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SIMPLE AND ECONOMIC SKILL MODULES IN LAPAROSCOPIC SURGERY

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ABSTRACT

Development of laparoscopic surgery is remarkable, recent years and an alternative to open surgery in all surgical areas. The rapid development and improve mentof laparoscopic surgery raises the question of education. It's aim ed to develop a simple, economical and practical model instead of the high cost of virtiual simulators for laparoscopic basic traning. A cartboard box, webcam and seven study modules that will improve basic surgery skills are prepared. 5 junior and 4 senior assistants have been included to study. The participants we reasked to repeate very game ten times and the times were recorded. It's found significant the statical analysis ofintra group and between groups that reduction of working time between the first at tempt with the last at tempt of the participants. There are many expensive Simulators for education except operation room. But by using this easy to install, simple and economical method an education box and skill modules can be created. This method will be contributeto develop the daily practical, especially centers with fewer opportunities.
Key Words:L*laparoscopic surgery, simple, economical and practical model*

INTRODUCTION

The quick increase of laparoscopic surgery brings about training problem and assistants need to accommodate to laparoscopic procedure beforehand (K. Tanoue, S. Ieiri, K. Konishi 2008). Because performing the procedures in laporoscopic surgery requires different hand skills than using in open procedures (Munz Y, Kumar BD, Moorthy K 2004).

During the laporoscopic surgery, while the surgeons are watching the operation in a two-dimensional (2D) video monitor, they should think, animate and perform it as three-dimensional (3D). Accessing is limited because surgery procedure is performed as

locating long forseps in the trocars which are in ventra wall. These factors redound difficulties which are related with endoscopic surgery. Undoubted, therefore, laparoscopic training intended for surgeons is very important to decrease the fatal accidents that can be bounded illiteracy and bad technique (Madan, Frantzides, Shervin, 2003).

The traditional methods intended for acquiring surgery skills can't fulfill the new skills that need for laporoscopic surgery. As the topics of quality control and patient security, with increasing financial limitations, revive the training in the skill laboratories instead of the training in the operation room (Aggarwal, Moorthy, Darzi, 2004; Bridges, Diamond, 1999).

Training systems intended for laparoscopy are 2 types; physical and virtual (Blacker, 2005; Dauster, Steinberg, Vassiliou et al. 2005). Virtual reality trainers pass on the surgeon varous skill levels as from basic plays to specific surgery procedures that are very close to reality. But the high cost of this technology limits the usage (Martinez, Espinoza, 2007). Virtual trainers which are purposeful education and training are too expensive to have and they also require special area. On the other hand, physical trainers are low cost great alternative that allow the surgeons to training over the physical models in the real world and offer a real opportunity to interact very similar physical conditions with the real surgeon's (Martinez, Espinoza, 2007).

METHODS AND PROCEDURES

A medium size carton box that can be acquired from hospital and markets, webcamand computer were used to create a training box. A half-open training box is obtained by crimping the carton of the folding sites and using stable. The webcam which was located in the little window that is opened carton box offers 2-dimension study opportunity with the image that is transfered to the monitor by connecting the computer (Fig 1). The trocar input locuses can be changed cavalierly on the carton box and different manipulations and angles can be attempted. Webcam contrivance can be set up at home, Office and guard room easily, moreover if the laptop is used, the locality narrowness is destroyed.

In the designing laparoscopic tarining box, seven game were used to develop the previosly designed laparoscopic skill. The participants were seperated in two groups. In the first group, the assistants who begin the general surgery assistant training newly and hasn't got any laparoskopic surgery experiments without watching the laparoscopic operations and holding the camera and in the second group the assistants who are more practised and in the last months of their assistants took part in. Five junior assistants and 4 senior assistants made each exercises for 10 times during a month in the quards. Working times were recorded as minute and seconds in each exercises.

Exercise 1

The removal process of geometric shapes (triangle, square and circle) were drawn on foam by laparoscopic scissors and dissector (Tab. 1). Foam gives feelling hard by tissue in dissection and scission process. Owing to this process, hand-eye coordination, recognation the tissue, acquiring the dissection skill with scissor were measured and developed.

