

Umbilical Complications That Require Surgical Intervention after Gynecologic Laparoscopic Surgery

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Background: In laparoscopic surgery, the trocar is often inserted through the umbilicus because of the ease of insertion and inconspicuous postoperative scar formation. However, postoperative complications that require plastic surgical intervention may occur to the umbilicus.

Methods: We reviewed 14 patients who received plastic surgery for umbilical issues following gynecologic laparoscopic surgery in our department from January 2015 to September 2021.

Results: Most complications requiring umbilical surgery post gynecologic laparoscopic surgery include local infections, scar contractures, ectopic endometriosis, and umbilical necrosis. Mass resection and umbilical formation procedures were performed under general or local anesthesia. After a follow-up period of 6 months following surgery, no incidences of tumor development or recurrence of infection were seen, and the hypertrophic scar at the wound site gradually healed after the complete removal of the tumor and adequate suturing. Pathologically, 90% of the cases with keloid-like collagen disorder had concomitant inflammatory diseases such as epidermal cysts and abscesses.

Conclusions: The majority of umbilical complications associated with laparoscopic surgery were predicted to be due to implantation of epithelial and tumor components during laparoscopic surgery and delayed postoperative inflammation. Therefore, it is necessary to educate surgeons about general measures of local infection control and careful surgical manipulation to prevent umbilical problems associated with laparoscopic surgery. (*Plast Reconstr Surg Glob Open* 2023; 11:e5391; doi: 10.1097/GOX.0000000000005391; Published online 13 November 2023.)

INTRODUCTION

Since 1994, the Ministry of Health, Labour, and Welfare in Japan has approved laparoscopic surgery for gynecological conditions. As a result, procedures like uterine myomectomy, hysterectomy, and surgery for malignant uterine tumors, laparotomy, or transvaginal surgery are now done via laparoscopy. Laparoscopic surgery is becoming increasingly popular due to its wide field of view, minimally invasive operation, early recovery, and better cosmetic appearance, and its use is expected to further expand in the future.¹ Currently, the standard

procedure is to enter the first trocar from the base of the umbilicus.² This helps to prevent difficulties, allows for the insertion of additional trocars, and provides access for the recovery of specimens. There has not been a thorough discussion of umbilical complications resulting from laparoscopic surgery in the literature, although complications in the umbilical region that require plastic surgical treatment arise because of the difficulty of diagnosis, sluggish wound healing, and the complexity of the three-dimensional structure.^{3,4}

In this article, we focused on the umbilical complications that required surgical intervention after laparoscopic surgery in gynecology, based on cases we experienced at our hospital, with a literature review.

PATIENTS AND METHODS

This research was approved by the institutional review board of the National Tokyo Medical Center (Study number R22-109). The study was conducted in accordance with Helsinki Standards 2013. We retrospectively reviewed the charts and computed tomographic scans of patients who

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Received for publication June 29, 2023; accepted September 21, 2023.

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DOI: 10.1097/GOX.0000000000005391

Disclosure statements are at the end of this article, following the correspondence information.

developed complications at the umbilicus after laparoscopic gynecologic surgery and required surgery for these complications. From January 2015 to September 2021, a total of 1623 patients underwent laparoscopic surgery at the Tokyo Medical Center gynecology department, of which eight (0.49%) patients experienced umbilical complications. Including referrals from other hospitals, 14 women underwent surgery at the Tokyo Medical Center plastic surgery department in the same period. The following demographic data was collected: age at the time of surgery, body mass index (BMI), resected organs in prior surgery, clinical findings, contents of operation, and pathological findings.

For patients with cutaneous fistulas, urografin was injected into the fistula and a 2-mm slice fistulography computed tomography was taken to confirm the extent of the fistula. Tumor removal or debridement, as well as umbilical plasty, were surgical procedures carried out under general or local anesthesia. For general anesthesia, cephazolin sodium (1g) was administered intravenously immediately before and after surgery, and for local anesthesia, oral antibiotics were administered 1 day post-operatively. All tumors that were removed underwent histological analysis. Postoperative radiation therapy was not performed for patients with keloids.

STATISTICAL ANALYSIS

For age and BMI, mean and SD values were computed using Microsoft Excel (Microsoft Corp, Redmond, Wash.).

