SKIN-TISSUE-SPARING EXCISION WITH ELECTROSURGICAL PEELING (STEEL): A SURGICAL TREATMENT OPTION FOR SEVERE HIDRADENITIS SUPPURATIVA HURLEY STAGE II/III

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**ABSTRACT**

**Background:** Surgery is the only curative treatment for removal of the persistent sinus tracts in the skin that are characteristic of severe hidradenitis suppurativa (HS). Complete resection of the affected tissue by wide excision is currently regarded as the preferred surgical technique in these cases. However, relatively large amounts of healthy tissue are removed with this method and suitable skin-tissue saving techniques aiming at creating less extensive surgical defects are therefore needed in severe HS.

**Method:** We describe a skin-tissue saving surgical technique for HS Hurley stage II-III disease: the Skin-tissue-sparing Excision with Electrosurgical Peeling (STEEP) procedure.

**Discussion:** In contrast to wide excisions that generally reach into the deep subcutaneous fat, the fat is maximally spared with the STEEP procedure by performing successive tangential excisions of lesional tissue until the epitheliazed bottom of the sinus tracts has been reached. From here secondary intention healing can occur. In addition, fibrotic tissue is completely removed in the same manner since this also serves as a source of recurrence. This tissue sparing technique results in low recurrence rates, high patient satisfaction with relatively short healing times and favorable cosmetic outcomes without contractures.
**INTRODUCTION**

Hidradenitis suppurativa (HS) is an inflammatory skin disease characterized by painful deep-seated nodules and abscesses that mainly occur on apocrine gland bearing skin.\(^1\) In a later stage, sinus tracts surrounded by extensive fibrosis are formed in the dermis that in severe cases even extend into the deep subcutaneous fat. These sinus tracts serve as a source for the characteristic chronically recurring inflammation in HS. The Hurley classification is frequently used to reflect disease severity by determination of: (i) the character of the lesions (solitary nodules or abscesses correspond to stage I disease while stage II/III disease is characterized by sinus tract formation); and (ii) the extensiveness of the lesions (differentiation of stage II from stage III disease is made by determining whether or not there is healthy skin between the lesions).\(^2\)

Despite the numerous therapeutic options it is still difficult to treat HS, especially in severe cases (Hurley stage II or III disease). Severe HS is characterized by both inflammation and a permanent destruction of the normal skin architecture by the epithelialized sinus tracts and fibrotic scars. Therefore, treatment requires a combined approach in order to be successful. First, inflammatory activity needs to be improved. This can be achieved by systemic anti-inflammatory or immunosuppressive treatment. However, (non-inflammatory) sinus tracts and fibrotic scars will remain present after systemic therapy. The only way to permanently remove these sinus tracts and fibrotic tissue is by means of surgery.

Currently, the classic deroofing technique and wide excision are regarded as the preferred surgical methods for treating HS Hurley stage I/II and stage II/III respectively.\(^3,4\) However, Hurley stage II/III disease remains a surgical challenge and the surgical treatment has dual aspects. On the one hand, the goal of surgery is to achieve complete removal of lesional tissue. On the other hand, it is important to spare as much healthy tissue as possible to prevent the formation of serious contractures and to promote wound healing. The latter is not achieved with wide excision. To meet both goals to a maximum we have developed a surgical technique for severe HS where the advantages of both wide excision and the deroofing technique are combined: the Skin-Tissue-sparing Excision with Electrosurgical Peeling (STEEP) procedure.
TECHNIQUE

The STEEP procedure is performed under general anesthesia. The procedure starts with palpation of the affected area to localize inflammatory nodules and fibrosis. Visible sinus tracts are then sondaged with a probe to investigate their extensiveness. The sinus roof is subsequently electrosurgically incised with a wire loop tip coupled to an Erbotoom (Erbe USA Inc. Surgical Systems). This method is similar to the deroofing technique as described previously for Hurley stage I/II disease.\(^{(3,4)}\) Subsequently all lesional tissue, including fibrosis that is identified by palpation, is removed from the incision on to the deeper skin layers by successive tangential electrosurgical transections (figure 1). The epithelialized sinus floors and subcutaneous fat are left intact where possible. This procedure of incising sinuses and tangential peeling off affected tissue is continued until the whole area is clear of lesional tissue and fibrosis. Finally, the wound margins are meticulously checked with a probe for the presence and removal of any residual sinus tracts. Hemostasis is achieved by using the coagulation mode of the Erbotoom. The wound margins (i.e. healthy tissue) are injected with triamcinolonacetonide 10-20mg and bupivacaine 0.5%(10ml) to prevent hypergranulation. Wounds are left open to heal by secondary intention. Post-operative wound care consists of twice daily irrigation followed by alginate and silicone dressings. Pain is managed with acetaminophen, non-steroidal anti-inflammatory drugs or, in severe cases, opiates. Generally, patients can leave the hospital on the day of surgery.

