CASE SERIES

Single-port laparoscopic appendectomy using a needle-type grasping forceps for selective adult patients with acute uncomplicated appendicitis

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Abstract

Laparoscopic appendectomy has been performed by surgeons all over the world with the advantages of minimal injury. However, conventional multiple ports procedure still has room for improvement to further reduce surgical stress. We present a novel technique of single-port laparoscopic appendectomy using a needle-type grasping forceps (SLAN) for the treatment of uncomplicated appendicitis in adults, which produces just a 1 cm umbilical incision. Fourteen adult patients underwent this technique without any complications. Many advantages were observed, including minimal surgical trauma, less pain, faster recovery and unobviousable scars. In conclusion, SLAN provides a new choice of minimal invasive procedure for surgeons to treat adult patients with acute uncomplicated appendicitis.

INTRODUCTION

Acute appendicitis in adults is a common acute abdomen worldwide, and surgical resection is the main treatment. In 2019, we performed a novel technique of single-port laparoscopic appendectomy using a needle-type grasping forceps (SLAN) for uncomplicated appendicitis in children, and obtained satisfactory clinical outcomes, including minimal surgical trauma, less pain, faster recovery and fewer complications [1]. However, the application of SLAN in adults remains difficult and controversial, and surgical outcomes should be confirmed by clinical practice. The objective of this study was to describe the technical details of SLAN and to evaluate its clinical outcomes in selective adult patients with uncomplicated appendicitis.

SURGICAL TECHNIQUE

An empty bladder and >6 h fasting before surgery was necessary for the patient but insertion of a gastric tube or urinary catheter was unnecessary. Under general anesthesia, the laparoscopic display was placed on the right side of the patient, who was in the supine position. The surgeon stood on the lower left of the patient, while the assistant stood on the upper left. After conventional disinfection, a pneumoperitoneum tube, 5-mm 30°-laparoscopic lens, ultrasonic scalpel and suction device were prepared (Fig. 1a).

A curved incision of 1 cm length was made at the lower edge of the umbilical ring, and abdominal cavity was exposed according to the open technique. The disposable bag was placed...
The root of the appendix should be ligated with 7–0 surgical suture. (3–0 absorbable suture. for absence of bleeding, the umbilical incision was sutured by a contact with the incision. After the umbilical port was checked was removed through the 10-mm disposable trocar to avoid procedural trocar. The CO2 pneumoperitoneum was released, pulled out by laparoscopic separation forceps through the main cavity. After the terminal ileum, the triangular ligament needle-type grasping forceps was pierced into the abdominal wall at the McBurney site, where the needle-type grasping forceps was pierced into the abdominal cavity. After the terminal ileum, the triangular ligament and cecum were identified, the mesentery of the appendix was dissociated to the root (Fig. 1c), and two 7–0 surgical sutures were ligatured to ‘slim’ the root (Fig. 1d), and a minimal Hem-o-lock clip was used to close the proximal root of the appendix (Fig. 1e). Another 7–0 surgical suture was ligated at the distal end of the appendix. The appendix was cutoff at 3–5 mm distance from the root. A one-sixteenth Iodophors gauze was placed into the abdominal cavity through the main procedural trocar, to improve the cosmetic outcome. A small Hem-o-lock clip was used to clamp the appendix root.

DISCUSSION

Acute appendicitis is a common type of acute abdomen in adult patients and appendectomy is the main treatment [2]. Nowadays, single-port laparoscopic appendectomy has been confirmed to be a feasible and safe alternative to standard laparoscopy [3–5]. The objective of SLAN is to further reduce the surgical stress by minimal incision along with several advantages: (i) it was assisted by the needle-type grasping forceps, meanwhile traditional laparoscopic surgical instruments were also used, and conventional surgical procedures and principles were followed, which can result in a short learning curve; (ii) just a 1 cm trambilical incision can reduce patients’ surgical stress and enhance recovery process, which meets the concept of Enhanced Recovery After Surgery [6, 7] and are conducive to day surgery [8]; (3) this technique was confirmed to be performed in adult patients without limit of BMI.

