Deep Dissecting Hematoma

An Emerging Severe Complication of Dermatoporosis

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Objective: To outline the characteristics of deep dissecting hematoma (DDH).

Design: Retrospective medical record review.

Setting: Department of Dermatology, University Hospital of Geneva, Geneva, Switzerland.

Patients: Thirty-four patients with DDH.

Interventions: Deep incision or surgical debridement was performed in all the patients. Direct closure of the incision was possible in 6 patients, and split-thickness skin grafting was applied to 17 patients.

Main Outcome Measures: Sex of the patient, the affected area, presence of dermatoporosis, presence of systemic treatment, initial and late symptoms, anatomic location of DDH, and the mean length of hospital stay.

Results: Most frequently, elderly women were affected (mean age, 81.7 years); women outnumbered men by a ratio of 5:1. In all the patients, the leg was the affected part of the body. All the patients, except for the 2 youngest ones, had advanced dermatoporosis, and the most severe form was seen in the older patients who were receiving long-term treatment with systemic corticosteroids. Half of the patients were receiving anticoagulation drugs. The initial symptoms in all the patients were pain and swelling of the leg. Erythema and edema without fever were observed. Skin necrosis developed as a late manifestation. Erysipelas was the initial diagnosis in up to 14 patients who had been treated with antibiotics before admission. The mean delay before hospital referral was 16.4 days. Magnetic resonance imaging and histopathological analysis confirmed deep anatomical location of DDH. Hospital treatment consisted mainly of deep incision and debridement followed by direct closure, skin grafting, or wound healing per secundam. The mean length of hospital stay was 3.5 weeks.

Conclusions: Deep dissecting hematoma is an emerging clinical entity and a major complication of dermatoporosis. Prompt diagnosis and treatment is a major factor for the prognosis. Health care professionals, especially general practitioners, should be aware of the symptoms and signs of this condition as well as the risk factors involved. Given the high cost of treatment, in addition to the inconvenience it causes for the patient, preventive measures should be implemented early.

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We recently proposed the term “dermatoporosis” to define the various clinical manifestations and complications of chronic cutaneous insufficiency or fragility syndrome.1-3 Dermatoporosis is an emerging problem of the aging population; the first clinical manifestations appear at around 60 years of age, and the signs of fully developed disease are seen at ages 70 to 90 years. The clinical presentations of this entity include the morphologic markers of fragility (eg, senile purpura, stellate pseudoscars, and skin atrophy) and functional expression of skin fragility (eg, frequent skin laceration resulting from minor traumas, delayed wound healing, and subcutaneous bleeding) with the formation of deep dissecting hematoma (DDH), potentially leading to large zones of necrosis.3 We have proposed 4 stages of dermatoporosis: stage 1, the presence of extreme skin thinning, senile purpura, and pseudoscars; stage 2, the presence of some localized skin lacerations in addition to the lesions found in stage 1; stage 3, larger and more numerous skin lacerations with prominent delayed healing; and stage 4, DDH associated with any of the other 3 stages.

Deep dissecting hematoma is an important complication of dermatoporosis. It is caused by the mechanical fragility of the aged skin, occurs predominantly in the lower extremities of elderly patients with dermatoporosis, and results in long and costly hospital stays (see the "Results" section). Herein, we report our experience with 34 patients seen over 7 years and outline the characteristics of this emerging syndrome.
A total of 34 patients who had been hospitalized from 1999 through 2006 at the Department of Dermatology of the University Hospital of Geneva (Geneva, Switzerland) were enrolled in this study. The mean (SD) age of the patients was 81.7 (12.6) years (range, 44-102 years). Of the 34 patients analyzed, 29 were female (85.3%) and only 5 were male (14.7%). The female to male ratio was 5:1.

MAGNETIC RESONANCE IMAGING

A diagnostic magnetic resonance image (MRI) scan was performed to evaluate the precise anatomical extent of the lesion. Imaging was performed on an Interna MRI scanner (model 1.5-T; Philips Medical Systems, Best, the Netherlands) equipped with a head coil. Gadolinium diethylenetriamine pentaacetic acid (Gadovist; Schering, Berlin, Germany) enhanced axial T2-weighted sequences (echo time [TE], 100 milliseconds; repetition time [TR], 3500 milliseconds) and echo-planar single-shot isotropic diffusion-weighted sequences (TE, 64 milliseconds; TR, 2968 milliseconds) were performed. Five-millimeter-thick diffusion sequences were acquired with b values of 0 and 1000 s/mm². On these sequences, the hematoma was clearly depicted as a bright structure expanding between the subcutaneous fat and the muscular fascia.

