Chapter 7

How to Prevent Irregular Adsorption of Fatty Tissue into the Irrigation-Suction Instrument

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Additional information is available at the end of the chapter

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Abstract

Background: While using an irrigation-suction instrument for laparoscopic surgery, the irregular adsorption of fatty tissue may damage the tissue or obstruct continuous sucking. New devices of divided silicone drain tip and Count-on Q™ to prevent irregular adsorption of fatty tissue were reported. Materials and methods: A cigarette-type silicone drain was cut 4 cm in length, slipped over the instrument to cover the side holes, leaving 1.2 cm free from the end and fixed by means of 1-0 silk above the side holes. The free tip was divided vertically into four even pieces like octopus arms. Count-on Q™ was the irrigation-suction instrument equipped with multiple small side holes. Results: Divided silicon drain tip could prevent the irregular adsorption of fatty tissue (greater and lesser omentum or epiploic appendices) and could suck saline, fresh, and coagulated blood continuously. Count-on Q™ also could prevent the irregular adsorption of fatty tissue and could suck saline and fresh blood except coagulated blood continuously.

Conclusions: This simple, easy, and inexpensive device of divided silicon drain tip facilitated the prevention of irregular adsorption of fatty tissue while using a usual irrigation-suction instrument. Count-on Q™ was the masterpiece of irrigation-suction instrument, preventing irregular adsorption of fatty tissue by itself.

Keywords: laparoscopic surgery, irrigation-suction instrument, irregular adsorption of fatty tissue, divided silicone drain tip, count-on Q

1. Introduction

Several industrial companies manufactured irrigation-suction instruments that can be inserted into a 5-mm trocar for laparoscopic surgery. The instrument of 5 mm in diameter was equipped

with a main end hole and 8–12 pieces of small side holes for 1-cm length of the end. However, when we used the instrument, irregular adsorption of fatty tissue, for example, greater omentum (**Figure 1**), lesser omentum, and epiploic appendices (**Figure 2**) into the end hole or side holes, was experienced frequently. The sucked fatty tissue should be detached with forceps (**Figure 3**), which might cause the fatty tissue injury or obstruction of continuous sucking. Bowel injury by such instrument during laparoscopic surgery was reported in 1995 [1]. Already in ophthalmology about silicone tip, a decrease in complications during cataract surgery with the use of a silicone-tipped irrigation/aspiration instrument was reported in 2005 [2]. A novel laparoscopic suction device for applying precise aspiration during laparoscopic surgery, sponge-tip suction tube, was reported to prevent suctioning intra-abdominal organs, such as the intestine and omentum in 2008 [3]. We firstly reported the details of a new device made up of a divided silicone drain tip attached to the end of an irrigation-suction instrument to prevent irregular adsorption of fatty tissue in 2015 [4]. Furthermore, novel endoscopic catheter for "Laparoscopy-Like" irrigation and suction inspired by natural orifice translumenal endoscopic surgery (NOTES) was reported to result in no mucosal injuries in the EIS suction in 2016 [5].

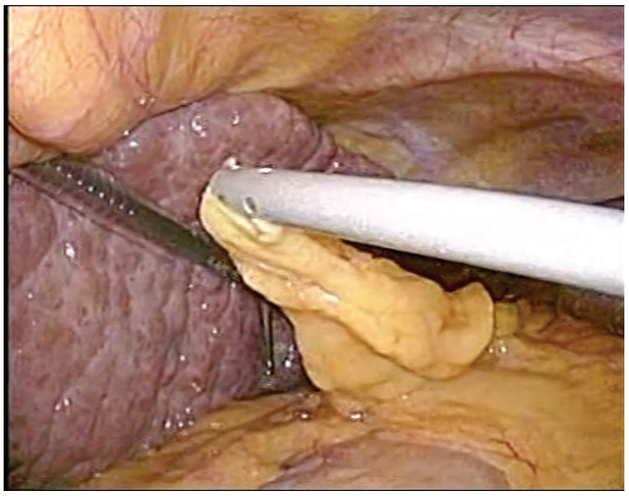

Figure 1. Irregular adsorption of greater omentum into a usual irrigation-suction instrument.

