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ORIGINAL ARTICLE

Bevacizumab and Panretinal photocoagulation protect against ocular hypertension after posterior subtenon injection of triamcinolone acetonide for diabetic macular edema

Yi-Ting Hsieh [a,b,c], Chung-May Yang [a], Shu-Hui Chang [b,*]

[a] *Department of Ophthalmology, National Taiwan University Hospital, Taipei, Taiwan*
[b] *Division of Biostatistics, Graduate Institute of Epidemiology & Preventive Medicine, College of Public Health, National Taiwan University, Taipei, Taiwan*
[c] *Department of Ophthalmology, Taipei Tzu Chi Hospital, Buddhist Tzu Chi Medical Foundation, New Taipei, Taiwan*

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KEYWORDS
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panretinal photocoagulation;
steroids

Background/Purpose: To analyze the prognostic factors for ocular hypertension after posterior subtenon injection of triamcinolone acetonide (PSTA) for the treatment of diabetic macular edema (DME).
Methods: Patients who received PSTA for DME from January 2006 to December 2011 were enrolled retrospectively and were followed until December 2012 in one hospital. Modified Cox regression models were used to analyze the factors associated with ocular hypertension, which was defined as an intraocular pressure $>$ 21 mmHg after PSTA.
Results: A total of 180 PSTA injections were given to 114 eyes from 73 adults with DME. During a mean follow-up of 50.4 weeks after each injection, ocular hypertension occurred in 20.6% of injections (28.1% of eyes). Treatment-naïve patients with proliferative diabetic retinopathy (PDR) had a higher risk of ocular hypertension after PSTA than those with nonproliferative diabetic retinopathy (NPDR) [hazard ratio (HR) = 3.255, $p = 0.030$]. Intravitreal injection of bevacizumab (IVB) before PSTA had a significant effect in lowering the risk of ocular hypertension after PSTA in patients with PDR who had received panretinal photocoagulation (PRP) (HR = 0.107, $p = 0.035$). Both prompt PRP and IVB following PSTA had a protective effect against ocular hypertension in treatment-naïve patients with PDR (HR = 0.086, $p = 0.0002$ and HR = 0.155, $p = 0.049$, respectively).

Conflicts of interest: The authors have no conflicts of interest relevant to this article.

* Corresponding author. Division of Biostatistics, Graduate Institute of Epidemiology and Preventive Medicine, College of Public Health, National Taiwan University, Room 538, 17 Xu-Zhao Road, Taipei 10055, Taiwan.
E-mail address: shuhui@ntu.edu.tw (S.-H. Chang).

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Conclusion: Treatment-naïve patients with PDR had a higher risk of ocular hypertension after PSTA than those with NPDR. Bevacizumab and prompt PRP both had a protective effect against ocular hypertension after PSTA in patients with PDR.

Introduction

Diabetic retinopathy (DR) is one of the leading causes of visual loss worldwide,[1] and diabetic macular edema (DME) is the most common cause of visual loss in patients with DR.[2] The breakdown of the blood—retinal barrier, increased permeability of macular retinal vessels, and exudation of serous fluid and lipids into the macula lead to visual deterioration in patients with DME.[3] Treatments for DME include laser photocoagulation, corticosteroids, anti-vascular endothelial growth factor (VEGF) administration, and pars plana vitrectomy.[2,3] Triamcinolone acetonide is a minimally soluble repository steroid that can slowly release its contents. Posterior subtenon injections of triamcinolone acetonide (PSTA) and intravitreal injections of triamcinolone acetonide (IVTA) both have been shown to decrease macular thickness and improve vision in patients with DME.[4—8] Combined treatment with triamcinolone acetonide and anti-VEGF has also been advocated to treat DME.[9—11] In addition, for patients with proliferative diabetic retinopathy (PDR) and concomitant DME, PSTA has been proved to be effective in preventing panretinal photocoagulation (PRP)-induced macular edema.[12]

One of the most important side effects of PSTA is ocular hypertension after injections; some patients even require surgical intervention to control their intraocular pressure (IOP).[13—22] Persistent ocular hypertension may also rarely occur after intravitreal administration of anti-VEGF.[23] To the best of our knowledge, the role of anti-VEGF in ocular hypertension after PSTA for DME has not been investigated. In this study, we retrospectively collected data from patients who received PSTA for DME in order to investigate the risk and protective factors regarding ocular hypertension after PSTA; in particular, we examined the effect of anti-VEGF as well as the severity of DR on IOP after PSTA. We also evaluated the timing of PRP with respect to ocular hypertension after PSTA in patients with PDR and DME.

Materials and Methods

Study sample

We retrospectively collected data from patients who received PSTA for DME in Taipei Tzu Chi Hospital, Buddhist Tzu Chi Medical Foundation, between January 2006 and December 2011. The follow-up period ended in December 2012. The exclusion criteria for this study were as follows: (1) a history of glaucoma or an IOP $>$ 21 mmHg at the time of PSTA; (2) concurrent antiglaucoma medication at the time of PSTA; (3) iris or angle rubeosis; (4) simultaneous systemic or intravitreal steroid treatment during the follow-up period; (5) systemic connective tissue disease; (6) scleral buckle or intravitreal silicone oil; (7) retinal vascular occlusive diseases; and (8) follow-up time $<$ 2 months. After exclusion, a total of 114 eyes from 73 patients were included in this study. The mean age at the time of the first PSTA was 63.4 $\pm$ 10.1 years (range, 42—89 years), and 44.7% patients were females. This research adhered to the tenets of the Declaration of Helsinki, and Institutional Review Board (IRB) approval was obtained from the IRB of Taipei Tzu Chi Hospital, Buddhist Tzu Chi Medical Foundation. Waiver of informed consent was approved by the IRB due to the retrospective nature of this study. Power analysis was performed to justify the number of patients enrolled in the study.

Procedure for PSTA

The procedure for PSTA was modified according to the method described by Nozik.[24] The patient was asked to direct his or her gaze superonasally, and an injection of 40 mg/mL of triamcinolone acetonide was administered inferotemporally into the posterior subtenon space with a 27-gauge needle.

IOP and clinical characteristics

The IOP was measured with a noncontact tonometer (CT-80; Topcon Corporation, Tokyo, Japan). Baseline IOP was measured in each eye just before PSTA. Thereafter, the IOPs were monitored at least monthly for the first 3 months. Patients' age, sex, and severity of DR at baseline were recorded. The severity of DR at baseline was classified into nonproliferative diabetic retinopathy (NPDR) or PDR, according to the criteria proposed by the Global Diabetic Retinopathy Project Group[25]; for eyes with PDR, they were further classified according to the presence of PRP. In this study, all the eyes with PDR without previous PRP were treatment-naïve at baseline, which means that no retinal laser or anti-VEGF agents had been given to these patients before PSTA. The use of anti-VEGF therapy was also recorded. In this study, bevacizumab was the only anti-VEGF agent used for all patients.

Outcomes and follow-up events

In this study, we defined ocular hypertension as an IOP $>$ 21 mmHg. The primary endpoint was defined as the first IOP $>$ 21 mmHg after PSTA for a single eye. More than one PSTA treatment was performed in some eyes during the