Hidradenitis Suppurativa: Successful Treatment Using Carbon Dioxide Laser Excision and Marsupialization

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BACKGROUND Hidradenitis suppurativa (HS) is a disease associated with significant patient morbidity and less-than-ideal therapies.

OBJECTIVES To determine the long- and short-term benefits of carbon dioxide (CO_2) laser excision and marsupialization in the management of persisent lesions of HS.

METHODS Patients with long-standing lesions of HS were treated using a CO_2 laser to excise inflammatory and draining masses.

RESULTS One hundred eighty-five areas were treated in 61 patients using the CO_2 laser excision and marsupialization technique in 154 sessions. Local anesthesia was used for all but three sessions. Healing occurred primarily through secondary intention. In follow-up from 1 to 19 years, acceptable to excellent qualities of healing occurred. Recurrence within the treated area occurred in two of 185 sites treated.

CONCLUSION CO_2 laser excision and marsupialization appears to be an effective therapy for management of persisent or late-stage HS. There was good patient comfort during and after treatment, lower costs than with inpatient modalities, good healing, and minimal risk of recurrence within the treated areas.

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The presence of chronic furuncular masses, usually in intertriginous areas, characterizes hidradenitis suppurativa (HS), a disease responsible for substantial morbidity. These masses may persist, or intermittently heal and flare, over the course of months or years. Also characteristic of the condition is the development of sinus tracts or connections from one furuncular mass to another. Preferred sites are the groin, axillae, and buttocks and perirectal skin, although other sites may also be affected.[1] It may be present as part of a "follicular occlusion tetrad," also including cystic acne, folliculitis decalvans (dissecting cellulitis of the scalp), and pilonidal sinus.[1]

Etiologies of HS have focused on possible endocrine abnormalities,[2] sweat gland dysfunction,[3] infectious colonizations,[4] and keratinization defects within the follicle.[1] Lithium therapy has rarely been associated with onset of the disease.[5] Recently, genetic studies in a single family with HS identified localization at chromosome 1p21.1-1q25.3.[6] Therapies have variously included hormonal medications, antibiotics, and antiinflammatory agents, as well as compounds that could alter follicular keratinization. Recurrences and ongoing disease have been common in spite of these therapies.

Surgical treatment of the end-stage of HS has been shown to be moderately effective. Excision, with or without skin grafting, has been successful in eradicating focal areas of disease[7,8] but usually requires hospitalization and general anesthesia. Such treatment may also require significant limitations during the postoperative recovery period. Recurrences and postsurgical morbidity have been concerns.[9] In

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small series of patients, treatment using carbon dioxide (CO_2) laser excision and marsupialization has been described to be of value.[10–12]

Herein, we describe a series of 61 patients with longstanding HS treated with the technique of CO_2 laser excision and marsupialization. This modality was selected because, with the vascular-control effects of the laser, there would be an ability to more adequately visualize cutaneous sinus tracts; the procedure could be performed in an outpatient setting, using local anesthesia; in previous patients treated for other conditions, there had been outstanding patient comfort after management with the laser; and the qualities of wound healing after surgery using CO_2 laser had been good to excellent.

Study Group

Sixty-one consecutive patients with HS were treated. Characteristics of the patients are summarized in Table 1.

TABLE 1. Hidradenitis Suppurativa (HS)—Patient Characteristics

Patient profile	
Patients, *n*	61
Men/women	19/42
Age at first laser treatment, average (range)	
All patients	38.5
Men	41 (21–67)
Women	36 (21–73)
Years of disease before laser treatment, average (range)	8.5 (1–25)
Race, *n* (%)	
Caucasian	55 (90)
African-American	6 (10)
Obese, *n* (%)	8 (13)
Dermatologic history, *n* (%)	
History of acne	33 (54)
History of pilonidal sinus	18 (30)
Family history of HS	16 (26)
History of folliculitis decalvans	5 (8)
History of hirsutism	2 (5)
History of premenstrual flare	3 (7)
Previous treatment for HS, *n* (%)	
Oral and/or topical antibiotics	61 (100)
Isotretinoin	10 (16)

Other therapies: Incision and drainage, excision and closure or grafting (13 patients), acitretin, Avlosulfon, salicylazosulfapyridine, colchicine, cyclosporine, ketoconazole, spironolactone, cimetidine, and X-ray. Four patients had reported previous episodes of cellulitis requiring hospitalization and intravenous antibiotics. Other medical problems: Diabetes mellitus (7 patients); seborrheic dermatitis (2 patients); seizure disorder (2 patients); alopecia areata, anxiety disorder, fatigue, hypercholesterolemia, rosacea, pyoderma gangrenosum, psoriasis, childhood eczema, autism, mitral valve prolapse, hypertension, chronic obstructive pulmonary disease, kidney cyst, Down's syndrome, demyelinating disease (1 patient each). Laboratory: Serum total and free testosterone and dehydroepiandrosterone sulfate (DHEA-S) levels were normal in 8 of 9 female patients tested. One patient had high DHEA-S with normal free testosterone levels. Cultures of draining areas demonstrated normal skin flora in all 18 patients tested and *Pseudomonas aeruginosa* in 1 patient.