RESULTS

Patient Introduction

The 14 cases that were a part of the study are broken down as follows. BMI varied from 17.87 to 32.28 (23.7 ± 4.4), and the age ranged from 28 to 60 years (mean age \pm SD, 44.6 ± 9.5 y) (Table 1). Organs removed in gynecologic

Takeaways

Question: What mechanisms lead to umbilical complications following laparoscopic surgery, and what are the recommended interventions for management?

Findings: We reviewed 14 patients who received plastic surgery for umbilical issues following gynecologic laparoscopic surgery. Most complications requiring umbilical surgery were local infections.

Meaning: In the case of local infections, pathologically, 90% of the keloid-like collagen disease cases had coexisting inflammatory diseases such as epidermal cysts and abscesses.

surgery were the uterus in eight cases and ovaries in six cases. The frequent clinical signs were keloids (11 instances), fistula and epidermal cyst formation (nine cases), increased mass of the umbilical tumor during menstruation (one case), scar contracture (one case), and umbilical necrosis (one case). All the patients with fistulas underwent fistulography computed tomography and were confirmed to have fistulas that remained shallower than the fascia.

Operation

In three cases, general anesthesia was used during surgery, and in 11 cases, local anesthetic was used. In cases with fistulas, indigo blue was injected previously, and the mass including the stained area was removed. When there was scar contracture, Z-plasty was added, and when there was umbilical necrosis, debridement was performed. In all cases, the skin defects were small, and all wound sutures were combined with umbilical formation by anchoring the skin at the wound margin to the fascia (Fig. 1). The rolled ointment-containing gauze was bolster-fixed to the lower umbilical wall of the patient to prevent the umbilical fossa from becoming shallow.

Table 1. Basic Data for Each Case

Case	Age	BMI	Resected Organ	Clinical Findings				Operation	Pathological Findings		
				Keloid	Fistula/ Epidermal Cyst	Abscess/ Prolonged Infection	Others		Keloid	Epidermal Cyst	Others
1	37	20.52	Ovary		+	+		Mass removal		+	
2	60	22.66	Uterus	+	+	+		Mass removal	+	+	
3	53	23.67	Ovary	+	+	+		Mass removal	+	+	
4	53	29.67	Uterus	+	+	+		Mass removal	+	+	
5	49	27.07	Uterus	+		+		Mass removal	+		
6	44	17.87	Ovary	+		+		Mass removal	+		
7	48	19.6	Uterus	+				Mass removal	+	+	
8	52	-	Uterus	+	+	+		Mass removal	+	+	
9	54	21.64	Uterus	+	+	+		Mass removal	+	+	
10	28	-	Uterus	+	+	+		Mass removal	+	+	
11	33	32.28	Ovary	+	+	+		Mass removal	+	+	
12	31	-	Ovary				Menstrual swelling	Mass removal		Ectopic endometriosis	
13	45	-	Uterus				Scar contracture	Z-plasty			
14	37	21.56	Ovary			+	Umbilical necrosis	Debridement			

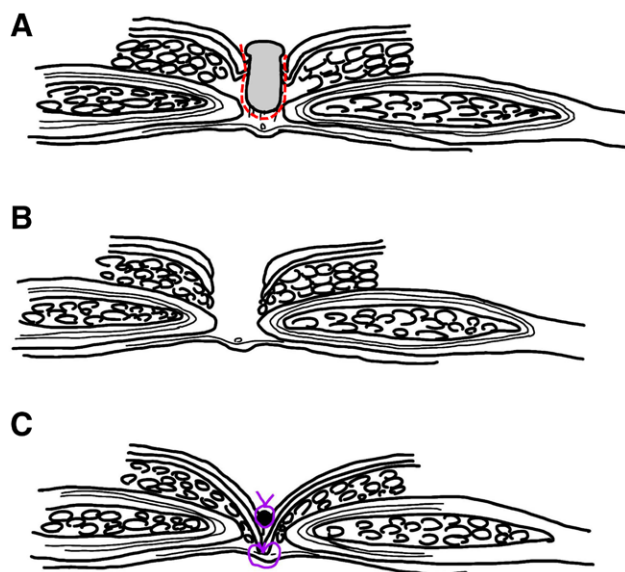


Fig. 1. Illustrations of the operation procedure. A, Incision lines (red dotted line) designed to include all masses on the umbilical surface. B, Tissue defect after mass resection. C, Skin was fixed to the rectus abdominis fascia to recreate the umbilical fossa.

