

# Diabetic Retinopathy in Patients With Diabetic Foot Ulcer: A Systematic Review

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## Abstract

This review discusses the evidence on diabetic retinopathy (DR) in patients with diabetic foot ulceration (DFU). A systematic literature review was performed on PubMed, Medline, Springer Nature, and Scopus, following the PRISMA guidelines, using the following terms, individually or in combination: “diabetic foot ulcer” OR “diabetic foot syndrome” OR “DFU” and “diabetic retinopathy.” The initial search yielded 648 articles published between 1975 and 2020. After applying exclusion and inclusion criteria, a total of 9 articles were analyzed, assessing the correlations between DR and DFU. In all cases, DR and especially proliferative diabetic retinopathy were significantly higher in the presence of DFU, though the frequency of DR showed large variability (22.5% to 95.6%). There was a significant correlation between advanced stages of DFU and increased frequency of DR and proliferative diabetic retinopathy. On the other hand, there is a risk of accelerated progression of DR in nonhealing DFUs, possibly related to chronic inflammation and associated infection. Hence, patients with DFUs should be monitored by an ophthalmologist, and those with DR should be promptly referred to a specialized diabetic foot clinic.

## Keywords

diabetic retinopathy, diabetic foot ulcer, inflammation, progression, microvasculopathy, neuropathy

It is well known that diabetes mellitus (DM) is a major worldwide public health concern. The number of subjects with DM continues to rise and it is estimated that it will 4.4% of the population worldwide will have DM by 2030.<sup>1</sup>

Diabetic foot ulcer (DFU) is one of the most frequent and invalidating complications, of DM.<sup>2,3</sup> More than 85% of lower-limb amputations in DM began as DFUs.<sup>4-7</sup> The latter increase morbidity, hospitalization, depression, and health expenses, as well as impoverishing the quality of life.<sup>4-7</sup> Epidemiological studies have shown that the main risk factors are peripheral arterial disease (PAD), diabetic polyneuropathy (DPN), infection, and precipitating trauma, all of them more frequent with long DM duration, hyperglycemia, hypertension, and other microvascular complications of DM.<sup>5-16</sup> Not only do DFUs present a challenge for healing, but they also very frequently recur.<sup>17</sup>

Diabetic retinopathy (DR) is caused by microvascular damage of retinal capillaries and still represents an important cause of blindness.<sup>18,19</sup> Its first coexistence with DFU was discussed by Walsh et al in 1975.<sup>8</sup> He observed that a subgroup of patients with new-onset DM also had DFUs,

and he described this constellation as the “eye-foot syndrome.”<sup>8</sup> Subsequent workers have found significant associations between DR and DFUs, partly explained by their common underlying mechanism of diabetic microangiopathy.<sup>5-17,20-24</sup> This association becomes again important, given the increasing morbidity and complexity of DFU patients nowadays.<sup>25-28</sup> Therefore, the present review aimed to discuss available evidence on DR in patients with DFU.

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