوب التعلم الذاتي ثلاثي الأبعاد المكانية ودمج التشريح بشكل أوثق مع الإعداد السريري. الطريقة: مع أخذ هذه التحديات في الاعتبار، تم تسجيل فيديو بشكل بطيء لمدة 30 دقيقة لعملية استئصال المرارة بجراحة المنظار لسيدة عمرها 54 عاما واستعماله لتكملة التعليم التقليدي لتشريح البطن والحوض. وقد أجريت هذه الدراسة في أكتوبر 2010. النتائج: كان عدد المشاركين في هذه الدراسة 48 طالبا في السنة الاولى من دراستهم الطبية في مساق التشريح في كلية طب عُمان الخاصة. تم الحصول على ملاحظاتهم من خلال استبيان، وتبين أن عرض الفيديو ساعد الطلاب على إدراك أهمية تعلم التفاصيل التشريحية خلال مساق التشريح. الخلاصة: يعتبر تسجيل عمليات البطن الجراحية بالمنظار طريقة فعالة لتدريس التشريح ما قبل السريري ومصدر مهم في التعلم الذاتي للطالب. كما أنها تساعد الطلاب على تقدير مدى الأهمية السريرية للتشريح العياني وتعزيز دوافعهم للتعلم.

الكلمات الرئيسية : تسجيل جراحة البطن بالمنظار، تسجيل فيديو، تجويف البطن، التعليم الطبي.

ABSTRACT: ***Objectives:*** In order to increase their effectiveness, methods of teaching morphological sciences need to be revised to incorporate the recent technological advances made in the field of medicine. Teaching human structure with conventional methods of prosections using dissected cadaveric specimen alone quite often fails to prepare students adequately for their clinical training. A learner-oriented method, incorporating three dimensional spatial anatomy and more closely mirroring the clinical setting, is required. ***Methods:*** With these challenges in mind, a 30-minute slow-paced video recording of a cholecystectomy performed laproscopically on a 45 year-old lady was adapted to supplement the conventional teaching of anatomy of the abdomen and pelvis. This study was carried out in October 2010. ***Results:*** The subjects of this study were 84 students in a first year preclinical MD course in human structure at the private Oman Medical College. Their feedback was obtained via questionnaire and revealed that the video presentation helped the students to realise the significance of the anatomical details learnt during the human structure course. ***Conclusion:*** Recordings of laparoscopic surgeries are an effective preclinical anatomy teaching resource in student-centred learning. They also help the students to appreciate the clinical relevance of gross anatomy and enhance their motivation to learn.

Keywords: Laparoscopic surgery recordings; Video recording; Abdominal cavity; Medical education.

Recent technological advances have revolutionised the realm of patient care and led to remarkable changes in the nature of anatomical knowledge required by a clinician. It has therefore become necessary to review teaching strategies to ensure that these newly desired learning outcomes are addressed. Although the curricula used in medical schools worldwide are diverse, the level of anatomical knowledge required to become an efficient clinician remains agreed upon. Until recently, the conventional method of learning the subject by dissection of human cadavers and didactic lectures has served its purpose. With the advent of modern surgical techniques and interventional devices, the nature of living anatomy required for a medical

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student has changed immensely.[1] There has also been a growing tendency to replace the hours of dissection with prosected specimens, anatomical models and simulated procedures as a result of the dearth of conventional learning resources including cadaveric material, and the reduction in time allotted to anatomy teaching. It has been suggested that this reduced attention to anatomy has resulted in a situation, in many medical schools, where undergraduate education in anatomy is below the minimum necessary for safe medical practice.[2] This has led to calls for the 21st century curriculum to move from the passive, didactic and highly detailed courses that used to be taught towards more functionally and clinically relevant modes of teaching.[3] The introduction of a laparoscopic video presentation into a preclinical anatomy course is one example of this trend.