HISTOLOGIC ANALYSIS

Punch biopsy specimens 4 mm in diameter were fixed in 10% phosphate-buffered formaldehyde, embedded in paraffin, and processed for histologic analysis. Sections were cut at 5 µm, mounted onto slides, and stained with hematoxylin-eosin according to standard procedures.

RESULTS

CLINICAL FEATURES

Most (32) of the patients (94%) had severe dermatoprosis at the time of admission to the hospital. Before the diagnosis and treatment, 4 of the patients (12%) were prescribed systemic steroids or inhalers, and 17 (50%) were prescribed the following anticoagulative medication: 10 patients (29%) were prescribed aspirin; 6 (18%), Sintrom (Novartis Pharma, Basel, Switzerland); and 1 (3%), Pla-vix (Sanofi/Bristol-Myers Squibb, Geneva, Switzerland).

Two of the patients (6%) had a partial loss of sight. The leg was the affected site in all of the 34 cases (100%). The trauma that led to the DDH took place at the patient’s home in 11 patients (32%), in public places in 13 patients (38%), and in unspecified locations in 10 patients (29%). The initial symptoms and clinical presentation in all the patients were pain, tenderness, swelling, and erythema of the leg without any systemic fever (Figure 1). Skin necrosis developed as a late manifestation.

Before referral to the hospital, a diagnosis of erysipelas was made in 14 patients, and 8 of these were treated with antibiotics. Initially, no definite diagnosis could be made for 20 patients. The mean (SD) delay before hospital referral was 16.4 (13.9) days (range, 2-51 days).

DIAGNOSIS

The diagnosis of DDH may be quite difficult to make in the initial stages owing to its misleading clinical appearance characterized by erythema, edema, and tenderness, which suggests an infection. Radiologic examination may be of help to exclude DDH in these cases. In well-developed lesions, an MRI scan of the affected zone shows that the hematoma is located between the subcutaneous fat and the muscle (Figure 2).

Histopathologic analysis of a biopsy specimen from the lesion confirms the subcutaneous localization of the hematoma and the presence of degenerative changes in the dermal and subcutaneous vessels (Figure 3). Because the hematoma is located beneath the subcutaneous fat, a deep biopsy is needed to obtain a correct diagnosis.

TREATMENT

Deep incision or surgical debridement was performed in all the patients who were admitted to the hospital. Direct closure of the incision was possible in 6 of the cases (18%); split-thickness skin grafting was applied to 17 patients (50%); and conservative treatment, including vacuum-assisted closure therapy, was the treatment of choice in 7 patients (21%). No follow-up could be made for 4 patients (12%) who were transferred to another hospital.

Almost half of the patients had other health conditions that delayed the healing process. Diabetes mellitus
accounted for 1 of these conditions in 6 patients (18%), chronic venous insufficiency in 4 patients (12%), arterial insufficiency in 4 (12%), and polyneuropathy of the legs in 2 (6%); no delayed healing factors were observed in 18 patients (53%). Five of the patients (15%) even had 2 delayed healing factors involved. The number of patients with only 1 factor was 11 (32%).

The mean hospital stay was 24 days (range, 2-62 days). The mean cost per patient was 40 000 Swiss francs ($32 200) (range, 3200-96 000 Swiss francs [$2500-$77 300]).

**COMMENT**

Deep dissecting hematoma is a poorly known but severe complication of dermatoporosis. It can be seen in a non-negligible proportion of elderly patients with extreme skin atrophy. In DDH, minimal traumas are thought to cause massive bleeding into a virtual space between the subcutaneous fat and muscle fascia. The fragile vessels showing age-related degenerative changes that are situated very close to the skin surface owing to extreme skin atrophy are most likely susceptible to easy bleeding, and diffusion of blood under the subcutaneous fat results in DDH. Initially, the traumatized zone is erythematous, swollen, and hot, and, despite the absence of local or generalized symptoms of infection, frequently patients are diagnosed as having erysipelas, and most are treated with antibiotics. Later, resulting hematomas form large, tender, and ecchymotic lesions (Figure 1). Incision of the lesion at this stage allows the elimination of coagulated blood from the cavity (Figure 4). If this is not performed, the hematoma progressively occupies more space and cuts off the blood supply to the skin, causing ischemia that ultimately leads to necrosis (Figure 5). In this case, surgical evacuation of the hematoma and the necrotic tissue should immediately be performed to avoid extensive skin damage. Large and deep excisions descending to the muscular level and resulting in important tissue loss may be necessary. Vacuum-assisted closure and/or autologous thin skin grafts may be used to obtain reepithelization of these large defective skin surfaces.