Subcutaneous drains were not inserted. In our postoperative protocol, bolster fixation was released approximately after 2 weeks; thereafter, umbilical fossa compression with a cotton ball was continued until 3 months postoperatively. All reconstructions were performed immediately at the time of closure. None of the patients had their umbilicus removed completely.

Pathology

The pathology of the resected specimens revealed keloid-like collagen sequences in 10 cases and epidermal cysts in nine cases, with the presence of both in eight cases. The other case was of endometriosis. Pathology was not performed in cases where the tumor was not resected, for example, in a case of debridement.

Postoperative Condition

In all cases, there was no recurrence of infection after a follow-up period of 6 months postoperatively; there were few instances of hypertrophic scarring of the wounds, but all eventually healed (up to around 2.5 y) with conservative treatment, which included topical steroid tape and ointment, local injection, and oral administration of Tranilast and Saireito, a Chinese herbal remedy.

Following is a representative case. In all cases, we reconstructed a satisfactory umbilical shape. The follow-up period ranged 6–18 months.

CASE REPORT

Case 4: Local Infection

Five years ago, a 53-year-old woman underwent laparoscopic total hysterectomy and bilateral ureteral stenting for uterine fibroids. After the operation, the umbilicus was

repeatedly infected and formed an abscess twice in a year. A local physician prescribed antibiotics for the patient, but due to recurrent infections, the physician sent the patient to a plastic surgeon (Fig. 2A). White atheromatous material was observed deep within the fistula. General anesthesia was used throughout the tumor excision procedure. Dye was injected into the fistula, and the entire mass including all stained areas and scar tissue was removed, leaving less than 1 cm of the umbilical base. The umbilical fossa was created by stitching the dermis to the white line. The pathological diagnosis was the coexistence of epidermal cysts and keloids (Fig. 2B–D). Six months postsurgery, there was no evidence of recurrence of either infection or keloid formation (Fig. 2E).

DISCUSSION

In the current study, we looked at 14 patients who had gynecological department laparoscopic surgery with an umbilicus incision. All the patients developed umbilical problems and required plastic surgery. Lee and Hong⁵ observed that in laparoscopic surgery, there is no apparent difference between transumbilical and periumbilical incision in terms of factors such as length of hospital stay and pain score; however, transumbilical incision has advantages, such as reduced operative time, and is currently a popular technique.⁶ In a case series of 430 patients who underwent laparoscopic gynecologic surgery, trocar insertion time was significantly associated with preperitoneal fat thickness, and it has also been reported that the thinner the adipose tissue, the shorter the time required for surgery.⁷ Also to be taken into consideration as a differential diagnosis are an umbilical hernia, embryologic remnant abnormalities, metastatic tumors, ectopic endometriosis, suture granulomas, and epidermal cysts, although the development of an umbilical mass following laparoscopic surgery is extremely rare.^{8,9} Local infection, ectopic endometriosis, scar contracture, and tissue necrosis were the most frequent causes of surgery needed for an umbilical complication after laparoscopic surgery in our department (79%), which is consistent with prior data. One case not included in this report but scheduled for surgery in the future in our department includes an umbilical hernia.

Imamura et al¹⁰ compared 50 cases of each transumbilical incision with periumbilical incision for laparoscopic colorectal resection. Postoperatively, bacteria were detected only in one case of transumbilical incision. As a result, the transumbilical incision had a low risk of postoperative surgical site infection and better cosmetic results than periumbilical incision. Therefore, it is unlikely that wound infection would be caused by the umbilical base. Particularly, in people without a history, epidermal cysts emerging from the umbilicus' epidermis should be taken into consideration as a frequent umbilical complication.¹¹ Some reports of laparoscopic surgery leading to epidermal cysts in the umbilicus^{3,12,13} also support this theory. In fact, in our department, nine of 14 surgical cases demonstrated epidermal cysts on pathology. Andreadis et al¹⁴ states that “any trauma or surgical

