

Small Incisional Surgery for Small Intestinal Diseases is a Safe and Feasible Procedure for Non-Obese Patients

Hidejiro Kawahara^{1,2*}, Nobuo Omura²

***Corresponding author:**

Hidejiro Kawahara, MD, Ph.D.
Department of Surgery
Kashiwa Hospital
Jikei University School of Medicine
163-1 Kashiwashita, Kashiwashi
Chiba 277-8567, Japan
Tel: +81 471641111 Ext. 3421
Fax: +81 471633488
E-mail: kawahide@outlook.jp
ORCID ID: 0000-0002-8618-1556

¹Department of Surgery, Kashiwa Hospital, Jikei University School of Medicine, Chiba, Japan

²Department of Surgery, Nishisaitama-chuo national Hospital, Saitama, Japan

ABSTRACT

Background: The small intestine is not fixed to the retroperitoneum, and lesions in the small intestine can be resected through a very small skin incision, similar to laparoscopic surgery, if it is placed accurately. In 2010, we reported on small incisional surgery (SIS) for small intestinal diseases, in which the skin incision was placed at the umbilicus based on anthropometric analysis. However, the feasibility and usefulness of SIS for resection of small intestinal lesions have not been elucidated.

Methods: From January 2015 to December 2018, seven consecutive patients diagnosed with small intestinal tumors preoperatively underwent partial resection of the small intestine with a 4-cm skin incision at the umbilicus, were retrospectively registered. After the partial resection of the small intestine extracorporeally, intestinal reconstruction was manually performed by end-to-end anastomosis. Four of the patients had cancer, and three patients had Meckel's diverticulum with inflammation.

Results: The length of the skin incision was 4 cm in all patients. No patient required enlargement of the skin incision. The mean surgical time was 52.0 (43-58) min. The mean blood loss was less than 5.0 ml. The mean postoperative hospital stay was 9.0 (8-10) days. No postoperative complications were encountered.

Conclusion: SIS with a 4-cm skin incision at the umbilicus for resection of small intestinal lesions seems feasible and safe for non-obese patients, similar to single incision laparoscopic surgery.

Key words: small incisional surgery, laparoscopic surgery, small intestinal disease

INTRODUCTION

Recently, laparoscopic surgery has been performed for various diseases with smaller surgical incisions instead of open surgery. However, the small intestine is not fixed to the retroperitoneum, and lesions in the small intestine can be resected through a very small skin incision if it is placed accurately. In 2010, we reported on small incisional surgery (SIS) for small intestinal diseases, in which an incision was placed at the umbilicus based on anthropometric analysis (1). In this previous study, each visceral position (X cm, Y cm), measured by the coordinate originating in relation to the umbilicus in all cases, was as follows: duodenojejunal flexure (1.3±1.3, 9.4±2.1) and ileocecal valve (-7.3±1.0, -2.8±1.7) (fig. 1). The distance between the duodenojejunal flexure and ileocecal valve

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was approximately 15 cm. The length of the small intestine was approximately 2,500 cm, and it was located between the two positions. When the incision was made at the umbilicus, almost the entire length of the small intestine, including the disease site, could be delivered through the umbilical incision. However, the feasibility and usefulness of SIS for the resection of small intestinal lesions has not been elucidated.

METHODS

From January 2015 to December 2018, seven consecutive patients diagnosed with small intestinal tumors preoperatively underwent SIS with a 4-cm skin incision at the umbilicus at Kashiwa Hospital, Jikei University, were retrospectively registered. Four of the patients had cancer, and three patients had Meckel's diverticulum with inflammation (*table 1*). The Ethics Committee for Biomedical Research of the Jikei Institutional Review Board approved the protocol [30-431 (9452)], and all patients or their family members provided written informed consent to participate.

SURGICAL TECHNIQUE

First, a 4-cm incision with placement of a wound protector was made at the umbilicus. After the detection of the disease site in the small intestine under direct vision, the small intestine, including the disease site, was delivered through the wound (*fig. 2*). Partial resection of the small intestine was performed extracorporeally, and intestinal reconstruction was manually performed by end-to-end anastomosis. Finally, the length of the skin incision immediately after removing wound protector was measured (*fig. 3*). Any drainage tubes for peritoneal drainage were not installed.

Table 1 - Characteristics of the patients

Variable	n=7
Age (years)	46.7 (17-64)
Gender	
Male	4 (57)
Female	3 (43)
Body mass index (kg/m ²)	22.9 (21.6-23.4)
Duration (min)	52.0 (43-58)
Bleeding (ml)	10 >
Postoperative hospital stay (days)	9.0 (8-10)
Diseases	
Meckel's diverticulum with inflammation	3 (43)
Small intestinal cancer	4 (57)

The data are presented as mean (range) or as n (%).

