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ORIGINAL ARTICLE
Reconstructive

Contact Dermatitis Caused by Dermabond Advanced Use

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Background: Dermabond Advanced (DBA) has been widely used globally; however, severe contact dermatitis (CD) can be a serious adverse effect of DBA use. In this study, we investigated the characterization and incidence rate of CD after using DBA and the safe use of DBA.
Methods: One hundred consecutive patients who underwent skin closure with DBA were investigated. All patients were women undergoing breast reconstruction. DBA was applied to their trunk and limbs following reconstruction.
Results: Seven patients (7%) presented with CD. Of these, 4 patients exhibited CD after the second DBA use; sensitization influence by the first DBA use was considered. One of 3 patients presenting with CD after the first DBA use was allergic to cosmetic glue, and the influence of immunological cross-reaction of acrylates was suggested.
Conclusion: We consider that DBA use is inadequate for wounds with an improper margin and in dry and low-skin barrier areas such as the trunk and limbs because it may induce irritant CD and sensitization of DBA and subsequent allergic CD. Frequent use can also induce sensitization. If patients have a history of acrylate allergies, DBA use should be avoided because immunological cross-reaction from acetylates could result. *(Plast Reconstr Surg Glob Open 2018;6:e1841; doi: 10.1097/GOX.0000000000001841; Published online 14 September 2018.)*

INTRODUCTION

Dermabond Advanced (DBA) is a liquid skin adhesive agent containing 2-octyl-cyanoacrylate. It has been widely used globally and has many advantages. It is easy to handle and apply to the skin surface. Faster and stronger skin closure is achieved compared with traditional skin closure by suturing.[1] It also acts as a barrier to the bacteria that may lead to infection.[2] Moreover, DBA is waterproof; hence, patients can take shower immediately after surgery.[2–4] There are also no sutures to remove, which is especially useful for small children. Regarding the cosmetic result, it is considered that DBA offers the same results as that of traditional suture closure.[5–7] Conversely, some case reports on contact dermatitis (CD) after DBA use, which is a bothersome complication and sometimes leads to a serious systematic allergic reaction, have been reported recently.[8–14] However, accurate and reliable information regarding the incidence has not been reported in previous studies and also in the attached document on DBA.

In this study, we investigated the characterization of CD after DBA use and examined its incidence rate from our clinical experiences to clarify the adequate use of DBA. Based on these results, we also evaluated the safe use of DBA in the clinical setting.

PATIENTS AND METHODS

We conducted a retrospective review of 100 consecutive patients who underwent skin closure with DBA at Jichi Medical University Hospital between June 2012 and December 2015 (Table 1). All patients underwent breast reconstruction surgery, and DMB was mainly used on their trunks, such as, for abdominal wound closure after abdominal flap elevation (Fig. 1), abdominal secondary scar revision, small skin stab closure for fat aspiration in minor revision of reconstructed breasts, and other surgeries. Before DMB use, deep dermal suture with 3-0 or 4-0 absorbable monofilament suture was carried out in all

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Received for publication February 22, 2018; accepted May 4, 2018.
Name of Trial database registered: Investigation about contact dermatitis after DERMABOND use.
All study participants provided informed consent, and the study was approved by the appropriate ethics review boards at Jichi Medical University.

DOI: 10.1097/GOX.0000000000001841

Disclosure: *The authors have no financial interest to declare in relation to the content of this article. The Article Processing Charge was paid for by the authors.*

Table 1. Patient Demographics and History

Patient characteristics	Patients (n = 100)
Age	
Mean (range)	48 y (30–72)
Sex	
Male/female	0/100
Occurrence of CD	7 (7.0%)
No. DBA uses	
Mean (range)	2.0 (1–6)
Surgical procedures	Related to breast reconstruction*
	Abdominal wound closure after flap elevation (74)
	Secondary abdominal scar revision (51)
	Stab closure of lipoaspiration to harvest grafted fat (32)
	Others (3)

*The procedures were carried out in duplication.

