

# Criteria for improving visual acuity in ischaemic branch retinal vein occlusion using argon laser

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## Abstract

**Purpose** To re-assess the value of argon laser treatment for macular oedema in ischaemic branch retinal vein occlusion (I-BRVO).

**Methods** Case series consisting of three patients with macular oedema following I-BRVO. Three patients were studied including two patients where ischaemia extended to include the foveal avascular zone (FAZ), with additional retinal neovascularisation in one of these. Heavy, overlapping areas of treatment were applied to the ischaemic retina up to 500 microns from the fovea.

**Results** All cases in the series benefited from significantly improved visual acuity. In one case laser was given several years after the initial retinal vasculopathy.

**Conclusions** Argon laser treatment may improve visual acuity in I-BRVO even with severe ischaemia extending into the FAZ. Treatment intensity must be sufficient to destroy ischaemic retina. Visual benefit may last for several years, and treatment can be undertaken several years after I-BRVO. The benefit to visual acuity of argon laser treatment in I-BRVO needs to be re-assessed in a prospective study.

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**Keywords:** retinal vein occlusion; laser treatment

Branch retinal vein occlusion (BRVO) is a common ophthalmic disease, but the management of some aspects of the condition has yet to be adequately documented.<sup>1–3</sup> Macular oedema is the major cause of vision loss in these patients and it is still unclear when or indeed if argon laser treatment should be used to improve visual acuity when BRVO is associated with ischaemia (I-BRVO).<sup>2–4</sup> Some

I-BRVO patients benefit from treatment, but important aspects of the treatment regimen remain unclear such as which patients to treat, when to treat, and how much treatment is needed.

We present three cases of I-BRVO that *may suggest answers* to some of these questions. In each case, blue-green argon laser was applied using an area centralis lens. Laser spot sizes of 100–200  $\mu\text{m}$ , for 0.1–0.2 ms and power ranging from 100 to 200 mW were used in a dense grid pattern. This was applied to the ischaemic area as defined by fluorescein angiography. No laser spots were applied closer than 500  $\mu\text{m}$  to the fovea.

## Case report

### Case 1

In 1994, a 59-year-old female patient had suffered an I-BRVO secondary to hypertension and hypercholesterolaemia. After 7 years, visual acuity was still poor at 6/36 and fluorescein angiography revealed marked retinal ischaemia extending into the foveal avascular zone and recent retinal neovascularisation in the upper temporal quadrant (Figure 1a). There was no significant vitreous haemorrhage. Upper temporal sector argon laser photocoagulation was recommended and undertaken.

After 4 months, there had been significant regression of pre-retinal neovascularisation and, remarkably, there had been marked improvement in acuity to 6/9. This improved acuity was still evident 1 year later.

### Case 2

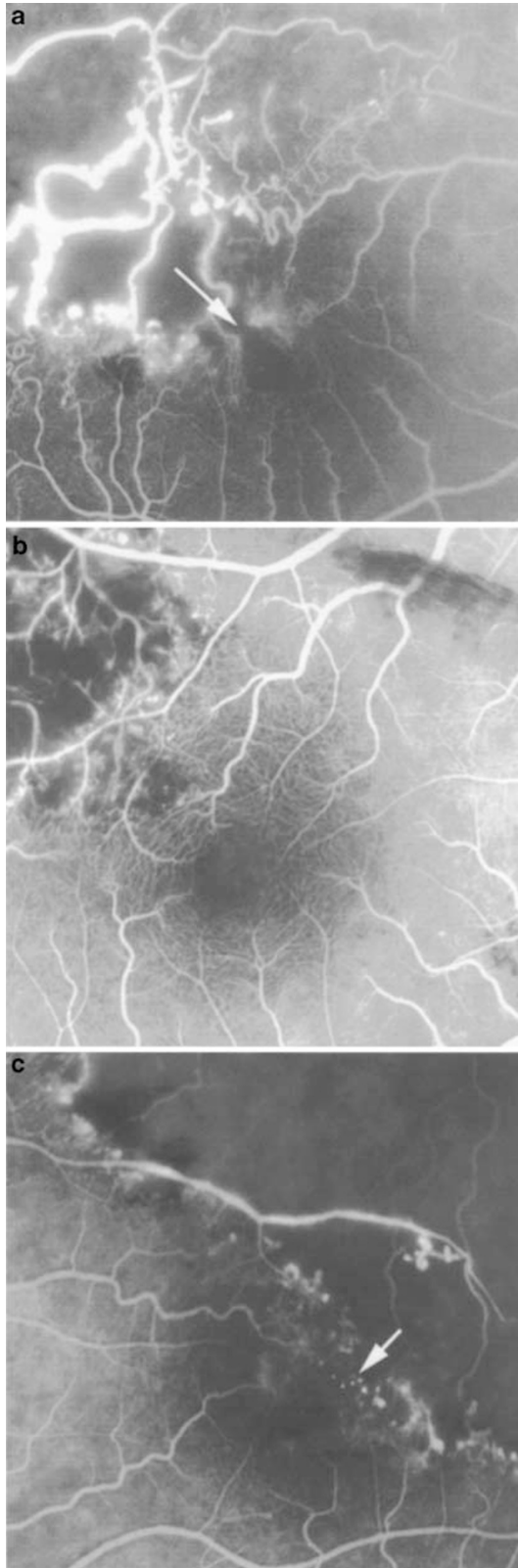
A 45-year-old, female, non-insulin dependent diabetic suffered an I-BRVO reducing acuity to 6/60 (Figure 1b). After 4 months, acuity

