

# Intraoperative Injection of Coloring Dye in the Surgical Treatment of Hidradenitis Suppurativa: A Case Report

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## Abstract

Hidradenitis suppurativa (HS) is a recurring and chronic inflammatory skin disease. Various medical and surgical treatments, with varying degrees of efficacy, have been applied based on the Hurley staging system. Since medical treatment cannot change the natural course of the disease and relapse is inevitable in the long-term, radical excision to reduce recurrences is considered as the only curative therapy option for patients with severe II and III stage HS. However, such methods may require intensive reconstructive surgeries and are often accompanied by intraoperative or postoperative problems, resulting in extended treatments. Several methods to detect the degree of the disease and define the resection area have been employed; coloring agents have also been recommended as an option. In this case, we focused on the use of a coloring dye to determine the precise resection margin for a patient with severe HS, as there have been no conclusive reports on the use of a coloring dye in intraoperative operations or follow-up findings. This method could help preserve more viable tissue to reduce the possibility of complications and the duration of hospitalization.

**Keywords:** Hidradenitis suppurativa; Resection margin; Coloring agent; Mapping technique; Indigo carmine

## Introduction

Hidradenitis suppurativa (HS) is a chronic, recurring inflammatory skin disease that affects apocrine sweat gland-rich regions such as the axillae, perineum, groin, and perianal region [1-3]. In spite of attempts to treat it with various medications, painful abscesses with malodorous purulent discharge associated with deep sinus tracts frequently recur [1]. Since this constellation of repeated symptoms has a negative impact on the psychosocial life quality of lives of patients, a variety of surgical treatments such as incision and drainage of abscesses and deroofting of tracts, and local and wide excision of affected skin regions have been proposed [4-7]. However, inadequate excision during surgery due to vague boundaries of the lesions brought on by repeated wound inflammation is pointed out as the most probable cause of recurrence [4]. While wide excision involving adjacent viable tissues is considered the most effective treatment with the lowest recurrence rate, such surgical procedures additionally require a higher cascade of reconstructive procedures [4-8]. Therefore, many clinicians have attempted to develop a method to evaluate the extent of the disease, and to determine a precise resection margin that reduces the risk of recurrence and postoperative recovery time with less permanent scarring [4,7,9,10]. In contrast to a wide excision involving massive amounts of normal soft tissue with a blunt approach to the affected margin, this case report demonstrates the effectiveness of using a dye in a pa-

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tient with severe HS to precisely excise sinus tracts and selectively preserve viable soft tissues for wound coverage. This resulted in faster healing with less risk of recurrence, scar contracture, and additional surgery. Written informed consent was obtained from the patient.

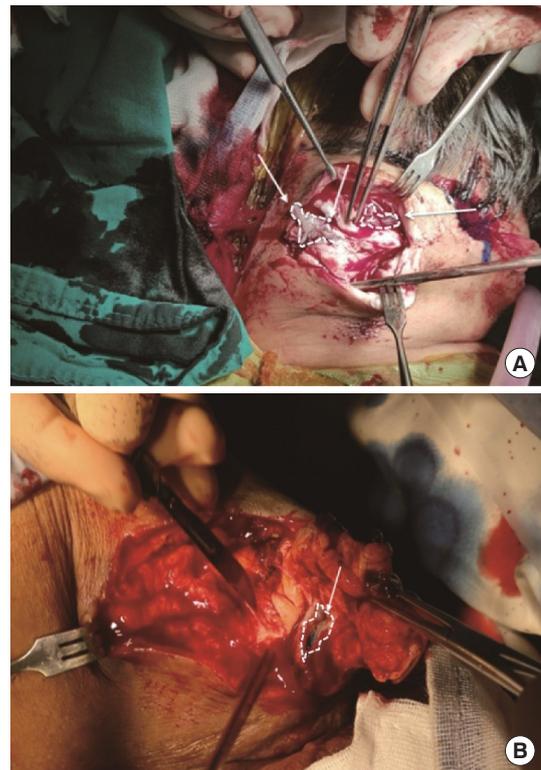
## Case

A 45-year-old male smoker with hypertension and diabetes presented with slightly tender brown nodules and purulent discharge on the nape of the neck and left inguinal region. The patient previously visited a clinic and underwent incision and drainage because of the initial occurrence of HS located at the nape of the neck 1 year earlier. The surgical wound healed without any postoperative problems. However, 6 months after the initial incision and drainage, the patient suffered from