Deep dissecting hematoma occurs mainly in advanced stages of dermatoporosis; however, according to the degree of the trauma, it can be seen at any stage. Yet, DDH of the skin usually is not readily diagnosed. Often, the patient is initially diagnosed as having erysipelas, and antibiotic treatment is started without any successful results. Although in rare cases attempts to drain the hematoma are made, incisions are not deep enough, and it is only when necrosis of the skin occurs that the patient is referred to the hospital.

Early diagnosis and treatment is of paramount importance for the prognosis of patients with DDH, as well as the effect that the cost of treatment will have on the health care system. The sooner the diagnosis is made and the hematoma is evacuated, the less likely that the patient will experience a large skin injury. In a case that is diagnosed early, usually a simple but deep incision to evacuate the blood clot and closure by direct suture is sufficient.

The awareness of physicians, especially general practitioners, who are the first point of contact with the patients, should be enhanced regarding DDH. When a physician encounters a patient with a red, hot, and swollen leg, DDH should always be considered as differential
Figure 3. Histopathologic analysis of a biopsy specimen from the deep dissecting hematoma shown in Figure 1 shows the hematoma situated beneath the subcutaneous fat and some degenerative changes in the dermal and subcutaneous vessels (hematoxylin-eosin, original magnification [A] ×2 and [B] ×5).

Figure 4. Photographs of a patient with a deep dissecting hematoma (the same patient as in Figure 1). Incision of the nodule (A) allows the elimination of coagulated blood from the cavity (B).

Figure 5. Necrosis of large zones of the leg as a consequence of untreated deep dissecting hematoma.
Figure 6. Hypothetical development of deep dissecting hematoma (DDH). Compared with normal skin (A), dermatoporotic skin (B) shows notable atrophy of the epidermis (brown) and the dermis with pseudoscar (gray) and senile purpura (red rectangles), bringing the vessels (pinkish red) of the subcutaneous fat (yellow) into a close contact with the surface tissues, which are ruptured as a result of a minor traumatic event leading to massive bleeding DDH (C) (red) between the subcutaneous fat and the fascia (blue) of the muscle (pinkish violet).

diagnosis. The presence of cutaneous markers of dermatoporosis, as well as risk factors (ie, old age, history of recent trauma, lengthy steroid treatment, anticoagulation therapy, visual impairment), should also be explored.6

For elderly patients who are prescribed steroids and anticoagulative medication and/or have additional health problems (ie, diabetes mellitus, venous and arterial insufficiency, polyneuropathy) that will delay the healing process, the quality of life for the patient will be poorer, whereas the cost of treatment will increase. In addition to prompt diagnosis and treatment, therefore, the importance of implementing preventive measures needs to be emphasized.

Although its pathogenesis is not known, DDH has some characteristics similar to those of aortic dissection. A classic aortic dissection begins with a laceration of the aortic intima and inner layer of the aortic media, forming an entrance tear that allows entering blood to split the aortic media.7 The splitting of the media is responsible for formation of a double-channel aorta, with an aortic dissection flap dividing the aortic lumen into true and false lumens. Blood under pressure dissects media longitudinally, and the double-channel aorta is formed with blood filling both true and false lumens.8

The histologic changes that occur in the media of a normal aorta include (1) cystic medial necrosis, defined as pooling of mucoid material; (2) degeneration of elastic fibers, including fragmentation, elastolysis, and reticulation; (3) zonal fibrosis, defined as an increase in collagen at the expense of smooth muscle cells; and (4) medionecrosis, defined as areas with apparent loss of nuclei. The changes show a striking correlation with age and may represent the normal aging process for the aorta. The pathologic balance between elastin fragmentation and fibrosis is an important consideration when evaluating the pathogenesis of dissecting aneurysm.8

We suggest that the extreme atrophy of epidermis and dermis that occurs in dermatoporosis causes the subcutaneous vessels to come into close contact with the surface. Owing to the decreased viscoelastic properties of skin in dermatoporosis,9 these vessels most likely are no longer supported by dermal collagen and hyaluronate. A minor traumatic event to this zone results in the easy rupture of these vessels, showing age-related degenerative changes that are similar to those described for the aorta and that increase their fragility. The hemorrhage occurs between the subcutaneous fat and muscle fascia, and, as in aortic dissection, blood under pressure dissect the virtual space between the skin and the muscle (Figure 6).

