Surgical treatment of chronic hidradenitis suppurativa: CO₂ laser stripping—secondary intention technique

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Summary
The objective of our study was to evaluate a surgical method of management of patients with hidradenitis suppurativa (HS), using a CO₂ laser technique for stepwise horizontal vaporization and peroperative monitoring of the removal of diseased tissue. Twenty-four patients were selected for treatment, 21 women and three men, who had suffered from HS for a mean of 13 years (range 1–28 years) and experienced more than three recurrences of suppurating lesions during the year prior to entering the study. The mean follow-up time after CO₂ laser surgery was 27 months (range 15–47 months), with clinical follow-up once or twice a week during the wound-healing period, and then at intervals of 1–3 months to evaluate recurrences and assess the end result. The patients' healing time was approximately 4 weeks (range 3–5 weeks). During the follow-up period two patients had recurrences in the treated areas. Twenty-two patients had no recurrences in the treated areas, but in four cases de novo suppurating lesions appeared 5–10 cm beyond the initial sites of surgery. Ten patients had exacerbations of HS lesion(s) in a region other than the treated site. Eight patients did not have any recurrences.

Post-surgery results were satisfactory both cosmetically and with regard to quality of life. The CO₂ laser stripping—secondary intention technique is a rapid, efficient, and economical method for the treatment of HS. It allows simple treatment of early lesions which would otherwise have been treated using less effective local conservative remedies.

Hidradenitis suppurativa (HS, syn. acne inversa) is a cicatrizing and persistent disease of apocrine gland-bearing areas in adults. The severity of the condition varies from a few suppurating lesions to widespread and disabling disease. The aetiology is obscure, but suggested contributory factors include a genetic predisposition, comedones occluding the pilosebaceous apparatus, bacterial infection, and hormonal factors.

Many treatments have been tried, including systemic or local antibiotics, hormones such as oestrogen, progesterone, and cyproterone acetate, corticosteroids, and retinoids. In refractory cases surgery is essential. Simple incision of lesions offers only a short period of relief from pain, is associated with a high recurrence rate, and is therefore of little value in the long term.

The surgical methods employed in individual cases depend on several factors. Simple excision with primary closure, marsupialization, or curettage and electrocoagulation of the sinus tracts may be adequate, but in cases involving the entire apocrine gland-bearing area more extensive surgery is often necessary. Large wounds resulting from major excisions are either covered by flaps or meshed grafts, or left to heal by secondary intention. We describe an elementary technique using a CO₂ laser for the therapy of hidradenitis suppurativa, which aims to produce complete ablation of diseased tissue combined with the greatest possible preservation of healthy tissue.

Methods
Twenty-four patients (21 female), mean age 36 years (range 22–57 years), took part in the study. The diagnosis of HS was based on the history and clinical features at the initial consultation. All of the patients had one or more active suppurating lesions, and had suffered from 3–12 recurrent episodes of abscess formation during the 12 months prior to the consultation, or had continuous suppurating lesions, involving the axillary, inguinal, and perineal areas, buttocks, upper thighs, or the female breast. One or more lesions, up to 7 cm in size, were selected for treatment in the study. All patients were stage II cases, according to clinical staging adapted from Hurley. I.e. recurrent abscesses
with tract formation and cicatrization, and single or multiple, widely separated lesions. Cases with concurrent diseases known to have a tendency to fistula formation, such as Crohn’s disease, ulcerative colitis or rheumatoid arthritis were excluded from the study. The patients were otherwise healthy, with the exception of one insulin-dependent diabetic, one patient with treated hypothyroidism, and three obese subjects. Seven patients had a previous history of adolescent acne, or had mild active acne vulgaris. The mean duration of disease was 13 years (range 1–28 years). Previous treatments included prolonged antibiotic therapy (17 patients), local incisions (14), cyproterone acetate (1), isotretinoin (1), excision (2), and excision with grafting (1). The treated anatomical regions were: the breast (2), axilla (5), inguinal–perineal region (11), the gluteal–perineal region (6). In one case both the axillary and the perineal areas were treated. In some cases a biopsy was taken for histopathological examination.

The most problematic lesions were selected for treatment. Areas which had been ‘silent’ for more than 2 years, but with signs of earlier activity, i.e. scars with post-inflammatory hyperpigmentation, were judged to be ‘burned out’ and were not treated.

**Anaesthesia**

The diseased area was delineated with ink. Following cleansing with 0.05 mg/ml chlorhexidine solution, the area was anaesthetized with injections of lidocaine 1.0 mg/ml (Xylocaine®, Astra, Södertälje, Sweden). Richly enervated areas, such as the groins, were pretreated with a lidocaine/prilocaine cream (EMLA®, Astra) prior to the injections. In areas with active abscesses or pustules, an alternative method for local anaesthesia was used. In these cases, the solution was injected and infiltrated around, and not directly into, the affected site, forming a square around the area, in order to avoid direct contact with infected tissue and injection into the abscess itself, thereby avoiding an increase of pressure and pain, or provocation of a purulent discharge. This procedure led to complete anaesthesia within 5–10 min.

