



A Comparative Study between Single Loop Ligature and Conventional Two Loop Ligature among Surgical Team

¹Dr. Rahul Goswami, ²Dr. M.B. Bagwan, ³Dr. Aditya Patel

^{1,3}Resident, ²Associate Professor, Department of General Surgery, Krishna Vishwa Vidyapeeth, Karad, Maharashtra, India

Corresponding author: Dr. Rahul Goswami, Resident, Department of General Surgery, Krishna Vishwa Vidyapeeth, Karad, Maharashtra, India

Email: Dr.rahulgoswami53@gmail.com

ABSTRACT

Aim: The purpose of this study is to make a comparison between the conventional two-loop ligature and a single loop ligature used by the surgical team.

Materials and Methods: There were a total of 100 patients who had the Single Loop Ligature procedure done on them. Of them, 50 patients had the procedure done by surgical trainees, while the other 50 patients had the procedure done by gastrointestinal surgical professionals. The remaining 50 patients each had a conventional two-loop ligature, which was performed by surgical residents. The residents in the surgery were in their third year of training as physicians. Throughout the course of their clerkship, students were strongly encouraged to learn fundamental laparoscopic procedures using the laparoscopic trainer panel, and they were required to conduct one of these methods on a pig at the training center on an annual basis.

Results: Surgical residents who performed Single Loop Ligature and who also performed Conventional Two Loop Ligature as seen operation was completed in less time in single loop as compared to two port, which was statistically significant ($p < 0.05$). In light of the fact that the other clinical outcomes were not significant, we may conclude that they are analogous. When groups 1 and 2 were compared, group 1 had a considerably lower mean age (27.69 ± 5.63 vs. 39.88 ± 6.39 , $P < 0.001$) than group 2. It was shown that group 1 patients had considerably shorter mean hospital stays (2.55 ± 0.77 days compared to 2.86 ± 1.88 days, $P = 0.002$). In the group 1 of surgical residents who did single loop ligature, the mean age was much lower (27.69 ± 5.63 vs. 34.85 ± 3.71 , $P = 0.001$), and the mean hospital stay was significantly shorter (2.55 ± 0.77 vs. 3.01 ± 1.11 , $P = 0.01$). More difficulties were seen in group 2, however this did not constitute a major finding since it indicates that all groups are equivalent.

Conclusion: The Single Loop Ligature is a technically possible and safe treatment that may be performed by surgical residents using standard laparoscopic equipment after a brief period of learning the technique. As an alternative to the conventional two-loop ligature, the single-

loop ligature will soon be available for use in surgical procedures. The time has come to initiate a methodical education and training program for single-loop-ligature surgical procedures.

Keywords: Single Loop Ligature, Conventional Two Loop Ligature, Surgical Team

Introduction

Laparoscopic appendectomy has emerged into the therapy of choice in the treatment of acute appendicitis, which is one of the most prevalent reasons for emergency procedures.^{1,2} Single-loop laparoscopic surgery is a kind of laparoscopic procedure that was developed as a result of advancements in laparoscopic procedures and tools.³ At the present time, the Single Loop Ligature procedure is one of the single-loop laparoscopic operations that is done the most often. Because of its widespread popularity in the surgical community, training programs for surgeons now need to include secure means of teaching this technique in order to equip the next generation of general surgeons with the self-assurance necessary to successfully conduct the surgery.⁴ This study was carried out because there are gaps in the existing literature, and its objectives were to evaluate the early experience of residents in Single Loop Ligature; investigate the surgical feasibility and safety of SILA and Conventional Two Loop Ligature; and compare the clinical outcomes of Single Loop Ligature procedures carried out by surgical residents and surgical staff.

