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## **Bullosis diabeticorum in median nerve innervated fingers shortly after carpal tunnel release: case report.**

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#### Abstract:

Bullosis diabeticorum is a cutaneous manifestation of diabetes mellitus, mainly observed in the lower extremities in patients with longstanding disease. The etiology is unknown, but an association with neurologic or vascular disturbances has been suggested. We have reviewed a case of a 70-year old man with rapid development of bullae in median nerve innervated fingertips following carpal tunnel release.

#### Introduction:

Bullosis diabeticorum is a rare, but characteristic, cutaneous manifestation of diabetes mellitus<sup>1</sup>. The majority of patients described in the literature are elderly men with longstanding diabetes and neuropathy, presenting with spontaneous bullae, usually confined to the feet or legs, although presence of bullae on the hands have been described<sup>1-3</sup>. Typically, the bullae develop overnight without preceding trauma<sup>2,3</sup>. The pathophysiological mechanism(s) and possible factors triggering the condition are not known, but it may be associated with neurologic or vascular disturbances<sup>1,3,4</sup>.

#### Case report:

A 70-year old man with type 1 diabetes for 60 years and multiple complications in terms of ischemic heart disease, retinopathy, nephropathy, peripheral diabetic neuropathy and a left trans femoral amputation presented with clinical findings of bilateral carpal tunnel syndrome. An electrophysiological test showed a decreased conduction in the median nerve across both wrists. In the right hand, the latency of the motor conduction to the abductor pollicis brevis muscle was increased (6.9 msec – normal value 4.1msec), but the amplitude was normal (2.7 mV – normal 2.6 mV). The sensory conduction was completely absent to the middle finger and reduced to 25 m/s (normal 41 m/s) to the thumb. The amplitude of the latter response was

also reduced (1  $\mu$ V – normal 7  $\mu$ V). The right ulnar nerve was slightly affected by neuropathy (motor conduction velocity to the abductor digiti minimi muscle in the wrist was just below normal (42m/s – normal 45 m/s), and the sensory conduction to the fifth digit was 29 m/s – normal 40 m/s) The nerve conduction test in his right leg showed clear signs of motor neuropathy with markedly reduced amplitude in the peroneal nerve (0 mV – normal 2 mV). Sensibility measured with 2 point discrimination was 5-6 mm in the thumb and index finger, 10-12 mm in the long and radial half of the ring finger and less than 5mm in ulnar half of the ring finger and the little finger. The clinical picture with electrophysiological support was consistent with carpal tunnel syndrome without any focal compression of the ulnar nerve. The patient underwent an uncomplicated standard open right carpal tunnel release under local anaesthesia (Carbocain® 10 mg/ml; 10 ml local injection) and with application of a tourniquet (pressure set at 250 mmHg) on the forearm for 19 minutes. Intraoperatively, the median nerve showed hourglass narrowing and an altered coloration. A soft dressing was applied. Because of difficulties coping at home, the patient was admitted to the hospital after surgery.

Approximately three hours later, he complained of intense, burning pain in the median nerve innervated fingers of his right hand. Bullae, filled with clear fluid, rapidly developed on the fingertips of the thumb, index finger, middle finger, and the radial half of the ring finger (Fig 1). Capillary refill and temperature of the fingers were normal. The pain subsided within 24 hours, but the bullae remained and were left to heal spontaneously. At the two weeks follow-up, the symptoms of carpal tunnel syndrome had subsided and the bullae had become dark brown crusts. Two months after the surgery, the patient had no pain or numbness left in his hand and the fingertips had healed without scarring.

Discussion:

Bullosis diabeticorum following carpal tunnel release has been described once before <sup>5</sup>. That patient was an older man with diabetes mellitus, although without diabetic complications. His surgery was performed under local anaesthesia with epinephrine without using a tourniquet. He presented with blisters of the fingertips of the index finger, middle finger and radial half of the ring finger three days after the operation. Our patient developed the condition within three hours together with intense and burning pain.

We have no explanation for the origin of the blisters in both patients. The development of the bullae in median nerve innervated fingertips shortly after the nerve release most likely indicates an axonal origin, unknown if associated to the size of the axons, but suspiciously related to small diameter nerve fibers (i.e. non-myelinated) due to intra-/subepidermal skin separation (see below), in the pathophysiological mechanism.

The etiology of bullosis diabeticorum is poorly understood. The bullae often occur spontaneously without prior mechanical trauma and are usually painless although they can be associated with discomfort or a burning sensation <sup>2</sup>. They are filled with clear fluid and show no evidence of primary infection or inflammation and usually heal without scarring in 3-6 weeks <sup>1</sup>. Diabetic bullae are commonly found on the tips of the toes and the plantar surfaces of the feet <sup>1</sup>. Few cases have been presented with bullae on the finger pulps and they occur without a concomitant nerve compression lesion<sup>2</sup>. Reports of histopathologic examinations are inconsistent. The level of skin separation has been found to be intraepidermal (subcorneal to suprabasilar) in some patients and subepidermal (from lamina lucida to lamina densa) in others <sup>1-3</sup>. The heterogenic results may be explained by different pathogenetic events or by different stages in development <sup>2,3,6</sup>. Reepithelization of the floor of a bullae can occur rapidly and therefore an old subepidermal blister can be misinterpreted as being located intraepidermally <sup>3</sup>. Toonstra reported that skin biopsies in one patient with recurrent bullae of the fingers showed subepidermal blister formation at the level of lamina lucida on multiple

occasions<sup>3</sup>. Bernstein et al found that subjects with insulin-dependent diabetes had a reduced threshold for suction-induced blister formation at the level of lamina lucida compared to normal controls<sup>7</sup>.

Several authors have noted that their patients had evidence of neuropathy<sup>2,8,9</sup> although this is not universal<sup>3</sup>. Microangiopathy<sup>4</sup>, calcium and magnesium imbalance secondary to nephropathy<sup>10</sup>, glycaemic regulation or adverse effects of modern diabetic medication<sup>8</sup> have been suggested as important factors. Since histopathological examinations often are inconclusive, diagnosis is clinical. Differential diagnoses to diabetic bullae include bullous pemphigoid, bullous impetigo, porphyria cutanea tarda, and lesions seen with coma induced by barbiturate or carbon monoxide poisoning<sup>1,6</sup>, but these diagnoses were not appropriate for our patient. Although the bullae initially presented together with intense pain, the protracted course and the small, grouped blisters or ulcers typically seen in herpetic whitlow, was not consistent with our case. Nor were hand ischemia or allergic reaction to surgical scrub likely explanations.

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#### Figure legend

Figure 1. Photo of the patient's hand three hours (a, b) and two weeks (c, d) after carpal tunnel release.