Exercise 2

The collecting process the colourful beads into two used antibiotic bottles. It was asked to carry the colourful beads on the left side (red) into the same color bottle which was on the right side by using the laparoscopic hand instrument that was on their right hands. And it was also asked to carry the colorful beads on the right side (blue) into the same colour bottle which was on the left side by using the laparoscopic hand tool that was on their left hands (Tab. 1). 5 beads were used for each colour. Times of participants were recorded. In this study, it was aimed to control the tools by both two hands. It is a study intended for developing hand- eye coordination and 3-dimension perceive.

Exercise 3

A packet tire, a circular wooden piece, glass nail and colorful stickers were used in this study. The same colour stickers were fixed as face to face on the wooden piece as equal intervals. Nails were crashed into wooden in the middle of the stickers. Afterwards it was asked to pass on the packet tires in the contrivance which was placedin the training

box to the same colour nails by keeping with the laparoscopic hand tools particularly (Tab.1). With this study, it was aimed to develop hand-eye coordination and using the both two hands.

Exercise 4

Suture study. Two suction pipes were placed on the drain as there will be 0,5 cm distance between the metal wires that the top of it is circle and the holes of it will be as face to face. A module was formed as there were two in a drain part; and there were three piece double metal wires in the other part and the module was also formed as when the drain pieces come to side by side, the distances will be in such a way that equal. Furthermore the highness of these five piece double metal wires were adjusted as different of each other. Than these afoot drain parts were fixed on a carton with flaster. Afterwards, with needles surgical suture fibre were transmitted through the two circles were in top of the wires in on go by using two laparoscopic hand tools (Tab. 1). With this study, it was aimed to develop hand skill for laparoscopic suture and obtain hand-eye coordination. Keeping the needle appropriately and accurately with the hand tool with the appropriate hand motion adaptable to curvine, it is possible to pass the needle through the 2 circles in the same time. Because keeping the needle on the appropriate angle and tieing a knot process require the well-matched motion between right and left hand, with this study it was aimed to work the both two hands in coordination and develop hand-eye coordination.

Exercise 5

The removal process of the circle on the ballon that has got full water by laparoscopic dissection scissor. After putting the smaller balloon of the 2 different colours and sizes as in the picture, the inner balloon was filled with water. It was asked to remove the circle shape drawn on the outer balloon using with laparoscopic gresper and scissor as protecting the watery balloon (Tab. 1). Because of the inner balloon was watery, the very limited distance between the two balloons requires to use the scissor very carefully. In the literature, there are studies maden with gloves. We think that using the balloons in two different colours increase the perception.

Exercise 6

The suture study using endostich tool. Endostich is a hand tool that provides very big convenience on suturing in laparoscopic surgery. Because of having ease of use, it provides easy, secure and quick knot opportunity to surgeon. Because endostich tool and suture material are expensive, it is not possible to do suture study with this. A disposible endostich tool and a needle of endostich suture material that had used in operationsand will waste was taken and washed. Than it was cut from the nearest point of silky needle that in the middle of the needle (Tab. 2). Than the needle was fixed in the endostich and 3 knots were tied in the middle of the thread with 3/0 silky. Than the short top was cut near by the knot. It is hard to pass through tissues and stripes with endostich tool that has a knot in the middle, so a study mechanism was created by setting up 2 metal wires, that the tops of them was shape of circle, on a carton. Afterwards, suture study was done by passing the needle through the circles with afoot endostich in this mechanism (Tab. 2).

Exercise 7

Laparoscopic knot study. Tieing knot as laparoscopic is hard and it's learning curve is long process. Turning the suture material around the laparoscopic hand tool is a hard process and it is the part of the operation that causes the most time-loss. In this study, we dealed with the process of turning the suture metarial around the laparoscopic hand tool . This method is also used so rarely in the literature. During the operation, after passing the suture with needle, the suture material is cut before the knot process. The both two free tops are kept as has 0,5-1 cm space in any tops by laparoscopic hand tool (it should be 2 gresper or 1 grasper dissector, as rather) (Tab. 2). Than the laparoscopic hand tool which is keeping the suture material is turned by forefinger. To not the first knot let up, 3 full rotation is complated (Pic.41). Afterwards, the suture material is kept of the top of the hand tool that rotation was done by the other hand tool and it is removaled of it's vent. During this process, one of 3 full rotation will be lost. The other free top is kept by the hand tool that rotation was done and the knot is tied by pulling through the rings occured on the hand tool. Afterwards, this same process is prepared more 2 times with 2 full rotation and the knot will be corrected (Tab. 2).