**Surgical procedure**

A Sharplan 1030® (Laser Industries Ltd, Tel Aviv, Israel) was used, operating at 30 W, with a manually controlled hand-piece. The selected area was ablated in one initial layer with the laser beam, by passing it rapidly over the tissue using a ‘paintbrush’ technique. The spot size of the CO₂ laser beam was defocused to 2 mm. The hand-piece was used in rapid movements, controlling the beam to the shortest possible exposure times, with as much power as is controllable in the surgical situation, thereby causing as little lateral heat conduction and unwanted non-specific thermal injury as possible. The power should be kept at a setting at which the heat at the impact site is high enough to promptly vaporize the tissue, with a narrow coagulation margin and minimal charring. If irradiation of a charred surface is continued, it will be heated to more than 400°C, causing heat injury to the underlying tissues and margins. To avoid unintentional burns of surrounding healthy tissue, a sodium chloride-soaked gauze boundary can provide good protection when working with this relatively high power CO₂ laser.

After cleansing the surface with 0.9% saline solution to remove devitalized tissue, and drying it with a swab, the treated area can be evaluated and, if necessary, repeated ablations can be performed. The depth of each level of vaporization is controlled by the selection of power and the velocity of the movements of the hand-piece. We used the 30 W CO₂ laser setting, but lower energies are advisable when the operator is not accustomed to the method. Particular caution is recommended in patients in whom the ratio of diseased skin/healthy subcutaneous tissue underlying the lesions is low, where the procedure is limited by muscle fascia or vital parts other than the subcutaneous fat. The resulting depth of the vaporization procedure is determined by the surgeon after inspection for signs of healthy and diseased cutaneous tissue. The vaporization procedure is repeated downwards and outwards until fresh yellow fat tissue is exposed, and there is no remaining dense or discoloured tissue. The smaller blood vessels are coagulated by the laser, and little or no bleeding occurs during the procedure. Bleeding from vessels larger than 0.5–1 mm in diameter should preferably be dealt with by electrocoagulation or ligation.

After a final soak with physiological saline solution, and examination for remaining diseased areas and bleeding points, the treated site was covered with dry dressings held in place by surgical adhesive tape, or with tubular gauze.

**Post-surgery**

Immediately after the wounds had been dressed, the
patients were instructed to go for a short walk. They remained at the clinic for 3 h following the procedure, in case there was any bleeding. The dressings were initially left on for 2–3 days in order not to disturb the wounds. Thereafter, daily cleansing (gentle showers until complete healing occurred) was performed by the patient. Analgesia was with standard doses of paracetamol. Antibiotics were used if there were clinical signs of secondary infection.

The patients were seen weekly until the treated areas had healed, monthly for another 3 months, and every 6 months thereafter for a mean of 27 months (range 14–45 months). Post-treatment evaluation consisted of assessment of healing time, recurrences, scarring, and patient satisfaction.

Results

The HS lesions of 24 patients were treated using the CO₂ laser stripping–secondary intention technique. The size of the treated area varied from 6 to 40 cm², in a total of 33 operating sites. The duration of the procedure, including anaesthesia, was less than 20 min in most cases. Each lesion was vaporized within a few minutes. In six cases, biopsy material was sent for histopathological examination, and all the biopsy specimens showed a benign, chronic inflammatory picture. The mean follow-up time was 27 months (range 15–47 months).

The results of the procedure were good, with a mean healing time of 4 weeks (range 3–5 weeks) and a low frequency of local recurrence (Table 1). In two cases there were recurrences within the scars of treated lesions 4 and 6 months post-surgery, respectively. The remaining 22 patients had no recurrence within the treated regions, but in four patients there were new lesions or recurrences 5–10 cm distant from the operation scars. These appeared more than 6 months after surgery. Ten patients had recurrences of their HS in a region different from that which had been treated. Two cases of secondary infection were seen on days 6 and 10. With late onset of pain and perilesional erythema, but no fever. Bacteriological cultures in these cases grew streptococci types G and A, respectively. In both patients the secondary infection responded to treatment with standard oral doses of phenoxyethyl penicillin. Post-operative pain in three patients lasted 3–4 days, and was satisfactorily controlled with paracetamol. After healing, all patients thought that their disease was considerably better than prior to surgery. The treated areas were symptom-free, with the exception of two cases, and remained so for the duration of follow-up. All patients were pleased with the appearance of their scars following complete wound healing. One inguinal scar in a female patient was hypertrophic and tender for the first 2 months, but improved within 2 weeks following an intralesional steroid injection.