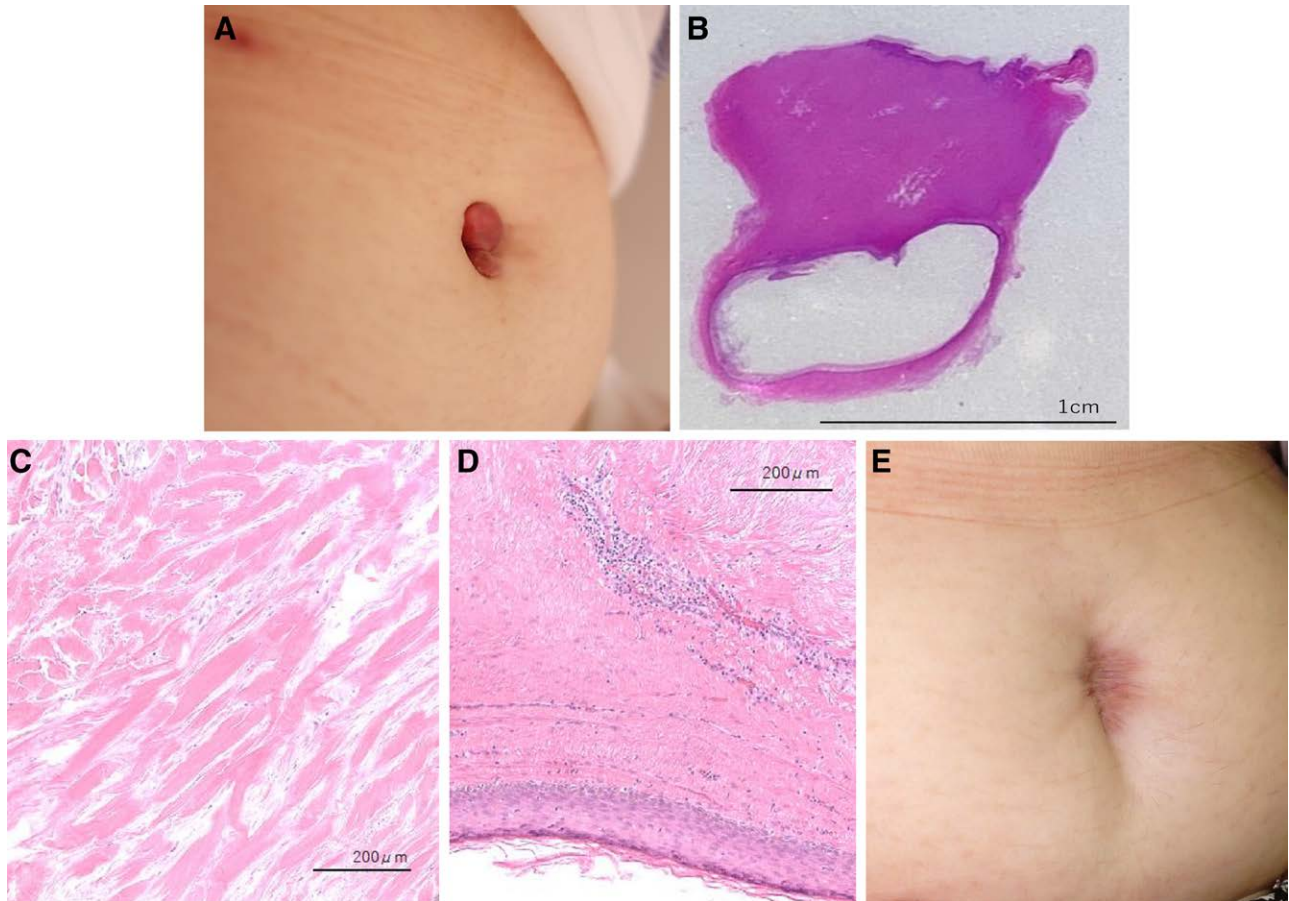


Fig. 2. Clinical course of representative case. A, After 18 months of laparoscopic surgery, pain and keloid formation were noted in the umbilicus. B, HE staining of the specimen. C, Appearance of hyalinized collagen fibers in the reticular layer. D, Multilayered squamous structures of the epidermal cysts. E, No signs of recurrence after 18 months of surgery.

procedure can develop epidermal cysts.” Because epidermal cysts are caused by subcutaneous implantation of epidermal components, laparoscopic surgery itself is a risk factor for epidermal cyst formation and wound healing failure, but we discovered no reports of epidermal cyst formation at trocar insertion sites other than the umbilicus. Because the umbilicus is a unique part with a tiny area, a mass of collagen fibers makes tissue stretching difficult. The laparoscope is frequently driven through a small incision, increasing the likelihood of implanting epidermal components.