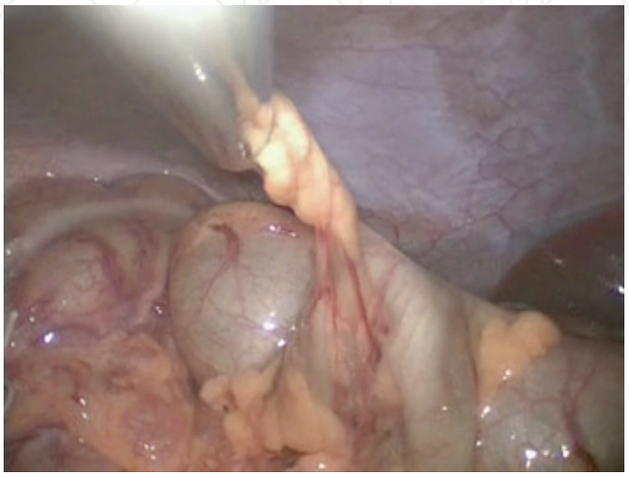

Figure 2. Irregular adsorption of epiploic appendices into a usual irrigation-suction instrument.

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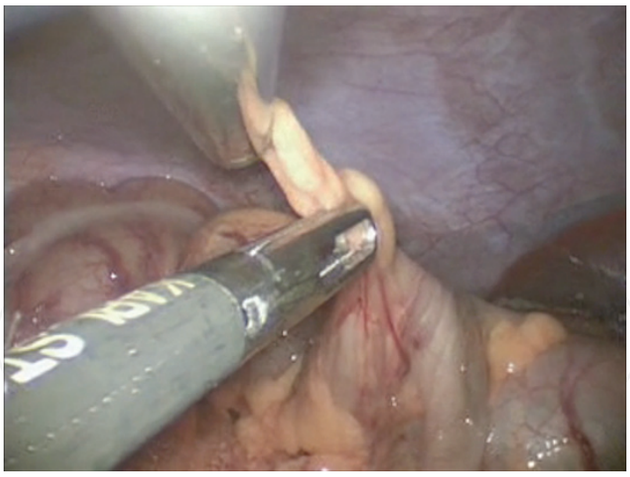

Figure 3. The sucked fatty tissue should be detached with forceps.

Herein, we mentioned the further experience of usefulness using divided silicone drain tip in several laparoscopic surgeries after the first report.

In addition, we mentioned another new instrument named Count-on Q™ (Pro-Seed Co., Tokyo, Japan), which was released in Japan in October 2014. This marvelous instrument could almost perfectly avoid irregular adsorption of fatty tissue by itself with multiple side holes while using it.

2. Divided silicone drain tip

2.1. Materials and methods

We previously reported the details of divided silicone drain tip (**Figures 4** and **5**) as follows: "We used a cigarette-type silicone drain of Type A No. 6 Penrose drain (Fuji Systems Inc., Tokyo, Japan). Type A means round, and No. 6 means 6 mm in outside diameter. The silicone drain was cut 4 cm in length, slipped over the instrument to cover the side holes, left 1.0–1.5 cm (1.2 cm was optimum) free from the end of the instrument and fixed by means of 1-0 silk at the central site above the side holes of the instrument. Finally, the free part of the silicone drain was divided vertically into four even pieces like octopus arms. As the instrument attached with the divided silicone drain tip could not be inserted from 5 mm trocar, it was inserted from 12 mm trocar or directly through the EZ Access (Multi channel port, Hakko Co., Ltd., Nagano, Japan) when placed on the abdomen [4]" After our first report in 2015, we used divided silicone drain tip for several laparoscopic surgeries of esophageal hiatal hernia, gastric cancer, colon cancer, rectal prolapse, appendicitis, liver cancer, cholecystolithiasis, and cholecystitis.

