DISTANT EFFECT OF PERIPHERAL BRANCH VEIN OCCLUSION ON THE MACULA*

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INTRODUCTION

MACULAR EDEMA AND/OR EXUDATE IS A VERY COMMON RETINAL VASCULAR cause of decreased vision that may be produced by a number of disease entities such as diabetes, vein occlusion, cataract surgery, Coats' disease, telangiectasis, radiation retinopathy, and uveitis, to name just a few[1]; it is a leading cause of decreased vision in the United States today. We know very little, if anything, about the exact mechanism of the cause of edema and lipid formation in the fovea[2]; however, we are fortunate in recognizing that we can sometimes treat edema by management of the underlying disease entity (eg, uveitis) or by using laser photocoagulation (eg, branch vein occlusion).

In order to take one step in learning more about possible mechanisms in the production of edema and lipid in the hope that we can treat this problem more efficiently, we wish to draw attention to cases of branch vein occlusion that may answer some questions, in part, but also raise a number of other questions. Branch vein occlusion provides an interesting model for the study of macular edema and exudate because it is a situation in which there appears to be one acute, stable event that can produce macular edema and this event remains constant, unlike, for example, diabetes, that is often progressive.

Occasionally, when branch vein occlusion is associated with cystoid edema, we see dilated and leaking capillaries beyond the geographic region that should be affected. For example, Fig 1 shows a small *superior* branch vein occlusion in which there is dilatation and leakage of capillaries extending *inferior* to the macula. In attempting to understand this and similar phenomena, we will present two cases of much more distant branch vein occlusion that have had an effect on the macula.

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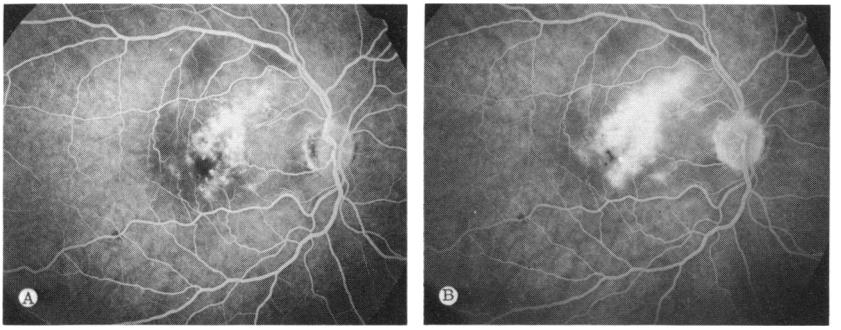

FIGURE 1
A: Fluorescein angiogram, transit phase, demonstrating small *superior* branch vein occlusion with dilated and leaking capillaries extending to *inferior* aspect of the fovea. B: Fluorescein angiogram, late phase.