Another intriguing new result from the survey was that keloids were present in histology in 90% of the cases that acquired local infection. Although the umbilicus is structurally challenging to keep clean, Yang et al¹² stated that epidermal cyst formation itself may be a contributing factor in keloid formation after laparoscopic surgery. The wound itself being a risk factor for epidermal cyst formation, the difficulty of suturing between layers due to the anatomy of the umbilicus, and wound healing failure have all been suggested as causes for this. As a result, treatment should proceed with the understanding that there are cases in which the keloid may appear to be just a keloid at the initial diagnosis, but after the

keloid volume is reduced with conservative treatment, the presence of epidermal cysts or fistulas may become apparent. Kurokawa et al¹⁵ reported that following surgery for umbilical keloids, postoperative radiation therapy was beneficial in preventing keloid recurrence and that radiation therapy was effective because no recurrence of keloids was found after 15 months of postoperative follow-up. However, we were able to achieve a cure without irradiation by conducting surgery on epidermoid cysts, which are the cause of keloid development. McClenathan also reported that complete excision of the cyst can lead to a complete cure of that.¹¹

As a result, we assume that a simple complete resection of the tumor can manage local infection while preventing the formation of keloids. The tissue loss during tumor excision was always limited, and the skin was able to be sutured to the fascia to create the umbilical fossa. In all cases, we reconstructed a satisfactory umbilical shape immediately after tumor excision. This was probably due to the prevalence of some of the umbilical tissue that could be used for the reconstruction.

Based on our experience, we present a method for cases of umbilical complications after laparoscopic surgery (Fig. 3). First, if the disease is accompanied by

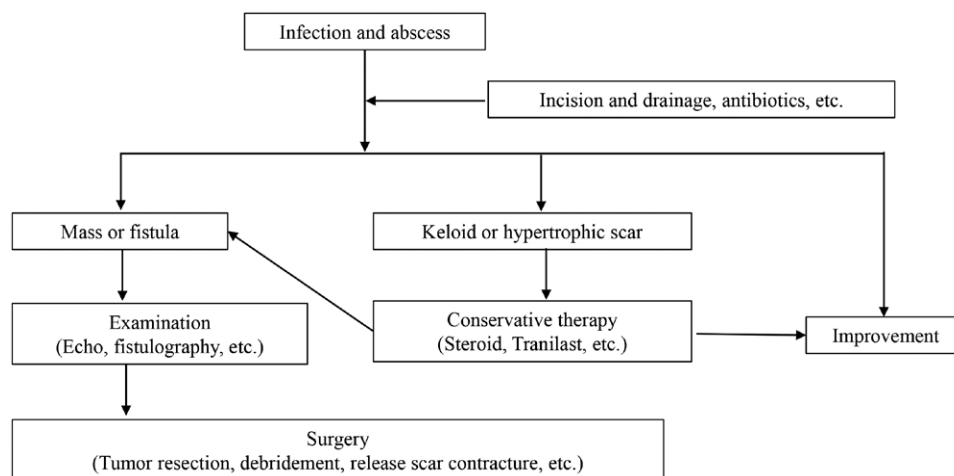


Fig. 3. Treatment flowchart for postlaparoscopic umbilical complications.

infection, treatment of the infection is the priority. If a mass or fistula is detected on examination, complete surgical resection should be regarded early on. On the other hand, if the umbilicus is accompanied by keloids or hypertrophic scars, conservative therapy should be initiated. If a fistula or epidermal cyst is discovered as the keloid or hypertrophic scar improvement, surgery to eliminate the underlying cause is required. Postsurgery radiotherapy is not considered required for all patients with keloids.

Based on the previous discussion, we recommend three points for laparoscopic surgeons to avoid such medically induced umbilical complications. First, the umbilicus must be cleaned preoperatively. As mentioned above, no clear evidence shows an association between the umbilicus and surgical site infection prevention; however, a study reported that umbilical procedures decrease the number of bacteria inside the umbilicus and increase the effectiveness of disinfectants,¹⁶ which needs a recommendation. Second, gentle manipulation of the tissue is recommended. Tissue contusion, burial of epithelial components, or infection must be avoided during laparoscopic surgery. Following this, a report assessing Z-plasty at wound closure after a vertical umbilical incision recommended manipulating the tissue gently and widening the incision to the required size. Third, the use of a protective agent such as Vaseline to reduce skin friction at the wound edge may be helpful in the gentle manipulation of tissue.