Materials and Methods

There were a total of 100 patients who had the Single Loop Ligature procedure done on them. Of them, 50 patients had the procedure done by surgical trainees, while the other 50 patients had the procedure done by gastrointestinal surgical professionals. The remaining 50 patients each had a conventional two-loop ligature, which was performed by surgical residents. The residents in the surgery were in their third year of training as physicians. Throughout the course of their clerkship, students were strongly encouraged to learn fundamental laparoscopic procedures using the laparoscopic trainer panel, and they were required to conduct one of these methods on a pig at the training center on an annual basis. During the second year of their residency, the residents were responsible for performing more than 25 instances of conventional two-loop ligation by the operator and assisted with at least 25 cases of single-incision laparoscopic ligation (SILA) procedures conducted by gastrointestinal surgeons. The gastrointestinal and intestinal surgical personnel carried out the SILA procedure on all of the patients who required an appendectomy. Surgical residents carried out the SILA procedure on a selection of patients who were generally healthy and young. Data on the patient's demographics, the length of the surgery, the duration of the patient's postoperative hospital stay, and any difficulties that arose during the procedure were gathered prospectively. Patients who had conventional two-loop ligatures done by surgical residents as well as patients who had single-loop ligatures performed by surgical residents were both evaluated statistically and clinically for their results. Patients who had a Single Loop Ligature done on them by surgical residents as well as patients who had a SILA performed on them by surgical professionals were compared statistically and clinically.

Operation or Surgical Procedure

A 1.5 to 2-centimeter vertical skin loop was constructed from the center of the umbilicus into the peritoneum as part of the Single Loop Ligature surgery, which, to provide a quick overview, was performed using the open loop approach. The newly formed loop was outfitted with a glove port that had three trocar channels. Conventional laparoscopic equipment of 5 millimeters in diameter, such as a laparoscope tilted at an angle of thirty degrees, as well as straight, rigid tools very similar to those used for conventional laparoscopy, such as a Babcock clamp, forceps, scissors, and electrocautery. Two separate administrations of Vicrylendo-loop were used in order to ligate the appendiceal base. An 11-mm infraumbilical trocar was placed by needle insufflations, and two additional 5-mm trocars were placed in the suprapubic area and left lower quadrant, respectively, during the conventional two-loop ligature procedure that was performed using three-trocar techniques. Specifically, the infraumbilical trocar was used. The remainder of the appendectomy surgery was carried out in the same manner as the Single Loop Ligature.

The typical postoperative order package for appendicitis was administered to each and every patient who was equipped with a computerized intravenous patient-controlled analgesia device. The patient-controlled analgesia included 15 mg/kg of fentanyl, combined with or without 1 mg/kg of ketorolac tromethamine, and diluted to a volume of 100 mL with saline. Each patient began taking small sips of water six hours following the procedure, then progressed to a diet of soft blended foods, and then to their usual diet when they were able to handle it. Patients were released from the facility if they were able to tolerate a normal diet without any further complications. This would typically take place on the second postoperative day.

An Examination of the Statistics

The Student t test was used to do comparisons of continuous variables, and the results were presented in the form of mean and standard deviation values. The chi square test was used in order to do research on categorical variables. A probability level of 0.05 or below was considered significant. The Statistical Package for the Social Sciences (SPSS) version 25.0 was used throughout each and every statistical analysis that was carried out.

Results

Table 1: Comparison of Clinical Outcomes of Single Loop Ligature between Group 1 and 2

Parameter	Group (n=50)	1%	Group (n=50)	2%	p-value
Gender					
Male	20	40	23	46	0.22
Female	30	60	27	54	
Age					
Below 30	4	8	3	6	
30-40	30	60	20	40	
40-50	12	24	25	50	

Above 50	4	8	2	4	
Mean Age	27.69±5.63		39.88±6.39		0.001
BMI	23.31±2.34		25.87±3.69		0.31
Pathology Perforated	27	54	28	56	0.41
Non-perforated	23	46	22	44	
Operation time	47.11±6.98		59.88±7.85		0.002
Drain insertion	5	10	7	14	0.36
Hospital stay	2.55±0.77		2.86±1.88		0.002
Abdominal abscess	3	6	3	6	
Wound dehiscence	3	6	4	8	0.22
Complication	5	10	6	12	

