



EDUCATION

Trial integration of combined ultrasound and laparoscopy tuition in an undergraduate anatomy class with volunteer participation – A pilot study[☆]

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ABSTRACT

Anatomy is a cornerstone of medical undergraduate curricula. Due to increasing changes in various medical fields, a lot of new subjects were introduced in undergraduate curricula, while the teaching areas of basic sciences, i.e. anatomy, were reduced. The introduction of advanced diagnostic and therapeutic devices, i.e. ultrasound and laparoscopy, with outstanding imaging quality will be increasingly introduced in basic sciences. In our project, we examined the effect integrating ultrasound and laparoscopy in an anatomy undergraduate course to illustrate the female pelvis. Anatomy students that completed their practicum and cadaver dissection course were enrolled in our project. They received a theoretical introduction followed by a practical course of ultrasound or laparoscopy in the department of obstetrics and gynaecology. Following the course the students had to answer two questionnaires that evaluated their satisfaction, subjective knowledge-gain, problems and content of the course. At the end, a closing briefing was done to discuss the clinical skills and the course. The answers of the questionnaire were summed up in a Likert scale. 25 students were enrolled in the project. 52% attended laparoscopy operations, while 48% attended ultrasound examinations. After analysing the questionnaires using Likert scales (1 = strongly agree, 5 = strongly disagree) a general satisfaction of 1.5, a subjective knowledge gain of 2.4 and a thrive to extend these clinical skill programs in gynaecology and other specialities in basic science of 1.5 and 1.2, respectively, was reported. There were no statistically significant differences in the Likert scores between both groups ($p > 0.05$). The introduction of ultrasound and laparoscopy in undergraduate basic science teaching programs is a promising method and should be further evaluated, standardized and expanded.

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1. Introduction

Human anatomy has been a cornerstone of medical undergraduate curricula for decades and a basic science needed by all physicians throughout their career (Turney, 2007; Peterson and Tucker, 2005). The development of new significant sciences, the introduction of new technologies and the subsequent exponential growth of the spectrum of knowledge required in the field of

medicine, have all contributed to a global reduction in the time allocated to anatomical undergraduate studies (Sriharan, 2005; Shaffer, 2004; Drake et al., 2009). The resulting deficiencies in the anatomical background knowledge of undergraduate students has raised concerns in medical schools (Sriharan, 2005; Bagley et al., 2011; Bergman et al., 2008; Prince et al., 2005; Waterston and Stewart, 2005). These shortcomings in anatomical knowledge have also been linked to the increase in medico-legal complaints against surgeons (Ellis, 2002).

In order to maintain the essential undergraduate anatomy curriculum but, at the same time, impart knowledge on new indispensable clinical skills, the incorporation of basic sciences in clinical classes was recommended (Elizondo-Omaña et al., 2010). The implementation of three-dimensional animation design,

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cross-sectional teaching using MRI and CT scans as well as other sophisticated techniques may not only facilitate the teaching of anatomy but also help to incorporate it in the clinical syllabus (Turney, 2007; Shaffer, 2004; Johnson et al., 2012; Schober et al., 2014; Schramek et al., 2013). In gynaecology and obstetrics, endoscopy and ultrasound are routine clinical skills with potentially good teaching capabilities.

Ultrasound plays a central role in medical diagnostics and therapy in primary, secondary and tertiary health care facilities (Levi, 1997). Being safe, easily available, non-invasive, non-radiating, illustrative and easy to perform, it can present anatomical planes and therefore also be an optimal teaching tool. Furthermore, many ultrasound devices are small hand-held units, making them ideal for student teaching purposes (Campbell, 2013; Mulvagh et al., 2014; Alpert et al., 2009). Due to the intimacy of gynaecological examinations, gynaecological ultrasound has received little attention in undergraduate medical education. However, rising numbers of ultrasound-based teaching programs in clinical subjects, including gynaecology, have been reported (Mulvagh et al., 2014; Hamza et al., 2016; Blackstock et al., 2015; Hoppmann et al., 2006, 2008, 2011a, 2011b, 2012, 2014, 2015; Connolly et al., 2015; Dinh et al., 2015; Solomon and Saldana, 2014; Baltarowich et al., 2014; Cawthorn et al., 2014; Cortez et al., 2014; Wagner et al., 2014; Bahner et al., 2014; Mouratev et al., 2013; Knobe et al., 2012; Brown et al., 2012a; Dubosh, 2011; Rao et al., 2008; Fernandez-Frackelton et al., 2007). Using ultrasound, the anatomy of the small pelvis can be well presented, hence connecting the undergraduate anatomy curriculum with obstetrics and gynaecology as a clinical undergraduate subject (Hoppmann et al., 2015; Brown et al., 2012b).

