Assessment of Intravitreal Triamcinolone Acetonide on Cystoid Macular Edema in Branch Retinal Vein Occlusion

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Abstract

***Purpose*:** To assess the effectiveness of intravitreal injection of triamcinolone acetonide on macular edema associated with branch retinal vein occlusion (BRVO).

***Design*:** A prospective noncomparative interventional case series.

***Patients & Methods*:** Fourteen eyes of 14 patients with macular edema associated with BRVO were enrolled. In all patients after thorough ophthalmic examination, 4 mg triamcinolone acetonide was injected intravitreally, then all eyes followed at 1 day, 1 week, 1, 3 and 6 months. Ten eyes were followed until 9 months. Central macular thickness was measured with Optical Coherence Tomography (OCT) at baseline and 3 months after injection. Best Corrected Visual Acuity (BCVA) and 1-mm central macular thickness were main outcome measurements.

***Results*:** Mean baseline BCVA: 1.33±0.52: logarithm of Minimum Angle of Resolution (logMAR) improved to 0.81±0.56 (P=0.002) at 1 month, 0.65±0.48 (P=0.001) at 3 months, but decreased to 0.85±0.44 (P=0.005) at 6 months. In 10 eyes of 14 eyes that were followed for 9 months, mean BCVA decreased to 1.20±0.48 (P=0.171).
A 32% reduction of pre injection value of 1 mm central foveal thickness observed at 3 months (565±199.58µm versus 383.78±145.70µm, P=0.001). Ocular hypertension was developed in six patients that was controlled by topical antiglaucoma medication. Cataract developed or progressed in two eyes.

***Conclusion*:** Intravitreal triamcinolone acetonide can decrease macular edema and improve visual acuity in BRVO in short term but further study is required with control group and longer follow up to clarify the benefits and risks of this treatment.

***Key words*:** Intravitreal Triamcinolone Acetonide, Branch Retinal Vein Occlusion, Central Macular Thickness.

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Introduction

Branch retinal vein occlusion (BRVO) is a common retinal vascular disease causing visual loss by macular edema, retinal capillary non perfusion or intraretinal hemorrhage.[1] Occlusion in BRVO occurs at arteriovenous crossing sites which share a common adventitial sheath.[2]

Cystoid macular edema is more often associated with a disruption of the blood-retinal barrier and persistent decrease in visual acuity.[3]

The Branch Retinal Vein Occlusion Study reported that laser photocoagulation resulted in a reduction in visual loss 6 months or more following treatment.[1] A number of other treatments for BRVO have been evaluated including laser-induced chorioretinal anastomosis[4] , surgical cannulation of branch retinal veins[5] , vitrectomy with adjunctive sheathotomy of the retinal vein adventitia.[6]

Triamcinolone acetonide with no known toxicity when injected intravitreally[7] and has been shown to reduce breakdown of the inner blood-retinal barrier and stabilize it.[8] A few studies were reported effectiveness of intravitreal triamcinolone acetonide on macular edema due to BRVO.[9,18,19,20,25]

Because many cases of macular edema in BRVO do not respond to laser photocoagulation and with this belief, that, triamcinolone acetonide can reduce macular edema we proposed this study to investigate the effectiveness of intravitreal triamcinolone acetonide as treatment of macular edema with corresponding improvement of visual acuity (VA) in patients with BRVO.

Patients and Methods

This study was a prospective interventional case series performed following the tenets of Declaration of *Helsinki*, and after approval by the Institutional Review Board.

Fourteen eyes of 14 patients with macular edema due to BRVO with best corrected visual acuity (BCVA)≤0.4 logarithm of minimum angle of resolution (logMAR) and at least 1 month duration of disease, were enrolled.

Exclusion criteria were macular BRVO with BCVA>0.4 log MAR, one eye patients, eyes with hazy media, other ocular diseases that may prominently affect VA (cataract, age related macular degeneration, diabetic retinopathy) and history or confirmed diagnosis of glaucoma or intraocular pressure (IOP)≥22mmHg.

Measurement of BCVA, and IOP, slit lamp examination, funduscopy, fundus photography, retinal map thickness analysis with optical coherence tomography ([OCT] Stratus *Zeiss* instruments version 3, *Germany*) and fluorescein angiography (FA) were performed at presentation. All patients were informed about the procedure and consents were obtained. All injections were performed under sterile condition in operating room. After topical anesthesia with tetracaine 0.5%, and instillation of povidone-iodine 5% in cul-de-sac, eyes were draped.

A sterile speculum was placed. An anterior chamber paracentesis (0.1)ml was performed. The drug (4mg triamcinolone acetonide in 0.1ml) was injected into the vitreous cavity inferotemporally through pars plana with a 27-gauge needle on a 1ml tuberculin syringe. Then the Speculum was removed.

Eyes were patched with gentamicin ointment. Then the patients were instructed to instill ciprofloxacine 0.3% ophthalmic drop for one week. Patients were thoroughly examined 1 day, 1 week, 1, 3, 6, and 9 months after injection. At 3 months follow up, fundus photography and retinal map thickness analysis also were performed. The main outcome measures were BCVA which was determined by the Early Treatment Diabetic Retinopathy Study chart and calculated as logMAR, and 1-mm central macular thickness that measured with OCT. Paired-sample t-test and Pearson correlation analysis were used for analysis. A p-value of <0.05 was considered significant.