From May 2019 to April 2020, we performed 14 adult patients for acute uncomplicated appendicitis using SLAN. None of the cases were converted to open surgery or conventional laparoscopic surgery midway. The mean age was 37 years (ranged from 25 to 66 years), and the average body mass index (BMI) was 23.88 kg/m² (range, 17.47–33.61 kg/m²). The mean operation time was 49 min (ranged from 41 to 60 min), and the mean time of first exhaust after surgery was 1.5 days (rang, 1–2 days). The average visual analogue scale (VAS) score of postoperative Day 1 was varied from 0 to 2 scores, which showed slight and tolerable pain [9]. The mean length of postoperative hospital stay was 1.7 days (ranged from 1–2 days) (Table 1). From 12 to 24 months after surgery, follow-up was accomplished by telephone, WeChat or outpatient. Neither incision infection, incision hernia, adhesive intestinal obstruction nor abdominal abscess formation was observed. No visible scars were discovered in the incision (Fig. 3), and satisfied feedback was obtained from all patients.

Nonetheless, careful selection of adult cases is still important. A comprehensive medical history, physical examination and laboratory tests should be completed before surgery. SLAN should not be performed in patients with a high suspicion of appendical perforation and formation of abscesses around the appendix, a large number ascites, severe adhesions, or other complex conditions, or in patients who need abdominal drainage tubes. In addition, the principle of surgical asepsis should not be performed in patients with a high suspicion of appendical perforation and formation of abscesses around the appendix, a large number ascites, severe adhesions, or other complex conditions, or in patients who need abdominal drainage tubes. In addition, the principle of surgical asepsis should not be performed in patients with a high suspicion of appendical perforation and formation of abscesses around the appendix, a large number ascites, severe adhesions, or other complex conditions, or in patients who need abdominal drainage tubes. In addition, the principle of surgical asepsis should not be performed in patients with a high suspicion of appendical perforation and formation of abscesses around the appendix, a large number ascites, severe adhesions, or other complex conditions, or in patients who need abdominal drainage tubes. In addition, the principle of surgical asepsis should not be ignored. For example, the tip of the needle grasping forceps must be disinfected before being pulled out, and the incision should be protected without any contact when the diseased appendix is removed. Although there are many options for adult appendectomy, we offer clinicians a new strategy to further improve the cosmetic outcome.
Table 1. Clinical characteristics and surgical outcomes of adult patients who underwent SLAN

| Patient no. | Gender | Age (year) | BMI (kg/m²) | Diagnosis | Appendix diameter at base (cm) | Incision length (cm) | ASA² stage | Operative time (min) | First exhaust time after surgery (d) | VAS score of POD1 | SIHD | Postoperative hospital stay (d) |
|-------------|--------|------------|-------------|-----------|-------------------------------|----------------------|-------------|---------------------|--------------------------------------|----------------|-------|--------------------------|
| 1           | Female | 50         | 25.58       | APA       | 1.3                           | 1                    | II          | 58                  | 2                                    | 1               | Grade A | 2                        |
| 2           | Male   | 66         | 25.78       | ASA²      | 1.5                           | 1                    | II          | 50                  | 2                                    | 2               | Grade A | 2                        |
| 3           | Female | 25         | 24.26       | APA       | 1.5                           | 1                    | II          | 55                  | 1                                    | 1               | Grade A | 2                        |
| 4           | Male   | 25         | 22.10       | ASA²      | 0.6                           | 1                    | II          | 51                  | 1                                    | 1               | Grade A | 2                        |
| 5           | Female | 29         | 20.58       | ASA²      | 0.7                           | 1                    | I           | 47                  | 2                                    | 2               | Grade A | 2                        |
| 6           | Female | 57         | 24.82       | APA       | 0.7                           | 1                    | II          | 50                  | 1                                    | 1               | Grade A | 2                        |
| 7           | Female | 28         | 19.40       | APA       | 0.8                           | 1                    | I           | 45                  | 1                                    | 1               | Grade A | 1                        |
| 8           | Female | 34         | 22.84       | ASA²      | 0.6                           | 1                    | II          | 45                  | 2                                    | 1               | Grade A | 2                        |
| 9           | Male   | 55         | 24.65       | APA       | 0.8                           | 1                    | II          | 51                  | 1                                    | 2               | Grade A | 2                        |
| 11          | Female | 33         | 33.14       | APA       | 0.75                          | 1                    | II          | 60                  | 2                                    | 2               | Grade A | 2                        |
| 12          | Female | 25         | 20.20       | APA       | 0.8                           | 1                    | II          | 41                  | 2                                    | 0               | Grade A | 2                        |
| 13          | Male   | 29         | 17.47       | APA       | 1.5                           | 1                    | I           | 45                  | 2                                    | 2               | Grade A | 2                        |
| 14          | Female | 27         | 33.61       | ASA²      | 0.8                           | 1                    | II          | 50                  | 1                                    | 1               | Grade A | 1                        |

