

Effect of Preoperative Warm-up Exercise Before Laparoscopic Gynecological Surgery: A Randomized Trial [☆]

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BACKGROUND: Laparoscopic surgical procedures require a high level of cognitive and psychomotoric skills. Thus, effective training methods to acquire an adequate level of expertise are crucial. The aim of this study was to investigate the effect of preoperative warm up training on surgeon's performance during gynecologic laparoscopic surgery.

MATERIALS AND METHODS: In this randomized controlled trial, surgeons performed a preoperative warm up training using a virtual reality simulator before laparoscopic unilateral salpingo-oophorectomy. Serving as their own controls, each subject performed 2 pairs of laparoscopic cases, each pair consisting of 1 case with and 1 without warm up before surgery. Surgeries were videotaped and psychomotoric skills were rated using objective structured assessment of technical skills (OSATS) and the generic error rating tool by a masked observer. Perioperative complications were assessed. Statistical analysis was performed using a mixed model, and mean OSATS scores were compared between both the groups.

RESULTS: In total, data of 10 surgeons and 17 surgeries were available for analysis. No differences between educational level and surgical experiences were observed between the groups. Mean standard error psychomotoric and task-specific OSATS scores of 19.8 (1.7) and 3.7 (0.2) were observed in the warm up group compared with 18.6 (1.7)

and 3.8 (0.2) in the no warm up group, respectively ($p = 0.51$ and $p = 0.29$). Using generic error rating tool, the total number of errors was 8.75 (2.15) in the warm up group compared with 10.8 (2.18) in the no warm-up group ($p = 0.53$). Perioperative complications and operating time did not differ between both the groups.

DISCUSSION: The present study suggests that warm-up before laparoscopic salpingo-oophorectomy does not increase psychomotoric skills during surgery. Moreover, it does not influence operating time and complication rates. (Medical University of Vienna-IRB approval number, 1072/2011, ClinicalTrials.gov number, NCT01712607) (J Surg Ed 73:429-432. © 2016 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

KEY WORDS: computer-simulation, laparoscopic training, salpingo-oophorectomy, training, warm-up

COMPETENCIES: Patient Care, Practice-Based Learning and Improvement, Medical Knowledge

INTRODUCTION

Laparoscopy has become the standard approach for many conditions in various surgical specialties such as gynecology. Minimal invasive procedures in general and laparoscopic surgery in particular require a high level of cognitive and psychomotoric skills.¹ It has been shown that surgical training improves not only performance in the skills lab but also during real surgery.^{2,3} Other professions—such as athletes and musicians—with comparable cognitive and psychomotoric skill requirements use warm-up exercises to enhance their technical abilities and performance.⁴ It has

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been previously shown that virtual reality simulation can be used to effectively train psychomotoric skills, improve surgeons' learning curves, and improve surgical performance.²⁻⁴ Performing warm-up exercises before laparoscopic surgery is a novel concept with a number of studies suggesting that this simple training method could improve performance during surgery.⁵⁻⁷ The aim of this study was to investigate the effect of warm-up exercises on a virtual reality simulator on surgical performance during laparoscopic unilateral salpingo-oophorectomy (USO).