Whatever the methods used to teach anatomy, it is very clear that the learner needs to comprehend the three-dimensional structure and the spatial relations of the organs in as live a manner as possible in order to apply this knowledge in later clinical practice.[4] Radiological images and videos of laparoscopic procedures seem to be resources of choice to address this issue. Laparoscopic training using embalmed cadavers has been used in some schools of medicine,[5] but it has mainly been centered on reviewing basic anatomy for clinical students and residents in specific specialities and principally designed to develop laparoscopic skills in surgical trainees.[6,7] The main hindrance to this method has been the fact that the cadaveric material does not show the flexibility of tissue and the liveliness of the organs. To circumvent this problem, Thiel embalmed cadavers that maintain the colour, consistency and flexibility of a live body, and avoid *rigor mortis* changes, have been used to simulate minimally invasive techniques and to review the clinical trainees' knowledge of anatomy.[6,8] However, information regarding the structured use of laparoscopic surgery to teach preclinical students seems to be scanty. In an attempt to enhance the learning outcomes of preclinical students, it was decided to test the use of a video of a laparoscopic procedure to supplement the conventional methods employed in teaching anatomy of the abdomen and pelvis to preclinical students in a private medical school in Oman.

Methods

Eighty-four students took part in this study as part of their regular teaching programme: a mandatory course in human structure (anatomy) in their first preclinical year of medical studies. All of the students were enrolled in a full time degree in medicine (MD), after three years of premedical studies. The study was carried out during October 2010. It was part of ongoing research into improving teaching and learning in medical education and, as such, conformed to all of the ethical requirements and had the approval of the institutional review panel for ethics.

A video of a cholecystectomy performed laparoscopically on a 45 year-old lady was used to supplement the module on the anatomy of the abdomen and pelvis. The laparoscopic procedure had previously been explained to the patient and informed consent obtained to use the video for teaching medical students.

The video presentation, which lasted approximately thirty minutes, was preceded by a lecture introducing laparoscopic surgery and the steps involved in it. In the first part of the video, prior to the surgery and soon after establishing the pneumoperitoneum, the consultant surgeon scanned the abdomen of the patient with the camera to provide a 'laparoscopic excursion' of the abdominal cavity thereby demonstrating the general anatomy of the region and the disposition of the viscera *in situ*. The video showed the abdominal surface of the diaphragm and subsequently the anterior abdominal wall, the general outlay of the peritoneum and the disposition of the abdomino-pelvic organs. The video was presented at a slow pace, with frequent pauses and with a live commentary on the structures seen, allowing time for the students to observe and appreciate all the major structures within the abdominal cavity *in situ*. These included the greater omentum, the lesser omentum and the abdominal organs and also the major pelvic organs. Peristalsis of the intestines, the ureter and the pulsations of the mesenteric arteries were all clearly visible and well appreciated in the video. In the second part of the video, the gall bladder surgery highlighted the detailed anatomy of the extra hepatic biliary system. Thus the anatomy of the cystic duct, biliary duct and common bile duct as well as the cystic artery was clearly visualised.

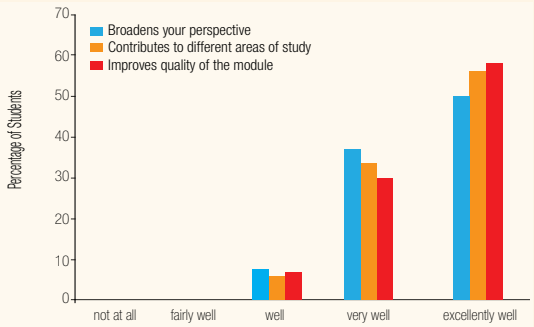

Figure 1: Student responses for overall opinions on the video.

Feedback from the students regarding the effectiveness of this presentation as a means of enhancing the understanding of the normal anatomy of the abdomino-pelvic cavity was obtained by means of a questionnaire with four sections. Three were in the form of direct questions on: 1) Appreciation of specific organs; 2) Functional anatomy of some abdominal structures, and 3) General comments on the overall effectiveness of the programme. The students were requested to register their understanding on a five point Likert scale ranging from 'Not at all' to 'Excellently well'. In the fourth part of the questionnaire, students provided written comments on the programme itself. The responses were analysed and the data are presented below.