Figure 2 illustrates an example of the satisfying cosmetic results we achieve with the STEEP procedure. This 46-year old woman with severe therapy resistant HS in the genital area was initially treated with intravenous infliximab for six months. After five infusions, inflammatory activity had improved and the STEEP procedure was then successfully performed in two separate sessions. Currently (i.e. three years later), the disease is still in remission. Additionally, her quality of life has significantly improved, as reflected in a reduction of her Dermatology Life Quality Index (DLQI) from 28 points (maximum: 30) at the beginning of infliximab treatment to 3 points at eight months after the final STEEP procedure.
Figure 1. Wide excision (a): red dotted line represents the cutting surface. Healthy tissue is removed and resection reaches into the subcutaneous fat. STEEP-procedure (b): inflammatory nodules, sinus tracts and scar tissue are localized by a probe or with palpation. Affected tissue is then peeled off layer by layer by means of multiple tangential transsections (red dashed lines). The epithelial lining is spared in non-inflammatory sinus tracts but is totally excised in inflammatory sinus tracts (blue dashed lines). The procedure is repeated until a plane has been obtained that is free of lesional tissue. The result is that the final defect is smaller compared to wide excision.

Figure 2. Right groin before treatment with the STEEP procedure. Sondage with a tissue forceps demonstrates the depth of the sinus tract (a). The right groin 24 weeks after the STEEP procedure (b).
DISCUSSION

Treatment of HS is a challenge for both physicians and patients due to its complex and largely unknown pathogenesis. It is generally accepted that in order to achieve satisfying results in severe cases (Hurley stage II/III disease), a dual therapeutic approach is required. Usually, the first step is inhibition of inflammatory activity with anti-inflammatory or immunosuppressive agents, including infliximab. However, systemic treatment will not restore the skin’s original architecture, meaning that epithelialized cysts and sinus tracts will remain present in the affected skin once the inflammation has been treated. This may facilitate access for (commensal) bacteria, leading to repetitive inflammation and further extension of the disease, with ever-increasing architectural destruction. This vicious circle can only be interrupted by surgical removal of these residual lesions.

The STEEP procedure is a promising tissue-saving surgical technique for HS Hurley stage II/III. Tissue-saving surgical techniques are importance to HS for two main reasons: (i), HS especially occurs in the body folds, which are areas prone to the formation of contractures after surgery and (ii) large interconnected skin areas are frequently involved, making it even more important to reduce the size of the already large surgical defects to a minimum. A suitable tissue-saving surgical technique for Hurley stage I or limited stage II disease is the deroofing technique. However, in case of extensive Hurley stage II/III disease dominated by fibrotic tissue, the deroofing technique is ineffective since fibrosis is not removed. Removal of fibrotic tissue is important because it may contain skin appendages that serve as a source for recurrence and also prevent adequate wound contraction and subsequent healing. In addition, the deroofing technique is too time-consuming in severe HS. Surgical intervention by means of wide excision is therefore often considered as the most effective treatment in these cases. However, the STEEP procedure has several advantages over both wide excision and the deroofing technique in severe HS. First, wide excisions always reach into the healthy deep subcutaneous fat, while the STEEP procedure with its successive tangential transsections leaves the epithelialized bottoms of the sinus tracts and a large extent of the subcutaneous fat intact, leading to more superficial and smaller defects (fig 2). This results in relatively shorter healing times and fewer complications, such as contracture formation. Furthermore, recurrence rates around the operated area are reduced to a minimum since at the end of the STEEP procedure residual affected tissue is identified and removed by sondaging the final wound margins with a probe and extensive palpation. Tissue-sparing surgery in HS can also be accomplished with the use of a CO₂ laser, as previously demonstrated. The main advantage of CO₂ laser incision is that proper hemostasis is achieved allowing adequate visualization of remaining lesional tissue. During the STEEP procedure prompt cauterization of bleeding vessels can be easily achieved.
as well by switching between the surgery and electrocautery mode of the electrosurgical unit using a foot pedal. For the performance of multiple transversal sections as we describe for our surgical technique, electrosurgery has some important advantages over CO\textsubscript{2} laser, namely:

(i) the depth of vertical incisions with transversal electrosection is more easily controlled and adjusted by the surgeon. This leaves the epithelialized sinus bottom intact and warrants deep excision of fibrotic and inflammatory tissue at the same time while a CO\textsubscript{2} laser removes a continuous horizontal plane of one depth, making it less precise and less tissue-sparing; (ii) laser treatment is more expensive in terms of purchasing the device, the need for a special room to perform the treatment and safety notices; and (iii) a basically trained dermatosurgeon can perform electrosurgery, while laser treatment requires more experience and skills.

In our clinic, we have performed the STEEP procedure under general anesthesia in 156 patients with Hurley stage II/III disease between 2004 and 2013. The feedback from the patients is generally very positive. Patients with extensive disease at multiple locations were usually operated in several sessions. The wounds are allowed to heal by secondary intention since in our experience, and that of others, it is time-efficient and leads to good cosmetic and functional results.\textsuperscript{14,15} Furthermore, it allows prolonged wound drainage, diminishing the risk of wound infection.\textsuperscript{14}

In conclusion, we consider the STEEP procedure with electrosurgery superior over wide resections and deroofing in Hurley stage II/III disease for several reasons: (i) recurrence rates are low as it specifically aims at complete removal of lesional and fibrotic tissue; (ii) it saves healthy tissue to a maximum which leads to rapid healing, satisfying cosmetic results and prevention of contractures; (iii) healing time is further improved by allowing re-epithelization of the defects from the intact epithelialized sinus floors and dermal tissue where possible rather than from subcutaneous fat; and (iv) in contrast to laser surgery the procedure can be performed by basically trained dermatologic surgeons.
REFERENCES