2.2. Results

An irrigation-suction instrument attached with the divided silicone tip could supply water straightly (**Figure 6**), which could avoid wetting the scope. The divided silicone drain tip could block and prevent the irregular adsorption of fatty tissue (**Figure 7**), and at the same time,

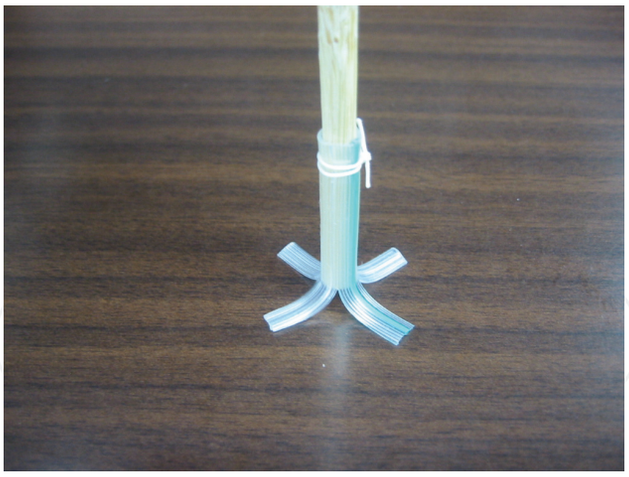

Figure 4. The shape of divided silicone drain tip into four pieces.

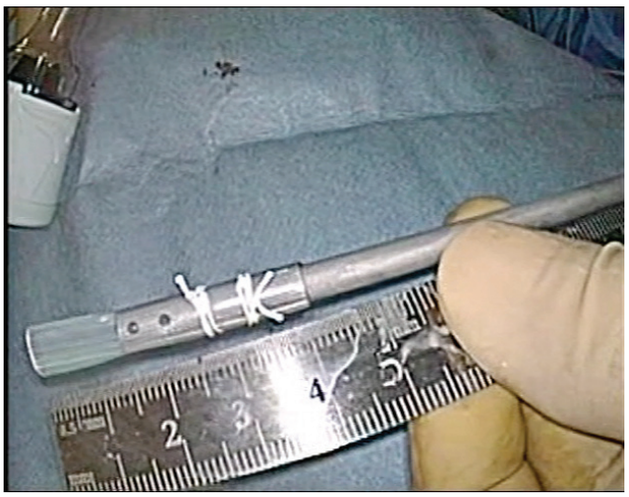

Figure 5. Silicone drain divided into four pieces at the tip of 1.2 cm was attached to a usual irrigation-suction instrument.

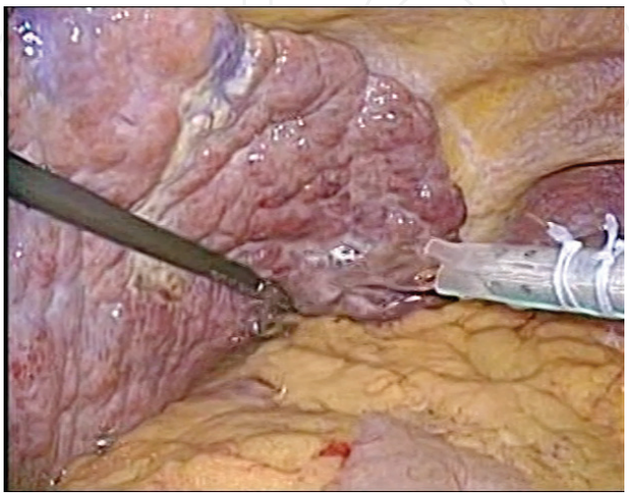

Figure 6. The divided silicone tip attached to an irrigation-suction instrument could supply water straightly.

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saline or fresh blood could be sucked continuously (**Figure 8**). Coagulated blood also could be sucked through the divided silicone drain tip (**Figures 9** and **10**). This device would be effective for sucking a large amount of irrigated saline for a long time continuously.

2.3. Comments

As it was mentioned in the previous report [4], we studied reports on "irrigation-suction instrument" and "irregular adsorption of fatty tissue" in PubMed and Japanese Medical Abstracts Society Web (JMASWeb). There were no paper and only four proceedings of conference in JMASWeb (in Japanese). However, the technique was different from ours. We studied the optimum length and pieces of the divided arms in silicone drain tip. The length of 1.2 cm and the pieces of four were optimum. Silicon drain of 100% was flexible and had many fine vertical ditches at the inner side. These ditches enforced drainage and increased the tenacity of the arms to block fatty tissue. It could be detected with its X-ray impermeable marker when dropped in the abdominal cavity.