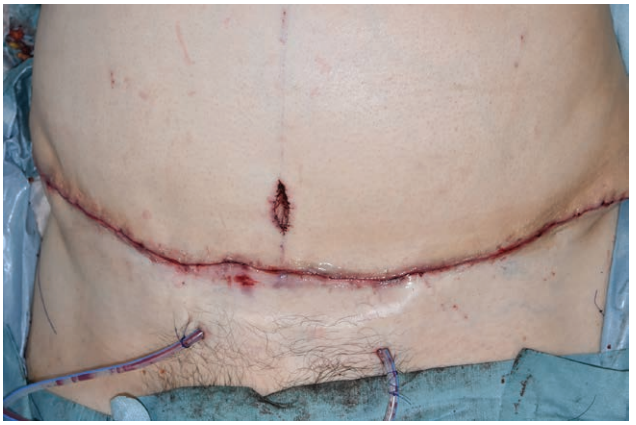

Fig. 1. Abdominal wound closure with Dermabond after flap elevation.

patients. In many patients, DMB was used multiple times (mean, 2 times; range, 1–6 times). The characteristics of each patient, history of surgery, and incidence of CD after DBA use were investigated from clinical charts and photographs. All study participants provided informed consent, and the study was approved by the appropriate ethics review boards at Jichi Medical University.

RESULTS

The mean age of the patients was 48 years (range, 30–72 years; Table 1). Seven patients presented with typical CD including pruritic rash, skin redness, inflammation, and delayed skin pigmentation. Their characteristics are briefly presented in Table 2. Three of 7 patients experienced CD after the first use of DBA. Conversely, the other 4 patients did not exhibit CD after the first use of DBA; instead, it developed after the second use. CD was treated by steroid ointment in all patients, and the acute symptoms such as eczema and itching were cured in a relatively short period of time. Severe symptoms were also avoided. However, postinflammatory hyperpigmentation remained long.

CASES

Patient 1

A 53-year-old woman with a history of allergy to eyelash extension glue underwent secondary autologous breast reconstruction. DBA was used for skin closure at the donor site of the abdominal flap. She exhibited CD after the first use of DBA and experienced severe itching and long-lasting skin pigmentation (Fig. 2).

Patient 2

A 36-year-old woman with allergies to unknown antibiotics underwent immediate breast reconstruction with an abdominal flap. DBA was used for the first time to close the abdominal donor-site wound. The wound was healed without any issue at that time. However, when abdominal scar revision was performed and DBA was used again 8 months after the first operation, she experienced severe CD (Fig. 3).

Patient 3

A 46-year-old woman with allergy to crustaceans underwent autologous breast reconstruction; DBA was used several times. She exhibited CD every time DBA was used; this was documented in her medical record. Later, she received forearm scar revision caused by anticancer drug leakage. DBA was erroneously used again; we removed it immediately and closed the wound with a nylon blade. However, acute allergic reactions occurred with severe blisters and skin redness (Fig. 4).

DISCUSSION

CD is a localized skin inflammation with eczema caused by contact with a foreign substance and mainly divided into 2 classes, such as irritant contact dermatitis (ICD) and allergic contact dermatitis (ACD). ICD is defined as inflammatory dermatitis that occurs when the epidermal barrier is broken and antigens can easily pass through. Allergic contact dermatitis is thought to be a type IV delayed allergic reaction; it occurs with smaller amounts of hapten than ICD and sometimes appears after the second and subsequent use of DBA due to sensitization.[15] In our study, we experienced CD in 7 of 100 patients on their

