Original Investigation

Conisation course for medical students – experience from a German university hospital

Ferenc Zoltan et al. Conisation for students

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Abstract
Objective: The conisation is one of the most common surgical procedures in gynaecology. Nevertheless, corresponding expertise of the surgeon is required. With small cone the oncological risk and with large cone the obstetric risk increase. Our prospective study aimed at finding out whether the self-developed conisation simulator is an appropriate instrument for medical students to learn the practical performance of conisation.
Material and Methods: After a previous demonstration a loop conisation was done by the students at the sausage model as part of the gynaecological and obstetric practical clerkship. Then the study doctor was asked about the suitability and the realistic approach of the simulation course and the depth of the cones created by the students (target range 8-10 mm) as well as the LEEP score was measured. The students were asked to answer 12 questions with five answer categories of a questionnaire about the benefits of the course.
Results: A total of 89 students participated in the course. The median cone depth was 8 mm (standard deviation 3.3 mm, minimum 3 mm, maximum 25 mm). The observed LEEP score amounted to 1.5. 88 answered the questionnaire (86 in full). The evaluation of the questionnaires showed a great satisfaction with the course of both the physician being in charge of the study and the students. Students considered the course as realistic one and the physician could have imagined all participants to assist in a conisation. Students rated the course consistently positive, especially towards the increase in practical skills. The greatest approval was observed for the statement "I enjoyed the course." and the slightest approval for "I have gained enough self-confidence for the application of high-frequency surgery."
Conclusion*:* Practical surgery exercises on the surgical simulator are considered successful. They should be extended to other gynaecological operations as well as other medical subjects.
Keywords: conisation simulator-student teaching-questionnaire

Introduction

Conisation is one of the minor gynaecological operations and in addition, it is one of the most common surgical procedures in gynaecology. Therefore, it is considered a typical operation for beginners, whereas the procedure can not be regarded as trivial. The removal of a too small cone including diseased tissue is at the expense of the oncological safety, thus requiring follow-up operations and/or therapies [1]. On the other hand, due to a more generous conisation the oncological safety can be increased but at the same time the patient's obstetric risk in the event of a subsequent pregnancy increases. For example, the risk of cervical insufficiency and consecutive premature birth in pregnancy after conisation is about 25%, depending on the source of literature [2; 3]. This is aggravated by the fact that cervical dysplasia in need of treatment mostly occur in young women aged 30-35 years [4].
How should one deal with this dilemma in clinical practice? Not letting young colleagues perform conisations anymore is the wrong way – because soon there will not be specialists anymore. On the other hand, the patients should not be endangered.
Therefore, we developed a special simulator for practicing a conisation with the electric loop [5] which was applied during the gynaecological and obstetric practical clerkship. The doctor being in charge of the study (study doctor) was asked whether this simulator proved to be suitable. The students were asked whether this simulator helped them to enhance their personal competence and increase the quality of their study. Finally, students should state whether they trust the practice to perform a conisation themselves.

Material and Methods

Conisation simulator

The conisation simulator was used as part of the gynaecology and obstetrics practical clerkship at our gynaecological clinic in the summer semester 2018 (examination period 13.04.2018-13.07.2018). This is a prospective study with medical students of the 5th year. The only inclusion criterion was participation in the conisation simulation course. We informed the students in detail about the study before participating. Participation was voluntary and anonymous. The study was previously approved by the local Ethics Committee (number 259/17). A loop electrosurgical excision procedure (LEEP) was performed on the simulator. The conisation simulator is a tabletop model with a self-holding speculum. A stone slab forms a stable surface, and a polystyrene plate lying on top of it does conform well to the shape of the speculum. A self-holding speculum with smoke evacuation is ideal for performing a LEEP in local anaesthesia under realistic conditions. For the simulation of the portio we used the end of a sausage. The cervical canal was visualized by the injection of red dye. Thus, the fragmentation and thickness of the cone could be better illustrated. The sausage was placed directly on the neutral electrode and fixed with a Velcro bandage (see figure 1 **and figure 2**). This allowed numerous quick repetitions. The LEEP was performed with the monopolar power device ERBE Vio300D (Erbe Elektromedizin GmbH, Tübingen, Germany) with a loop electrode (Erbe Elektromedizin GmbH, Tübingen, Germany) under colposcopic view (Olympus OCS-500, Olympus Europe, Hamburg, Germany). This was previously reported by the study group of Takacs et al. [5].