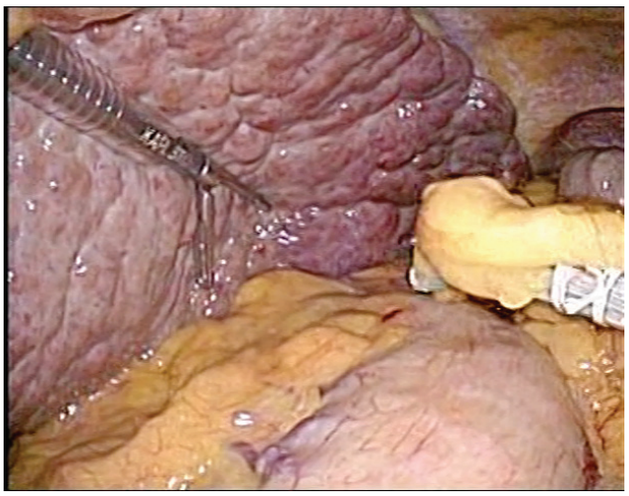

Figure 7. The divided silicone tip could block fatty tissue only to suck saline.

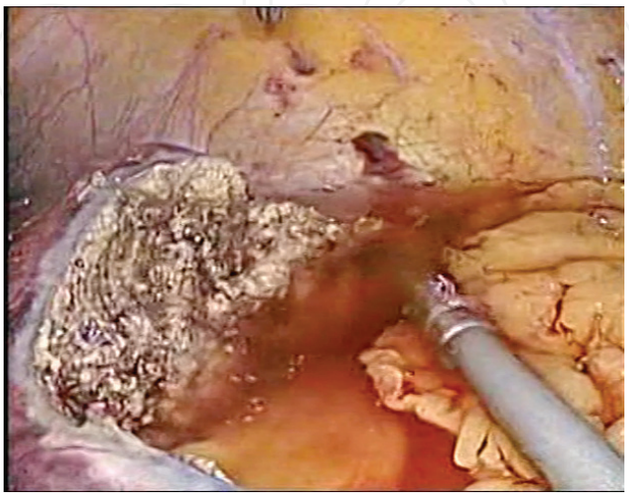

Figure 8. The divided silicone tip could suck saline continuously without irregular adsorption of fatty tissue.

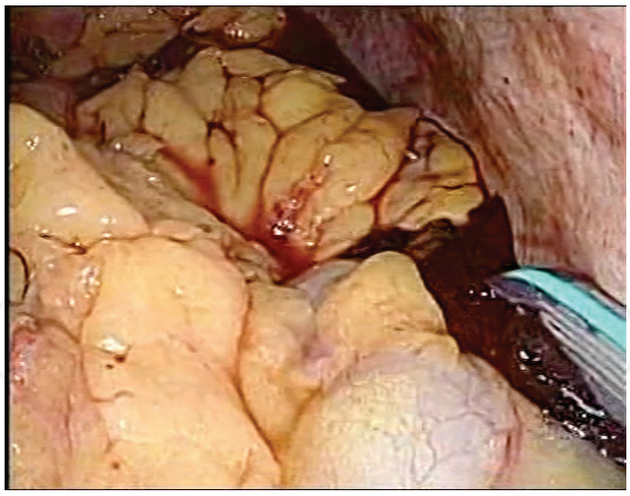

Figure 9. Before sucking the coagulated blood.