Post-surgery

Only minor bleeding during cleansing was reported. All patients had minimal analgesic requirements, and all were fully ambulant. Hospitalization was not needed, nor was professional medical help with wound care, although this was offered, if necessary, to all patients. Only a short time off work was necessary: 15 patients were able to go back to their ordinary work in less than 3 days, six had to stay away from work for 4–8 days, and three were off work for 2–3 weeks. Patients who had experienced other methods of surgical treatment favoured the laser method, and all stated that they would be willing to go through the operation again, should this be required.

Discussion

Knowing the poor prognosis with regard to complete resolution in long-standing cases of HS, and understanding the need for early surgical intervention, we were seeking a rapid and convenient surgical method that was radical, but at the same time tissue-sparing, involved a minimum of post-operative professional wound care, and which would be applicable to an out-patient situation.

The CO₂ laser has previously been used in HS surgery and, in our opinion, is a suitable tool with which to work on this infected tissue. It is relevant to use bacterial killing (heat) and non-touch techniques when dealing with markedly inflamed and purulent tissue. The CO₂ laser cuts and seals small blood and lymphatic vessels, it prevents the spread of bacteria to the surrounding tissues or to the bloodstream, and provides a blood-free operation field which facilitates macroscopic examination of the pathology of the tissue.
Figure 1. A 28-year-old woman (a) before, (b) directly after CO₂ laser vaporization of hidradenitis suppurativa of the groin, and (c) 1 week, (d) 3 weeks, and (e) 3 months later, without surgical closure of the defect.
Favourable effects on the healing of experimentally infected wounds after CO₂ laser sterilization have been reported. In our study only two of 24 cases became infected with β-haemolytic streptococci.

In our work, we have further developed the techniques and strategies of the CO₂ laser to optimize its use in the different stages of HS. Instead of using the laser as a substitute for a scalpel, and cutting vertically into the surface around the diseased tissue, we employed a different technique. We vaporized the tissue in layers, until all of the macroscopically abnormal tissue had been removed. If it was discovered that the disease was more widespread than initially expected, the ablated area could be extended. The principle is to be as radical as possible but to save sufficient healthy tissue to ensure rapid healing and avoid unnecessary scarring. From our own experience of scalpel excisions of HS, there is a risk of removing unnecessary amounts of tissue, as the assessment of how much tissue should be excised is an approximation. The CO₂ laser technique provides a more subtle approach to surgery for this disorder.

Despite the use of several different medical approaches to the management of HS, surgical intervention is necessary in most cases. The choice of method depends on the location and size of the affected area. As the aetiological importance of the apocrine gland itself is not clear, we would argue that surgery should be restricted to the diseased and damaged skin. We agree that the surgical method of choice in most instances is wide local excision and healing by secondary intention, but with the proviso that it should only be as wide as is absolutely necessary. We found that this can be accomplished by the method used in this study. The patients in our study were predominately women, and this may reflect the fact that HS, particularly the genito-crural and axillary forms, principally affects otherwise healthy females during their fertile years. The perianal form of the disease is more common in men.

A considerable proportion of hidradenitis suppurativa patients benefit from CO₂ laser treatment. Surgery alone is permanently curative in some patients, but is only of temporary benefit in others. Our results are comparable with those from other surgical methods. The treatment can be repeated, and as it is tissue-sparing the risk of contractures is reduced. In recurrent cases, CO₂ laser surgery, combined with medications such as retinoids or cyproterone acetate is recommended. Simple excision and primary closure has been advocated for small axillary HS lesions, but in cases with extensive involvement, where primary closure is not possible, healing by secondary intention is an alternative to skin grafting or skin flaps. Our patient group included five with axillary lesions, and all of them healed without complications.

This treatment method is suitable for both severe cases of HS and early or long-standing mild cases. Probably the largest group of HS patients are those with mild to moderate disease who, despite the limited extent of their disease, suffer a great deal of discomfort. For both economical and practical reasons, in clinical practice there is a tendency for surgery to be employed in the most advanced cases. The patients in our study, who gained considerable benefit from laser surgery, had previously been treated conservatively. We believe that this method offers sufficient advantages to merit its use in early surgical intervention.

We have not assessed the financial implications of this treatment, but there are at least three reasons why the CO₂ laser would be more economical than traditional excisional surgery: (i) the total operation time is shorter, which keeps the need for qualified personnel to a minimum, and permits a more rational use of operating-room facilities; (ii) nursing assistance post-operatively is not necessary; (iii) the post-operative disability is less, and fewer patients have to refrain from work. A more detailed cost–benefit analysis of this method remains to be performed.

In conclusion, our results indicate that, in patients with chronic HS, the CO₂ laser secondary–intention technique is a safe, simple, rapid and economical surgical method, with satisfactory cosmetic and functional results, which is suitable for an out-patient setting. The technique allows early treatment of HS lesions which previously would perhaps have been managed by less effective local conservative therapy.

References
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