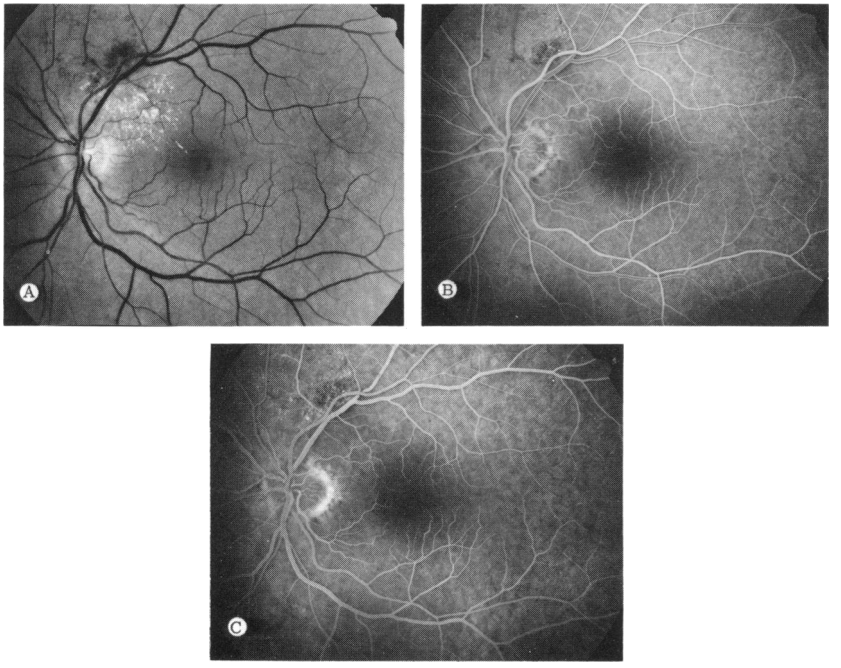

FIGURE 2
A: (Case 1), Fundus photograph, 20/20 vision. B: Fluorescein angiogram, transit phase, demonstrating small *superior* branch vein occlusion without macular involvement. C: Fluorescein angiogram, late phase, demonstrating small superior branch vein occlusion without macular involvement.

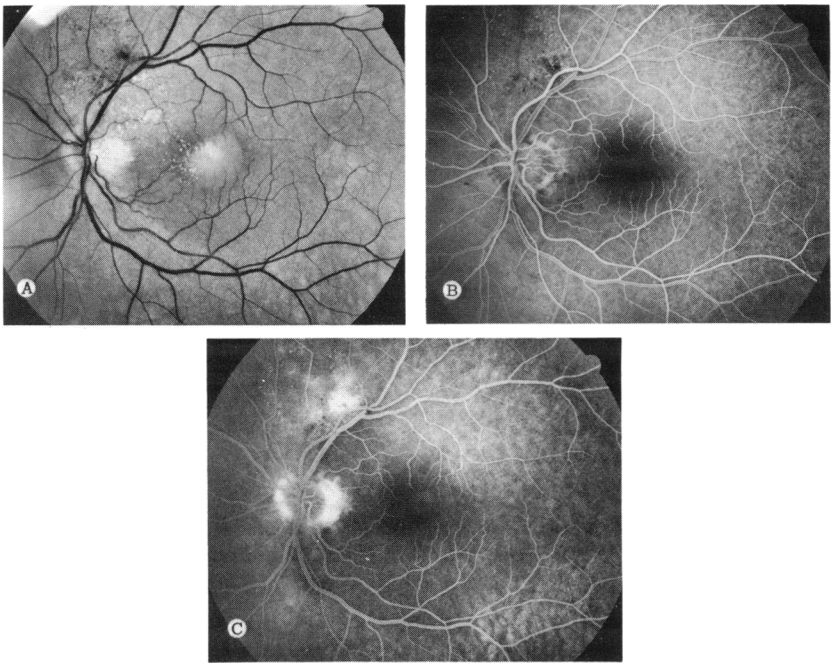

FIGURE 3
A: (Case 1), Fundus photograph, 1 year following Fig 2, vision 5/200. B: Fluorescein angiogram, transit phase, demonstrating no macular abnormality. C: Fluorescein angiogram, late phase, demonstrating no macular abnormality.

CASE REPORTS

CASE 1

A 67-year-old white man was referred to us with a small superior branch vein occlusion (Fig 2). The fellow eye was normal. The fluorescein angiogram demonstrated a small area of capillary dilatation in the superior fundus distant from the macula. At the time we first saw the patient, he was asymptomatic with vision of 20/20. We reassured the patient and the referring physician that this branch vein occlusion would probably remain asymptomatic and that no therapy was in order. We saw the patient on one more occasion 6 months later with no change in the fundus or vision; we returned the patient to the referring physician for further routine follow-up as needed.