MATERIALS AND METHODS

In this randomized controlled trial, surgeons performed a preoperative warm-up training using a virtual reality simulator before USO. Obstetrics and gynecology residents and specialists were eligible for study inclusion, and a questionnaire was filled out before each surgical case. All surgeries were performed as first cases of the day to prevent introduction of bias (e.g., fatigue, first compared 2 second or third surgery of the day) between November 2012 and March 2014. Serving as their own controls, each subject performed 2 USOs, consisting of 1 case with and 1 without warm-up before surgery. Warm-up exercises were performed using a virtual reality simulator (LapSim). The following LapSim Basic Skills exercises were performed: peg transfer, pattern cutting, and fine dissection.³ Each subject performed USO for benign indication using standard laparoscopic instruments. A single standard operative technique had been used to perform all USOs. De-identified video footage of the surgical procedure was captured and scored at a later date by a blinded laparoscopic expert gynecologist using objective structured assessment of technical skills (OSATS). A validated global rating scale and a task-specific checklist were used to assess the technical performance at salpingo-oophorectomy procedure.⁸ Higher OSATS scores indicated better surgical performance. In addition to global and task-specific surgical skills, we also evaluated technical errors and resulting events using the generic error rating tool (GERT).^{9,10} Higher GERT scores indicated worse surgical performance. Operating time and perioperative complications were documented. Statistical analysis was performed using a mixed model. Mean [standard error (SE)] global rating scale, task-specific OSATS scores, and GERT scores were compared between both the groups. Achievement of proficiency was not assessed in this trial. Clinical characteristics, operating time, and complication rate were compared between both the groups. Institutional review board approval was obtained from the Ethics Committee of the Medical University of Vienna (IRB approval number, 1072/2011, ClinicalTrials.gov number, NCT01712607).

RESULTS

In total, data of 10 surgeons and 17 surgeries were available for analysis. The group of 10 surgeons consisted of 4 obstetrics and

gynecology residents and 6 specialists. Mean age of the surgeons was 36.1 years, and all were right handed and 5 women and 5 men surgeons were included. Preoperative virtual reality training was feasible in all cases, and a mean SE warm-up exercise duration of 11.2 (0.8) minutes was observed. No differences between educational level and surgical experiences were observed between the groups, as each surgeon was used as his or her own control. In both the groups, no perioperative complications were observed. Mean SE operating time in the warm-up group and no warm-up group were 24.7 (5.6) and 25.0 (5.6) minutes, respectively ($p = 0.86$). Using a general psychomotoric and a task-specific assessment, mean SE OSATS scores of 19.8 (1.7) and 3.7 (0.2) were observed in the warm-up group and 18.6 (1.7) and 3.8 (0.2) in the no warm-up group, respectively (95% CI for the mean difference, -3.1 to 5.3 , $p = 0.51$; and -0.5 to 0.2 , $p = 0.29$). Using GERT, the total number of errors was 8.75 (2.15) in the warm-up group compared with 10.8 (2.18) in the no warm-up group (95% CI for the mean difference, -9.9 to 5.8 , $p = 0.53$). Assessment scores for both the groups are shown in the Figure.

DISCUSSION

In this randomized controlled trial, we did not observe a positive effect of preoperative warm-up before laparoscopic salpingo-oophorectomy.

There is significant evidence of performance benefits from warm-up exercises in disciplines such as sport, dance, and music. Therefore, professional athletes, musicians, or dancers engage in warm-up to create the ideal conditions to deliver an expert performance.^{4,6} Recent studies showed that warm-up exercises performed before laparoscopic surgeries have the potential to improve technical performance during surgery.^{1,2} Calatayud et al.¹¹ found significantly better surgical performance on laparoscopic cholecystectomy following a short virtual reality warm-up training

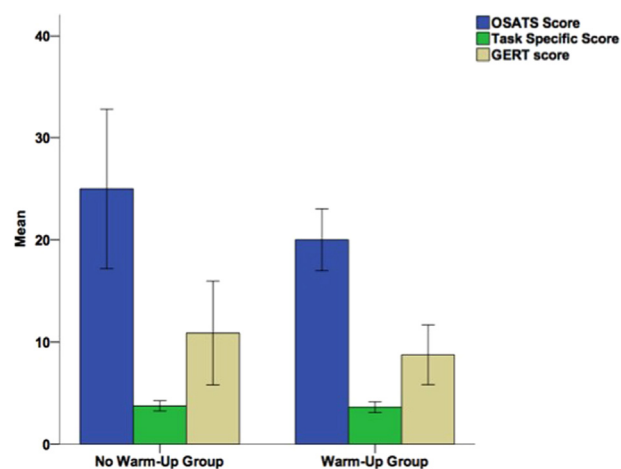


FIGURE. Mean assessment scores for each study group, bars indicating standard errors.

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