

Sealing of a drain hole using 2-octylcyanoacrylate monomer after lymphadenectomy for gynecologic cancer

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Summary

In this study, the authors investigated whether lymphocele infection can be prevented using 2-octyl cyanoacrylate monomer, a skin closure material that provides a microbial barrier. The subjects were 34 patients treated with 2-octyl cyanoacrylate monomer to close the drain hole (n=17) or with natural drain closure only (n=17). In the control group, eight cases (47.1%) had leakage of lymph fluid that required regular changes of dressing after removal of the catheter, seven (41.1%) had lymphocele, and three (17.6%) developed lymphocele with infection. In contrast, in the 2-octyl cyanoacrylate monomer group, no cases had long-term leakage of lymph fluid and none required dressing changes, although three had leakage after the first application and required a second application of 2-octyl cyanoacrylate monomer for closure. Six cases (35.3%) had lymphocele and there were no cases with infection in the 2-octyl cyanoacrylate monomer group. 2-octyl cyanoacrylate monomer may contribute to reduction of the incidence of lymphocele infection and reduce the clinical burden caused by dressing changes.

Key words: Lymphadenectomy; Lymphocele; 2-octyl cyanoacrylate monomer.

Introduction

In gynecologic malignancies, surgery including lymphadenectomy is usually selected as the first treatment to evaluate tumor progression, treat primary tumor, and metastasis. Formation of lymphocele is a complications occurring after lymphadenectomy, with a reported incidence in the range of 1-58% [1-4]. Most lymphocele are asymptomatic and are usually identified in postoperative or routine follow up. However, 5-34.5% are symptomatic, and conditions such as infection may delay subsequent cancer treatment [1, 5, 6]. A draining catheter is generally inserted into the pelvic cavity during surgery to divert both blood and lymph fluid to prevent formation of a lymphocele. However, catheter drainage may actually increase the incidence of lymphocele formation and may be involved in development of infection [7]. A drain hole that may allow overflow of lymph fluid remains after removal of the catheter, and the present authors hypothesize that an open hole and wet conditions may be associated with lymphocele infection.

A highly purified 2-octyl cyanoacrylate monomer is a skin closure device closing easily approximated skin edges of wounds. This material provides a protective barrier that adds strength and inhibits bacteria, with formation of an especially flexible microbial barrier against organisms responsible for surgical site infections. Here, the authors investigated whether these properties of 2-octyl cyanoacrylate monomer applied to a drain hole can prevent lymphocele infection after lymphadenectomy.

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Materials and Methods

The subjects were 34 patients with gynecologic cancer who underwent surgery including lymphadenectomy performed by the same surgeon at the Department of Obstetrics and Gynecology, National Hospital Organization Saitama National Hospital, between September 2014 and July 2015. The patients were classified into two groups, based on treatment after postoperative removal of the draining catheter: cases in which 2-octyl cyanoacrylate monomer was used to close the drain hole and form a protective barrier (monomer group, n=17), and those in which the drain hole was allowed to close naturally (control group, n=17). In the 2-octyl cyanoacrylate monomer group, the edge of the drain hole after removal of the catheter was adjusted by pushing the skin, and then 2-octyl cyanoacrylate monomer was spread over the hole wound and left to seal for one minute. In the control group, the drain hole after removal of the catheter was simply covered with an absorbent pad. Clinical background, amount and duration of leakage of lymph fluid, and incidences of lymphocele formation and infection were compared between the groups. Data were analyzed by Fisher exact test and Student *t*-test using SPSS software, with $p < 0.05$ considered to be significant. The study protocol was approved by the institutional ethics committee.

Results

The clinical features of the 2-octyl cyanoacrylate monomer group (n=17) and the control group (n=17) are shown in Table 1. The average (\pm SD) ages of the patients

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Table 1. — Demographic and clinical characteristics of the cases.

Item	Monomer (n=17)	Control (n=17)	p-value
Age (years, average)	53.5	55.1	0.70
Body mass index (kg/m ² , average)	22.4	22.7	0.84
Types of cancer (n)			
Cervical cancer	5	4	
Endometrial cancer	4	9	
Ovarian cancer	8	4	
Area of lymphadenectomy			
Pelvic lymphadenectomy	5	10	
Pelvic + para-aortic lymphadenectomy	12	7	

in these groups were 53.5 ± 10.3 and 55.1 ± 13.4 years, respectively, and the mean BMIs were 22.4 ± 4.6 and 22.7 ± 3.8 kg/m², respectively, with no significant differences between these values. In the 2-octyl cyanoacrylate monomer group, the patients had cervical (n=5), endometrial (n=4), and ovarian (n=8) cancer, and lymph node dissection was performed by pelvic lymphadenectomy alone (n=5) or with para-aortic lymphadenectomy (n=12). In the control group, the patients had cervical (n=4), endometrial (n=9), and ovarian (n=4) cancer, and underwent pelvic lymphadenectomy alone (n=10) or with para-aortic lymphadenectomy (n=7).