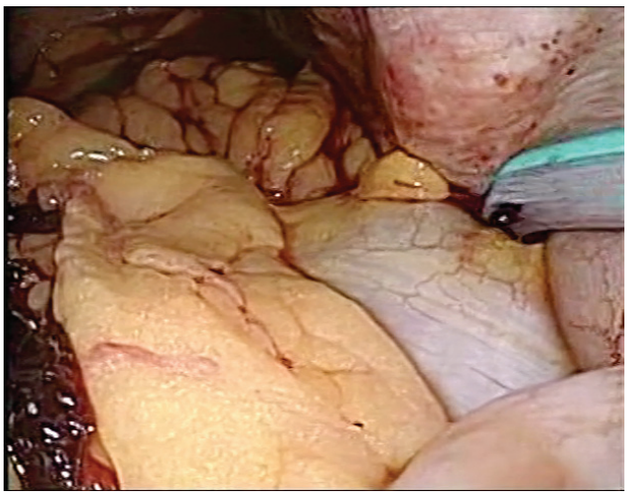

Figure 10. After sucking the coagulated blood.

3. Count-on Q™

3.1. Materials and methods

The Count-on Q™ (**Figure 11**), the basic concept that was devised by Dr. Atsushi Umemoto (Sainokuni Higashiomiya Medical Center, Saitama pref., Japan), was manufactured and released in Japan in October 2014. It was made of stainless steel, was re-usable, and had four types of lengths (32, 40, 50, and 60 cm). It consisted of an inner pipe of 4.0 mm in diameter and an outer sheath of 5.0 mm in diameter (**Figure 12**). The inner pipe was 0.5 cm shorter than the outer sheath, had a main end hole and four small side holes on the end and had a bulge of 1.0-cm length at the middle to seal the opening space from the outer sheath. The outer sheath

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Figure 11. Count-on Q™.

Figure 12. Count-on Q™ consisted of an inner pipe (right) and an outer sheath (left).

had five small holes on the end plane, four small holes on the end side, and 25 small side holes by five lines for 10.5-cm length from the tip (total 134 holes). Count-on Q™ was attached with a screw to the FineFlow™ irrigation-suction system (Pro-Seed Co., Tokyo, Japan) when using (**Figure 13**).

3.2. Results

We used Count-on Q™ two times in laparoscopic cholecystectomy and laparoscopic rectopexy for rectal prolapse. Saline was splashed in all directions (**Figure 14**) and could be sucked continuously without irregular adsorption of fatty tissue (**Figure 15**). Count-on Q™ could also suck fresh blood, but could not suck up the coagulated blood (**Figure 16**) and the small piece of tissue (**Figure 17**) because the holes were small. By the structural benefit, Count-on Q™ could suck only saline or fresh blood without sucking air while being sunk in at least 1-cm depth.

3.3. Comments

The same structural irrigation-suction instrument for open surgery had already existed. On the other hand, the concept to make the same one for laparoscopic surgery was marvelous. I tried to suck a cup of water by Count-on Q™ and could suck it up to the bottom of the cup without sucking air. In twice clinical use, we tried a large amount of irrigation and stress-free

Figure 13. Count-on Q™ attached to FineFlow™ irrigation-suction system.

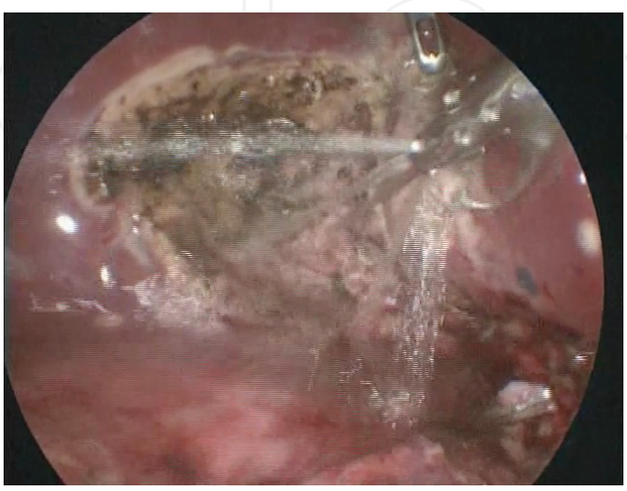

Figure 14. Saline splashed in all directions from count-on Q™.