BMI: body mass index.
ASA²: acute simple appendix.
ASA²: American Society of Anesthesiologists.
APA: acute purulent appendix.
VAS: visual analogue scale, score range 0–3 means slight and tolerable pain.
POD1: postoperative Day 1.
SIHD: surgical incision healing grades.
Grade A: surgical incision healing excellent, without any side effects.

CONCLUSION

SLAN is proved to be a novel and simple procedure which can be safely performed in adult patients with uncomplicated appendicitis. Further research with large sample size and long-term follow-up results should be conducted.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest in association with the present study.

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REFERENCES

1. Chen Y, Yuan JQ, Guo SG, Yang ZJ. Single-port laparoscopic appendectomy using a needle-type grasping forceps for acute uncomplicated appendicitis in children: case series. Int J Surg Case Rep 2020;70:216–20.
2. Prechal D, Post S, Pechlivanidou I, Ronellenfitsch U. Feasibility, acceptance, safety, and effectiveness of antibiotic therapy as alternative treatment approach to appendectomy in uncomplicated acute appendicitis. Int J Colorectal Dis 2019;34:1839–47.
3. Duza G, Davrieux CF, Palermo M, Khiangte E, Azfar M, Rizvi SAA, et al. Conventional laparoscopic appendectomy versus single-port laparoscopic appendectomy, a multicenter randomized control trial: a feasible and safe alternative to standard laparoscopy. J Laparoendosc Adv Surg Tech A 2019;29:1577–84.
4. Barutcu AG, Klein D, Kilian M, Biebl M, Raakow R, Pratschke J, et al. Long-term follow-up after single-incision laparoscopic surgery. Surg Endosc 2020;34:126–32.
5. Choi GJ, Kang H, Kim BG, Choi YS, Kim JY, Lee S. Pain after single-incision versus conventional laparoscopic appendectomy: a propensity-matched analysis. J Surg Res 2017;212:122–9.
6. Trejo-Avila ME, Romero-Loera S, Cárdenas-Lailson E, Blas-Franco M, Delano-Alonso R, Valenzuela-Salazar C, et al. Enhanced recovery after surgery protocol allows ambulatory laparoscopic appendectomy in uncomplicated acute appendicitis: a prospective, randomized trial. Surg Endosc 2019;33:429–36.
7. Leissner KB, Shanahan JL, Bekker PL, Amirfarzan H. Enhanced recovery after surgery in laparoscopic surgery. J Laparoendosc Adv Surg Tech A 2017;27:883–91.
8. Sabbagh C, Masseline L, Grelois G, Ntouba A, Dembinski J, Regimbeau JM. Management of uncomplicated acute appendicitis.
appendicitis as day case surgery: can outcomes of a prospective study be reproduced in real life? *J Am Coll Surg* 2019;229:277–85.

9. Price DD, McGrath PA, Rafii A, Buckingham B. The validation of visual analogue scales as ratio scale measures for chronic and experimental pain. *Pain* 1983;17:45–56.