

Evaluation of Specialized Laparoscopic Suturing and Tying Devices

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ABSTRACT

Background: Laparoscopic suturing and tying constitute advanced minimally invasive surgery skills. Developing proficiency in the standard methods with needle drivers is often an arduous process. Recent advances in laparoscopic instrumentations has allowed for easier methods of suturing and tying. This study investigated the hypothesis that the use of a specialized suturing device and a specialized tying device allows inexperienced medical students to suture and tie laparoscopically.

Methods: Preclinical medical students who had not received any training in open or laparoscopic surgery were included in this investigation. Each student was given a 5-minute demonstration of a specialized suturing device and a specialized tying device. The medical students were not allowed to deploy either device before actual use. After the demonstration, each student was given the device to use in a porcine model. Times were recorded and a subjective grade was given for each student.

Results: Twenty medical students were involved in this study. All medical students were able to complete the task of suturing and tying. The average time to suture was 104.6 seconds and the average time to tying was 31.2 seconds. The average subjective performance grade was 90 (out of 100).

Conclusion: Specialized devices are easy to learn and use for laparoscopic suturing and tying with minimal instruction even for inexperienced medical students. Even surgeons who are not well versed in laparoscopic surgery should be able to suture and tie with certain laparoscopic instruments.

Key Words: Laparoscopic surgery, Porcine model, Training.

INTRODUCTION

The evolution of laparoscopic surgery has expanded to more advanced and complex general surgery procedures. For patients to benefit from laparoscopy, surgeons must first develop and hone those laparoscopic surgery skills necessary for these advanced operations. Laparoscopic suturing and tying are among these advanced minimally invasive surgery skills required for many complex procedures. Developing proficiency in the standard methods of laparoscopic suturing and tying with needle drivers may often be an arduous process.

Industry has developed a plethora of devices to help surgeons suture and tie more easily laparoscopically. Devices like the Suture Assistant (Ethicon Endo-Surgery, Cincinnati, OH) and Endostitch (United States Surgical Corporation, Norwalk, CT) have been utilized by various surgeons to facilitate suturing and tying. We arbitrarily chose to examine 2 devices: Sew-Right and Ti-Knot (LSI Solutions; Victor, New York). This study explored the use of this specialized suturing device and this specialized tying device by inexperienced medical students without any formal training.

METHODS

Only first- and second-year medical students who had not received any training in open or laparoscopic surgery were included in this investigation. Each student was given a 5-minute demonstration of both devices. The medical students were not allowed to actually deploy either device during the demonstration.

Each student was then given the device to use in a porcine model. Students were instructed to suture 2 pieces of small intestine together. Successful completion of the task, times, and subjective grades were all recorded. The Pearson correlation was used for statistical analysis. $P < 0.05$ was considered statistically significant.

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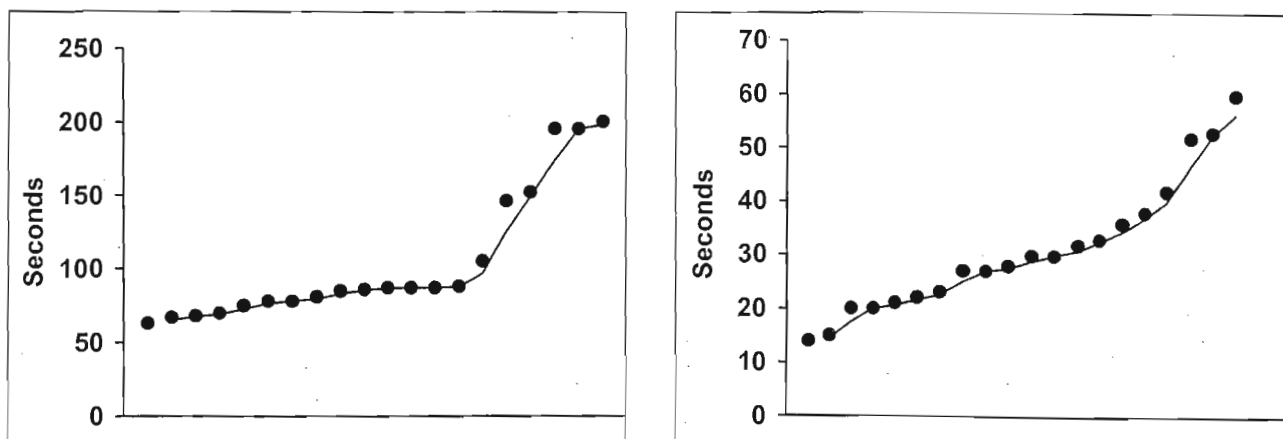


Figure 1. Distribution of suturing (Left) and tying times (Right). The graphs demonstrate a wide distribution of times for both tying and suturing.

RESULTS

Twenty medical students were involved in this study. All medical students (100%) were able to complete the task of suturing and tying. The average time to suture was 104.6 seconds. The average time to tying was 31.2 seconds. There was poor correlation between time to suture and time to tie ($r=0.39$; $P=0.09$). **Figure 1** demonstrates the distribution for the times to suture and tie.