One year after we had seen the patient, the referring physician brought him back to our attention with vision having declined to 5/200 and lipid appearing now in the macula (Fig 3). We suspected that a separate problem had developed, but we

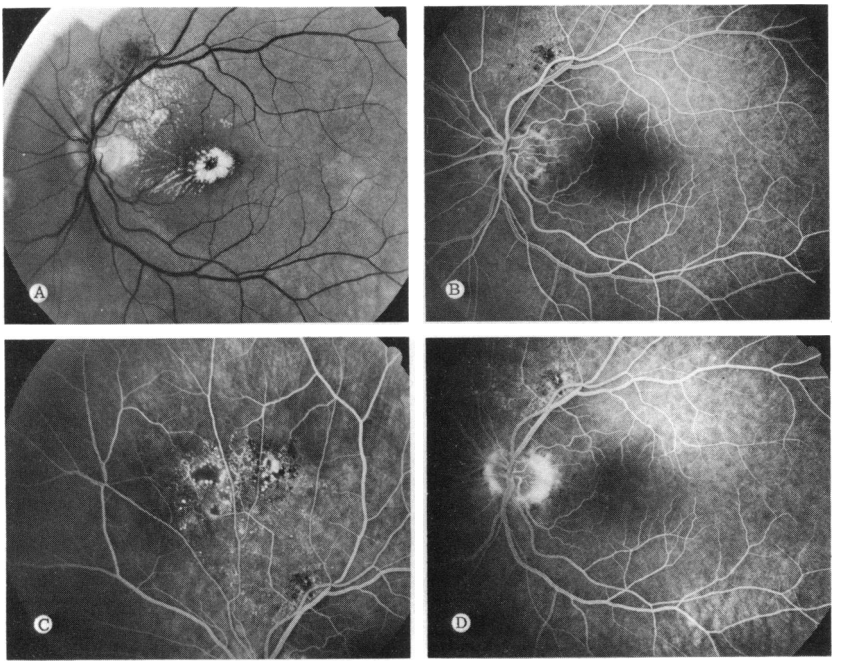

FIGURE 4

A: (Case 1), Fundus photograph, 2 months following Fig 3, demonstrating increasing foveal lipid. B: Fluorescein angiogram, transit phase, demonstrating no separate macular abnormality. C: Fluorescein angiogram, superior sweep, demonstrating extent of capillary abnormality from the branch vein occlusion. D: Fluorescein angiogram, late phase.

obtained a fluorescein angiogram that did not show a macular abnormality.

The patient returned in 2 months, now with more lipid in the macula (Fig 4) and a repeat fluorescein angiogram again showed no separate macular abnormality.

We elected to treat the region of the superior branch vein occlusion with grid photocoagulation, and this was accomplished under topical anesthesia without complication. Four months later (Fig 5), the macular lipid was just beginning to resorb, and 6 months following that (Fig 6) the lipid was almost totally reabsorbed. At 16 months following laser treatment, vision had returned to 20/20.

This case, and its apparent response to laser photocoagulation, suggest that a relatively small area of seemingly insignificant retinal vascular disease can have a distant effect on the macula, and that distant laser treatment might be beneficial.

CASE 2

This 66-year-old man was noted to have a superotemporal branch vein occlusion on a routine examination. The fellow eye was normal. Fluorescein angiography delineates the peripheral branch vein occlusion and the consequent capillary

