Primary Transpupillary Thermotherapy for Choroidal Melanoma

This is still a valuable treatment in properly selected cases.

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In the search for the optimal treatment of choroidal melanoma, there is a constant tug of war between achieving recurrence-free regression and minimizing treatment side effects. Transpupillary thermotherapy (TTT) was first described as an alternative to plaque radiotherapy in 1995 by Oosterhuis et al.[1] The procedure employs a 2 to 3 mm wide, 810 nm diode laser beam directed through a contact lens to encompass the tumor and 1 mm of surrounding tissue. The thermotherapy penetrates the retina into the choroid to a maximum depth of 4 mm, making it a worthwhile treatment option for small choroidal melanoma.[2] The advantages of TTT over plaque radiotherapy and charged particle irradiation include decreased cost, precise treatment, immediate tumor necrosis and regression, no need for sedation, and avoidance of visual loss from radiation maculopathy and papillopathy.[3,4] Herein we report a small choroidal melanoma treated with primary TTT.

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CASE DISCUSSION

A 40 year-old man was found on routine examination to have a pigmented fundus lesion in his left eye,

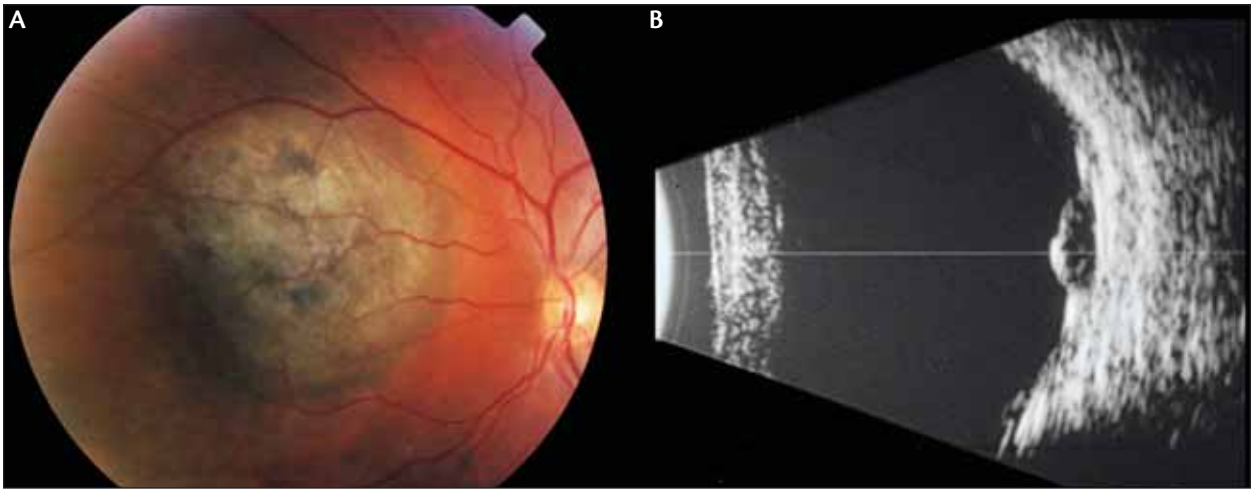

Figure 1. Fundus photograph of patient's left eye showing a well-circumscribed pigmented choroidal melanoma temporal to the optic disc (A). There was no subretinal fluid or orange pigment associated with the lesion, but on B-scan ultrasonography it was acoustically hollow and 3.1 mm thick (B).