CONCLUSIONS

Most complications requiring umbilical surgery after gynecologic laparoscopic surgery were local infection, scar contracture, ectopic endometriosis, and umbilical necrosis. The local infection group accounted for about 80% of the total, of which more than 90% overlapped with the keloid group, and a cure could be obtained by tumor resection. Because it has been suggested that most umbilical complications are medically caused by aggravation

of epidermal or tumor components into the umbilical wound during laparoscopic surgery, careful handling during laparoscopic surgery is considered to be vital in reducing these complications.

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DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

REFERENCES

- Hiraike O, Osuga Y. Prospects for gynecologic laparoscopic surgery. [Fujinnkafukukuukyoushujyutu no Tennbou]. [Article in Japanese.] *Sanka to Fujinka*. 2015;11:1205–1210.
- Tica VI, Tica AA, De Wilde RL. The future in standards of care for gynecologic laparoscopic surgery to improve training and education. *J Clin Med*. 2022;11:2192.
- Sakamoto A, Nishihara S, Tanaka T, et al. The analysis of complications following laparoscopic operations. *Gynecol Obstet Endosc*. 2004;20:153–157.
- Sakamoto A, Kikuchi I, Tejima K, et al. Evaluation of Z-plasty during wound closure following a vertical umbilical incision, in order to prevent deformity of the navel. *Jpn J Gynecol Obstet Endosc*. 2019;35:230–237.
- Lee SJ, Hong TH. Intraumbilical versus periumbilical incision in laparoscopic cholecystectomy: a randomized controlled trial. *Int J Surg*. 2016;33:83–87.
- Shih SL, Chen BH, Tam KW. Transumbilical versus periumbilical incision for laparoscopic surgery: a meta-analysis. *Am J Surg*. 2020;220:1592–1598.
- Nishimura K, Yoshimura K, Hoshino K, et al. Aiming for complete safety of first trocar insertion of laparoscopic surgery: usefulness of preoperative ultrasonography of umbilical region. *J Obstet Gynaecol Res*. 2019;45:652–656.
- Christine Li, Amanda R. Umbilical epidermal inclusion cysts, an unusual cause of umbilical mass following laparoscopic surgery: case report. *J Surg Case Rep*. 2022;3:1–3.

9. Noda M, Nishida H, Kondo Y, et al. A clinicopathological analysis of umbilical lesions. [Heso no shuryuseibyohen: Sono rinnshoubyourigakutekishoken to hasseikijyo nit suite]. [Article in Japanese.] *Jpn J Diagn Pathol.* 2007;24:191–197.
10. Imamura H, Fujita F, Kawakami Y, et al. Comparison of paraumbilical incision and umbilicus incision for surgical site infection in laparoscopic colorectal surgery. [Surgical site infection no kantenkaramita saisekkaihou no kentou]. [Article in Japanese.] *Jpn J Gastroenterol Surg.* 2013;46:237–242.
11. McClenathan JH. Umbilical epidermoid cyst: an unusual cause of umbilical symptoms. *Can J Surg.* 2002;45:303–304.
12. Yang J, Lee HJ, Kim WS, et al. Hidden epidermal cyst formation below the umbilical circular keloid. *Ann Dermatol.* 2021;33:582–583.
13. Sasaki R, Yamaguchi K, Imaizumi T, et al. Two cases of umbilical tumor. [Saibushuyou no 2 rei]. Article in Japanese. *Nishinohon J Dermatol.* 2016;78:625–629.
14. Andreadis AA, Samson MC, Szomstein S, et al. Epidermal inclusion cyst of the umbilicus following abdominoplasty. *Plast Surg Nurs.* 2007;27:202–205.
15. Kurokawa M, Yasuta M, Yoshizumi M. Surgical treatment of umbilical keloids after laparoscopic surgery. [Fukukukyo shujyutsugo no sai keroido no shujyutuchiryuu]. [Article in Japanese.] *Jpn J Plast Reconstr Surg.* 2021;41:1–5.
16. Kubo K, Nishiguchi H, Tachimori A, et al. Survey on the current status of preoperative umbilical procedures in gastrointestinal surgery. [Shokakigeke ni okeru jyutsuzen saishochi no genjyou ni kannsuru chousa]. Article in Japanese. *Kyuseiki Kanngo.* 2020;50:7–10.