The average subjective performance for tissue handling was 90/100. The overall subjective performance was 90/100. There was good correlation between subjective scores ($r=0.85$; $P<0.01$). **Figure 2** demonstrates the distribution of the subjective grades. Tissue handling and overall subjective scores inversely correlated between time to suture ($r = -0.44$; $P=0.05$ and $r = -0.60$; $P<0.01$) as well as time to tie ($r = -0.68$; $P<0.01$ and $r = -0.65$; $P<0.01$)

DISCUSSION

Our data demonstrate that inexperienced laparoscopic surgeons can easily learn how to tie and suture with specially designed tools. The development of laparoscopic suturing technique is an important part of the acquisition of advanced laparoscopic skills. Without laparoscopic suturing and tying skills, it is difficult to perform many complex laparoscopic procedures. The task of suturing via laparoscope takes considerable practice. It requires

appropriate angles and trocar placement.¹ For this reason, industry has developed many highly technologically advanced instruments to help beginning surgeons learn to tie and suture laparoscopically.

Laparoscopic techniques, especially suturing and tying, are often difficult for a multitude of reasons. The loss of tactile feedback, the loss of depth perception, and the "fulcrum effect" are just some of the reasons that laparoscopic surgery may be more difficult than open surgery. Because many surgeons who were trained exclusively in open surgery are now performing many advanced laparoscopic procedures, it is important that (while these surgeons are still on their learning curve) other options are available to assist in complex procedures.

Many authors have utilized various techniques in the instruction of laparoscopic suturing and tying.²⁻⁴ Although the long-term retention of these skills is unknown, these courses are ideal when teaching basic laparoscopic suturing and tying skills. One such study examined a course designed to teach inexperienced surgeons laparoscopic suturing and tying techniques.³ Medical students undergoing this course were able to suture and tie extracorporeally in an average of 94 seconds and intracorporeally in an average of 192 seconds. This study demonstrates that advanced techniques can be taught to even inexperienced surgeons through a training course. While this is an ideal method of training,

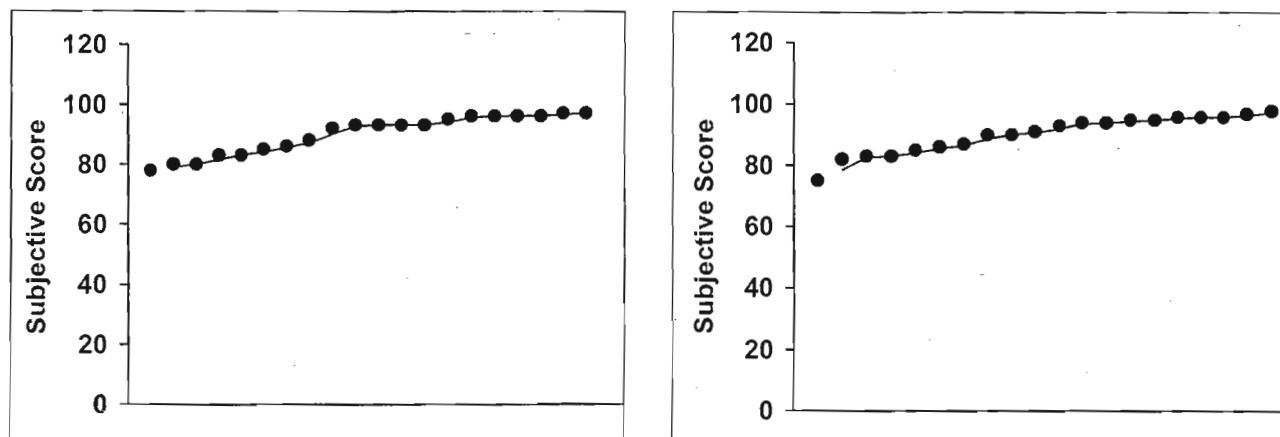


Figure 2. Distribution of subjective scores for tissue handling (Left) and overall performance (Right). The graphs demonstrate that most students scored well in both tissue handling and overall performance.

our data demonstrate that even without a formalized course, inexperienced surgeons can use certain instruments to suture and tie laparoscopically.

For those surgeons who do not have access to these courses or methods to train themselves in laparoscopic suturing, it is imperative that other options exist while they are on the learning curve. While these surgeons can convert to an open procedure when laparoscopic skills in suturing and tying skills are needed, technologically advanced instruments may help these surgeons in performing surgery.

References:

1. Joice P, Hanna GB, Cuschieri A. Ergonomic evaluation of laparoscopic bowel suturing. *Am J Surg.* 1998;176:373-378.
2. Harold KL, Matthews BD, Backus CL, et al. Prospective randomized evaluation of surgical resident proficiency with laparoscopic suturing after course instruction. *Surg Endosc.* 2002;16(12):1729-1731.
3. Champion JK, Hunter J, Trus T, Laycock W. Teaching basic video skills as an aid in laparoscopic suturing. *Surg Endosc.* 1996;10:23-25.
4. Pearson AM, Gallagher AG, Rosser JC, Satava RM. Evaluation of structured and quantitative training methods for teaching intracorporeal knot tying. *Surg Endosc.* 2002;16:130-137.

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