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Do laparoscopic pelvic trainer exercises improve residents' surgical skills? A randomized controlled trial

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ABSTRACT

Objective: The impact of surgical simulation devices on the training of gynecology residents has not been well defined. The aim of this study was to investigate whether the use of a laparoscopic pelvic trainer improved the surgical performance of residents.

Study design: This randomized controlled trial enrolled gynecology residents who were randomized into group A or group B in a 1:1 fashion. All participants performed three pelvitrainer assessments (T1, T2, T3) consisting of suturing a 4-cm incision in a porcine bladder. The baseline assessment (T1) was performed before training. Group A underwent training before the second assessment (T2) and group B underwent training between the second and third assessments (T3).

Results: A total of 26 residents were enrolled (group A, $n = 14$; group B, $n = 12$). At the first assessment (T1), there was no significant difference in the time taken to perform the procedure between the two groups (group A, 30 min vs group B, 30 min; $p = .35$), indicating homogeneity of the two groups. At T2, there was a difference between the two groups in the time taken to perform the leak-free closer (group A, 19 min vs group B, 30 min; $p = .08$). The time taken to complete the procedure was shorter after training for each group: 30 min (T1) vs 19 min (T2); $p = .02$ for group A and 30 min (T2) vs 17 min (T3); $p = .009$ for group B. Residents in group A did not receive any training during the 4-week period between T2 and T3, but their acquired skills persisted during this time.

Conclusion: The training on a laparoscopic pelvic trainer improves the surgical skills of residents, with performance persisting over time. It may be beneficial to use a laparoscopic pelvic trainer during residency programs.

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Introduction

Surgical education has adapted over recent years because of changes in healthcare management. Reduced working hours for residents, the increasing proportion of procedures performed using minimally invasive techniques, and increased attention to the quality of care delivered all impact on medical education. In our institution, these changes have reduced the caseload and procedural experience of young doctors during residency training, and have thus presented new challenges to training faculties.

Laparoscopic surgery is an important part of gynecologic surgery. Laparoscopy is a minimally invasive approach technically complex, as it requires classical surgical skills in addition to basic tactile skills and good hand-eye coordination. Training in the operating room increases the time required to complete procedures, and experienced surgeons may be reluctant to allow inexperienced residents to perform procedures. Young surgeons could develop the required dexterity and psychomotor skills outside the operating room before performing surgical procedures on patients. Training simulators have therefore been developed for gynecologic surgery.

There are currently a number of laparoscopic simulators in use, including box trainers and virtual reality trainers, which attempt to create conditions that can teach important skills [1-7]. The high cost of virtual reality training devices may limit the use of such

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35 devices in residency training programs. On the other hand,
36 laparoscopic pelvic box trainers provide a low-cost and robust
37 learning resource for the acquisition of fundamental laparoscopic
38 skills by gynecology residents. These devices may contribute to
39 uniform skill acquisition and can be used for assessment before
40 residents perform laparoscopic procedures on patients.

41 Although the current simulation technology appears to be
42 useful, its use in training programs still needs to be validated. The
43 skills obtained by using a simulation device should be similar to
44 those obtained by performing actual procedures. To date,
45 validation of the use of laparoscopic box trainers in residency
46 training programs is still limited [7]. We hypothesized that
47 residents could achieve proficiency in laparoscopic suturing after a
48 relatively short training period with the laparoscopic pelvic box
49 trainer. Our aim was to determine: (1) whether the use of the
50 laparoscopic pelvic trainer improves surgical skills, and (2)
51 whether the acquired surgical skills are maintained over time.

52 **Methods**

53 *Participants*

54 This randomized controlled trial enrolled gynecology resi-
55 dents who were randomized into group A or group B in a 1:1
56 fashion. All available residents were invited to participate. They
57 were also classified according to their surgical experience:
58 residents with limited experience (<10 laparoscopic procedures
59 performed as the primary surgeon) and residents with 10 or
60 more laparoscopic procedures performed as the primary
61 surgeon. All participants underwent an initial assessment before
62 training (T1). The training consisted in 8 h of basic training using
63 the pelvitrainer (Fig. 1). Group A received the training during the
64 first period (weeks 1-4) and group B received the training during
65 the second period (weeks 5-8). All participants were reassessed
66 after 4 weeks (T2) and 8 weeks (T3). Group A underwent training
67 between T1 and T2, and group B underwent training between
68 T2 and T3. None of the participants withdrew from the study after
69 randomization.