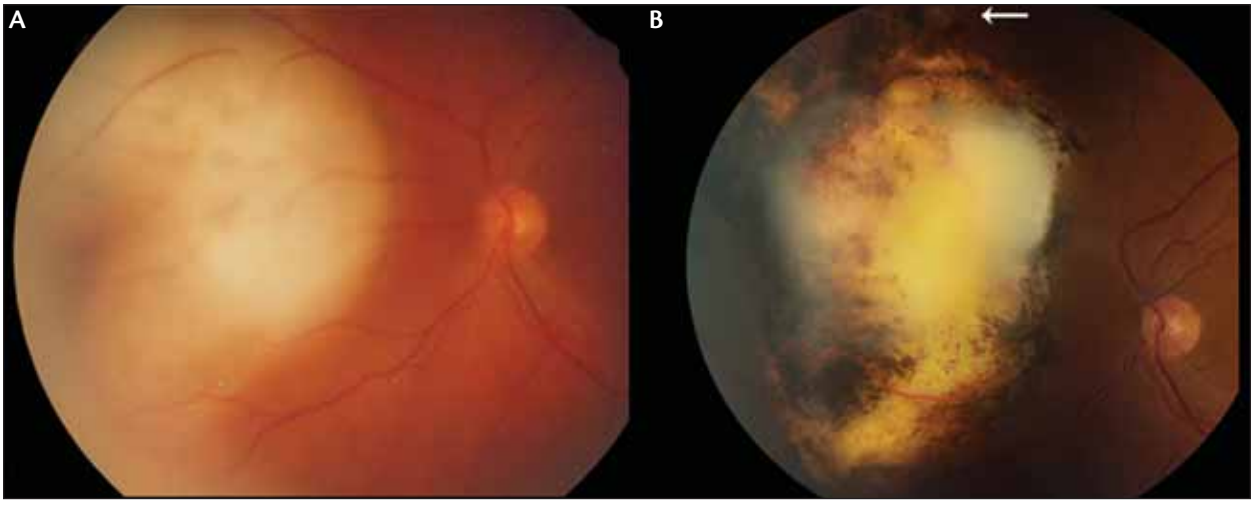

Figure 2. Fundus photographs of the patient's left eye immediately following the first TTT (A) and at his last follow-up visit 10 years later (B), after 3 sessions of TTT and one treatment with sector laser photocoagulation (white arrow). Note that the melanoma has been reduced to a flat, atrophic scar.

classified as a nevus. After 6 years of observation, the mass showed increase in basal diameter. The patient had no history of ocular disease or cancer.

On examination, the visual acuity was 20/20 in each eye. Slit-lamp examination and intraocular pressures were normal. The right eye was normal. The left fundus revealed a pigmented mass, 1.5 mm nasal to the optic disc and measuring 7.5 x 6.5 in basal dimensions and 3.1 mm in thickness (Figure 1A). Overlying fibrous metaplasia of the RPE and dependent shallow retinal detachment was found. B-scan ultrasonography revealed a dome-shaped, acoustically hollow mass (Figure 1B). Based on these findings and documented growth, the patient was diagnosed with small choroidal melanoma. Treatment options included enucleation, plaque radiotherapy, and TTT. TTT was preferred for complete tumor control and to minimize damage to the disc and macula.

The patient received three consecutive treatments of TTT, which reduced the melanoma to an atrophic flat scar (Figure 2A). Nine months after the final TTT, the patient developed a localized region of neovascularization adjacent to the treated area, which was successfully controlled with sector laser photocoagulation. During the subsequent 10 years of follow up, the tumor scar remained stable without recurrence (Figure 2B). Visual acuity remains 20/20 in each eye.

DISCUSSION

The popularity of TTT for small choroidal melanoma increased dramatically in the mid-1990s when initial observations reported successful control with minimal side effects,[1,4] but enthusiasm later waned following documented recurrences from several centers.[2,3] In 2002, Shields and associates[4] analyzed the clinical factors predictive of tumor recurrence and poor visual outcome following three consecutive sessions of primary TTT for choroidal melanoma in 256 patients. In this series, 91% of tumors showed regression without recurrence, and 9% showed recurrence, but one-half of those with recurrence were controlled with further TTT. Using Kaplan-Meier estimates, recurrence was found in 4% by 1 year, 12% by 2 years, and 22% by 3 years. Overall, 96% were controlled with TTT. Factors predictive of recurrence were optic disc overhung by tumor and increasing number of TTT sessions (implying poor response). If these factors were not present, then tumor recurrence was reduced to 10% at 3 years. Poor visual outcome (20/200 or worse) was most common in patients who had poor initial visual acuity.