multiple recurrences of dense grain-sized pustules on the nape of the neck (Fig. 1A) with the first appearance in the left inguinal region (Fig. 1B), accompanied by pain, foul odor, and sticky discharge. Pus cultures were obtained when he visited as an outpatient to treat his recurrence. After identification of *Actinomyces turicensis*, the patient was given oral Cephamedyl (cephalexin; Daehwa Pharmaceutical Co., Ltd., Seoul, Korea), three times a day for 5 days. The wound's condition did not improve even after 5 days of medications with daily dressing. The patient was admitted to the hospital for surgical intervention. During surgery under general anesthesia, a radical excision seemed to be required because interconnected sinus tracts and abscesses were found across the entire area of the nape of the neck and left inguinal region. Because a radical resection that includes the affected skin and subcutaneous fat down to the deep underlying fascia should be followed by a higher cascade of reconstruction, a selective local excision was performed by staining the abnormal tissues with coloring agent to preserve the viable tissues. Indigo carmine dye was



**Fig. 1.** Preoperative findings of the wound. (A) The nape of the neck. (B) Left inguinal region.



**Fig. 2.** Intraoperative view of the injection of indigo carmine dye. The infectious regions stained with indigo carmine (white arrows) were accurately thinned and resected (white dotted line) while sparing the viable tissues. (A) The nape of the neck. (B) Left inguinal region.



**Fig. 3.** Postoperative findings of the wound. No recurrence and complications after postoperative day 7. (A) The nape of the neck. (B) Left inguinal region.

injected firstly into each skin pit to dye the formulated fistulas. The abnormally dyed fistulas surrounding the cloudy, pink-colored unhealthy granulation tissues were accurately thinned and resected selectively by using a #15 blade and Bovie electrocautery under visual guidance, sparing the viable tissues (Fig. 2). After performing electrocoagulation to control bleeding, massive irrigation with 250 mL of 2% Taurolin (taurolidine; Samjin Pharm Co., Ltd., Seoul, Korea) mixed with saline was done. The wound was closed with sufficient adjacent soft tissues using 4-0 Vicryl and 4-0 Blue nylon layer by layer with two silastic drains inserted. To prevent postoperative infection, 2 g of Fazidone (cefazedone; Hawon Pharm Co., Ltd., Seoul, Korea) was administrated intravenously twice daily for the first 3 days. A conventional foam dressing with ofloxacin ointment (20 mg/g) was applied daily. Silastic drains were re-

moved at 3 days postoperatively. The patient was discharged 7 days after the surgical procedure without either minor or major complications (Fig. 3). This resulted in faster wound healing time and great patient satisfaction. The patient followed up as an outpatient for 3 and 6 months; no recurrence or complications were noted.

## Discussion

HS is a multifactorial disease related to smoking, obesity, diabetes, acne tendency, genetics, stress, excessive sweating, and poor personal hygiene [1-3]. Although the etiology of HS is still unclear, the initial symptoms of HS have a similar pathological origin to follicular occlusive diseases, such as acne conglobata, pilonidal sinus, and folliculitis [1]. Many apocrine ducts are thought to be obstructed and dilated by keratinous plugs, which provide a fertile environment for bacterial growth [4]. Widespread inflammation of the surrounding tissues, followed by the rupture of glands, leads to further tissue destruction and skin damage with scarring and fibrosis [1-4]. Therefore, appropriate treatment should be initiated in the early stage of HS to reduce the risk of progression. Unfortunately, HS treatment is very challenging because of frequent misdiagnosis and delayed treatment, which may eventually lead to a debilitating end-stage disease [1,7]. This results in a psychosocial and financial burden for people with HS [1-3,7].