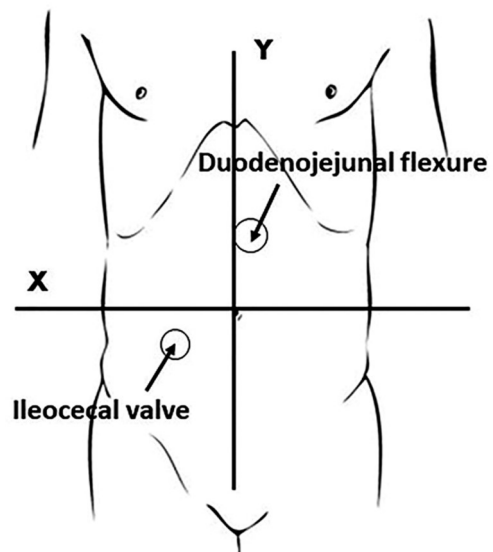


Figure 1 - Location in relation to the umbilicus
The location of the duodenojejunal flexure and the ileocecal valve were shown by the coordination originated in relation to the umbilicus

RESULTS

The length of the skin incision was 4 cm in all patients. No patient required enlargement of the skin incision. The mean body mass index (BMI) was 22.9 (21.6-23.4) kg/m². Obese patients were not found in them. The mean surgical time was 52.0 (43-58) min. The mean blood loss was less than 5.0 ml. The mean postoperative hospital stay was 9.0 (8-10) days. No

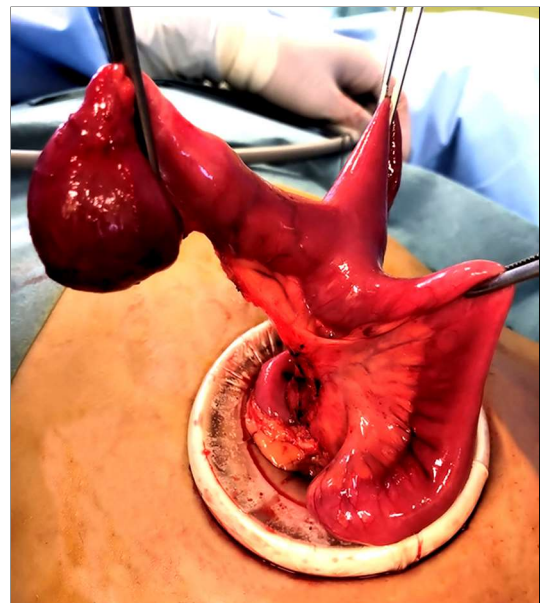


Figure 2 - Surgical view of the umbilical lesion during surgery
The small intestine including disease site was delivered through the umbilical wound.



Figure 3 - Surgical view of the umbilical lesion immediately after removing wound protector
No patient required enlargement of the skin incision.

postoperative complications were encountered. No postoperative recurrence was identified more than three years after surgery in patients with small intestinal cancer.

DISCUSSION

In our previous study (1), the location of the duodenojejunal flexure and the ileocecal valve had few anatomical variations. The duodenojejunal flexure was anthropometrically located at approximately 9 cm cephalad from the umbilicus and approximately 1 cm left side from the umbilicus. The ileocecal valve was anthropometrically located approximately 7 cm right from the umbilicus and 3 cm below the umbilicus. When the surgical incision was made at the umbilicus, almost the entire length of the small intestine, including the disease site, could be delivered through the umbilical incision without any laparoscopic assistance.

Recently, laparoscopic surgery has been performed for various diseases with smaller incisions instead of open surgery. In laparoscopic colorectal surgery for colorectal cancer, mobilization of the digestive tract and lymphatic dissection have usually been performed intracorporeally (2-5). As laparoscopic mobilization or dissection of the small intestine is not needed for the intestine, which is not fixed to the retroperitoneum, SIS can be performed with a relatively small incision without any laparoscopic assistance, which is similar to single incision laparoscopic surgery (SILS) (6,7). If the disease site in the small intestine cannot be delivered through the umbilical incision because the disease site is located near the ileocolic valve, SILS should be modified to mobilize from the cecum to the ascending colon to easily remove the disease site of the small intestine (8-10).

As to the day of discharge, the mean postoperative hospital stay was 9.0 days. It seems that all patients were physiologically ready to go home within 7 days after the operation. However, they wished to go home on a Sunday/holiday or the day before. This is the reason why the period of hospitalization was extended.

CONCLUSION

In conclusion, SIS with a 4-cm skin incision at the umbilicus for resection of small intestinal lesions seems feasible and safe for non-obese patients, similar to SILS.

Ethics approval and consent to participate

The Ethics Committee for Biomedical Research of the Jikei Institutional Review Board approved the protocol [30-431 (9452)], and all patients or their family members provided written informed consent to participate.

Consent for publication

The written consent to publish images or other personal or clinical details of participants was obtained from the patient.

Competing interests

The authors declare no competing interests.

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