Nowadays laparoscopic operations cover almost the whole spectrum of visceral surgery (Nano, 2012). Using high resolution and even three-dimensional imaging to envisage the female pelvis, viscera and retroperitoneum, laparoscopy also possesses a high potential of teaching properties (Wenzl et al., 1993; Baum et al., 2017; Van Bergen et al., 2000; Wagner et al., 2012). Operators have optimized the use of the technological advances for postgraduate training programs by presenting the steps of complicated operative procedures live in the operation room or using online video streaming (Ponsky and Rothenberg, 2015; Damore et al., 1999; Hiranaka et al., 2017). The idea of incorporating laparoscopy into an anatomy undergraduate teaching program is not new. In a series of projects, surgical laparoscopy on “fresh cadavers” has been incorporated in undergraduate teaching projects and showed a positive teaching effect (Saberski et al., 2015; Glasgow et al., 2006; Fitzpatrick et al., 2001).

To the best of our knowledge, no undergraduate human anatomy teaching program has yet included attendance in a theatre where live surgery on living human beings has been performed or in outpatient clinics where gynaecological ultrasound is performed using current advanced technology as a systematic illustration method for anatomy students (Metheny and Gajewski, 1998). Despite this unprecedented and quick technological advance and the easiness of the presentation of anatomical planes, little has been done to incorporate laparoscopic surgery in undergraduate anatomical teaching programs (Hamza et al., 2016).

Our study aims at presenting the illustrative advantages of gynaecological ultrasonography and gynaecological endoscopy for students enrolled in the anatomy course.

2. Methods

This was a conjoint project between the Department of Obstetrics, Gynaecology and Reproductive Medicine and the Institute of

Anatomy, Cell and Developmental Biology of the University of Saarland.

2.1. Preparation of the students

We offered a voluntary course to 25 anatomy students enrolled in the winter term of 2016/2017. The students were participants of the dissection course and had finished their lectures and cadaver dissection of the female pelvis to be eligible for the course. After enrolment in the program, the students received a briefing on ultrasound as a diagnostic tool. The sono-anatomy of the female pelvis was explained in 60 min. This was followed by another briefing in which operative laparoscopy was presented in 60 min. The students were then allocated to clinical phase groups who received a one-hour presentation of these clinical skills.

2.2. Assignment of the tutors

The course was held by gynaecologists and obstetricians and the presentation was given by an obstetrics and gynaecology consultant.

The tutors of the ultrasound course were consultants of the ultrasound outpatient clinic of the Department of Obstetrics and Gynaecology. After obtaining board-certification in obstetrics and gynaecology, they sub-specialized in ultrasound according to the guidelines of the German Society of Ultrasound (DEGUM) and Maternofetal Medicine and the German Board of Medicine (Metheny and Gajewski, 1998). They have had at least 8 years of training and experience in treatment and education after their graduation from medical college.

The tutors of the operative course were consultants of the Department of Obstetrics and Gynaecology, who, after board-certification in obstetrics and gynaecology, then sub-specialized in minimal invasive surgery according to the guidelines of the German Society of Gynaecological Endoscopy (AGE, 2017) and Operative Gynaecology and the German Board of Medicine (Saarlandes Äd, 2013). Their training and experience in treatment and education lasted at least 8 years after their graduation from medical college.

2.3. Student group allocation

In the Department of Obstetrics and Gynaecology, the students were divided into two groups (A and B), based on their own choice. Each teaching physician was assigned one anatomy student.

2.4. Clinical exposure phase

In the outpatient clinic group A was presented with ultrasound imaging of the urinary bladder, Douglas pouch, the uterus, endometrial lining and its adnexa of attending patients. Using transabdominal and transvaginal approaches, non-pregnant, early pregnant and puerperal uteri were scanned, showing the mid-sagittal plane and cross sections of the uterus with the endometrium.

Group B attended in the operative theatre, mostly in laparoscopic procedures that involved the uterus, i.e. excluding patients who had had a hysterectomy. In one instance, no laparoscopic surgery was carried out but a vaginal hysterectomy was performed. After the excision, the anatomy of the freshly-excised uterus was explained.

The anatomical knowledge of the students was derived from their anatomy lectures, cadaver dissection and the theoretical part of this course. 13 students chose to attend the laparoscopy session in the operative theatre, while 12 students chose to witness the ultrasound sessions in the outpatient gynaecological clinic. Each student received a log book, where the cases had to be documented

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