

Case Report

# Allergic reaction to Dermabond in gynaecologic surgery

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## Abstract

A 63-year-old female presented on post-operative day 7 status post total laparoscopic hysterectomy and bilateral salpingo-oophorectomy with sudden onset erythema and pruritus around all four port site incisions. Upon physical exam, a thin layer of Dermabond remained in place on the epidermis and an erythematous raised wheal (1-3 cm radius) surrounded each incision. The patient was advised to remove the skin adhesive with petroleum jelly and acetone. Dermatologist evaluation confirmed the suspicion of an allergic reaction to Dermabond and recommended application of a thin topical layer of hydrocortisone 1% to affected areas 2-4 times per day. Skin inflammation and pruritus abated completely within 2 days. Confirmatory allergic patch testing performed three years after initial reaction was positive for ethyl cyanoacrylate.

Dermabond is a liquid topical skin adhesive containing a monomeric 2-octyl cyanoacrylate formulation and the colorant D&C Violet #2 which should slough off with desquamation of the epidermis 7-14 days after application. There has never been a reported case resulting from gynaecologic surgery until now.

## Introduction

Laparoscopic and robotic hysterectomy are becoming increasingly popular alternatives to open abdominal procedures. Hysterectomy is one the most commonly performed surgeries in women in the United States. The number is still staggering even though some estimate that the number of hysterectomies has been steadily declining over the last decade from a peak of 681,234 performed in 2002 to 433,621 cases reported in 2010. This decline has been attributed to the introduction of minimally invasive techniques such as uterine artery embolization for the treatment of leiomyomata and non-surgical ablative therapies that are now commonly used for abnormal benign uterine bleeding [1]. However, it should be noted that these figures only include those patients requiring inpatient hospitalization and do not capture same-day surgery. Thus, the increasingly large number of hysterectomies being performed with traditional laparoscopic and robotically-assisted laparoscopic techniques may contribute to a gross underestimation of the actual number accomplished. In a cohort study of 264,758 women who underwent hysterectomy for benign gynaecologic disorders at 441 hospitals across the United States from 2007 to 2010, the use of robotically assisted hysterectomy increased from 0.5% in 2007 to 9.5% of all hysterectomies in 2010 and laparoscopic hysterectomy rates increased from 24.3% to 30.5% [2].

The increasing popularity of Dermabond in the gynaecologic operating room stems from its ease of use to close port site incisions at the end of laparoscopic surgery. Thus, allergic reactions should only increase as laparoscopic and robotically assisted hysterectomy replace open abdominal and vaginal techniques.

Dermabond is a liquid topical skin adhesive containing a monomeric 2-octyl cyanoacrylate formulation and the colorant D&C Violet #2 [3]. The use of Dermabond for surgical or traumatic wound closure was first approved in the United States by the FDA for human use in 1998. This addition is the most recent expansion of traditional skin wound closure techniques such as suture, staple, and adhesive tape approximation [4]. Dermabond has rapidly disseminated to nearly every surgical specialty due to the unique ease of use. The material is

rapidly converted from a liquid to a solid state via polymerization at room temperature without the need for a catalyst, evaporation of a solvent or application of pressure [5]. Contact with anionic substances, such as blood, initiates the polymerization reaction and the material quickly sets to form a dry solid film that holds apposed skin edges together [6]. This polymerization is an exothermic reaction which may release significant heat [7].

Use of cyanoacrylates for adhesive applications dates to their initial synthesis and patent in 1949 [8]. The adhesive property of the compound methyl 2-cyanoacrylate was first described in the literature by H.W. Coover and was marketed by the Eastman Kodak Company in 1958 as formulation "Eastman 910" [9]. The substance was used as an industrial adhesive for metal, glass, rubber, and plastics since its introduction and eventually gained popularity in households as Superglue. Medicinal use of cyanoacrylate adhesives before FDA approval dates to the Vietnam War where field surgeons regularly used the formulation to quickly stop haemorrhage from skin wounds [10]. Its medical use quickly spread and interestingly, the first reported use of a cyanoacrylate tissue adhesive on the human eye occurred in 1968 [11]. Off-label medical use was widespread in many surgical specialties and dentistry by the 1980's especially throughout Europe.