70 *Materials for training and testing*

71 The pelvitrainer consisted of a white plastic box with
72 three holes (a 10-mm hole for insertion of the laparoscope and
73 two 5-mm holes for insertion of the instruments). The system used
74 an endoscopic column with a camera, light cable, and 0°
75 laparoscope. The laparoscopic instruments used included straight
76 scissors, Johann forceps, and two needle holders. This system
77 created a realistic training environment for learning and practicing
78 laparoscopy. Suturing on uterine models was performed using 3-0
79 Vicryl®.

80 *Research design*

81 Local ethic committee determined that Institutional Review
82 Board approval was not necessary because the study was
83 conducted in an established educational setting, involving normal
84 educational practices.

85 All participants received instruction from the study coordinator
86 regarding the goals of the study and use of the pelvitrainer, using a
87 standardized protocol. The instructor and coordinator (FV)
88 supervised the training and provided feedback to facilitate skill
89 acquisition. The study coordinator was not a participant in the
90 study. The training was divided into two steps, each consisting of
91 four 1-h sessions. During step one, participants performed the
92 following tasks: putting matches in a box, passing matches
93 through rings, and passing suturing needles through rings. During

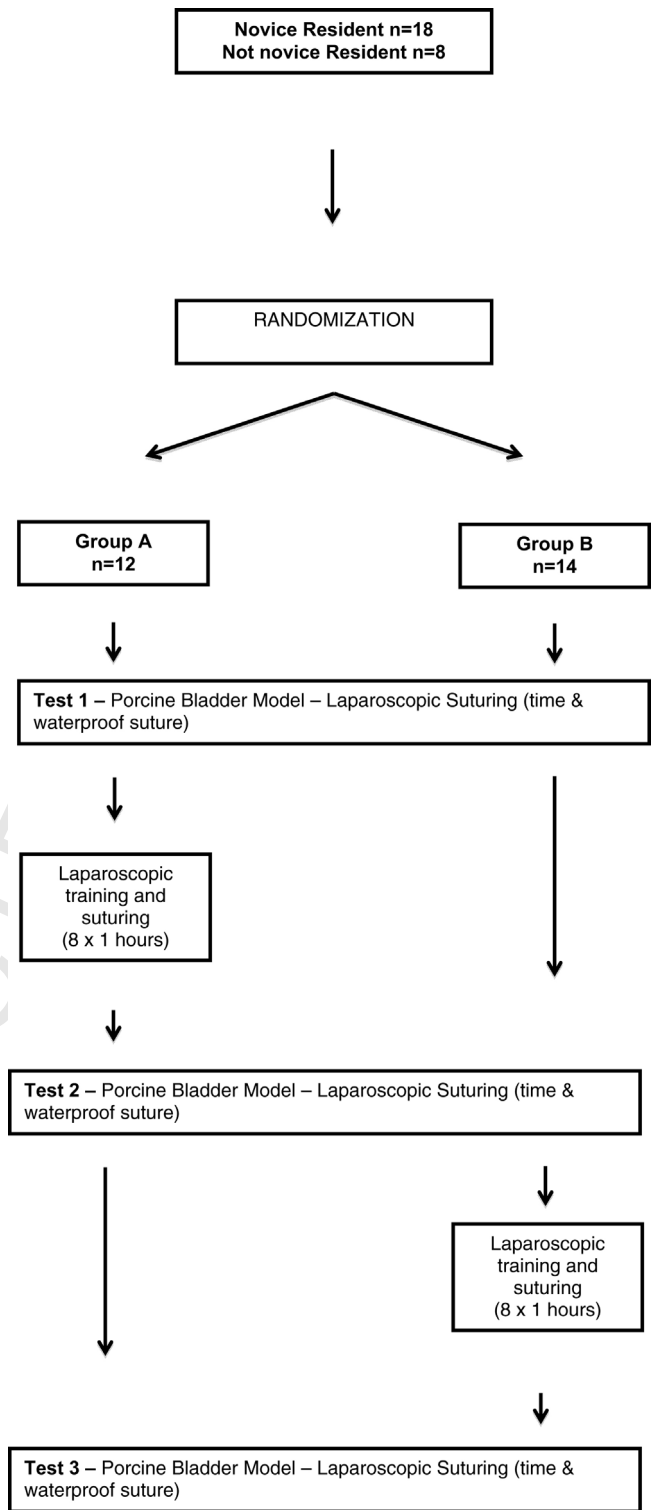


Fig. 1. Flowchart of the study.

94 step two, participants sutured incisions on a uterine model using
95 intracorporeal knot tying.

96 *Outcome measures*

97 The following outcomes were measured: the time to perform
98 laparoscopic suturing of a 4-cm incision in a porcine bladder using
99 interrupted sutures with intracorporeal knot tying, the time to
100 completion of the suturing (maximum 30 min), leakage from the

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