Treatment Technique

All but three treatments were performed in an office setting using local 1% lidocaine anesthesia with or without epinephrine; three patients had their procedure performed under general anesthesia in an ambulatory surgery center (Figure 1). Clean but not sterile technique was used. In each instance, the visual and palpable boundaries of the furuncular masses were defined and marked. The Sharplan CO_2 laser (Tel Aviv, Israel) was then used at a 0.22-mm spot size to excise the defined mass. Energies ranged from 8 to 30 W. Excision was performed to a level immediately beneath identified sinus tracts, scarring, or friable tissue. This was most frequently in a plane within the deep reticular dermis or upper subcutaneum. After removal of the furuncular and sinus tract mass, it was possible to explore the base and margins of the wound with a small probe and to identify additional sinus tracts. These areas were then also anesthetized and excised using the laser. Spot electrocautery using spark-gap electrical energy and, rarely, suture ligation were used to stop bleeding not controlled by the laser. At completion of all excisions, the laser was used in defocused mode to vaporize the base and margins of the field. In this manner, a uniform, smooth, pocket-like (marsupial) defect or plane was created (Figure 2).

All surgically treated areas were dressed with a bacitracin/polymyxin B ointment and hydrocolloid dressings for 2 days. Aftercare included daily warm tap water compresses, petroleum jelly, and Telfa

Figure 1. Nodular, inflammatory areas with cords representing sinus tracts and scarring. Right axilla.

dressing. Dressings were used until reepithelialization was complete.

Results

Results of treatment are summarized in Table 2. Sixty-one patients received 154 treatment sessions (average 2.5 treatments per patient, range 1–16 sessions per patient). All but three surgeries were performed in an outpatient setting using local anesthesia. In three sessions, general anesthesia in an ambulatory surgery center was used. Treatments were well tolerated in all patients. For large areas, in which there were dose limitations of anesthesia, the total excision and marsupialization was completed over two or more sessions.

Figure 2. Postoperative surgical wound demonstrating uniform plane, char from laser.

TABLE 2. Results of Treatment

Patients, *n*	61
Treatment sessions, *n*	154
Areas treated, n	
Total	185
Groin	75
Buttock	29
Perirectal	7
Axilla	34
Inframammary or chest	17
Abdomen	6
Legs	13
Neck	2
Pilonidal sinus	1
Scalp	1
Number of treatments per patient, average (range)	2.5 (1–16)
Patients with 1 treatment only or single area, *n*	26
Energy per treatment session, W, average (range)	16.7 (8–30)
Surface area treated per session, average, cm^2	43.9
Average time to heal, weeks	8.8

Two clinical characteristics appeared to be associated with more severe disease and greater number of affected areas and treatments: obesity and African-American heritage. Obese patients, especially, had more sites and required an average of 7.1 treatments per patient (vs an average otherwise of 2.5 treatments per patient, $p = .01$). African-American patients required 3.8 treatments per patient ($p = .12$). The combination of obesity and African-American heritage occurred in two patients and required nine and 16 treatments, respectively. Because of the small number of African-American patients, statistical significance could not be confirmed for these subgroups. Five of seven patients requiring more than four treatment sessions also had pilonidal sinus.

All patients healed with cosmetic and comfort qualities deemed acceptable to excellent in all areas (Figure 3). Secondary-intention healing took on average 8.8 weeks. There were no instances of reduced

Figure 3. Postoperative healing 9 weeks after laser excision and marsupialization.

range of motion. Seventeen patients (28%) and 33 of the 185 treated areas (18%) experienced postsurgical hypertrophic granulation tissue appearing approximately 5 weeks after surgery. Some patients appeared to be more susceptible, with one patient experiencing this in eight of 14 areas treated. All instances responded to treatment using topical silver nitrate. Two patients noted recurrence at the margin of previously treated areas. Three patients experienced postoperative cellulitis requiring outpatient oral antibiotics. A single patient experienced fever, leukocytosis, and rash consistent with Sweet's syndrome starting 1 month after surgery; this cleared with a short course of oral prednisone. Although most patients healed by secondary intention, one patient for whom suture closure was performed experienced dehiscence of the wound 2 weeks after surgery on two separate occasions. Follow-up after treatment noted an average of 4.1 years without disease recurrence in treated areas (range 1–17 years).

Discussion

HS remains a profoundly disabling, chronic disease of uncertain etiology and inconsistent therapies. The discomfort within affected areas, odor of drainage, challenge of cosmetically acceptable dressings, and risk of development of secondary malignancies are all concerns of affected individuals. The disease may be divided into several clinical and histologic stages. Initially, there is a follicular, inflammatory phase within a single focus or follicle; it may mimic a bacterial or fungal infectious event. Although it may appear to respond to antiinfectious treatment, recurrence within the site is common. With time, adjacent or distant areas may also demonstrate inflammatory nodules. Ultimately, intercommunication between furuncular swellings may occur, with recurrent tenderness and drainage. Because of the preponderance of occurrence in intertriginous areas, ambulation, and even sitting, may be compromised.