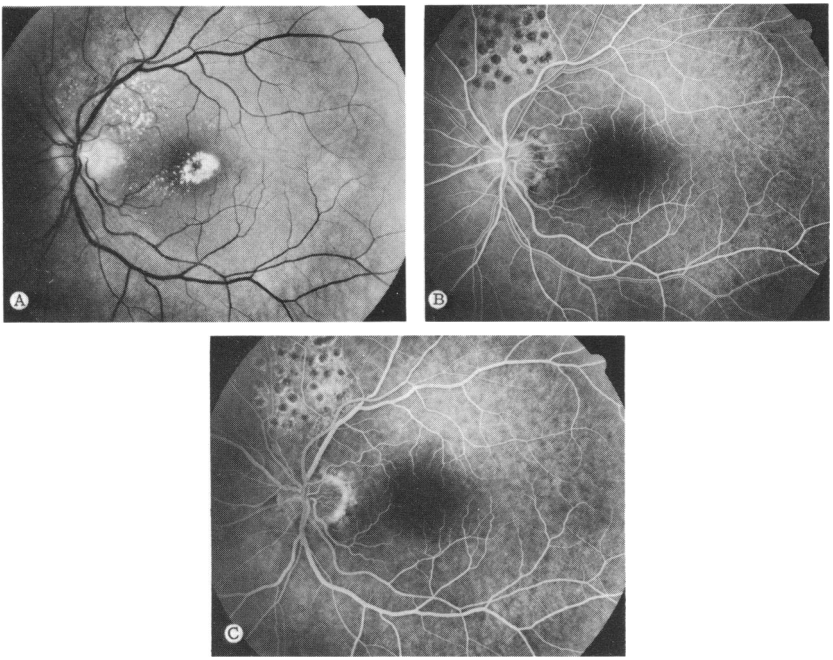

FIGURE 5

A: (Case 1), Fundus photograph, 4 months following *superior* scatter photocoagulation and 4 months following Fig 4, demonstrating slightly less foveal lipid. B: Fluorescein angiogram, transit phase, demonstrating pattern of scatter laser photocoagulation. C: Fluorescein angiogram, late phase.

nonperfusion, peripheral to the region from which the macula is drained (Fig 7A). Nevertheless, the late phase of the fluorescein angiogram demonstrates fluorescein leakage in the macular region (Fig 7B). Vision was not affected at this time and the patient was followed.

Several months later a repeat fluorescein angiogram (Fig 8) demonstrated reduced fluorescein leakage in the macular region. Laser treatment was not performed.

DISCUSSION

The cases presented here do not occur often in our experience, but they demonstrate the distant effect of a peripheral vascular event on the macula. When the effect is distant, the remote aspect is obvious. However, when the retinal vascular abnormality occurs closer to the macula, and the macula is involved with edema, perhaps this distant effect is still present, but not as obvious. For example, in Fig 1, perhaps the inferior macular

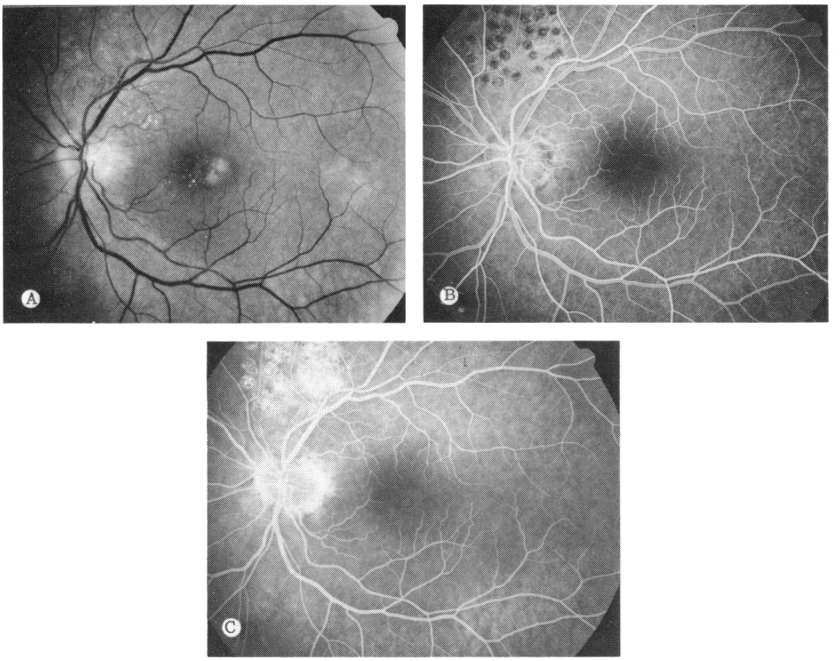

FIGURE 6

A: (Case 1), Fundus photograph, 6 months following Fig 5 and 10 months following laser photocoagulation, demonstrating marked decrease in foveal lipid. B: Fluorescein angiogram, transit phase, 10 months following laser photocoagulation. C: Fluorescein angiogram, late phase, 10 months following laser photocoagulation.