Concerns of tissue toxicity eventually excluded methyl 2-cyanoacrylate from use on human tissue [12]. Larger molecular weight monomers, such as the 2-octyl cyanoacrylate formulation used in Dermabond, have proven to be less histotoxic. Polymerized cyanoacrylate degrades into substances such as cyanoacetate and formaldehyde that may produce skin inflammation if accumulated

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in surrounding tissue [13]. Longer-chained cyanoacrylates, such as the 2-octyl cyanoacrylate monomer present in Dermabond, releases less degradation products than the short-chained monomers thus producing less potential histotoxicity. 2-octyl cyanoacrylate should slough off naturally with desquamation of the epidermis 7-14 days after application [14].

Although rare, cases of allergic contact dermatitis secondary to 2-octyl cyanoacrylate have been reported in the literature. However, there has never been a reported case resulting from use during gynaecologic surgery until now. Here we report a case of allergic reaction secondary to use of Dermabond at Mount Sinai Hospital in New York, NY.

## Case presentation

A 63-year-old nulliparous female presented on post-operative day 7 status post total laparoscopic hysterectomy and bilateral salpingo-oophorectomy with sudden onset of erythema and pruritus around all four port site incisions (Figure 1).

The surgical course a week before was uncomplicated. Intraoperatively, Veress needle entry was made into the abdominal cavity and a 5 mm trocar with scope was placed to visualize the abdominal cavity. Three additional trocars were placed in the right lower quadrant, left lower quadrant and at the umbilicus. The uterus was removed and then the vaginal cuff was closed with 0-vicryl suture. The trocars were removed, fascia closed with 0-vicryl suture and the skin edges were approximated and closed with two thin layers of Dermabond.

Past medical history is significant for stage 0 DCIS, chronic hypertension and migraine headache. Last menstrual period occurred at 42 years old. Surgical history is significant for partial left mastectomy performed two years prior and L5 laminectomy fifteen years before presentation. Anaphylactic allergic reaction, throat closure and systemic pruritus, has been noted following exposure to aspirin and codeine approximately 20 years prior. No history of previous extended contact with acrylate glues, such as Superglue, artificial nail or eyelash adhesives or dental treatment requiring use of adhesives.

Physical examination of the surgical incision sites revealed that they were all clean dry and intact. A thin layer of Dermabond remained in place on the epidermis and an erythematous raised wheal with a radius of 1-3cm surrounded each incision (Figure 2).

## Investigations

Not Applicable

## Differential diagnosis

Surgical site infection should always be considered when evaluating a potential allergic reaction to Dermabond or other skin adhesive.

## Treatment

The patient was advised to remove the remaining skin adhesive with petroleum jelly and acetone per the manufacturer's instruction and referred to a dermatologist. Subsequent dermatologic evaluation confirmed the suspicion of an allergic reaction to Dermabond. The dermatologist made recommendation to apply a thin topical layer of hydrocortisone 1% to affected areas two to four times per day.

## Outcome and follow-up

Skin inflammation and pruritus abated completely within two days. Skin patch testing performed three years after initial presentation was positive for ethyl cyanoacrylate.



**Figure 1.** Abdomen of 63-year-old patient on post-operative day 7 with sudden onset erythema and pruritus surrounding the umbilical, left upper abdominal, left lower abdominal and right lower abdominal 5-mm trocar sites



**Figure 2.** Close-up view of erythema surrounding the right lower abdominal 5-mm trocar site on post-operative day 7

## Discussion

Although there are only a few surgical cases reported regarding allergic reaction to topical application of 2-octyl cyanoacrylate, the current literature is rife with allergic reaction to other cyanoacrylate formulations especially when used during previous surgeries as outlined (Table 1) [13,15-24].