Early lesions of HS may mimic acne or folliculitis and may respond to treatment with antiinflammatory agents such as antibiotics, intralesional or systemic steroids, photodynamic therapy, electrosurgery, botulinum toxin, colchicine, dapsone, cyclosporine, and biologics.[13–23] Incision and drainage may temporarily relieve the pressure and pain of acute lesions but do not prevent recurrence within the area. The benefits of anti-androgens such as finasteride,[24] spironolactone, oral contraceptive agents, and cyproterone acetate,[2] as well as oral and topical retinoids,[25] have been inconsistent.

The development of intercommunicating tracts from one follicular nodule to another(s) characterize later lesions of HS. Pressure on a nodule will often produce drainage at a distant site. These tracts and sinuses are frequently epithelial lined and demonstrate scarring and acute inflammatory infiltration. It has been recently shown that epithelial stem cells can be found adjacent to the inflammatory follicular nodules,[26] suggesting that inflammatory follicular rupture may lead to seeding of the perifollicular interstitium with epithelial stem cells, causing the development of the tracts. Surgical removal of affected areas has generally been recommended as definitive therapy for persistent areas[27] but may be associated with significant surgical risks, expense, and recurrent disease.

Our patients had features in common with previously described individuals. Virtually all had

had treatment failures with antibiotics, antiinflammatory agents, and surgeries. They all had late-stage disease, with persistent, furuncular, or sinus tract disease or some combination. Our own personal experience and early published reports using CO_2 laser excision and marsupialization led us to use it on our larger series of patients. Intrasurgically, because of the nearly bloodless field, we were impressed with how easily sinus tract extensions could be grossly identified. These were usually within the lower reticular dermis or immediately above the subcutis. Tracts were occasionally noted to extend into the subcutis, or even muscle, but that was uncommon.

Postoperative care was simple and comfortable and resulted in cosmetically and functionally acceptable healing. Reepithelialization was complete in an average of 8.8 weeks. Complications after the surgery, or recurrence of disease within treated areas, were rare. Postoperative hypertrophic granulation tissue was common and responded to management with silver nitrate cauterant. In a single patient in whom suture closure was performed, dehiscence occurred on two occasions. Sutures had remained in place for 2 weeks before removal. This was consistent with previous observations that the development of tensile strength across the surgical wound is slower to develop after excision with CO_2 laser.

Based on our experience with late-stage HS and additional therapeutic descriptions, we have organized our treatment regimen to correlate with the stage of disease of affected individuals (Table 3). The prevention of inflammatory lesions should be the focus in early-stage disease. Solitary inflammatory papules or nodules may be treated with means designed to reduce or eliminate the current inflammatory event. When patients are affected with multiple inflammatory lesions, continuous antiinflammatory agents may be needed, but when scarring and sinus tract formation are present, the surgical removal of the tracts and scars is necessary for long-term success.

In summary, in our series of 61 patients, use of the CO_2 laser was found to be a highly effective therapy for management of the persistent, scarred, and sinus tract lesions of HS. Benefits of treatment using CO_2 laser excision and marsupialization included the ability to perform the surgery under local anesthesia and in an office setting (thereby reducing anesthesia risks and procedure costs), patient comfort and safety of the procedure, acceptable healing, and lack of recurrences. Although it did not prevent the

TABLE 3. Management of Hidradenitis Suppurativa Based on Stage of Disease

- Stage I
  - Management of high risk areas of limited disease
  - A. Management of areas at risk
    - 1. Topical and systemic antibiotics
    - 2. Topical, with or without systemic retinoids
  - B. Management of inflammatory, solitary lesions—papules, nodules
    - 1. Intralesional steroids
    - 2. Incision and drainage
    - 3. Oral antibiotics
    - 4. Excision—if persistent or scarring
    - 5. Electrosurgery
- Stage II
  - Management of patients with multiple inflammatory lesions
  - A. Medical
    - 1. Antibiotics
    - 2. Steroids
    - 3. Infliximab
    - 4. Acitretin
    - 5. Finasteride
    - 6. Cyproterone acetate
    - 7. Colchicine
    - 8. Dapsone
  - B. Surgical
    - 1. Excision of areas
    - 2. Incision and drainage
    - 3. Laser excision
    - 4. Cryosurgery
- Therapies that have been reported to be less than effective: photodynamic therapy, smooth beam laser, isotretinoin, methotrexate
- Stage III
  - Management of late effects or complications
  - A. Above therapies, plus
  - B. Management of scars or sinus tracts
    - 1. Excision of affected areas, with or without repair
    - 2. Carbon dioxide laser excision and marsupialization
  - C. Management of skin malignancies within scars: removal with Mohs control

development of additional lesions, patients consistently contrasted the lasting clearing of treated areas with their previous experiences using other modalities.

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