Application of 2-octyl cyanoacrylate monomer to the hole after removal of the draining catheter is shown in Figure 1. There were no adverse effects, including no skin burn due to the polymerization reaction. The clinical outcomes in each group are shown in Table 2. In the control group, eight cases (47.1%) had leakage of lymph fluid that required regular changes of dressing after removal of the catheter. The average period with leakage was 4.6 days, and the average volume was 161.6 ml. In contrast, in the 2-octyl cyanoacrylate monomer group, no cases ultimately had leakage of lymph fluid and none needed dressing changes ($p < 0.005$), although three cases had initial leakage after the first application and required closure with a second application

Table 2. — Clinical outcomes in the 2-octyl cyanoacrylate monomer and control groups.

Clinical outcomes	Monomer (n=17)	Control (n=17)	p-value
Leakage of lymph fluid after removal of draining catheter (%)	0*	47.1	< 0.005
Duration of leakage (days, average)	–	4.6	
Volume of leakage (ml, average)	–	161.6	
Lymphocele formation (%)	35.3	41.1	0.72
Size of lymphocele (cm, average)	6.9	7.1	0.73
Pelvic infection by symptomatic lymphocele (%)	0	17.6	0.22
Adverse effect	0	–	

* Three cases had leakage of lymph fluid, and these leaks were closed by a second application of 2-octyl cyanoacrylate monomer.

of 2-octyl cyanoacrylate monomer. Lymphocele formation occurred in seven cases (41.1%) with a mean size of 7.1 cm in the control group, and in six cases (35.3%) with a mean size of 6.9 cm in the 2-octyl cyanoacrylate monomer group, with no significant difference in incidence between the groups. A symptomatic lymphocele requiring treatment occurred in three cases (17.6%) in the control group, but in no cases in the 2-octyl cyanoacrylate monomer group.

Discussion

Lymphadenectomy is a surgical method used for stage evaluation and treatment of gynecologic cancer. Complications after lymphadenectomy include lymphocele and chronic lymphedema of the lower extremities. A lymphocele (also referred to as a lymphocyst) is a pooling of lymph fluid following surgical lymph dissection and inadequate closure of afferent lymphatic vessels. Some lymphoceles are symptomatic and cause postoperative morbidity and delay of cancer treatment, and thus it is important clinically to reduce the incidence and prevent infection of lymphoceles. Several techniques have been proposed to reduce this incidence after lymphadenectomy, including leaving the peritoneum open after surgery, leaving the vaginal stump open after surgery, preventive and prophylactic postopera-



Figure 1. — Application of 2-octyl cyanoacrylate monomer to the hole after removal of the draining catheter. Left: before removal of the draining catheter; middle: after removal of the draining catheter; right: Just after application of 2-octyl cyanoacrylate monomer.

tive drainage, omentoplasty [8], and new technologies using biological glue, Ultracision, LigaClip, and octreotide [8-14]. However, these procedures do not significantly inhibit lymphocele formation.

An infected lymphocele can be treated conservatively with antibiotics or intervention radiology, or surgically by laparoscopy or laparotomy [8]. However, most lymphoceles are asymptomatic and the best approach is to prevent infection. In this study, the authors hypothesized that lymphocele infection occurs via the draining hole just after lymphadenectomy. They then tried to block this process using a highly purified 2-octyl cyanoacrylate monomer that is used to close surgical wounds and provides a microbial barrier with inhibition of bacteria [15-20]. The incidence of lymphocele did not differ significantly between the 2-octyl cyanoacrylate monomer and control groups, but lymphocele infection did not occur in cases treated with 2-octyl cyanoacrylate monomer, whereas three cases (17.6%) had infection in the control group. 2-octyl cyanoacrylate monomer also eliminated leakage of lymph fluid, which reduced the time and effort required for changes of dressing regularly, and had no adverse effects, although allergic reactions to 2-octyl cyanoacrylate have been reported [21].

Conclusions

2-octylcyanoacrylate monomer can be used safely to reduce the incidence of lymphocele infection and lower the burden of dressing changes after lymphadenectomy.

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