

## Vascular Involvement in Diabetic Subjects with Ischemic Foot Ulcer: A New Morphologic Categorization of Disease Severity

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**Objectives** . Arteriographic lesions of diabetic subjects with critical limb ischemia (CLI) and ischemic foot ulcer were reviewed retrospectively, to provide new criteria for stratification of these patients on the basis of their vascular involvement. **Patients** . In 417 consecutive CLI diabetic subjects with ischemic foot ulcer undergoing lower limb angiography, lesions were defined as stenosis or occlusion, localization, and length (5 cm, 5e 10 cm, > 10 cm). In a subgroup of 389 subjects, foot arteries also were evaluated. Patients then were categorized into 7 classes of progressive vascular involvement based on angiographic findings.

**Results** . Of the 2893 found lesions (55% occlusions) 1% were in the iliac arteries, whereas 74% were in below-the-knee (BTK) arteries. Sixty-six % of all BTK lesions were occlusions, and 50% were occlusions > 10 cm ( $p < 0.001$  vs proximal segments). Occlusions of all BTK were present in 28% of patients, although there was patency of at least one foot artery in 55% of patients. The morphologic Class 4 (two arteries occluded and multiple stenoses of tibial/peroneal and/or femoral/popliteal vessels) was the most common (36%). An inverse correlation between morphologic class and TcPO<sub>2</sub> was observed ( $r = -0.187$ ,  $p = 0.003$ ).

**Conclusions** . In CLI diabetic subjects with ischemic foot ulcer, the vascular involvement is extremely diffuse and particularly severe in tibial arteries, with high prevalence of long occlusions. A new morphologic categorization of these patients is proposed.

**Keywords:** Diabetes mellitus; Critical limb ischemia; Peripheral artery disease; Diabetic foot.

Lower limb peripheral arterial disease (PAD) is a common complication of diabetes mellitus.<sup>1</sup> As compared to normal subjects, PAD prevalence is significantly higher in diabetic patients<sup>2</sup> and is associated with more severe clinical manifestations and a higher risk of critical limb ischemia (CLI) and limb loss.<sup>3</sup> The majority of non-traumatic major amputations are performed in diabetic subjects.<sup>4</sup> PAD in patients with diabetes also is different in terms of histological features and anatomic distribution of obstructive lesions.<sup>5,6</sup>

Previous papers have described the variation in distribution of arterial lesions among lower limb

arteries according to cardiovascular risk factor profile,<sup>7e 10</sup> showing an association between diabetes and infrapopliteal vessel obstructions.<sup>6e 8</sup> Few studies, however, specifically have addressed the distribution of lesions in diabetics<sup>3,6,11,12</sup> and most of those reports focus on small series consisting of heterogeneous groups of diabetic subjects with or without foot ulcer. To the best of our knowledge, only one paper<sup>13</sup> included a series of diabetic subjects exclusively selected for the presence of ischemic foot ulcer. This study<sup>13</sup> showed a predilection for distal artery involvement, but did not provide information about the length of lesions. Although the indications for revascularization in diabetics with CLI are well established,<sup>14</sup> a more informative morphologic picture to describe the typical arterial involvement could be useful. Furthermore, in our opinion, it would be

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