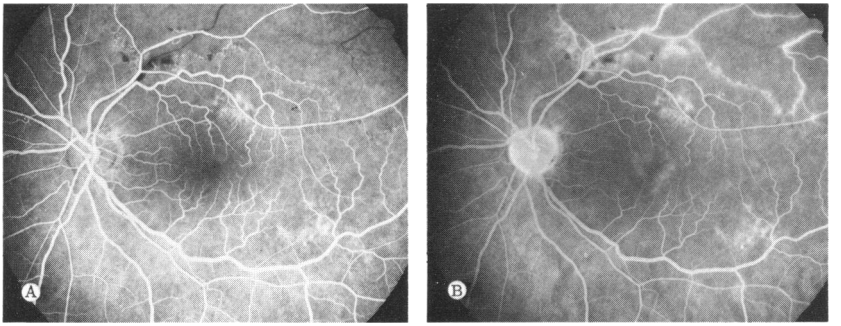

FIGURE 7

A: (Case 2), Fluorescein angiogram, late transit phase, demonstrating peripheral nonperfusion from branch vein occlusion. B: Fluorescein angiogram, late phase, demonstrating mild macular edema.

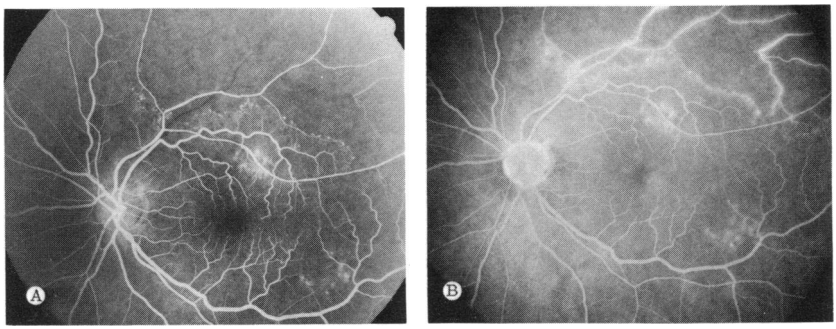

FIGURE 8

A: (Case 2), Fluorescein angiogram, transit pahse, 6 months following Fig 7. B: Fluorescein angiogram, late phase, 6 months following Fig 7, demonstrating less macular edema.

edema is a distant effect, although it is contiguous with the region of involvement. If that were the case, perhaps the entire area of edema need not be treated with grid photocoagulation in order to obtain total resolution of the edema.

The mechanism(s) of the distant effect of ocular disease on the macula, as previously observed and reported in such diverse situations as ocular surgery, uveitis, and Coats' disease, is not understood. In this report, we have presented two such cases of distant effect caused by peripheral branch vein occlusion in order to suggest that similar pathophysiologic mechanisms should be considered as possibly playing a role, at least in part, for macular edema that is not caused by peripheral disease.

We raise these possibilities for considering treatment recommendations. For example, in the Collaborative Branch Vein Occlusion Study, grid laser photocoagulation was recommended throughout the area of edema and capillary abnormality up to the edge of the capillary free zone.[3] However, in some cases, it is possible that the dilatation and capillary leakage at the edge of the capillary free zone may represent a distant effect and may not need treatment in order to be successful, just as we seem to have been successful in treating case 1. Consequently, we believe that the cases presented here raise the possibility that modification of present laser treatment recommendations could be explored in future pilot clinical research studies.

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DISCUSSION

DR FRONCIE A. GUTMAN. Doctors Patz and Finkelstein have documented that patients with branch retinal vein occlusions, which do not compromise venous drainage of the macula may still suffer macular complications. The two cases they presented were peripheral branch retinal vein occlusions not involving macular venous drainage which did suffer the respective macular complications of exudative change and intraretinal edema. The authors have properly noted that maculopathy, including macular edema and exudates, are seen in selected retinal conditions with peripheral retinal lesions. These diseases include angiomatosis retinae and juvenile Coats' disease.

The common features that characterize the findings and natural course of these diseases, include retinal vascular abnormalities, increased vascular permeability, retinal detachment, and chronicity. These common features are evident in branch retinal vein occlusion. Fluorescein angiography documents the increased permeability of the intraretinal microvascular abnormalities which may result in intraretinal and subretinal exudative change. Obvious exudative nonrhegmatogenous retinal detachments have been reported in branch retinal vein occlusions. Subclinical detachments are probably present in many branch retinal vein occlusions, and are due to transudation of intraretinal extracellular fluid into the subretinal space. The development of the subclinical detachment, plus the supine position in which people sleep, may encourage gravitational dissection of subretinal fluid into the macular area. Subretinal macular exudates represent the unreabsorbed lipoproteinaceous residues associated with the subclinical detachment.