As preventive measures, skin-protective clothing should be made available to the patient, and we recommend a tibia protector, possibly incorporated into stockings that are cosmetically acceptable. To avoid a possible trauma, a safe environment should be provided in the patient’s home, paying special attention to furniture with sharp corners. Public transportation officials should also be informed about this health problem, and necessary measures should be taken so that older passengers can travel safely.

New insights into dermatoporosis, including the absence of CD44 and hyaluronate in aging skin, allows us to understand the process of cutaneous atrophy.10 Prospective trials of any preventive intervention should be conducted, and DDH should be included in secondary end points. By increasing the awareness of the physician and the patient, and by early implementation of the necessary preventive measures, we hope that this painful and costly health problem will decline in number of cases and in severity.

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REFERENCES


Notable Notes

The COWABUNGA Cart: Intervention to Optimize Patient Safety, Quality of Care, and Work Efficiency in a Dermatology Hospital Practice

As embodied by Hippocrates’ primary charge to physicians, First, do no harm, patient safety is of paramount importance in the delivery of excellent health care. In 2000, the Institute of Medicine’s landmark report, “To Err is Human: Building a Safer Health System,” highlighted the impact of medical mistakes on health care outcomes and prioritized patient safety on the national scale. Patient safety is inextricably linked with quality of care, a concept that has been emphasized recently by health care professionals, researchers, and payers as a means to assess health outcomes. While patient safety and delivery of quality care are critical in the practice of medicine, work efficiency also is a legitimate concern of physicians, especially in today’s practice climate, which rewards productivity.

The practice of dermatology requires the performance of a high volume of biopsies and cultures. Therefore, accurate labeling of biopsy and culture specimens represents a particularly important component of patient safety and quality of care. A previous analysis of specimen labeling errors at one institution’s clinical laboratory found that the most common errors included specimen and requisition mismatching, absence of specimen labels, and mislabeling of specimens. Because supplies for specimen collection and labeling used by consultative services tend to be decentralized in the hospital setting, we suspect that the potential for labeling error is greater in hospital dermatology than in outpatient dermatology.

Decentralization of supplies also can contribute to work inefficiency. At our institution, biopsy supplies were previously kept in a portable (albeit cumbersome) box in the hospital dermatology work room, while acceptable specimen labels were obtained from the nursing station. Hand-carrying specimen requisition forms, biopsy supplies, and labeled specimen jars could be logistically challenging at times, particularly when biopsies were to be performed on multiple patients or anatomical sites.

To reduce the potential for specimen identification errors and to improve work efficiency in our hospital dermatology inpatient and consultation practice, we developed a cart with the following features: Computer On Wheels, with Availability of Biopsy supplies, Utensils for potassium hydroxide preparation and cutaneous culture, computerized Notes, and other General Applications (COWABUNGA) (Figure). An additional feature of the COWABUNGA cart is the attached liquid hand sanitizer holder, which facilitates hand hygiene. Designed to accompany the dermatology hospital team on rounds, the COWABUNGA cart also allows efficient bedside specimen acquisition and labeling as well as performance of adjunctive diagnostic tests (e.g., potassium hydroxide preparation). The availability of an internet-connected computer permits review of electronic medical records, entry of electronic orders, immediate postprocedural electronic documentation, and literature searches at the bedside. The COWABUNGA cart improves work efficiency, facilitates point-of-care evidence-based medicine queries, and offers the potential to reduce the risk of erroneous specimen labeling, thereby improving patient safety and quality of care.

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[Figure. The COWABUNGA (Computer On Wheels, with Availability of Biopsy supplies, Utensils for potassium hydroxide preparation and cutaneous culture, computerized Notes, and other General Applications) cart, involving a laptop computer to facilitate bedside access to the electronic medical record, point-of-care literature searches, and electronic postprocedural documentation. Also included on the cart are biopsy, culture, and potassium hydroxide assay supplies (arrow), specimen label printer (asterisk), and hand sanitizer.]