Results

The majority of students felt that this teaching paradigm had broadened their perspective (excellent = 51%), had contributed to different areas of study (excellent = 56%), and had improved the quality of the module on the abdomen and pelvis (excellent = 57%) [Figure 1]. As to their ability to appreciate the individual structures, students also had a very positive response, with outcomes of 'very well' or 'excellently well' for all 16 structures in the video. Particularly high scores were given for the structures of concern in this surgery with the vast majority of students considering them as 'very well' or 'excellently well' appreciated, for example liver (89%) and gall bladder (85%). Figure 2 shows the composite responses for the groups of structures involved at the site of surgery, the structures seen during the 'laparoscopic excursion' and the examples of 'living anatomy'. Of particular importance was the opportunity for students to see 'living anatomy' in the case of peristalsis of the intestines (excellent = 58%), pulsation of the mesenteric arteries (excellent = 27%) and peristalsis of the ureter (excellent = 39%). The complete set of responses can be seen in Table 1.

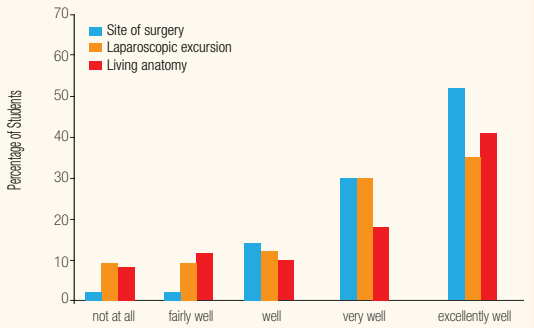

Figure 2: Composite student responses for the items related to the surgery, the 'laparoscopic excursion' and the 'living anatomy' items.

The written feedback from students was very supportive of these findings. Forty of the 84 students (48%) provided written feedback. Content analysis on the responses to these open questions revealed four main content categories. The most common was the general theme of "thank you" or "it was very good". The next most frequent content category was comments requesting that laparoscopic video teaching be used more frequently in the course and repeated in the future (45% of respondents). The third content category was that the activity had provided them with clear insight into functional anatomy in a living patient (40% of respondents). The final category was that the activity had helped them to understand the relative positions and spatial relations of the various structures better (23% of respondents). In addition to these four main categories which emerged from the content analysis, there was a variety of individual comments, for example that the activity "provided some variety" to the usual didactic teaching and that the activity "was motivating". One of the most insightful comments was that this "was the only time there has been complete silence in the lecture hall".

Discussion

This programme provided the preclinical students with the opportunity to observe *in situ* the live position and spatial relations of abdominopelvic

Table 1: Student responses for each item in the questonnaire

Structure/ Item	not at all	fairly well	well	very well	excellently well
Structure at the site of surgery					
Liver	0	1	8	30	45
Gall bladder	1	2	10	21	50
Cystic duct	5	3	19	22	32
Stomach	1	2	9	24	45
Coils of the intestine	11	12	15	19	24
Appendicitis piploicae	9	9	15	22	23
Taneai coli	9	9	15	22	23
Ascending coli	5	6	16	26	26
Vermiform appendix	9	6	6	26	34
Cecum	5	5	13	22	26
Transverse colon	5	6	14	26	27
Sigmoid colon	10	12	12	27	18
Structures seen on 'laparoscopic excursion'					
Urinary bladder	15	5	12	26	20
Fallopian tube	7	8	6	27	33
Ovary	7	7	5	28	31
Falciform ligament	10	13	9	20	30
Living anatomy					
Peristalsis of the intestines	2	5	6	18	49
Pulsation of the mesenteric arteries	10	14	15	14	23
Peristalsis of the ureter	9	12	9	13	33
Student's views of the video					
Broadens your perspective	0	0	8	32	41
Contributes to different areas of study	0	0	6	29	45
Improves quality of the module	0	0	0	26	45

organs. Additionally, the students could visualise the peristalsis of the intestines and the ureter and the pulsations of the arteries thus appreciating the dynamic anatomy of these regions. Routine cadaveric dissections do not offer the unique aspects which this programme provides to the learner.