Macular exudates were not recognized until 1 year had elapsed after the initial evaluation in their first case. This suggests that chronicity of the disease is a factor. The appearance of macular exudates in other diseases such as angiomatosis retinae and juvenile Coats' disease is also associated with chronicity.

A causal relationship between the peripheral lesion and the macular change, seems to be documented by laser destruction of the peripheral retinal lesion resulting in a disappearane of the macular exudates. In that sense, the reabsorption of subretinal exudates seen in case 1 would be similar to the clearing of exudates in the posterior pole seen with destruction of the peripheral lesions in juvenile Coats' disease and angiomatosis retinae.

The authors have raised an interesting hypothesis regarding the effect of distant peripheral laser treatment on macular edema in branch retinal vein occlusions. However, since case 1 did not have fluorescein angiographic evidence of macular edema, and case 2 received no laser treatment, no relevant observations or information was presented in support of this hypothesis. I personally have not seen peripheral laser treatment of ischemic retina in an eye with a branch retinal vein occlusion result in a remission of macular edema.

Case 2 is an example of a peripheral ischemic superior temporal retinal branch vein occlusion with documented intraretinal fluorescein leakage within an area of uninvolved retina. Intraretinal exudates and intraretinal microvascular abnormalities are commonly recognized in contiguous uninvolved retina adjacent to a segment of retina drained by an obstructed branch retinal vein. An obstruction of a branch vein results in stasis within the peripheral retina drained by that vein and causes the shunting of blood into the adjacent normal retina. However, this type of intraretinal change is different and does not seem to explain the more distant intraretinal edema seen in case 2. However, case 2 did have a large area of capillary nonperfusion, and I wonder if another mechanism might be considered. Is it possible that a humoral factor such as an angiogenesis factor, was produced by the ischemic retina and contributed to the distant intraretinal edema?

I would like to pose the following questions for the authors: (1) Did case 1 have macular edema or was the macular change simply macular exudates? (2) Has case 2 been followed for a longer period of time. If so, has preretinal neovascularization developed which might suggest the presence of an angiogenic humoral factor? (3) Have the authors seen a branch retinal vein occlusion with both macular edema and peripheral ischemia where they treated the peripheral ischemic retina with photocoagulation and documented a remission of the macular edema?

I want to thank the authors for permitting me to review and discuss this most interesting paper.

DR LEE M. JAMPOL. It would seem that in these various diverse entities there are three explanations for the appearance of material in the macula. One could be the release of mediators from the peripheral retina, as suggested by Doctor Gutman. Another would be a shift in the hemodynamics of the entire eye affecting other parts of the retina besides the area of obstruction. The third would be a physical dissection of materials from the peripheral retina to posterior pole, perhaps in the subretinal space. I would like to ask Doctor Finkelstein if he has a felling as to the contribution of these three possibilities.

DR DANIEL FINKELSTEIN. I would like to thank Doctor Gutman and Doctor Jampol for their discussions and thank Doctor Gutman for his suggestions of other mechanisms, in addition to the factors that we mentioned, which were very well taken and very interesting ones. I would agree with both Doctors Gutman and Jampol that there are a number of mechanisms that one can propose for a peripheral lesion having an effect on the macula. It is difficult for me to know how to approach those mechanisms. One of the major aspects of the cases we presented today was to raise the question as to whether the peripheral effect on the macula may be taking place at times that we don't now recognize, rather than trying to explain the mechanism for peripheral effect. We wanted to raise the question as to whether we need to treat macular edema in the same way that we have been or whether less laser treatment may also work; that is, with the laser treatment itself, we may obtain some information regarding the mechanisms. These were the only two cases that we have seen; hopefully, we will all keep an eye out for them as they turn up.