The course took place on the last day of the one-week practical clerkship and lasted 30 minutes. First, the study doctor carried out a loop conisation. Subsequently, the students (about 8 per group) had the opportunity to make a loop conisation and up to two post-resections on their own under supervision by the doctor.

After the course, the study doctor was asked if he considered the simulator as suitable for everyday use and the course as realistic and if he could imagine assisting the students in a LEEP. The study doctor was a specialist in gynaecology and obstetrics employed at the clinic where the study took place.

LEEP score for excision

To enable measuring the desired learning effect in the handling of the loop electrode after demonstration of the procedure by the study doctor, we asked the participants to perform an excision between 8 and 10 mm deep in a single cut. The specimens were measured with a digital calliper in the area of the cervical canal, visualized with dye. Depending on the depth and shape of the specimen, the students were able to perform a subsequent resection. The thickness of each specimen was added to obtain the total cone thickness. Even if the individual cuts show large deviations from the target range, they could still result in a normal mean thickness. To record the excisions that missed the target range of 8-10 mm, we recorded the deviations separately. The deviation from the desired cutting depth was calculated as follows: If the specimen thickness was between 8 and 10 mm, the deviation was 0. For superficial (less than 8 mm) cuts, for example, a 6-mm specimen had a depth deviation of 2 mm). For a cut that was too deep (more than 10 mm), for example, an 11 mm specimen had a deviation of 1 mm. To determine the fragmentation and the deviation together, we established a LEEP score and recently described it [5]. All variables were analysed descriptively using the median and standard deviation for continuous variables. The values were processed using an electronic database (Microsoft Office Professional, Excel version 2007, Redmond, Washington, USA).

Study questionnaire

The students also received a self-developed questionnaire for the evaluation of the event directly after performing the conisation. The following 12 statements were requested anonymously for the evaluation of the course with the aid of the questionnaire:

1. The course has improved my operational skills.
2. The course helps me in dealing with patients.
3. The course has improved my medical study quality.
4. I wish to do more operation simulation exercises in the practical year.
5. I wish to perform more operation simulation exercises in other subjects.
6. The surgical simulation improves my understanding of the subject gynaecology and obstetrics.
7. The course improves my competence in gynaecology and obstetrics.
8. The surgical simulation has expanded my competence in gynaecological examination.
9. I have received sufficient knowledge about high-frequency surgery.
10. I have enough confidence to perform high-frequency surgery myself due to the course.
11. I could carry out a LEEP under supervision myself.
12. I enjoyed the course.

For responding to the statements the students could choose between the 5 categories "applies", "rather applies", "neutral", "rather disagrees" and "does not apply" with a cross on the questionnaire.

Results

A total of 89 out of 90 medical students performed a conisation with the simulator. One person could not attend for health reasons.

The median cone depth during the 89 conisations performed by the medical students was 8 mm (standard deviation 3.3 mm, minimum 3 mm, maximum 25 mm). 34 conisations were too superficial and 14 too deep. Thus, 41 students (46.1%) reached the target range for cone depth of 8-10 mm with one conisation. 64 out of 89 students (71.9%) reached the target range, at least after a subsequent resection. A total of 34 subsequent resections with a median depth of 5 mm (standard deviation 1.9 mm, minimum 2 mm, maximum 10 mm) was performed. 25 participants (28.1%) did not reach the target range. We observed a LEEP score of 1.5 for the 89 medical students.
Out of the 89 students, 88 completed the evaluation form about the course. 86 forms were completely filled. In two questionnaires one answer was missing.
The study doctor assessed the conisation simulation course in all 89 cases as suitable for everyday use as part of the application in student teaching. Furthermore, the course was regarded as realistic and the study doctor could imagine assisting a loop conisation in the operation room to all 89 medical students after the course.
The students' conclusion in evaluating the course was consistently positive: The best rated item was item XII (fun with the conisation course with nearly 91% complete approval). The item with the worst assessment by the students was item X (enough self-confidence for performance of high frequency surgery on their own with only 30% complete approval). Table 1 summarizes the results of the course evaluation by the medical students.