The data in all the groups were analized by Shapiro-Wilks. According to this analize, non-parametric tests were performed. Friedman test was performed for intragroup variables; Mann Whitney U test was performed for intergroups.

RESULTS

All of the participants were men and the average age of senior assistants were 33 (28-36), junior's were 27 (26-29). The whole assistants were using their right hand. To create this training box, a medium size carton box that can be obtained from hospital and markets, webcam and computer were used. 7 games were performed by 5 juniors and 4 senior assistants in the afoot training box.

The performing time of the each participants were recorded. In all studies, it was seen that, in their first and last experiments, senior assistants had got significant difference than junior assistants in respect to time. But in all the studies, it was determined that the difference in the first experiment was decrease in the last experiments. And also in all the studies, it was determined that senior assistants' learning curves have drawn plateau early than the junior assistants(Fig. 2-8). Decreasing of time of completing the process between the first and last experiments of the assistants in both two groups was found statistically significant (p:0.014). This was shown that the method has reached it's aim.

DISCUSSION

The surgeons have to achieve specific skills to make laparoskopic surgery. Training outside of the operation room is necessary to avoid long and clumsy learning curves and it's negative effects for patients (Gallagher A, Satava RM 2002, K. Tanoue, S. Ieiri, K. Konishi at al. 2008, Scott DJ, Bergen P, Rege RV 2000). Nowadays, various simulators are used to carry out this. It is expected that important of training by using simulators will be increase. Because in the future, using animals for surgery tarining seems to decrease in worldwide. The difference of technological and cost between physical and virtual trainers limits standardize the academic training methods in this field. The simulators using virtual reality generally require experienced care staff, a special area and high cost. Fort his reason, the simulators are high-cost and they can't be used at home or in the developing countries.

Training with the pelvic trainerhas been shown to improve performance in the operating room (Chung, Sackier, 1998; Derossis, Freid, Abrahamowicz, 1998; Scott, Bergen, Rege, 2000). Munz and his friends made a controled study in box tariners with virtual trainers (LapSim) with 24 participants and they determined that there aren't any differences with regard to develop skills in both 2 studies (Munz, Kumar, Moorthy at al. 2004). When the box trainer group is compared with the control group, unlike the LapSim group, it showed less last test scores for most of test parameters can be more effective to teach psychomotor skills (but it doesn't prove it).

To develop laparoscopic skills, Hana Bruynzeel and her friends have compared the pelvic tariners' skills with mirror trainers, and they have used actualization time of suture task (Bruynzeel, Bruin, Bonjer at al. 2007). There is a disagreement about whether time is an optimal parameter to measure the developing or not. In Daniel Smith and his friends' study a Simulator was used to develop laparoscopic surgery skills and it was observed that laparoscopic surgery skills increased importantly expecially after the first 3 experiment (Smith, Farrell, McNatt, 2001). In their study, while temporal learning curve was becoming stabilize after first 3 repeats, accuracy of manipulations have continued to improve after 10 repeats. Besides this, Grantcharow and his friends showed that there are different curves for time, failure sum and motion economy during the laparoscopic training (Grantcharov, Bardram, Funch-Jensen at al. 2003). These authors claimed that temporal learning curve is the most true one, because while the temporal learning curve reaching to a level after only 7 training tasks, failure sum and motion economy become stabilize more earlier. This difference is presumably derived from the differences of the training tasks. Suture training tasks are accepted more hard and also they have more slowly learning curve.

We also think that time factor is the most realistic and practical tool to evaluate learning curve because measuring time correctly is more easy and less subjective. In our laparoscopic models, except the games of suture with needle, senior assistants developed their laparoscopic skills as average after 3. repeat; junior assistants developed their laparoscopic skills as average after 5. repeat. It was determined that the time difference started to increase between the junior and senior assistants at the last experiments.

