Dermatologic Conditions Associated with Diabetes

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Introduction
Diabetes mellitus affected approximately 4% of the world’s population in 1995 and is expected to reach 5.4% by 2025 [1]. The overwhelming majority of patients have type 2 diabetes, and the remainder have type 1 diabetes, gestational diabetes, and impaired glucose tolerance. Derangement of glucose metabolism and relative insulin availability affects nearly all organ systems in the body, including the skin. Patients with diabetes have deranged collagen production and poor wound healing, which leads to a multitude of skin disorders [2,3,4]. Various authors have reported cutaneous manifestations of diabetes ranging from 30% to 71% [5,6,7,8].

In a review in 1994, Perez and Kohn [2] divided skin lesions associated with diabetes into the following categories: skin diseases with a strong to weak association with diabetes mellitus, cutaneous infections, cutaneous manifestations of diabetic complications, and skin reactions to diabetic treatment. This article focuses on diseases associated with diabetes and cutaneous infections. Diabetic foot ulcers, although a common complication of diabetes, will not be discussed here.

Skin Findings with Strong Association to Diabetes
Diabetic dermopathy
Diabetic dermopathy is the most common cutaneous finding in patients with diabetes [2]. It occurs most commonly in patients with longstanding diabetes mellitus, is thought to be caused by microangiopathy, and occurs more frequently in patients with retinopathy, neuropathy, and nephropathy [7-9]. Discrete round or oval, flat dull-red papules on the extensor surfaces of the extremities characterize this disorder (Fig. 1). It occurs most commonly on the shins, thus the common term “shin spots.” The lesions are indurated initially, and heal with atrophic scarring. Old lesions tend to be hyperpigmented. It is felt that the lesions are initiated by trauma, but heal poorly due to the impaired microcirculation in diabetic patients [9]. Histologically, lesions are characterized by a mild lymphocytic infiltrate with thick-walled capillaries in the papillary dermis and extravasated erythrocytes [2]. There is no specific treatment; however, protection of areas of common trauma can prevent further damage.

Acquired ichthyosis
Ichthyosiform skin changes have not been reported in the literature as a common finding among diabetic patients until recently. A study of young type 1 patients found that ichthyosis of the shins was present in 48% of patients studied, compared with 6.5% of controls, and was correlated with retinopathy, duration of disease, and scleroderma-like changes of the skin. Additionally, 21% of type 1 patients were found to have dry, scaly palms compared with 0.8% of control subjects. The authors postulate that peripheral neuropathy of C fibers is the cause of the xerosis, although unpublished results of the authors demonstrated no change using thermal testing [8].

Acanthosis nigricans
Acanthosis nigricans (AN) is a marker for insulin resistance, and rarely, internal malignancy. It has been associated with diabetes, obesity, hyperinsulinemia, malignant tumors, hyperandrogenism, polycystic ovary syndrome (PCOS), and other endocrinopathies [10]. Velvety hyperkeratotic, hyperpigmented, warty plaques on the base of the neck and in the body folds characterize this disorder (Fig. 2). One recent study found that of female patients with AN, 39% had diabetes mellitus [11]. Patients with AN are typically obese. Histologically, lesions show hyperkeratosis, papillomatosis, irregular acanthosis, and minimal hyperpigmentation [12]. It is postulated that insulin binds to insulin-like growth
factor receptors and mediates epidermal proliferation [2,12]. Some groups have had success with treatment of AN using topical retinoids and calcipotriene, a vitamin D analogue [13,14].

**Diabetic thick skin**

Diabetic patients can develop thickened skin in a variety of clinical presentations, including scleroderma-like changes of the hands, finger pebbles, and scleredema adultorum. Scleroderma-like changes of the hands occur in young type 1 patients and are associated with limited joint mobility. It is associated with retinopathy, nephropathy, and neuropathy [2,15]. This finding can be present in up to 50% of patients with type 1 diabetes, and is highly associated with limited joint mobility. The pathogenesis is thought to be due to connective tissue glycosylation.

Thickness of diabetic skin was measured by Huntley and Walter [16]. They found that skin in diabetics was significantly thicker than matched controls [16]. Additionally, a pebbled texture to the dorsum of the fingers has been found in up to 72% of patients with diabetes (Fig. 3) [17]. Further, patients with diabetes are more likely to develop Dupuytren’s contractures than nondiabetics [2].

Scleredema adultorum is a condition that may occur in the presence or absence of diabetes. When not associated with diabetes, it can occur following upper respiratory infections, or in the presence of multiple myeloma. Firm, indurated plaques, primarily on the back and posterior neck characterizes it, and when associated with diabetes it is more common in obese diabetic males (Fig. 4). It tends to start insidiously, and improves only mildly with improved glycemic control. Histologically, specimens show thickened collagen bundles separated by increased mucin deposition. Treatment is disappointing, because improved glycemic control is only helpful in a minority of patients [18].

**Bullosis diabeticorum**

Bullosis diabeticorum is a rare entity, occurring primarily in noninsulin-dependent diabetic patients. Clinically,