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Iris and iridociliary melanoma : concepts in diagnosis and management

Razzaq, L.

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Chapter **8**

Ruthenium plaque radiation for iris and iridociliary melanomas: Development of dry eyes?

Lubna Razzaq¹, Rob J. W. de Keizer^{1,2}

¹ Department of Ophthalmology, Leiden University Medical Center (LUMC), Leiden, the Netherlands.

² Department of Ophthalmology, Antwerp University Hospital (UZA), Antwerp, Belgium.

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Treatment options for iris and anterior ciliary body melanoma include local resection, plaque radiation therapy, proton beam therapy and, for diffuse cases, enucleation [1-3].

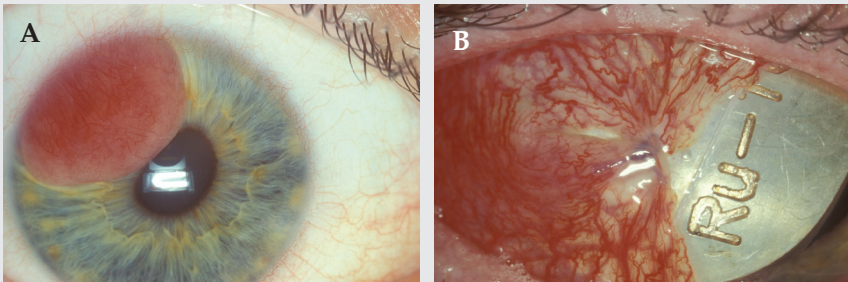
A radioactive plaque is placed directly over the cornea, but this irradiation may damage the limbal stem cells or corneal epithelial cells, which may lead to ocular surface disease, including dry eye problems [4, 5]. Such problems have been reported after the treatment of uveal melanomas with plaque therapy, proton beam radiotherapy and stereotactic radiotherapy [6-8]. We determined whether treatment of anterior melanoma with Ruthenium-106 plaque therapy induced complaints and clinical signs of dry eyes.

Materials and Methods

Between 1997 and August 2008, a total of 39 patients with iris and/or anterior ciliary body melanomas were treated with Ru-106 radiation therapy at the LUMC; 23 patients were seen for follow-up between January 2008 and April 2009 and included in this study.

All patients had been treated with a Ru-106 CIA plaque with an active diameter of 13 mm and surface area of 109 mm². For plaque application, the conjunctiva was opened and replaced over the plaque, using sutures (Figure 1A&B). Patients were asked regarding complaints of dry eye and the use of any topical and systemic medication. Tear film break up time (BUT) was determined in both eyes. A value greater than 10 seconds was regarded as normal. Schirmer test was performed and a value of ≤ 10 mm after 5 minutes was considered reduced.

Figure 1 (A) Iris melanoma in the supero-temporal quadrant of right eye (B) Ru-106 radiation plaque in place upon the cornea for the same tumour and covered by conjunctiva



Conjunctival and corneal staining was determined using the Oxford scheme [5]. For the BUT and Schirmer tests, a paired t-test was performed to obtain the difference of the mean values between the two eyes. A p-value of < 0.05 was considered significant.

Results

The mean age was 57 years (range 21 – 77). Data regarding the tumour staging, surface area covered, dosage and the ocular evaluations are given in Table 1. The mean maximum dose of radiation was 513.7 Gy (range 291.8 - 773.4) and the mean duration of plaque application was 95.5 hours (range 34.5 – 198.4). The median time interval between Ru-106 application and dry eye tests was 5 years, while this time interval was greater than 24 months in 21 patients (91%). (Table 1)

Three patients (13%) complained of dry eyes, four patients (17%) had a decreased BUT and Schirmer test, but only two patients had these low values in the treated eye. In the total population, the mean BUT of the treated eyes was 11.5 and of the untreated eyes 11.6 seconds (p-value: 0.88, confidence interval: -1.302 – 1.129). The mean values of the Schirmer tests were 14.9 and 15.0 in the treated and untreated eyes, respectively (p-value: 0.87, confidence interval: -1.812 – 1.551). Grade 1 Oxford staining was present in two patients (8.7%).

Discussion

Ru-106 is a beta-emitter with a half-value layer in water or tissue of 2.5 mm [9]. It has a very rapid dose fall-off allowing a high tumor dose while minimizing irradiation to contralateral ocular structures. In our study of 23 patients treated with Ruthenium for anterior melanoma, dry eyes developed in two patients (8.7%). We observed no significant differences in the BUT or Schirmer test values between treated and untreated eyes, although the radiation source was in close approximation to the cornea. The lacrimal gland and conjunctival goblet cells are not included in the field of irradiation, which constitutes an important difference in comparison with proton beam therapy or stereotactic radiation. We therefore conclude that signs and symptoms of dry eye were rare in anterior melanoma patients treated with Ruthenium plaque therapy. This can be attributed to low range and rapid dose fall-off of Ruthenium.

Table 1 Data of all the patients showing tumour staging (AJCC 7th edition), time interval between radiation and dry eye tests, surface area of cornea covered with plaque, BUT, Schirmer test and corneal staining using the Oxford scheme. BE: Both eyes, TE: Treated eye

S.no.	Tumour Staging	Time interval between radiation and tests (years)	Surface area of cornea covered with plaque (mm ²)	Symptoms of dry eye	BUT treated eye	BUT untreated eye	Schirmer treated eye	Schirmer untreated eye	Corneal staining of both eyes
1	T1b	9.5	60	No	10	10	10	10	Grade 0
2	T2	10	45	No	11	6	11	6	Grade 0
3	T1a	9	50	No	10	10	20	20	Grade 0
4	T2	8	40	No	11	10	10	12	Grade 0
5	T2	9	50	No	15	13	10	12	Grade 0
6	T1b	8	40	No	15	15	12	15	Grade 1 (BE))
7	T2	7	50	No	15	15	10	10	Grade 0
8	T2	7	70	Yes (BE)	2	3	9	5	Grade 0
9	T2	6.5	60	No	14	15	15	20	Grade 0
10	T1b	6	60	No	12	12	30	30	Grade 0
11	T1b	5	55	No	12	12	15	10	Grade 0
12	T1b	5	40	No	10	10	20	20	Grade 0
13	T1c	4	40	No	12	14	20	15	Grade 0
14	T1a	4	60	No	12	10	15	12	Grade 0
15	T2	3.5	60	No	15	10	10	10	Grade 0
16	T1a	3.5	50	Yes (TE)	8	10	5	12	Grade 1 (TE)
17	T2	3	65	No	12	12	10	10	Grade 0
18	T1a	2.5	50	No	10	10	30	30	Grade 0
19	T1b	2.5	60	No	12	14	15	20	Grade 0
20	T1c	2	60	No	15	15	15	17	Grade 0
21	T1a	2	65	No	15	14	18	10	Grade 0
22	T1a	1.2	40	No	12	12	25	25	Grade 0
23	T1b	0.5	50	Yes (BE)	5	15	8	15	Grade 0

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