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ORIGINAL ARTICLE

Macular pigment density variation after supplementation of lutein and zeaxanthin using the Visucam® 200 pigment module: Impact of age-related macular degeneration and lens status

Densité optique du pigment maculaire après supplémentation en lutéine et zéaxanthine grâce au module pigment du Visucam® 200 : impact de l'état du cristallin et de la dégénérescence maculaire liée à l'âge

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KEYWORDS
Age-related macular degeneration;
Macular pigment optical density;
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Visucam® 200

Summary
Purpose. — To assess the evolution of macular pigment optical density (MPOD) following supplementation with various macular formulations obtained with the Visucam® 200, and to study the factors affecting MPOD measurements.
Materials and methods. — In this prospective, randomized, double-masked multicenter study, patients were divided into 2 groups: group A (patients without retinal pathology who underwent cataract surgery 1 month previously) and group B (patients with neovascular age-related macular degeneration [AMD] in one eye). In each group, half of the patients were randomly assigned to receive a food supplementation either with or without carotenoids (5 mg of Lutein and

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1 mg of Zeaxanthin). Outcome measures included MPOD responses obtained with the Visucam® 200 for one year.
Results. — In total, 126 subjects (52 men, 74 women) with a mean age of 75.3 ± 7.61 years were enrolled. Mean MPOD values at the time of inclusion were statistically lower in group A (0.088 density unit [DU]) compared to group B (0.163 DU, $P < 0.05$). No statistically significant increase in MPOD was noted in either group, even after discontinuation of the supplementation. By multiple regression analysis, age, female gender, lens status and the presence of AMD seemed to significantly affect MPOD measurements.
Conclusion. — No significant improvement in MPOD seems to be detected with the Visucam® 200 after carotenoid supplementation. The MPOD measurement seems to be highly affected by cataract extraction and the presence of AMD.

MOTS CLÉS
Dégénérescence maculaire liée à l'âge ;
Densité optique du pigment maculaire ;
Lutéine ;
Zéaxanthine ;
Visucam® 200

Résumé
Objectif. — Étudier l'évolution de la densité optique du pigment maculaire (DOPM) après supplémentation par des formulations maculaires différentes grâce au module pigment maculaire du Visucam 200.
Matériels et méthodes. — Il s'agit d'une étude prospective randomisée multicentrique à double insu, ayant inclus des patients également divisés en 2 groupes : groupe A (patients opérés de cataracte depuis 1 mois, sans pathologie rétinienne) et groupe B (patients atteints de dégénérescence maculaire liée à l'âge [DMLA] exsudative sur un œil). Dans chaque groupe, la moitié des patients ont reçu un supplément alimentaire contenant ou pas des caroténoïdes (5 mg de Lutéine et 1 mg de Zéaxanthine). Les paramètres mesurés étaient la DOPM obtenue grâce au Visucam pendant un an.
Résultats. — Au total, 126 patients (52 hommes, 74 femmes) avec une moyenne d'âge ± déviation standard (DS) de 76,8 ± 7,61 ans ont été inclus. À l'inclusion, la valeur de la DOPM était significativement plus basse dans le groupe A (0,088 *density unit* [DU]) que dans le groupe B (0,163 DU, $p < 0,05$). Aucune amélioration significative de la DOPM n'a été notée après supplémentation dans les deux groupes, même après arrêt de la supplémentation. Par analyse de régression multiple, l'âge, le sexe féminin, l'état du cristallin et la présence de DMLA paraissent affecter significativement les valeurs de la DOPM.
Conclusion. — Aucune amélioration significative de la DOPM ne paraît détectable par le Visucam® 200 après supplémentation en caroténoïdes. La mesure de la DOPM paraît quant à elle très affectée par l'extraction de la cataracte et la présence de DMLA.

Introduction

Age-related macular degeneration (AMD) is the leading cause of blindness and visual impairment in industrialized countries [1,2]. Macular pigment (MP), which comprises three carotenoids (Lutein [L], Zeaxanthin [Z] and Meso-zeaxanthin [MZ]) [3—7], is concentrated in the center of the retina (macula lutea). It is known to act as antioxidant [8] and blue-light filter [9] protecting the macula and retinal pigment epithelium (RPE) from light-initiated oxidative and destructive processes by quenching oxygen radicals [10,11], which may be consequently beneficial in patients with AMD [12,13].

Whether the supplementation of MP is associated with a lower risk of AMD development is of an extreme controversy. While some studies proved that MP intake might lower the risk of AMD [14,15], other studies came up with opposite conclusions [16,17].

To determine such relationship, many investigators tried to measure the macular pigment optical density (MPOD) by several clinical methods such as heterochromatic flickering photometry [18], fundus reflectance spectroscopy [19], motion-detection photometry [20], Raman spectrometry [21] and autofluorescence spectrometry [22], but none of those techniques have yet been fully validated [23].

The Visucam® 200 (Carl Zeiss Meditec AG, Jena, Germany) is a new technique that has been suggested to measure the MPOD. It is based on reflectometry, and measures the MPOD through reflectance of a single 460-nm wavelength fundus. Until now, very few reports studied the reliability of this technique [18,24—26]. Moreover, some recent studies did not find any agreement when comparing the concordance of MPOD measurement obtained by Visucam® 200 with other techniques such as the heterochromic flicker photometry [18] and the modified Heidelberg Retina Angiograph [27]. On the other hand, no data