Discussion

Our study has revealed many interesting and surprising results. Thus, the conisation exercises with the Homburger conisation simulator were rated almost entirely positive by both the study doctor as well as the participating students. An indication of this finding can be seen in the fact that for all questions, the first answer category ("hits") was most often chosen. However, it also seems interesting that the students' answers were by no means homogeneous, but were very differentiated depending on the question. This increases the validity of the answers, since evaluations within the framework of student teaching run the risk that the same answer will always be chosen or overestimated because of a lack of interest, in order not to disappoint the teachers. Three basic tendencies can be read out of the data. First of all, the practical operation simulation exercises are very well received by the students, they are a lot of fun and there is a strong desire to implement more exercises during their studies. Second, they seem to bring about a global increase in knowledge, both in the theoretical and practical fields, while the practical gain in knowledge seeming to be greater than the theoretical one. Third, there are still reserves in preparing students for the practical application of surgical techniques to the patient under everyday clinical conditions. Thus, the self-confidence gained in using the methods of high frequency surgery in everyday life showed the lowest degree of agreement (35.2%) among the students. It must be emphasized that this can hardly be expected from a 30-minute course. Besides, it has to be kept in mind that, according to experience, only a maximum of half of the students are interested in working in an operative subject later on. Among future gynaecologists, the results might have been higher. To our knowledge, this is the first study ever examining a conisation simulator in the context of student teaching.
The fact that the majority of students was able to reach the target range for conisation-at least after performing a subsequent resection-can be regarded as an encouraging result. However, the conisation simulator should be evaluated in further studies also examining the impact of repetitive training on conisation depth, LEEP score and surgeon`s self-confidence.
In our study we dealt with practical exercises as an element of student teaching. These can be performed on humans (usually patients) as well as on animals (e.g. practice of complex surgeries or interventional procedures such as heart valve replacement) as well as - like in our case - on models specially created for an intervention [6-8]. Undoubtedly, the avital model is the most favourable solution, because it puts the doctors before the smallest ethical conflict. Additionally, almost all models are nearly unlimited reusable. An open question is the financing of simulation training. Unfortunately, not all university hospitals have a sufficient teaching budget to provide such models in sufficient numbers. One reason for this could be that practical exercises, especially of surgical interventions, are not yet an integral part of the curriculum within the clinical section of medical studies. If this would be the case, the medical schools would have a greater incentive to provide funding for it.
Alternative teaching concepts for practical exercises on the simulation model are theoretical knowledge transfer, e.g. in the context of a lecture or a seminar and showing techniques with the help of various media such as pictures or videos [9; 10]. We deliberately chose practical simulation exercises because we believe that surgical procedures are best learned by repeating the steps themselves. Amongst others the publication by Spüntrup et al. from 2012, which showed that endoscopic surgery can be learned through repeated practice, confirmed us in our concept [11]. In addition, we find it unethical to try operations primarily on humans or animals.
Based on our study results, we suggest our conisation simulator for the learning of loop electrosurgical excision procedure by medical students as well as physicians in further education.
We conclude that surgical simulation exercises – in this case, exercises for the implementation of loop conisations – can be carried out without problems under the everyday conditions of a university hospital and are rated positively by both the doctor and the student side. With their help practical surgical skills as well as theoretical knowledge can be taught efficiently. We propose to apply operation simulation exercises not only in

gynaecology, but also in other subjects comprehensively and to extend them to other operations or scientific issues.

Conflict of interest

The authors declare no conflict of interest.

The authors confirm that they have had full control of all primary data and that they agree to allow the journal to review their data if requested.

