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ORIGINAL ARTICLE

Retinal oximetry during treatment of retinal vein occlusion by ranibizumab in patients with high blood pressure and dyslipidemia

Oxymétrie rétinienne au cours du traitement par ranibizumab de l'occlusion veineuse rétinienne chez les patients atteints d'hypertension artérielle et de dyslipidémie

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Macular edema;
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Retinal oximetry;
Optical coherence tomography;
Ranibizumab

Summary
Introduction. — In the present study, we examined retinal vascular oxygen saturation in patients with retinal vein occlusion (RVO), high blood pressure (HBP) and dyslipidemia, before and during intravitreal vascular endothelial growth factor (VEGF) injection (ranibizumab).
Methods. — We retrospectively reviewed the medical records of six patients with visual acuity (VA) reduced by macular edema (ME) secondary to RVO with HBP and dyslipidemia, who underwent intravitreal anti-VEGF injection between October 2014 and February 2015 in the department of ophthalmology of François-Quesnay Hospital at Mantes-la-Jolie (France). The main inclusion criterion was the presence of RVO with ME and decreased VA. The primary endpoint was improvement of retinal venous oxygen saturation in patients with RVO before and 3 months after intravitreal ranibizumab injection. Secondary outcomes were improvement of retinal arterial oxygen saturation, improvement of best-corrected visual acuity (BCVA) on the Early Treatment Diabetic Retinopathy Study (ETDRS) scale, regression of ME measured by the central macular thickness (CMT) in nm and studying the correlation between blood pressure (BP) and retinal venous oxygen saturation before and after ranibizumab.

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Results. — Six eyes of six patients were included. Before treatment, the mean (standard deviation [SD]) of the retinal venous saturation (%) was 38.1 ± 14.2. Three months after the injections, the mean (SD) of the retinal venous saturation (%) increased statistically significantly 49.2 ± 11 ($P = 0.03$).
Conclusion. — In this study, retinal venous oxygen saturation in patients with RVO, HBP and dyslipidemia was partially normalized during intravitreal ranibizumab treatment.

MOTS CLÉS
Œdème maculaire ;
Occlusion veineuse rétinienne ;
Saturation veineuse rétinienne en oxygène ;
Oxymétrie de la rétine ;
Tomographie par cohérence optique ;
Ranibizumab

Résumé
Introduction. — Nous avons évalué la saturation en oxygène de la vascularisation rétinienne avant et au cours d'une injection intravitréenne d'*anti-vascular endothelial growth factor* (anti-VEGF) chez les patients atteints d'occlusion veineuse rétinienne (OVR) présentant de l'hypertension artérielle (HTA) et une dyslipidémie.
Méthodes. — Nous avons revu rétrospectivement les dossiers médicaux de six patients ayant une acuité visuelle (AV) diminuée en rapport avec un œdème maculaire (OM) secondaire à une OVR et présentant de l'HTA et une dyslipidémie. Ces derniers ont reçu une injection intravitréenne d'anti-VEGF entre octobre 2014 et février 2015 dans le service d'ophtalmologie de l'hôpital François-Quesnay à Mantes-la-Jolie (France). Le critère d'inclusion principal était la présence d'une OVR avec OM et une diminution de l'AV. Le critère principal était l'amélioration de la saturation veineuse rétinienne en oxygène chez les patients atteints d'OVR avant et 3 mois après l'injection intravitréenne de ranibizumab. Les critères secondaires étaient l'amélioration de la saturation artérielle rétinienne en oxygène, l'amélioration de la meilleure acuité visuelle corrigée (MAVC) sur l'échelle Early Treatment Diabetic Retinopathy Study (ETDRS), la régression de OM mesurée par l'épaisseur maculaire centrale (EMC) en nm et d'étudier la corrélation entre la pression artérielle et la saturation veineuse rétinienne en oxygène avant et après ranibizumab.
Résultats. — Six yeux de six patients ont été inclus. Avant le traitement, la moyenne (écart-type [ET]) de la saturation veineuse rétinienne (%) était de 38,1 ± 14,2. Trois mois après les injections, la moyenne (ET) de la saturation veineuse rétinienne (%) a augmenté de manière statistiquement significative 49,2 ± 11 ($p = 0,03$).
Conclusion. — Dans cette étude, la saturation veineuse rétinienne en oxygène chez les patients avec OVR présentant une HTA et une dyslipidémie était partiellement normalisée pendant le traitement par ranibizumab intravitréen.

Introduction

Retinal vein occlusion (RVO) constitute the second most common cause of retinal vascular disease after diabetic retinopathy. The prevalence of RVO is between 1% and 2% in patients older than 40 years [1]. The pathogenesis is multifactorial and still unclear. The prognosis of RVO is influenced by the location of the occlusion, by the extent of retinal non-perfusion [2—4] and by the secondary macular edema (ME). The RVO can lead to irreversible visual loss.

When RVO occurs, retinal perfusion is impaired but does not stop, indicating that collateral outflow is considerably expanded. Collateral capacity in symptomatic cases is not enough to ward off an increase retinal venous pressure, venous dilation, retinal hemorrhage, retinal edema. Studies have shown a reduction in retinal venous blood flow after RVO. Reduction of blood flow leads to retinal hypoxia [5] and upregulation of vascular endothelial growth factor (VEGF), which would lead to vasodilatation and hyperperfusion. This response is inappropriate in RVO leading to ischemia and edema. Until intravitreal VEGF inhibitors became available it was unknown to which extent VEGF upregulation is responsible for the clinical manifestations of RVO. Hence, VEGF inhibition may improve retinal blood flow and oxygenation by promoting collateral formation or capillary perfusion. Intravitreal treatment with ranibizumab reduces the progression of retinal capillary non-perfusion in RVO [6].

As a component of multimodal retinal imaging, studies show that oximetry may help produce an integrated overview of the pathophysiology of RVO and the effect of therapeutic VEGF inhibition [7,8]. High blood pressure (HBP) is a universally agreed RVO risk factor. Other RVO risk factors, though not universally agreed upon, include advancing age, arteriolosclerosis, diabetes, dyslipidemia, blood hyperviscosity, thrombophilia, ocular hypertension and glaucoma.

However, no studies using oximetry has evaluated the effect of anti VEGF in patients with RVO and having two