Reports on TTT failure have been somewhat sobering, but in our experience a large number of cases have succeeded with preservation of good visual acuity. In 2007, Pan et al[3] reported on 20 patients with small choroidal melanoma treated with a mean of two sessions of primary TTT and followed for a mean of 4 years. Only 11 (55%) achieved initial control and 9 (45%) showed recurrence, five of which were controlled with additional TTT. So overall, 16 (80%) showed complete control with TTT alone. No tumor-related metastasis was reported in that series, and 75% of patients had post-treatment visual acuity within one line of pretreatment acuity. In 2008, Aaberg et al[2] reported on 135 patients with choroidal melanoma treated with TTT.

TTT can spare patients the decline in visual acuity common with plaque radiotherapy.

That analysis was less refined in patient selection as not all melanomas were small, with 12% classified as medium size and tumor thickness up to 6.6 mm. These tumors were generally treated with one session initially, and further treatments were applied as necessary. Based on more recent personal experience, we now prefer TTT for small melanoma only and treat those that are less than 3.0 mm or even less than 2.5 mm thickness. Furthermore, all patients are treated with three scheduled sessions of thermotherapy, even if the tumor appears completely regressed. Results from the Aaberg report showed overall that 102 patients (76%) had successful tumor regression, but by Kaplan-Meier analysis 19% showed failure at 5 years and 33% at 10 years. Features that predicted treatment failure included a tumor base greater than 10 mm, thickness greater than 3 mm, high-risk characteristics (subretinal fluid, orange pigmentation, and tumor thickness greater than or equal to 2 mm), and tumors touching the optic disc. A particularly bothersome finding was the presence of extraocular extension in 11 cases.

The most common side effects of TTT for small melanoma in the published studies[2-4] included branch retinal vein occlusion, retinal traction, and retinal hemorrhage. Recurrences were discovered anywhere from 8 months to 8 years after the initial TTT session. Thus, when considering this treatment, it is important to evaluate whether the patient will be able to sustain careful, long-term follow-up to monitor for recurrences. The ideal tumor characteristics for primary TTT include dark pigmentation for best diode absorption; small size (thickness less than 3.0 mm and not of diffuse variety); and minimal or no contact with the optic disc, as heat absorption lessens at the disc. The greatest advantage of TTT over plaque radiotherapy is the preservation of vision, and this treatment is particularly beneficial for tumors near but not under the fovea. When the tumor is subfoveal or immediately adjacent to the fovea, however, we most often employ plaque radiotherapy combined with three sessions of extrafoveal TTT in order to adequately treat the tumor but retain useful vision as long as possible. Primary TTT can also be useful for elderly patients, particularly those with diabetes mellitus, so that macular edema might be avoided.

In summary, primary TTT remains a good option for treatment of selected small choroidal melanomas. It can spare patients the decline in visual acuity common with plaque radiotherapy. Long term monitoring is necessary with indirect ophthalmoscopy, fundus photography, and ultrasonography. In the case that we present, following three sessions of TTT for small choroidal melanoma, the tumor has remained under control without recurrence at 10 years and the patient has retained 20/20 visual acuity. This case is not unique, as we have a large number of patients who have tumor control and good vision 5 to 15 years after treatment. ■

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1. Oosterhuis JA, Journée-de Korver HG, Kakebeeke-Kemme HM, Bleeker JC. Transpupillary thermotherapy in choroidal melanomas. *Arch Ophthalmol.* 1995;113:315-321.
2. Aaberg TM Jr, Bergstrom CS, Hickner ZJ, Lynn MJ. Long-term results of primary transpupillary thermal therapy for the treatment of choroidal malignant melanoma. *Br J Ophthalmol.* 2008;92:741-746.
3. Pan Y, Diddie K, Lim JI. Primary transpupillary thermotherapy for small choroidal melanomas. *Br J Ophthalmol.* 2007;92:747-750.
4. Shields CL, Shields JA, Perez N, et al. Primary transpupillary thermotherapy for small choroidal melanoma in 256 consecutive cases. *Ophthalmology.* 2002;109:225-234.

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