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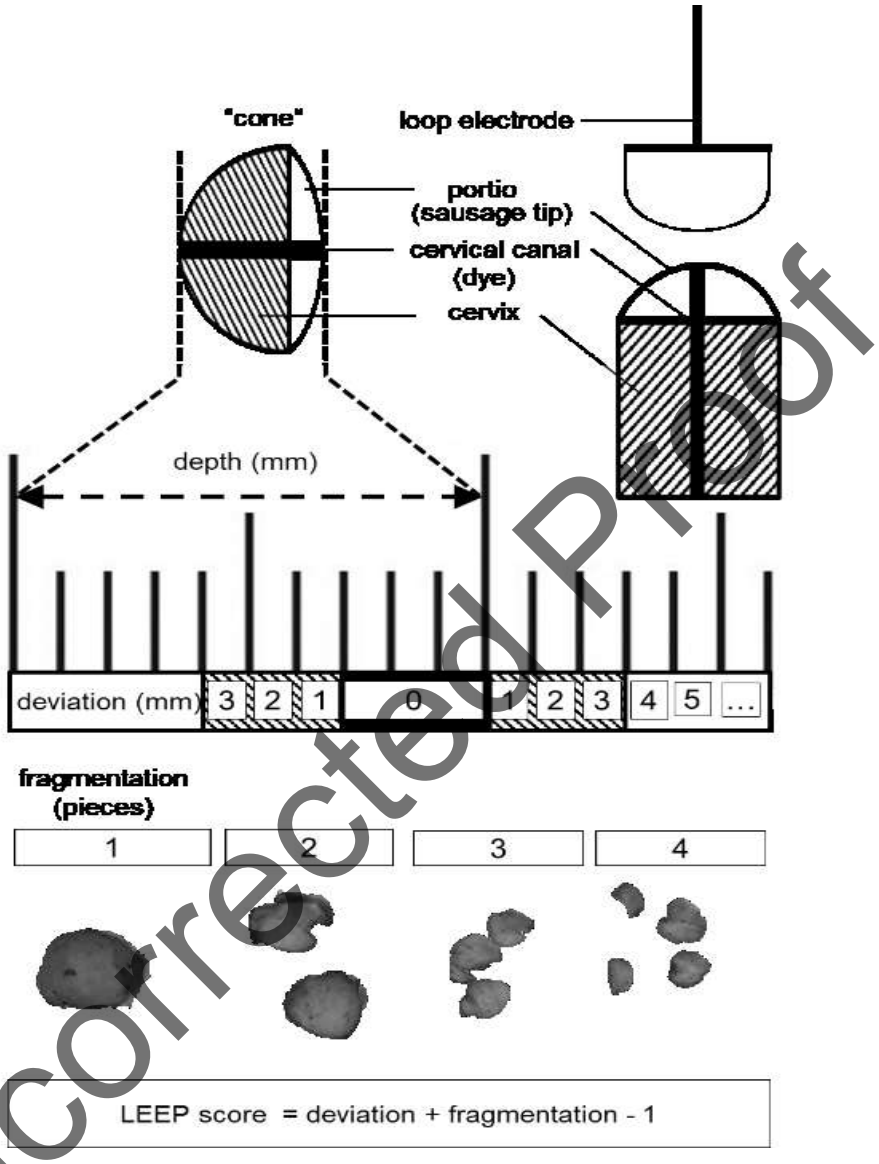

figure 1: LEEP simulator

Figure 1: Scheme of the LEEP simulator

Figure 2: Construction of the conisation simulator

Table 1: evaluation of the conisation course by the medical students (n=88)

Item	Applies	Rather applies	Neutral	Rather disagrees	Does not apply
I improvement of surgical abilities due to conisation course	45 (51.1%)	30 (34.1%)	12 (13.6%)	1 (1.1%)	-
II surgical simulation aid in daily treatment of patients	52 (59.1%)	26 (30.0%)	9 (10.2%)	1 (1.1%)	-
III improvement of study quality	58 (65.9%)	25 (28.4%)	4 (4.5%)	-	1 (1.1%)
IV students` desire for more surgical exercises in the practical year	74 (84.1%)	12 (13.6%)	1 (1.1%)	-	1 (1.1%)
V students` desire for more surgical exercises in other subjects	77 (87.5%)	9 (10.2%)	-	-	1 (1.1%)
VI improvement of understanding for the subject gynaecology and obstetrics	51 (58.0%)	29 (33.0%)	5 (5.7%)	2 (2.3%)	1 (1.1%)
VII improvement of the medical expertise in the subject gynaecology and obstetrics	41 (46.6%)	37 (42.0%)	8 (9.1%)	2 (2.3%)	-
VIII improvement of expertise in gynaecological examination	44 (50.0%)	34 (38.6%)	7 (8.0%)	1 (1.1%)	1 (1.1%)
IX extent of gained knowledge in high frequency surgery	38 (43.2%)	29 (33.0%)	14 (15.9%)	17 (19.3%)	-
X self-confidence in the application of high frequency surgery	26 (30.0%)	25 (28.4%)	26 (30.0%)	5 (5.7%)	6 (6.8%)
XI self-confidence to perform a LEEP on your own	31 (35.2%)	27 (30.7%)	15 (17.0%)	7 (8.0%)	8 (9.1%)
XII fun with conisation exercises	80 (90.9%)	7 (8.0%)	-	-	1 (1.1%)