



Endoscopic Surgeon Should be Aware of Earth Environment

Saburo Kakizoe^{1*}, Yumiko Kakizoe¹, Teruomi Iwai² and Keiji Kakizoe¹

¹Department of Surgery, ILIKAI KAKIZOE Hospital, Japan

²Department of Internal Medicine, ILIKAI KAKIZOE Hospital, Japan

Abstract

Endoscopic surgery uses many of disposable instruments which packed with plastic. We investigate the amount of plastic waste of each open and endoscopic surgery to know the actual situation and to try to reduce plastic surgery during operation. Total plastic weight is twice or three times heavier in endoscopic surgery than open surgery. However total medical waste in long operation is tend to be heavy in Open surgery. Even appendectomy and herniorrhaphy many of plastic are used in endoscopic surgery. Since the development and widespread practice of endoscopic surgery, there has been an increase in the number of disposables, and the plastic waste that packs them. We endoscopic surgeons try to demand that medical device companies reduce the amount of plastic wrapped in medical devices to keep the earth environment.

Keywords: Endoscopic surgery; Medical wastes; Earth environment

Introduction

Since 1990, endoscopic surgery grows rapidly as well developed and patient acceptable method, and the disposable medical instruments increase in the world. Although the medical wastes share a little part of total industrial wastes, we should be aware of the earth environment. The plastic waste has been major problems of the earth environment. The infected medical wastes including endoscopic disposable instruments are burned completely, which may cause CO₂ increasing. On the other hand, almost endoscopic disposable instruments are covered with plastic before use, and they are discarded as plastic waste (Figure 1). We investigate the medical waste during surgery in the focus of the plastic waste of open surgery and endoscopic surgery.

Methods

We investigate the weight of medical waste during surgery from patients since April 2019 to July 2020 who got surgery in our hospital. The medical waste is classified to Infected Waste (IW), Ordinal Paper Waste (OW), and Plastic Waste (PW). The amount of wastes in endoscopic surgery (34 cases), open surgery (21 cases) and converted endoscopic to open surgery (5 cases) are investigated. The operative time and amount of waste for each procedure were compared and discussed.

Results

As shown in Figure 2A, in terms of the total amount of waste, converted surgery is the most common, followed by open surgery and endoscopic surgery. As shown in Figure 2B, IW increases with time in open surgery, while in laparoscopic and converted surgery it increases for about 3 h after the start of surgery but remains constant thereafter. This is because in the case of open surgery, the amount of gauze used increases over time, whereas in the case of laparoscopic and converted surgery, the majority of IWs are made with disposable instruments. The amount used often depends on the procedure and does not increase with a longer surgery. As shown in Figure 2C, OW increases with time in open surgery and converted surgery. Laparoscopic surgery does not use so many OW. PW increases within 3 h of the start of surgery, as the previously mentioned in total waste in endoscopic surgery. PW volume increases over time in the case of open surgery and converted surgery (Figure 2D). By operative method as shown in Table 1, Plastic Waste (PW) is more common in endoscopic gastrectomy and colon/rectal surgery than in open surgery, because most instruments used in endoscopic surgery are packed in plastic. The reason why the IW of endoscopic gastrectomy and colon/rectal surgery are only twice heavier than IW of open surgery is probably because of the fact that heavy gauze waste, containing blood, is counted more in open

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*Correspondence:

Saburo Kakizoe, Department of Surgery, Internal Medicine, ILIKAI Medical INC, KAKIZOE Hospital, Kagamigawa 278, Hirado, Nagasaki 859-5152, Japan, Tel: 81-950-23-2151; Fax: 81-950-22-5131; E-mail: saburo-k@kakizoehospital.or.jp

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Table 1: Average waste of each operation.

| | Total waste | Infected waste | Ordinal paper waste | Plastic waste |
|--------------------------------------|-------------|----------------|---------------------|---------------|
| Gastrectomy, colectomy | 3060 ± 1035 | 2540 ± 1193 | 400 ± 158 | 120 ± 45 |
| Laparoscopic, gastrectomy, colectomy | 6684 ± 1238 | 5657 ± 887 | 279 ± 177 | 1536 ± 547 |
| Herniorrhaphy | 2233 ± 125 | 1700 ± 200 | 433 ± 153 | 100 |
| Laparoscopic, Herniorrhaphy | 3942 ± 1447 | 2646 ± 1430 | 281 ± 111 | 980 ± 111 |
| Laparoscopic, cholecystectomy | 4999 ± 1930 | 3969 ± 1815 | 266 ± 201 | 764 ± 223 |
| Laparoscopic, appendectomy | 4765 ± 658 | 3650 ± 495 | 250 ± 71 | 865 ± 233 |