The students who have been trained in the study was done by Hana Bruynzeel and his friends, reached a level after average 13-18 suture tasks (Bruynzeel, Bruin, Bonjer, at al. 2007). Scott and his friends showed that the necessary average repeat sum to reach a level in their study was 32 (Scott, Bergen, Rege, 2000). In our study game intended to improve laparoscopic skills, the participants made it for 14 times. After the study, after average 10 repeats, significant improvement was observed in the skills. However, it was also seen that learning curve is contunied. The skill of keeping the needle by laparoscopic hand tool was a component that causes to time loss. When the repeat sum improved, keeping needle practice developed in all the participants. We believe that assuring the training tools have functions in surgery scenarios help individuals to adapt to these scenarios more quickly.

Laparoscopic tasks in our study model, exceept operation room, includegames which are intended to improve the main psychomotor skills that necessary to main laparoscopic skills as recognation, penetration, traction, streching and transection the hand tools, using the nondominant hand, suture. We think that these games enable to test the possible scenario can be meet during the laparoscopic skills as independently of the patient. We believe that this simple, economic and ease usage training box and games will form an alternative to the virtual trainers.

As a result, there are lots of expensive simulators for the training outside of the operation room, but a training box can be formed with this easy setting, simple and economic method. This method will contribute to improve the daily practice as independently of the patient in the centers that have limited possibilities. Furthermore, it will also contribute to improve the hand-eye coordination with a less cost before patient practices.

REFERENCES

Aggarwal R, Moorthy K, Darzi A (2004) Laparoscopic skills training and assessment. Br J Surg 91: 1549–1558.

Blacker AJR. How to build your own laparoscopic trainer. J Endourol. 2005; 6: 748–752.

Bridges M, Diamond D (1999) The financial impact of teaching surgical residents in the operating room. Am J Surg 177: 28–32.

Bruynzeel H, Bruin A. F. J., Bonjer H. J., Lange J. F., Hop W. C. J., Desktop simulator:

key to universal training? Surg Endosc (2007) 21: 1637–1640.

Chung JY, Sackier J (1998) A method of objectively evaluating improvements in laparoscopic skills. Surg Endosc 12: 1111–1116.

Dauster B, Steinberg AP, Vassiliou MC, et al. Validity of the MISTELS simulator for laparoscopy training in urology. J Endourol. 2005;5: 541–545.

Derossis AM, Freid GM, Abrahamowicz M (1998) Development of a model for training and evaluation of laparoscopic skills. Am J Surg 175: 482–487.

Gallagher A, Satava RM (2002) Virtual reality as a metric for the assessment of laparoscopic psychomotor skills: learning curves and reliability measures. Surg Endosc 16: 1746–1752.

Grantcharov TP, Bardram L, Funch-Jensen P, Rosenberg J (2003) Learning curves and impact of previous perative experience on performance on a virtual reality simulator to test laparoscopic surgical skills. Am J Surg 185: 146–149.

K. Tanoue, S. Ieiri, K. Konishi, T. Yasunaga, K. Okazaki, S. Yamaguchi, Effectiveness of doscopic surgery training for medical students using a virtual reality simulator versus a box trainer: a randomized controlled trial Surg Endosc (2008) 22: 985–990.

Madan AK, Frantzides CT, Shervin N, Tebbit CL (2003) Assessment of individual hand performance in box trainers compared to virtual reality trainers. Am Surg 69: 1112–1114.

Martinez AM, Espinoza DL. Novel laparoscopic home trainer. Surg Laparosc Endosc Percutan Tech. 2007 Aug;17(4):300-2.

Munz Y, Kumar BD, Moorthy K, Bann S, Darzi A. Laparoscopic virtual reality and box trainers: is one superior to the other? Surg Endosc 2004; 18: 485-494.

Scott DJ, Bergen P, Rege RV (2000) Laparoscopic training on bench models: better and more cost effective than operating room experience? J Am Coll Surg 191: 272–283.

Smith CD, Farrell T, McNatt SS (2001) Assessing laparoscopicmanipulative skills. Am J Surg 181: 547–550.

Table 1: Modules for box training.