The conventional method of teaching anatomy through cadavers, either by dissections or prosections, helps them to understand the inter-relationships of the structures. Nevertheless, it does not give the learner the correct concept regarding the nature and appearance of these structures as living structures. In the conventional learning setting, the preclinical students must wait until they begin their surgery rotation before getting the opportunity to appreciate this all-important aspect of the human body. In the present context, an exposure to the annotated video-surgery has provided these students with the opportunity of appreciating the clinical relevance of the details of anatomy that are learned during the course of human structure. In this respect, this programme has achieved the goals of present day teaching of anatomy, as spelt out by Shaffer.[1] To our knowledge, laparoscopic surgery has not previously been used in an organised way to augment the learning outcomes of preclinical students.

It is clear that students rated this exercise very highly as is reflected by both their numeric responses and their written feedback. This programme broadened their perspective and improved their learning of the anatomy of the abdomen as well as enhancing the quality of the module. The written comments of students were very supportive of the use of laparoscopic surgery recordings. Invariably all of them appreciated the efforts taken to show them the video where they could 'peek into' the abdominal cavity of a patient. Many of them wanted to see videos of other anatomical areas during their course on human structure as it would help them to appreciate living anatomy better.

In the past, attempts have been made to review the anatomical knowledge of clinical trainees using laparoscopy on embalmed cadavers.[5,9,10] Although those learners had the privilege of developing dexterity using the tools on the cadaver, the programme lacked the effects achieved by viewing the live organs *in situ*, which is attained through the video demonstration of a surgical procedure.

Academic use of laparoscopic surgery recordings has previously been restricted to those used for training surgeons and quite often these procedures have been performed on laboratory animals in an effort to impart the techniques and dexterity to the surgeons in the making.[11] The possibility of using laparoscopic recordings for academic purposes was suggested in a review article, but so far there have been no reports of their organised use in an academic setting for preclinical medical training.[12]

Nowadays, there is a need to use innovative teaching methods to instill enthusiasm and positive learning attitudes in students. Videos of laparoscopic procedures, a valuable teaching resource, can be obtained without inconveniencing the patient since almost all such procedures are routinely recorded by surgical teams; it therefore requires neither extra time and effort nor any additional cost. Routinely recorded surgeries can be used in emphasising the spatial relationship of organs. Moreover, exposure to such surgical procedures enables the preclinical students to appreciate the relevance of anatomy learnt during the course of human structure to the practice of clinical medicine. Such awareness renders the learning process more useful and meaningful. This learning experience also provides an opportunity early in their career, for students to consider their future speciality and the field for their residency programme. Overall, this programme has proved to be a useful adjunct to the conventional method of learning morphological sciences.

The entire course content of the anatomy of abdomen and pelvis cannot, however, be taught through laparoscopic videos alone. It is understood that these videos, when properly used, become a valuable adjunct to the conventional teaching of gross anatomy, enhancing the appreciation of living anatomy of the region. It should be possible to choose appropriate laparoscopic surgery recordings to supplement the understanding of the anatomy of specific areas such as: laparoscopic cholecystectomy, herniorrhaphy, appendectomy, salpingectomy, and removal of the fibroids from the uterus. Recordings of such surgeries are available on the Internet and could be readily used to supplement conventional teaching;[13] however, the video used in the present context was unique since it was specifically recorded to enhance the learning of preclinical students. It amply served its purpose.

With the advent of recent technological advances in the field of medicine, it becomes necessary for medical educators to equip the students with tools for self-directed learning. This will help them to keep pace with the current trends in clinical sciences and to stay abreast of the developments in continuing medical education once they graduate.

Conclusion

The students' responses in the present study were positive enough to recommend that selected videos of laparoscopic procedures be used more widely in order to make the teaching of anatomy more interesting and relevant to clinical medicine. Encouraged by this experience, it is tempting to suggest that this modality of teaching may be incorporated as a standard element into the preclinical academic programme.

CONFLICT OF INTEREST

The authors reported no conflict of interest.

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