Results

Between September 2004 and November 2005, 14 eyes of 14 patients with macular edema due to BRVO were enrolled in our study. The mean age of patients was 55.43±10.83 years (range: 37-75) at injection time. There were 6 females and 8 males. All eyes received a single (4mg in 0.1ml) intravitreal injection of triamcinolone acetonide.

The mean duration from the onset of symptoms to treatment was 89.64±56.16 days (range;

35-240). One patient had diabetes mellitus. Four patients had hypertension and 2 of them had history of old BRVO in the other eye. Two patients were heavy smokers.

The mean BCVA at presentation time was 1.33±0.52 logMAR which significantly improved to 0.81±0.56 logMAR (P=0.002), (0.65±0.48 logMAR (P=0.001), 0.85±0.44 logMAR (P=0.005) at 1, 3 and 6 months respectively, but was decreased to 1.20±0.48 logMAR, (P=0.171) in 10 of 16 eyes, that followed up for 9 months.

A 32.22% reduction in mean pre injection 1 mm central macular thickness: 565±199µm to 383±145µm (P=0.001) was observed at 3 months of follow up.

Six eyes (42.08%) developed IOP value of 22 mmHg or above. Elevation of IOP occurred between 1 week and 1 month after injection which was assumed to be a side effect of triamcinolone acetonide. Elevation of IOP in all patients was controlled with one to tree topical antiglaucoma medications.

The duration of BRVO did not correlate with 6 month visual acuity gain, (P=0.169). There was no correlation between baseline 1mm central macular thickness and visual acuity gain at 6 months, (P=0.335). There was a correlation between the change in baseline 1mm central macular thickness and the corresponding visual acuity gain (P=0.008) at 3 months follow-up. Also there was a significant correlation between the baseline VA with VA gain at 6 months of follow up (P=0.01).

All eyes were phakic and 2 of these showed development or progression of cataract during follow up.

Discussion

Macular edema is a common cause of visual loss in patients with BRVO. Elevation of distal intravascular pressure causes disruption of the inner blood-retinal barrier and is often associated with significant leakage and a relatively poor prognosis.[3] In the acute phase of disease, when there is substantial intraretinal hemorrhage, it may be impossible to evaluate potential vision and difficult to provide a prognosis. One third to one half of patients with BRVO have a return of vision to $^{20}/_{40}$ or better without therapy.[10]

For treatment of macular edema associated with BRVO, grid laser photocoagulation in the region of the edema has been recommended[1,11,12], but this is known that to be ineffective in many cases.[13]

Another option for the treatment of macular edema is vitrectomy with mechanical sheathotomy at the site of occlusion in patient with BRVO.[14,15] However the surgical technique of vitrectomy with sheathotomy is difficult and the complication rate is not low.

Reroute the blood flow by a laser-induced chorioretinal venous anastomosis is the other approach for the treatment of macular edema due to BRVO but may be associated with some complications such as fibrovascular proliferation hemorrhage and tractional retinal detachment.[16] Intravitreal tissue plasminogen activator administration has also been tested, but with mixed results.[17]

Corticosteroids inhibit release of the inflammatory mediators such as prostaglandins and leukotrienes that implicated pathogenesis of macular edema.[18] Corticosteroids may also downregulate the production of vascular endothelial growth factor (VEGF), a known permeability factor.[19] Triamcinolone acetonide is a corticosteroid that has been shown to reduce breakdown of the inner blood-retinal barrier and stabilize it after intravitreal injection.[8]

In our study, we observed a 32.22% reduction in baseline macular thickness at 3 months (P=0.001), and correspondingly maximal improvement of visual acuity was observed at 3 months of follow up. Reduction of the mean visual acuity was observed after 3 months and declined to a level at 9 months, that not significantly different with the mean baseline visual acuity (P=0.171). This finding is in agreement with other studies[20-22] that, intravitreal triamcinolone acetonide can, reduces macular edema and correspondingly improves of VA in short term. After then, recurrence of macular edema and deterioration of VA occurs, that may be due to wash out of intravitreal triamcinolone acetonide.[23]

In our study 42.08% of patients developed IOP value of 22mmHg or higher, which was assumed to be a side effect of triamcinolone acetonide. Elevation of IOP in all patients was controlled with topical medications. At final visit IOP was controlled despite

discontinuation of drugs. *Jonas* et al[24] reported intraocular pressure rise in 70% of eyes with BRVO after 25mg triamcinolone injection. This dose is higher than our study that may be related to the injection of higher dose of triamcinolone acetonide.

In our study, all patients were phakic and cataract progression was observed in 2 eyes but not required cataract extraction. *çekiç* et al[22] reported cataract progression in 7 of 12 phakic patients during mean follow up of 13 months. Cataract extraction was performed in five eyes of them. The cause of higher rate of cataract progression in this study compared to our study may be the higher mean age of their patients, multiple injections of triamcinolone acetonide or longer duration of the observation.

We did not observe any other injection or triamcinolone related complications such as endophthalmitis, vitreous hemorrhage or retinal detachment in this study.

Conclusion

In conclusion, a single intravitreal injection of triamcinolone acetonide can cause reduction of macular edema due to BRVO and improvement of visual acuity at least in short term, but further study is required particularly with a control group and longer follow up to clarify the effects and complication rates of triamcinolone acetonide injection for macular edema due to BRVO.

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