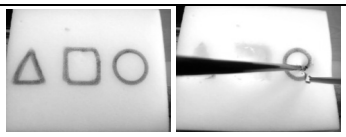
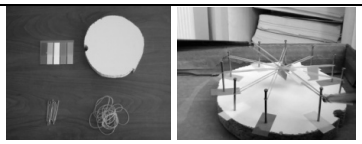
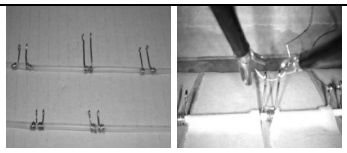
TRAINING MODULES	
Exercise 1	
Exercise 2	
Exercise 3	
Exercise 4	
Exercise 5	

Table 2: Modules for box training

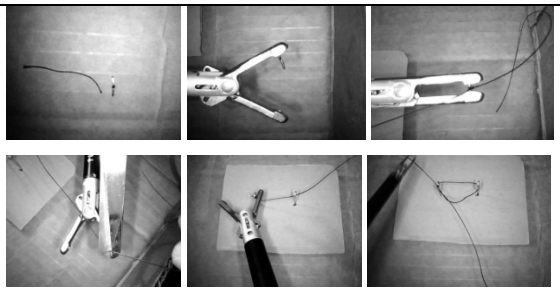
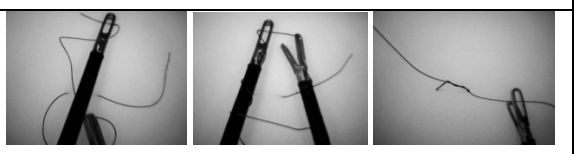
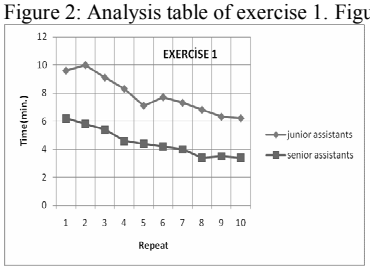
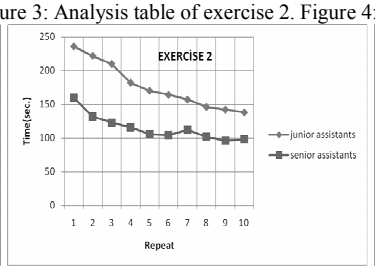
TRAINING MODULES	
Exercise 6	
Exercise 7	

Figure 1: Trainin box.

Figure 2: Analysis table of exercise 1. Figure 3: Analysis table of exercise 2. Figure 4: Analysis table of exercise 3.





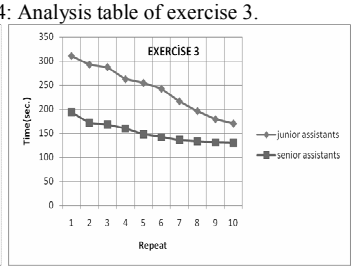
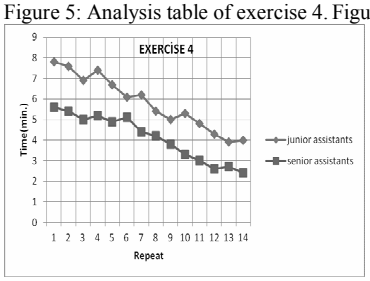
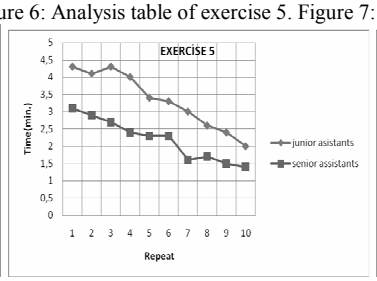


Figure 5: Analysis table of exercise 4. Figure 6: Analysis table of exercise 5. Figure 7: Analysis table of exercise 6.





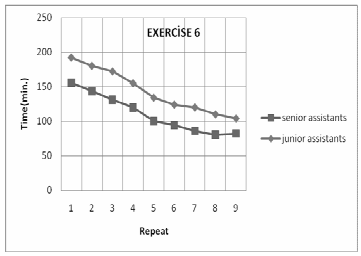


Figure 8: Analysis table of exercise 7.