Although the optimal treatment for HS is still debated [2,3,7], various types of medical and surgical treatments have been applied based on the Hurley staging system [1-3,7]. Medical treatments (e.g., antibiotics, hormone therapy, retinoids, immunosuppression, tumor necrosis factor- $\alpha$  inhibitors, laser and radiation therapy) have been used in Hurley stages I, II, and III to only temporarily relieve the initial clinical symptoms [2,3]. Therefore, immediate surgical interventions are recommended to achieve a complete remission and reduce likelihood of relapse [2,4]. Although minor surgical procedures such as incision and drainage, deroofting and local excision with primary closure have been performed in severe HS patients, 27% and 69% of cases managed with deroofting and limited local excision with primary closure, respectively, have recurred due to an inadequate excision of the affected regions [4,5]. Since the boundary of the affected apocrine bearing skin and the connections between the sinus tracts are not distinguished, an inadequate excision is considered the most probable cause of recurrence [5,8]. Scuderi et al. [7] demonstrated that a wide excision of the entire hair-bearing skin to

the deep underlying fascia and adjacent apocrine gland zones showed superior results in patients with Hurley stage II and III HS at a distance of 1–2 cm beyond the disease area. Many studies presented that a wide excision of the affected regions showed the lowest recurrence rate compared to other treatment methods [1-7].

However, the surgical treatment and reconstruction for patients with severe HS should be determined according to the location of the disease and the extent of reconstructive methods to reduce intraoperative or postoperative complications [4,5,8]. Danby et al. [11] reported that extensive excision in the axillary and inguinal areas near the vast neurovascular bundle may cause greater morbidity than the disease itself. In addition, unlike the treatment of malignancies, HS does not require extensive excision [11]. An extensive surgical excision followed by inadequate reconstruction is also associated with the possibility of increasing risk of healing disturbance, scarring, scar contracture, and limitation of motion [9,11]. Therefore, many clinicians have preoperatively attempted to evaluate the extent of the disease using magnetic resonance imaging and ultrasonography [4]. Other have tried inserting a blunt probe or injecting coloring agents into the tracts intraoperatively to visualize the connecting fistulas and minimize the excision area, thereby preserving as much viable adjacent tissues as possible [4,7,8]. Many cases have been reported where complete eradication of similar sinus tract diseases, such as pilonidal sinus disease and bladder and bowel fistulas, had been achieved by intraoperative injection of coloring agents into the formed sinuses tracts [12,13]. Doll et al. [12] reported that delineating the resection margin using methylene blue is considered the most effective method to reduce the recurrence of sinus tract diseases, because injection of methylene blue the interconnected sinus tracts provides visual guidance and results in a precise resection that helps preserve viable tissues. Buyukasik et al. [4] also suggested that mapping techniques using different coloring agents in HS patients are the best way to completely remove the affected lesions in wide excision. Indigo carmine was used in the authors' case because it was easily available in the operating room and its safety and effectiveness are similar to methylene blue. In addition, the Skin-Tissue-sparing Excision with Electrosurgical Peeling (STEEP) procedure was introduced as a promising tissue-sparing, probe-guided surgical technique for HS [10]. This method is a combination of wide excision and deroofting technique to treat Hurley II and III HS; it compensates for the shortcomings of wide excision [10]. However, the insertion of a blunt probe

against resistance may result in a false tract [9]. The injection of a coloring agent may be considered as a safer method to determine the resection margin. In addition, coloring agents are affordable and convenient to use during surgery.

Wide surgical excision is considered the treatment of choice for both acute and chronic HS conditions, because it has the lowest recurrence rate [4-8]. Subsequent surgical reconstructive procedures, such as grafting or various flap operations after a radical excision showed a lower long-term complication and recurrence rate than primary closure and secondary intention [4-8]. However, reconstruction after wide excision can prolong hospitalization because aggressive reconstructive procedures are required and mild or severe postoperative complications might arise, necessitating additional treatment [4,7]. Therefore, various methods to determine the accurate resection margins have been used for less aggressive but still curative resections for HS. Coloring dyes are an effective medium [4,7,8], but no definitive reports with intraoperative procedures or follow-up results have been published. In this report, we present a successful case of a patient with severe HS in which much viable tissue was preserved using dyes. A selective excision of dyed fistulas could be one of the alternatives for treatment of HS resulting in faster recovery and less scar tissue.

## Conflict of interest

No potential conflict of interest relevant to this article was reported.

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