Our case, and the cases reviewed here, highlight the usual temporal presentation of allergic reaction to Dermabond. Pruritus will begin at the incision sites around post-operative day 3 and continue until development of visually apparent erythematous wheals surrounding each site around post-operative day 7.

Reports have also described allergic contact dermatitis following application of cyanoacrylate-containing false eyelash glue [25,26]. Work as a cosmetician with regular exposure to cyanoacrylate-based eyelash extension glue has also been linked to occupational asthma and allergic rhinitis [27]. Occupational asthma has also been linked to exposure to cyanoacrylate adhesives used to affix sculpted acrylic artificial nails in beauty salons [28]. Extensive exposure to these sources of cyanoacrylate adhesives should be investigated before the decision is made to use Dermabond for surgical skin closure as they may predispose the patient to allergic reaction.

## Learning points/take home messages

- The use of Dermabond as the first choice for closing surgical wounds will only increase with the increasing number of gynaecologic surgeries being performed robotically and laparoscopically.
- The potential adverse effects resulting from use of Dermabond should be discussed with every patient before use.

**Table 1.** Published reports of an allergic reaction to Dermabond

Field	Age (years)	Time elapsed from surgery to onset of allergic reaction (days)	Previous history of cyanoacrylate use	Confirmatory Testing	Publication
Orthopedic Surgery	66	28	None	Dermabond D2++/D4+++	El-Dars, <i>et al.</i> 2010
Orthopedic Surgery	12, 14, 16	2-3, 7-14	Unreported; each with 1-3 prior orthopedic surgeries	Dermabond D2+++/D4+++	Gonzalo-Garijo, <i>et al.</i> 2009
Plastic Surgery (abdominoplasty)	32	7	Unreported	Dermabond Positive	Hivnor, <i>et al.</i> 2008
Plastic Surgery (breast augmentation)	36	3	Yes, 1-year prior for tubal ligation with haphazard application and prolonged embedded application	Unknown	Perry, <i>et al.</i> 2009
Plastic Surgery (breast augmentation)	44	10	Unreported	Octyl-2 cyanoacrylate and Prineo self-adhering mesh ++	Dunst, <i>et al.</i> 2010
Plastic Surgery	49	3	Unreported	Dermabond +++	Sachse, <i>et al.</i> 2013
Orthopedic Surgery	50, 41	21, 3	Yes, with acrylic nails, Yes	Dermabond & 2-hydroxyethyl methacrylate +++, Dermabond & N-2-butyl cyanoacrylate +	McDonald & Buckley 2014
Breast Surgery	35, 39, 61	8, 5	Yes, for all	None	Caton & Dauphine 2014
Breast Surgery	55	7	Unreported	None	Ricci, <i>et al.</i> 2014
Neurosurgery, Laparoscopic General Surgery	33, 65, 35, 44	7, 7, 7	None for first case & yes for other 3 cases	2-octyl cyanoacrylate ++ & +++	Bowen, <i>et al.</i> 2014
Orthopedic Surgery	30	1	Unreported	Dermabond, Dermabond with chlorhexidine, and Dermabond with povidone iodine +++	Lefevre, <i>et al.</i> 2016

- Care should be taken to apply Dermabond in thin layers to the edges of apposed skin with minimal seepage into the wound cavity.
- Surgical site infection should always be considered when evaluating a potential allergic reaction to Dermabond or other skin adhesive.
- If an allergic reaction is encountered, Dermabond should be removed with petroleum jelly or acetone. Inflamed skin should be treated with hydrocortisone 1% applied topically two to four times per day until reaction abates.
- Skin patch testing can be utilized to confirm clinical suspicion for an allergic reaction to Dermabond.

### Patient's perspective

Not applicable.

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