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Teaching of diagnostic skills in equine gynecology: Simulator-based training versus schooling on live horses

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ABSTRACT

Transrectal palpation and ultrasonography of the genital tract in mares are first-day skills for equine veterinarians. In this study, the learning outcome in equine gynecology after four times training on horses (group H4, n = 8), training on horses once (group H1, n = 9), and four times simulator-based training (group Sim, n = 8) was assessed in third-year veterinary students with two tests in live mares 14 days apart. The students of group H4 always scored better for transrectal palpation than students of group Sim and H1 ($P < 0.05$). Overall, the students reached better results for palpating the left versus the right ovary ($P < 0.001$), but group H1 students were least successful in obtaining correct ovarian findings ($P < 0.05$ vs. both other groups). Students' self-assessment reflected test results with palpation of the right ovary experienced as most difficult for group H1 students ($P < 0.01$ vs. both other groups). Groups did not score differentially for ultrasound examinations. Sim students were nearly as successful in transrectal palpation of the genital tract in mares as H4 students, and for most parameters assessed, they performed better than H1 students. After training four times on horses, students scored best but nevertheless the overall effect of intensive training was limited. Repeated simulator-based training is a useful tool to prepare veterinary students for transrectal palpation of the genital tract in mares and is more effective than one training session on horses.

1. Introduction

Transrectal palpation and transrectal ultrasonography of the genital tract are indispensable diagnostic procedures in equine gynecology and are therefore part of the curriculum at most veterinary schools. However, considerable practice is required to develop the skills needed to locate and describe the uterus and ovaries. Diagnostic procedures in bovine gynecology traditionally are taught in university teaching herds, on cattle before slaughter [1] or on privately owned cattle during farm visits. Training of veterinary students on live cows is often preceded by palpation courses with genital organs obtained from a slaughterhouse. With very few exceptions, none of this is an option in equine gynecology. For the year 2011, the European Commission reported less than 200 horses available for educational purposes in European Union countries [2] leading to a high ratio of students to teaching horses. Because of difficulties to obtain consent of the owner and the risk of horse fatalities due to transrectal perforation [3] access of veterinary students to privately owned horses is restricted. Furthermore, animal welfare and ethical considerations increasingly question the use of live animals for teaching purposes irrespective of species. This is particularly true for invasive or potentially stressful procedures [4]. The veterinary profession itself has been pivotal in developing alternatives to skills training on live

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animals. Simulation models have become available for a range of procedures in small animal surgery [5,6], dentistry [7], endoscopy [8], emergency resuscitation [9] and for transrectal palpation of the genital tract in cattle [10]. Some simulators use haptic technologies with the construction of virtual objects to reproduce the tactile sensations experienced when performing the procedure [11]. A bovine transrectal palpation simulator taking advantage of haptic technologies has been used in various educational settings [10,12,13], and a horse ovary palpation simulator has been tested [14].

The implementation of alternatives to training on live animals is hindered by a lack of research on the educational value of simulator-based versus established animal-based teaching methods [4]. Therefore, we have compared skills training of veterinary students in equine gynecology on a simulator and on live horses. The learning objective was to enable students to describe the uterus and ovaries after transrectal palpation and transrectal ultrasonography. We hypothesized that although frequent training on live horses may be the most efficient learning method, repeated simulator training is more efficient than less frequent training on live horses.

2. Materials and methods

2.1. Experimental design

A course on gynecologic examination in horses with focus on transrectal palpation and ultrasonography was offered to third-year veterinary students at Vetmeduni Vienna. The course started with 6 hours of lectures on equine gynecology (anatomy, ovarian cycle, gynecologic examination, pregnancy diagnosis), a demonstration of the gynecologic examination, and a case-based e-learning session. Thereafter, students were allocated at random to three different groups for the practical part of the course and received skills training in equine gynecology either four times on live horses (group H4, n = 8), once on live horses (group H1, n = 9), or four times on a training simulator (group Sim, n = 8). One day and 14 days after the last training session, the students' diagnostic skills were tested on live horses (Table 1).

The study was approved by the competent authority for animal experimentation in Austria with regard to the use of horses (Bundesministerium für Wissenschaft und Forschung, license number: BMWF-68.205/0203-II/3b/2013) and by the Ethics Committee of the Medical University of Vienna with regard to studies on human subjects (license number: EK 2131/2013). Students signed an informed consent at the beginning of the study.

2.2. Students

A total of 25 students (20 female, five male) with no previous experience in transrectal palpation of horses participated in the study. Students were between 21 and 33 years of age (24.2 ± 0.5 years). Twenty-three students were right handed and two left handed.

2.3. Horses

A total of 15 Haflinger and one Warmblood mare aged between 3 and 14 years were available for the study. All horses were used to rectal palpation of the genital tract for at least several months and showed no adverse reactions to this procedure. Before the experiment, they were examined daily or every second day during estrus to assess the exact day of ovulation and maximally every third day during the luteal phase of the estrous cycle. On each occasion, mares were examined by two students. During examinations, horses were placed in stocks. The mares did not receive any medications and were not sedated for transrectal examinations.

2.4. Simulator

A static simulator for transrectal palpation of the genital tract in horses was used for this study (Breed'n Bonny; Brad Pickford, Byaduk, Victoria, Australia). The simulator consists of a metal frame with a latex-made "back end" of a mare through which students may insert a gloved lubricated hand into a rubber tube representing the mare's rectum. Different nonpregnant and pregnant (Days 14–65) rubber uteri and ovaries of different size were available to simulate findings of different stages during the estrous cycle and pregnancy. The rectum and model genital organs were placed in a water-filled acrylic tube, which recreates an "in-mare" temperature and pressure (water rectum).

2.5. Gynecologic transrectal examination

During each training session and in both tests, students examined two horses or two different simulator settings. All students palpated with their dominant hand. For each examination, they were given maximally 5 minutes for transrectal palpation of the uterus and ovaries. Time measurement started after removal of feces from the horse's rectum. After the examinations, students documented their findings on uterine size, symmetry between uterine horns, uterine consistency/contractility, and size of both ovaries on an examination sheet. During the subsequent 5 minutes,

Table 1
Study schedule for students trained four times on horses (H4), once on horses (H1), or four times on a simulator (Sim).

Time	Group H4	Group H1	Group Sim
Week 1	Lectures, demonstration, case-based e-learning (all groups)		
Week 2: Day 1	Training on 2 horses	Training on 2 horses	Simulator training with 2 settings
Week 2: Day 2	Training on 2 horses	—	Simulator training with 2 settings
Week 2: Day 3	Training on 2 horses	—	Simulator training with 2 settings
Week 2: Day 4	Training on 2 horses	—	Simulator training with 2 settings
Week 2: Day 5	Test with gynecologic examination of 2 horses (all groups)		
Week 4	Test with gynecologic examination of 2 horses (all groups)		