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remained poor and so argon laser photocoagulation was recommended and undertaken in the ischaemic sector.

After 1 month, visual acuity had improved to 6/9 and this improvement was still evident 15 months later.

### Case 3

A 64-year-old male, hypertensive patient presented with an I-BRVO and an acuity of 6/24 (Figure 1c). This poor vision was still evident at 4 months and laser treatment recommended. Laser spot sizes of 100  $\mu\text{m}$ , for 0.1 ms and power ranging from 100 to 140 mW were used in a sparse grid pattern. Approximately 40 burns only were applied to a small area of ischaemic retina superotemporal to the fovea. This had no effect on acuity and a further 8 months later, argon laser photocoagulation was undertaken to a larger area of the ischaemia following the revised protocol given above. After 2 months, visual acuity had improved to 6/9 and this beneficial response was still evident 6 months later.

### Comment

It has been suggested that argon laser only be used to treat macular oedema caused by I-BRVO if the foveal avascular zone is still intact.<sup>2-5</sup> It has also been suggested that even in I-BRVO patients with intact foveal avascular zones, improvement with treatment may not be significantly different from that seen in the natural history of I-BRVO patients as a group.<sup>6-8</sup>

Clearly, the patients in this study benefited from treatment, most remarkably Cases 1 and 3 where ischaemia extended into the foveal avascular zone. When comparing these results with previous studies, it is noteworthy that in each case, the grid laser treatment applied was more intense than Branch Vein Occlusion Study Group<sup>2</sup> recommendations. This might explain why Patient 3 did not respond to initial laser treatment but benefited with marked acuity improvement when more intensive treatment was applied. Such treatment may be effective by more efficiently removing ischaemic retinal tissue and so more significantly reducing hypoxia. It has been proposed that by reducing hypoxia, a relative increase in inner retinal oxygen tension can lead to

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**Figure 1** Early venous phase fluorescein angiography of the macula in cases of I-BRVO. (a) Case 1, right eye showing upper temporal ischaemia extending into the foveal avascular zone (arrow); (b) Case 2, right eye showing marked upper temporal ischaemia extending up to but not including the foveal avascular zone that, however, appears enlarged and irregular; (c) Case 3, left eye, intense upper temporal ischaemia extending into the foveal avascular zone (arrow).

vasoconstriction and reduced hydrostatic pressure within vessels. According to Starling's law, there would then be a relative influx of extracellular fluid into the vessels reducing macular oedema.<sup>9</sup> Although such treatment could lead to clinically significant scotoma, this is probably outweighed by the advantage of improved foveal acuity.<sup>10</sup> It was also particularly surprising to see visual improvement in Case 1 after 7 years and this suggests that outer retinal cells at the fovea may be able to survive local ischaemia for several years.

These cases therefore suggest that argon laser treatment may improve visual acuity in I-BRVO even with severe ischaemia extending into the foveal avascular zone, if treatment intensity is enough to destroy ischaemic retina. This therapeutic benefit may be achievable for several years. It is clear, however, that a large prospective study is needed to specifically reinvestigate the visual functional benefits of laser therapy in I-BRVO.

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