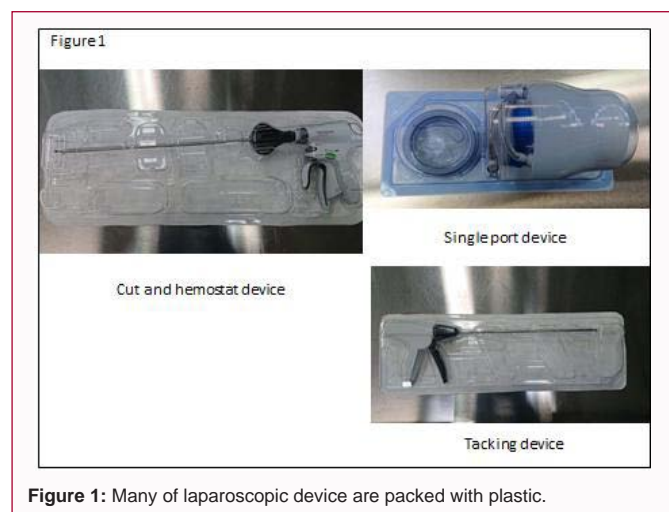
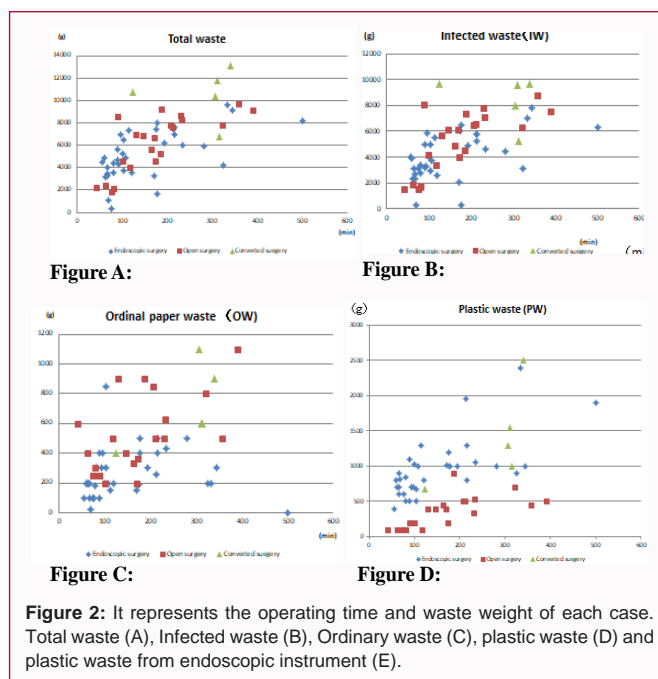


Figure 1: Many of laparoscopic device are packed with plastic.

surgery. We use Semi-disposable trocar for laparoscopic surgery. We believe that this reduces plastic waste in any way possible. The reason why the endoscopic procedure with the similar operative time but the cholecystectomy produces less plastic waste than the appendectomy is because the appendectomy is performed in a single port and the single port instrument is packed with more plastic. Even if it is a relatively short operation, many disposable instruments are used for endoscopic hernia repair. Although various types of meshes are packed with plastic and they are used in both open and endoscopic herniorrhaphy, PWs are increased by using a tucker in endoscopic surgery.

Discussion

Plastic is an important material in our daily lives due to its versatility, light weight and low production cost. Plastics became essential in many sectors such as construction, engineering applications, automotive, aerospace and medical industry. In modern society, plastics are used in various fields due to their convenience. Therefore, the increase in plastic waste has become a major environmental problem [1-4]. Since 1990, endoscopic surgery grows rapidly as well developed and patient acceptable method, and the disposable medical instruments increase in the world [5,6]. Although the medical wastes share a little part of total industrial wastes, we should be aware of the earth environment. When considering solid waste composition, it is necessary to incorporate various factors into the analysis [7]. In the present study, it was found that disposable instruments used in endoscopic surgery are incinerated as IW, while open surgery is heavier because of the addition of blood-containing gauze and other [8]. Operative time and waste compared between endoscopic and open surgery, endoscopic surgery increases in the first three hours of surgery, but not much afterwards. Open surgery has an increase in all waste over time because of the blood-containing



gauze and mechanical anastomosis devices and the plastic that wrapped them. Endoscopic surgeons use various devices, such as trocars and harmonics, at the beginning of the operation, and the amount of plastic wrapped in them increases at the beginning of the operation [9]. Although appendectomy is a short operative time procedure, the proportion of PW was significant. We use the single port method to perform an appendectomy. The single port method for appendectomy has become widely used [10-12]. Although it is a sophisticated operation, it uses more instruments and therefore more plastic packing them. Since the development and widespread practice of endoscopic surgery, there has been an increase in the number of disposables, and the plastic waste that packs them. Our hospital has been using semi-disposable products to reduce medical waste since 1991 when we began endoscopic surgery; however this study has made us realize that there is still room for improvement. While it is acceptable for various endoscopic surgical instruments to be disposable, one must consider whether or not the plastic that wraps them is necessary. We endoscopic surgeons try to demand that medical device companies reduce the amount of plastic wrapped in medical devices to keep the earth environment.

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