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Patient Self-Report of Prior Laser Treatment Reliably Indicates Presence of Severe Diabetic Retinopathy

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Abstract

PURPOSE—To determine whether patient self-report of prior laser treatment can be used as a reliable tool for assessing the presence of severe diabetic retinopathy.

DESIGN—This was a retrospective study on two groups of diabetic subjects.

METHODS—One hundred patients with diabetes were recruited from the general eye and retina clinics at the University of Chicago Hospitals. The patients were asked, “Have you ever received laser treatment for your diabetic eye disease (DED)?” A chart review was then conducted noting if the patient had received either focal laser treatment for diabetic macular edema or panretinal photocoagulation for proliferative diabetic retinopathy. Data from the Wisconsin Epidemiological Study of Diabetic Retinopathy (WESDR) were also analyzed. Participant responses to the question “Have you had laser photocoagulation treatment for your eyes?” were analyzed with documentation of photocoagulation scars determined by grading seven-standard field color fundus photographs.

RESULTS—In the University of Chicago group, 96 of 100 (96%) of patients were accurate in reporting whether they had received previous laser treatment for DED (sensitivity 95.8%, specificity 96.1%, and positive predictive value 88.5%). In the WESDR analysis, 2,329 of 2,348 (99%) of participants were accurate in reporting whether they had prior laser treatment for DED (sensitivity 96.0%, specificity 99.5%, and positive predictive value 95.6%).

CONCLUSIONS—The high sensitivity and specificity of our results validate the use of patient self-report as a useful tool in assessing past laser treatment for severe diabetic retinopathy. Patient self-report may be a useful surrogate to clinical examination or medical record review to determine the presence of severe diabetic retinopathy.

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Most of the visual morbidity attributable to diabetic retinopathy can be attributed to its two severe manifestations: diabetic macular edema (DME) and proliferative diabetic retinopathy (PDR). In such cases, the use of focal laser therapy or panretinal photocoagulation (PRP), respectively, is often employed. Laser treatment for DME or PDR may therefore be used as an indicator for the presence of severe diabetic retinopathy that requires laser photocoagulation treatment. Since it is often not possible to obtain information on prior laser treatment from medical records for individuals in the large cohorts that have already been developed, questioning individuals in these cohorts about prior laser treatment for diabetic eye disease (DED) may be a useful surrogate in determining the presence of severe diabetic retinopathy.

The goal of our study is to determine the validity of patient self-report of prior laser treatment as a useful proxy to identify individuals with severe diabetic retinopathy as defined by the presence of PDR or DME requiring laser treatment. Thus, we specifically hypothesize that self-reported laser treatment for DED is associated with the presence of severe diabetic retinopathy as documented in medical (or study) records of persons with diabetes.

METHODS

At the university of chicago hospitals, 100 patients with both type 1 and type 2 diabetes mellitus were recruited from the general eye and retina clinics. The patients completed a questionnaire that inquired, “Have you ever received laser treatment for your DED?” Subsequently, we conducted a chart review noting whether the patient had received laser treatment for diabetic retinopathy (ie, either focal laser treatment for DME or PRP for PDR). We included documented laser treatment performed at the University of Chicago Hospitals as well as evidence of prior laser treatment on funduscopic examination. In addition, it was noted from the chart review whether the patient had received any other type of laser treatment, for example, peripheral iridotomy, posterior capsulotomy, or barricade laser retinopexy.

The Wisconsin Epidemiologic Study of Diabetic Retinopathy (WESDR)[1–5] was initiated to describe the prevalence and severity of retinopathy and its relation to risk factors, such as the level of glycemia and blood pressure, in a cohort of patients with type 1 and 2 diabetes. Detailed clinical and epidemiologic data are available on these individuals over a 25-year period. A structured interview was conducted by the examiners in this study on factors related to diabetes and the interviews included a question about laser treatment for DED. WESDR participants were asked, “Have you had laser photocoagulation treatment for your eyes?” Responses to this question from 2,348 WESDR participants, including persons with younger- and older-onset (type 1 and type 2) diabetes, were compared with data on retinopathy from grading of seven-standard field color fundus photography. The fundus photography grading protocol has been described in detail elsewhere.[4,6–9] PRP was documented by the grading of fundus photographs, and in the absence of fundus photographs, medical records were obtained documenting that macular edema attributable to diabetes had been present prior to the focal (or grid) photocoagulation. For situations in which participants gave a history of laser photocoagulation but there were no signs of treatment burns, information was requested from the treating ophthalmologist to verify that such treatment had been done and to ascertain whether macular edema had been present prior to focal laser treatment.

For both study groups, frequencies of responses and assessment of having had prior laser treatment were determined. Sensitivity, specificity, and positive and negative predictive values were calculated for each study group.