Table 2. Patients of Contact Dermatitis

Patient No.	Age	Allergic History	Occurrent Procedure of Contact Dermatitis
1	53	Cosmetic glue for eyelash extension	Abdominal wound closure after flap elevation (first time use)
2	36	Antibiotics of unknown type	Scar revision of the abdominal scar after flap elevation (second time use)
3	46	Crustaceans	Stab closure of fat aspiration for fat graft for breast (second time use)
4	51	Milk product, chicken, fish, egg, oyster	Stab closure of fat aspiration for fat graft for breast (second time use)
5	48	None	Scar revision of the abdominal scar after flap elevation (second time use)
6	43	None	Abdominal wound closure after flap elevation (first time use)
7	46	Metallic allergy	Abdominal wound closure after flap elevation (first time use)

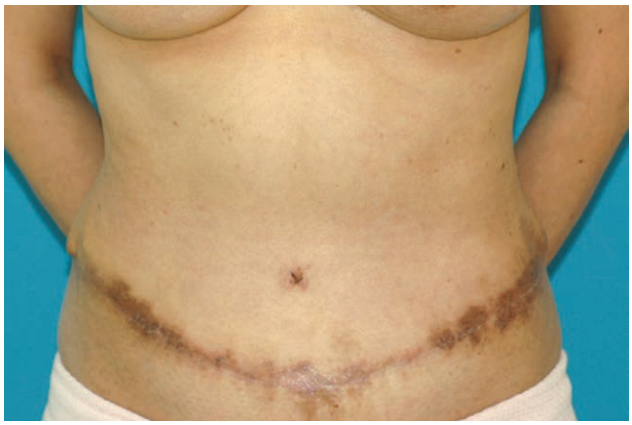

Fig. 2. A 53-year-old woman represents contact dermatitis just after the first use of Dermabond for abdominal wound after flap elevation. She experienced severe itching and long-lasting skin pigmentation after dermatitis.

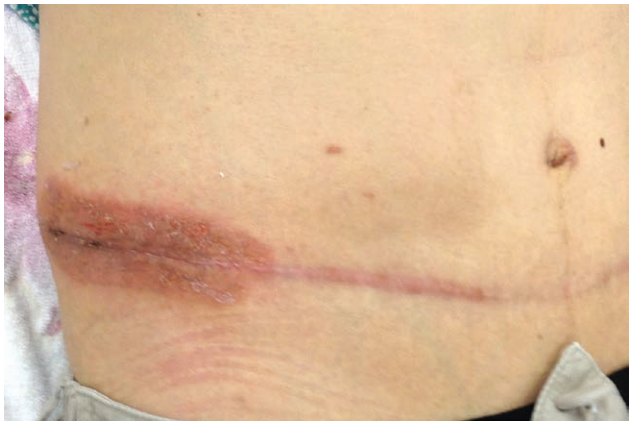

Fig. 3. A 36-year-old woman exhibited severe contact dermatitis after a second use of Dermabond for abdominal scar revision. No issue was observed after the first Dermabond use to close the abdominal donor-site wound.

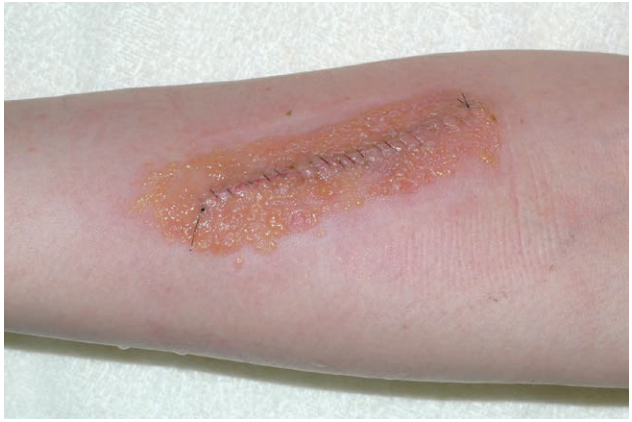

Fig. 4. A 46-year-old woman had a documented history of contact dermatitis after Dermabond use. Later, she received scar revision of her forearm scaring caused by anticancer drug leakage of anticancer drug. Dermabond was erroneously used again; it was immediately removed, but acute allergic reactions occurred with blisters and skin redness.

trunks and limbs (7.0%). The incidence rate was higher than what we expected, and it seemed to be unacceptable for clinical use. We supposed there were several reasons for such a high incidence.

