Laser photocoagulation for I125 radiation-induced retinopathy in choroidal melanoma: a case report

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ABSTRACT

We describe herein a case of a 25 year-old female with main complain visual acuity loss in his left eye (OS) associated to a choroidal melanoma. Treatment with plaque brachytherapy using I125 was started. It was observed improvement regarding tumor size and best-corrected visual acuity (BCVA). However, at 39 months of follow up on brachytherapy, fundoscopic signs of radiation-induced retinopathy (microaneurysms, retinal hemorrhages, hard exudates, and neovascularization) were observed. Fluorescein angiography confirmed the diagnosis of radiation-induced retinopathy, with large areas of ischemia and neovascularization. Focal argon photocoagulation was used as treatment with excellent results in 5 years follow-up.

Keywords: choroidal melanoma, brachytherapy, radiation-induced retinopathy.

INTRODUCTION

Brachytherapy with radioisotopes has become the treatment of choice for choroidal melanoma, a common primary malignant intraocular tumor, due to the given capacity for preservation of the vision and the eye. We describe herein a case of radiation-induced retinopathy in a patient treated with brachytherapy using I125, its clinical recognition and management.

CASE REPORT

A 25 year-old female patient came to our attention in the emergency room with a 15 days history of floaters and decreasing of vision in her left eye (OS). Best-corrected visual acuity (BCVA) was 0.9 in the right eye (OD) and 0.16 in the OS. Biomicroscopy of anterior segment in both eyes was unremarkable. Funduscopic examination showed a nodular, dome-shaped and well-circumscribed mass located temporally to the macula and a serous retinal detachment. No macular involvement was detected in the left eye (Figure 1A).

A and B-scan ultrasound of the eye were performed and revealed a 10,31 x 4,36 mm dome-shaped lesion with low reflectivity, excavation of underlying uveal tissue and an acoustic quiet zone at the base of the tumor, corresponding to the typical "acoustic hollowing". Kappa angle was observed (Figure 1B).

CT scan of the globe and orbit showed a temporal posterior mass with contrast enhancement in the left eye, suggestive of choroidal melanoma (Figure 1C). Neither orbital infiltration nor bone affectation was found.

Complementary examinations were performed such as complete blood analysis (including tumoral markers-CEA, CA 15.3, CA 19.9) and abdominal ultrasound and X-ray of the lungs. All exams were normal.

According to the findings, we decided to treat the patient with plaque brachytherapy using I125. A computer calculation was used to determine the dose and duration of plaque application (80-100 Gy to the apex of the tumor, at 50-125 cGy/h). An appropriate sized plaque was sutured temporarily to the sclera underlying the melanoma (after previous desinsertion of the external rectus muscle), considering a margin of 2 mm over the largest tumor basal dimension. The radioactive plaque was left for 3 days, after which it was removed, with reinsertion of external rectus muscle.
After 5 months, BCVA in OS was 0.4, and funduscopic examination revealed a reduction in size of the mass (Fig. 2), and a fibrotic appearance. The ultrasound showed a considerable reduction in height of the mass (10.53 x 2.32 mm), although it demonstrated choroidal excavation and positive kappa angle. The complementary exams were repeated - especially liver function as well as the lung X ray and liver tomography - showing normal results.

Thirty-eight months after plaque therapy, BCVA had improved to 0.6. Ultrasonography showed a reduction in size of the mass (7.15 x 2.38 mm). However, hard exudates surrounding the choroidal lesion were noted.

These hard exudates were suggestive of radiation-induced retinopathy. At 39 months follow-up, signs of radiation-induced retinopathy such as microaneurysms, retinal hemorrhages, hard exudates, and neovascularization were observed (Figure 3).

By fluorescein angiography evaluation, it was observed large areas of ischemia and hyperfluorescence as well as areas of neovascularization (Figure 4).

We decided then to perform treatment with argon photocoagulation over the tumor surface and the 2 mm margin. Typical laser settings included a 100 μm spot size, 0.1–0.2 ms duration, and 150–180 mW. A tight pattern of scatter laser photocoagulation was performed.

Twelve months after laser treatment, BCVA improved to 0.8, and the retinopathy showed no signs of progression. Five years after photocoagulation, the BCVA remained the same (0.8), and the lesion showed a fibrotic and stationary appearance surrounded by laser spots. Ultrasonography demonstrates no changes, except for a small retinal detachment over the lesion probably secondary to radiotherapy (Figure 5).

DISCUSSION

Choroidal melanoma is the most common primary malignant intraocular tumor and the second most common type of primary malignant mela-

oma in the body. Therapeutic options include enucleation, plaque brachytherapy or external beam radiation. Mortality rates for medium-sized melanomas did not significantly differ between any of these treatments. This is the main reason why brachytherapy has become the treatment of choice, given its capacity for preservation of the vision and the eye.

Several radioisotopes have been used for brachytherapy (cobalt-60, palladium-103, rutenio-106, iridium-192, and I-125). The I-125 emits low energy photons, which in theory decreases radiation-induced complications. However, it is associated with a varied range of complications, involving anterior and posterior segment of the eye such as dry eye and keratitis, iris neovascularization and neovascular glaucoma, radiation-induced cataract, radiation-induced optic neuropathy and scleral necrosis, episcleral deposits, and radiation induced retinopathy.

The pathogenesis of this retinopathy is related to the loss of vascular endothelial cells and relative sparing of pericytes with local capillary occlusion and, finally, neovascularization, vitreous hemorrhage, tractional retinal detachment, and macular edema.

The prevalence of this complication varies from 10 to 63%.

A variety of treatments have been proposed and used for this complication, including intravitreal injections of triamcinolone and bevacizumab, hyperbaric oxygen treatment and laser photocoagulation; however, the best results have been found with laser photocoagulation. In 1997, Finger et al. suggested that treating the irradiated zone with scatter laser photocoagulation was adequate to induce regression of radiation retinopathy associated to plaque brachytherapy. Some authors have suggested that scatter argon laser photocoagulation of the radiation targeted zone is effective in preventing or regressing radiation retinopathy. In their study, laser photocoagulation regressed radiation retinopathy in 29 (64.4%) of the 45 patients treated after the onset of radiation retinopathy (17 with only retinopathy, 10 with a combination of retinopathy and maculopathy, and two with only maculopathy). Additionally, 16 patients received laser treatment before clinical evidence of retinopathy; only one of them developed radiation maculopathy and two developed retinopathy without maculopathy (all three responded to additional laser photocoagulation).

Other authors have suggested that focal laser therapy may modestly improve visual acuity and promote resolution of macular edema at 6 months, but benefit from a single treatment is not sustained at 2 years.
Despite the fact that local tumor control rates after ophthalmic plaque radiation therapy are greater than 90% in most series, BCVA after plaque radiation therapy is, unfortunately, typically poor. This can be related to the development of ischemic retinopathy, where laser ablation of the ischemic zone may be helpful for long term BCVA maintenance resulting in stable results after 5 years of follow-up, as observed in this current case.

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