RESULTS

Table 1 shows the results for the study at the University of Chicago Hospitals. Twenty-four of the 100 patients had documentation of prior laser treatment for DED in their medical record. Twenty-three of the 24 patients who had received prior laser treatment reported this accurately. One patient previously received focal laser treatment, but did not report this on the questionnaire. Of the remaining 76 patients who had not received laser treatment for DED, 73 reported accurately. Three patients who had received previous laser treatment for non-DED (including selective laser trabeculoplasty, argon laser trabeculoplasty, and neodymium-doped yttrium-aluminum-garnet suture lysis) answered incorrectly, mistakenly assuming that these laser treatments were done for their DED. The sensitivity of the questionnaire in assessing prior laser treatment for DED was 95.8% (23 of 24), with a specificity of 96.1% (73 of 76). The positive predictive value (PPV) was 88.5% (23 of 26), and the negative predictive value (NPV) was 98.6% (73 of 74).

For the WESDR subjects, the mean (standard deviation) age was 50.9 (22.1) years and the median age was 56 years. In the WESDR data (Table 2), 224 of the 2,348 participants (9.5%) had received laser treatment for DED. Two hundred and fifteen of the 224 participants answered the questionnaire accurately, with 184 of the 188 participants who received PRP and 31 of the 36 participants who received focal treatment answering accurately. A total of 2,114 of the 2,124 participants who had not received laser treatment answered the questionnaire accurately. For the WESDR participants, the questionnaire had a sensitivity of 96.0% (215 of 224), a specificity of 99.5% (2,114 of 2,124), a PPV of 95.6% (215 of 225), and a NPV of 99.6% (2,114 of 2,123).

DISCUSSION

This study assessed the accuracy of patient self-reporting of prior laser treatment for DED with documented diabetic retinopathy treatment history from medical records and ophthalmoscopic exams. We found that patients reported prior diabetic laser treatment history accurately. The sensitivities of the questionnaire in each of the groups ranged from 94.8% to 96.6%, with a range in specificities from 96.1% to 99.6%.

Our results reassure that questions on the history of laser treatment for diabetic eye problems, as judged by analysis of our two groups, may be good surrogates for determining the presence of past laser treatment for severe DED and may serve as a surrogate for severe retinopathy requiring laser photocoagulation. A questionnaire proxy provides an inexpensive measure to assess a large group of diabetic patients for macular edema and proliferative retinopathy requiring laser photocoagulation in the absence of formal funduscopic examinations or medical record review when these data are unavailable, which may prove to be useful in large clinical trials as a surrogate measure of severe retinopathy requiring laser photocoagulation.[10] In genetic studies of severe diabetic retinopathy, history of laser treatment may prove useful as a phenotypic marker when detailed clinical data on these endpoints are lacking. Because of the known relation of severe diabetic retinopathy to systemic disease, patients answering our question affirmatively should be closely followed by their primary care physicians for the possibility of renal and cardiovascular disease.[11,12]

There are some limitations to our study. We speculate that patients who received focal laser treatment may be less reliable in their questionnaire responses than those receiving PRP, because of the longer time and often more intense treatment of PRP compared to focal laser photocoagulation. The sample size of our study, however, is too small to address this question and a larger population study is necessary to explore this further. Also, the question used for the University of Chicago study participants did not ask about the specific type of treatment

they received and whether it was for DME or PDR. Future studies on self-report of laser treatment should include questions that are more specific. An interesting question that we did not explore is the frequency of false-positive responses in subjects who have had prior nondiabetic laser treatment, although the results from the University of Chicago group do not suggest a high false-positive rate. There may be a much lower specificity for a diabetic population that has had many other laser treatments (eg, an elderly diabetic population with a high frequency of pseudophakia or glaucoma). While we were able to ascertain a large population of White diabetic subjects for this study, we have limited numbers of African Americans and no other ethnic groups are represented in our study. Individuals in our study may also be skewed towards groups that are more intensely involved in their health care as all individuals had to agree to participate in a research study. All subjects in the University of Chicago study receive their health care at an academic medical center, which again may represent a bias in our study and may limit the extent to which one can extrapolate the findings to other ethnicities and other diabetic populations.

In conclusion, in this study self-report of prior laser treatment in two groups of diabetic participants was a reliable tool for assessing the presence of severe diabetic retinopathy requiring such treatment. Patient self-report may be a useful surrogate to clinical examination or medical record review to determine the presence of DME and PDR requiring laser photocoagulation.

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TABLE 1

University of Chicago Analysis: Patient Self-Report of Prior Laser Treatment and Accuracy of Self-Report

	Number of Patients Reporting Prior Laser Treatment for Diabetic Retinopathy	Number of Patients Reporting No Laser Treatment for Diabetic Retinopathy	Total
Number of patients giving accurate report[a]	23	73	96
Number of patients giving inaccurate report	1	3	4
Total	24	76	100

[a] Accuracy determined by chart review confirmation of laser treatment.

TABLE 2

Wisconsin Epidemiologic Study of Diabetic Retinopathy Analysis: Patient Self-Report of Prior Laser Treatment and Accuracy of Self-Report

	Number of Patients Reporting Prior Laser Treatment for Diabetic Retinopathy	Number of Patients Reporting No Laser Treatment for Diabetic Retinopathy	Total
Number of patients giving accurate report[a]	215	2114	2329
Number of patients giving inaccurate report	9	10	19
Total	224	2124	2348

[a] Accuracy determined by grading of fundus photograph for the presence of photocoagulation treatment scars.