First, we supposed that the site of DBA application in our series would influence the incidence rate of CD. Generally, cyanoacrylates produce rapid polymerization upon contact with keratin, making it unlikely to trigger an immune response.[8,11] However, the epidermal barrier of the trunk and limbs in adult tends to be damaged because the skin of the trunk and limbs of an adult was generally dry and easily stimulated by friction from clothes. Therefore, antigens could penetrate the skin resulting in frequent CD in our patients.[16] In addition, it carried a risk of sensitization to DBA for the wound with row surface exposure.[13] In our study, the length of the wound was long and the wound margin did not always oppose accurately in many patients; thus, the row surface tended to remain even though deep dermal suture was carried out before DBA use (Fig. 1). These effects might cause sensitization of DBA and subsequent type IV allergic reaction. In our study, CD developed in 4 of the total 7 patients not with the first DBA use, but after the second use. In these patients, we considered that sensitization to DBA had been occurred with the first use of DBA. The frequent use of DBA (mean, 2 times; range, 1–6 times) may also have influenced the high incidence of CD because sensitization will increase simply by the frequent use. Therefore, when using DMB for the trunk and limbs in adults, we have to account for the risk of sensitization of DBA. Especially for long wounds with improper skin contact, it would be better to avoid using DBA.

Second, we considered the possibility that immunological cross-reaction existed in the adult patients with CD. The main component of DBA, 2-octyl-cyanoacrylate, is a long-chained acrylate and can induce a cross-reaction with other acrylates.[12,17,18] Acrylates were considered to be occupational contact allergens, and they have been seen in some cosmetics such as gel nails, acrylic nails, and cosmetic glues for eyelash extensions today. Today, many women perform nail and eyelash extensions. It is said that there is a female predominance of acrylate allergy, with a male/female ratio of 1:15.[17] Adult women are thought to contact acrylates frequently and a cross-reaction of 2-octyl-cyanoacrylate and other acrylates may occur. In our patient (patient 1), she had a history of allergy to cosmetic glue and presented with CD after the first DMB use. We supposed she might already have an allergy to acrylates by immunological cross-reaction of acrylates. Therefore, we believe it is very important to ask if patients have experienced allergies related to acrylates before using DBA.

In the past reports, the time at which patients had skin redness or pruritic rash varied from a few hours to 3 weeks after surgery.[8,9,11,12] Therefore, a patient who exhibits CD later may not be diagnosed properly initially. DBA cannot be easily peeled off once attached, and the wound area is exposed to the antigen for a long period. Therefore, CD often develops seriously, and systemic administration of large amounts of steroids is sometimes required for a severe allergic reaction.[12] We must understand the risk of

CD after DBA use and observe the wound until the product peels off spontaneously. The absence of the need to remove sutures is one of the advantages of DMB. That can be very variable for young patients. For adult patients, however, it is less relevant in comparison with young patients. Based on these facts, we believe that we should be more careful when using DMB.

The limitation of this study is that it was retrospective case series and there was no comparable investigation. It is also necessary to further investigate the differences in the incidence by site, age, and sex in a large sample of patients. However, there has been no detailed report on the frequency and occurrence status of CD due to DMB so far. Therefore, we believe that our study is valuable in that it provides the frequency of complications of DMB and highlights the benefits for surgeons in the ease-of-use of DMB.

CONCLUSIONS

Here, we report 7 adult cases of CD caused by DBA in 100 adult patients. DBA is useful for wound closure, but CD can be a serious problem for patients. We have to appreciate the risk of this bothersome side effect of DBA and observe the wound until the product peels off spontaneously. Use for wounds with improper margin contact and an exposed surface in some parts, use for dry and low-skin barrier area, multiple use in the same patient, and risk sensitization of DBA and related CD should be carefully considered. If patients have histories of allergies to acrylates, use of DBA should be avoided.

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