According to table 1, clinical outcomes were compared between surgical residents who performed Single Loop Ligature and who performed Conventional Two Loop Ligature. It was observed that the operation was completed in less time in single loop as compared to two port, which was statistically significant ($p < 0.05$). In light of the fact that the other clinical outcomes were not significant, we may conclude that they are analogous. When groups 1 and 2 were compared, group 1 had a considerably lower mean age (27.69 ± 5.63 vs. 39.88 ± 6.39 , $P < 0.001$) than group 2. It was shown that group 1 patients had considerably shorter mean hospital stays (2.55 ± 0.77 days compared to 2.86 ± 1.88 days, $P = 0.002$). Three patients in the first group had to be readmitted after experiencing postoperative wound dehiscence collection. Both were well treated with intravenous antibiotics, and drainage was not necessary for either one of them. Among the second group, three patients had to have a percutaneous drain inserted after being readmitted to the hospital with postoperative intra-abdominal abscess.

Table 2: Comparison of Clinical Outcomes of Single Loop Ligature between Group 1 and 3

Parameter	Group 1 (n=50)	1%	Group 3 (n=50)	3%	p-value
Gender					
Male	20	40	25	50	0.15
Female	30	60	25	50	
Age					
Below 30	4	8	2	64	
30-40	30	60	25	50	
40-50	12	24	20	40	
Above 50	4	8	3	6	
Mean Age	27.69±5.63		34.85±3.71		0.001
BMI	23.31±2.34		24.01±2.85		0.26
Pathology Perforated	27	54	25	50	0.52
Non-perforated	23	46	25	50	

Operation time	47.11±6.98		48.96±4.62		0.002
Drain insertion	5	10	5	10	0.28
Hospital stay	2.55±0.77		3.01±1.11		0.003
Abdominal abscess	3	6	2	4	
Wound dehiscence	3	6	3	6	0.33
Complication	5	10	5	10	

According to table 2, the mean age of the surgical residents in group 1 who conducted Single Loop Ligature was substantially lower (27.69 ± 5.63 vs. 34.85 ± 3.71 , $P = 0.001$), and the mean hospital stay was much shorter (2.55 ± 0.77 vs. 3.01 ± 1.11 , $P = 0.01$). More difficulties were seen in group 2, however this did not constitute a major finding since it indicates that all groups are equivalent.

Discussion

Acute appendicitis is one of the most prevalent conditions requiring gastro-intestinal surgery, and laparoscopic appendectomy has become the gold standard approach for treating this condition. Because of advancements in surgical processes and technologies, patients now need less postoperative pain treatment, which in turn has led to improved aesthetic results for patients. The next step forward in the development of minimally invasive surgery is being referred to as single loop ligature surgery. Appendectomy is a relatively simple procedure that was performed in this study by third-year residents who were proficient in conventional laparoscopic appendectomy. They used conventional laparoscopic instruments and technique to perform the procedure through a single loop ligature, which showed comparable clinical outcomes to conventional two loop ligature. While there were three instances that required extra trocar insertion in order to install an intra-abdominal drain, none of the cases required a conversion to an open operation or a conventional two-loop ligature. As compared with patients who had a conventional two-loop ligature done by surgical residents, patients who had a single-loop ligature put on them required a much shorter amount of time in the operating room and spent significantly less time in the hospital after the procedure. There was not a discernible difference in operation time or postoperative complications between the Double Loop Ligature performed by the surgical crew and the Single Loop Ligature performed by the surgical personnel. recommending that surgical residents be able to conduct a single loop ligature with an acceptable degree of risk. Importantly, the mean operation time was obtained after roughly 8 instances of single loop ligatures, and if residents had prior experience with conventional two loop ligatures, they swiftly and easily conquered the single loop ligature learning curve. While doing a Single Loop Ligature, the location of a drain is an important concern, and in order to accomplish this, we placed an extra 5-mm trocar around Mcburney's point. Many randomized controlled studies ^{1, 3, 5} demonstrated that the conventional two-loop ligature took much less time to perform than the single-loop ligature did, on average, during the operation. Yet, according to the findings of our research, the operating time required for a single loop ligature was noticeably less than that required for a conventional two loop ligature. It's possible that this was caused by the fact that the Single Loop Ligature method used a pre-made glove port. This resulted in a reduction in the amount