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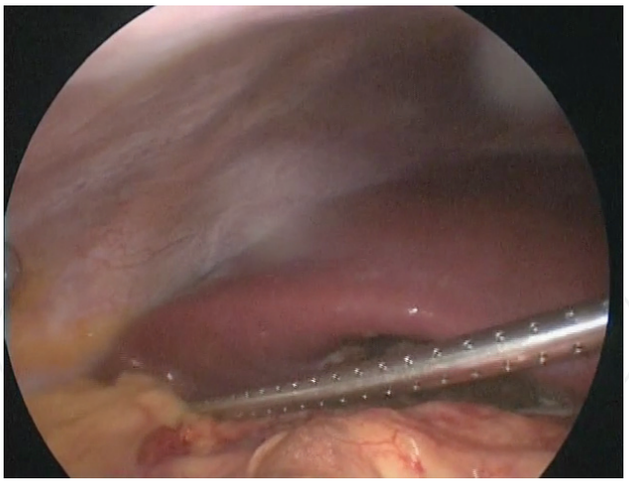

Figure 15. Count-on Q™ in the fatty tissue could suck continuously without irregular adsorption of fatty tissue.

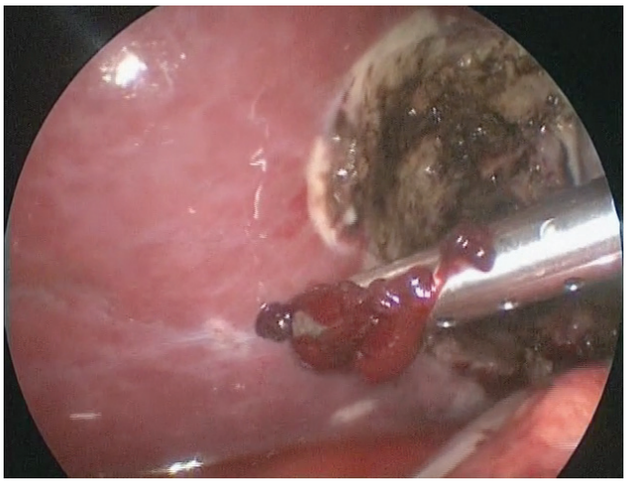

Figure 16. Count-on Q™ could not suck up the coagulated blood.

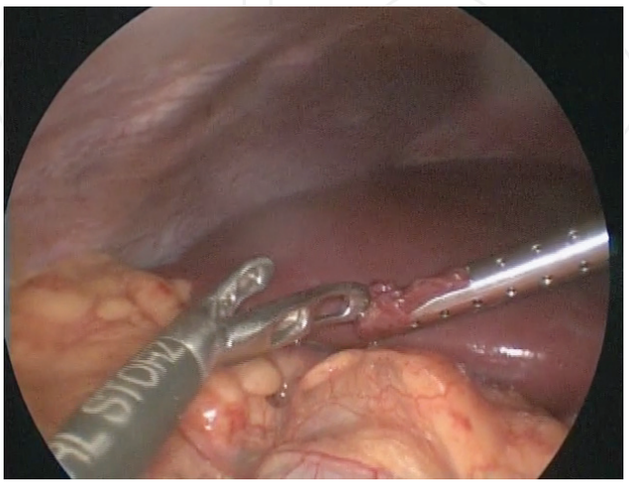

Figure 17. Count-on Q™ could not suck up the small piece of tissue.

continuous suction of saline and fresh blood. However, it could not suck the coagulated blood or the small piece of tissue because the holes were small. Therefore, it would be more suitable for a large amount of irrigation and suction for laparoscopic surgery of acute pan-peritonitis, for example, caused by digestive tract perforation.

4. Conclusions

Divided silicon drain tip was a simple, easy, and inexpensive device to facilitate the prevention of irregular adsorption of fatty tissue while using a usual irrigation-suction instrument for laparoscopic surgery.

Count-on Q™ was the masterpiece of irrigation-suction instrument, preventing the irregular adsorption of fatty tissue by itself.

Acknowledgements

I confirmed the permission from Fuji Systems Inc. (Tokyo, Japan) to use the silicon drain for this new method. I had no funding about this chapter.

Conflict of interest

I declare that there was no conflict of interest.

Notes/thanks/other declarations

I declared to express my thanks to Pro-Seed Co. (Tokyo, Japan) for the permission to report the Count-on Q™ with the FineFlow™ irrigation-suction system.

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