of time spent inserting and withdrawing trocars. Also, we closed the fascia layer of the umbilical loop in the same way in both the Single Loop Ligature and the Traditional Two Loop Ligature. This was done in order to ensure consistency. In the last step of the Single Loop Ligature procedure, the subcutaneous layer of the umbilical loop was not sutured but rather squeezed with gauze.^{1,3,5,6} Infection of the wound is the complication that has been reported as being the most common after a Single Loop Ligature procedure, and the results of our study demonstrated the same result. Infection of a wound does not extend a patient's stay in the hospital or need another surgery; however, careful cleansing of the umbilicus before to surgery and the administration of disinfectant after surgery reduce the likelihood of this happening.⁷ A glove port, also known as a double-ringed wound retractor, was used in this investigation; nevertheless, further research on the function of wound retractors in wound defense is necessary. As a potential long-term complication of SILA, umbilical hernia has been suggested by a few authors.⁸ During the course of the investigation, none of the patients who had previously been reported as having had single loop ligation at our hospital developed loopal hernia.⁹ The Single Loop Ligature has a good chance of becoming the standard treatment for acute appendicitis in the near future, and single-loop laparoscopic surgery for additional organs will progressively become an alternative for surgical procedures. In the future, the education curriculum for residents need to include single-loop laparoscopic surgical training and involvement that requires active participation from the residents.^{10,11}

Conclusion

The Single Loop Ligature is a technically possible and safe treatment that may be performed by surgical residents using standard laparoscopic equipment after a brief period of learning the technique. As an alternative to the conventional two-loop ligature, the single-loop ligature will soon be available for use in surgical procedures. The time has come to initiate a methodical education and training program for single-loop-ligature surgical procedures.

References

1. GaoJ, Li P, Li Q, Tang D, Wang DR. Comparison between single-incision and conventional three-port laparoscopic appendectomy: a meta-analysis from eight RCTs. *International Journal of Colorectal Disease*. 2013;28(10):1319-1327.
2. Burjonrappa SC, Nerkar H. Teaching single-loop laparoscopic appendectomy in pediatric patients. *JSLs*. 2012;16:619–622.
3. Hua J, Gong J, Xu B, Yang T, Song Z. Single-incision versus conventional laparoscopic appendectomy: a meta-analysis of randomized controlled trials. *Journal of Gastrointestinal Surgery*. 2014; 18(2):426-436.
4. Lee SE, Choi YS, Kim BG et al. Single port laparoscopic appendectomy in children using glove port and conventional rigid instruments. *Ann Surg Treat Res*. 2014; 86:35-38.

5. St Peter SD, Adibe OO, Juang D et al. Single incision versus standard 3-port laparoscopic appendectomy: a prospective randomized trial. *Ann Surg.* 2011;254(4):586-590.
6. Lee J, Baek J, Kim W. Laparoscopic transumbilical single-port appendectomy; initial experience and comparison with three-port appendectomy. *SurgLaparoscEndoscPercutan Tech.* 2010; 20:100–103.
7. Oltmann SC, Garcia NM, Ventura B, Mitchell I, Fischer AC. Single-incision laparoscopic surgery: feasibility for pediatric appendectomies. *J Pediatr Surg.* 2010;45:1208–1212.
8. Lacher M, Muensterer OJ, Yannam GR, Aprahamian CJ, Perger L, Megison M et al. Feasibility of single-incision pediatric endosurgery for treatment of appendicitis in 415 children. *J LaparoendoscAdvSurg Tech A.* 2012;22:604–608.
9. Perez EA, Piper H, Burkhalter LS, Fischer AC. Single-incision laparoscopic surgery in children: a randomized control trial of acute appendicitis. *SurgEndosc.* 2013;27:1367–1371.
10. Kang DB, Lee SH, Lee SY, Oh JT, Park DE, Lee C et al. Application of single incision laparoscopic surgery for appendectomy in children. *J Korean Surg Soc.* 2012;82:110–115.
11. Hong TH, Kim HL, Lee YS, Kim JJ, Lee KH, You YK et al. Transumbilical single-port laparoscopic appendectomy (TUSPLA): scar less intracorporeal appendectomy. *J LaparoendoscAdvSurg Tech A.* 2009;19:75–78