

Superficial X-ray radiotherapy results in tissue conservation and long-term control of melanoma in situ of the lower eyelid

Abstract

We present the case of a middle-aged woman with melanoma in situ (MIS) involving the cutaneous and conjunctival surface of the lower eyelid. This patient was treated with superficial radiotherapy (RT) using an Xstrahl[®] machine (Xstrahl Ltd, Camberley, Surrey, UK) and experienced a complete response without residual side-effects. At 24 months of follow-up, the response was maintained with no evidence of disease or late effects. Discussion points include patient selection for RT and the choice of the Xstrahl[®] superficial X-ray radiotherapy machine over electrons and brachytherapy.

Keywords: lower eyelid, melanoma in situ, outcome, radiotherapy, skin cancer

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Introduction

Melanoma in situ (MIS), also known as lentigo maligna (LM) or Hutchinson's melanotic freckle (HMF), is a form of melanoma that occurs on exposed sun-damaged skin of elderly people.¹ Australia has the highest incidence of melanoma in the world and, with an aging population, MIS rates are increasing.² The estimated annual incidence of all MIS from an Australian cancer registry, which tracked patients between 2006 and 2007, was 27.0 per 100 000 (LM 12.2, non-LM MIS 5.9, and unclassified MIS 9.0).³ There is up to a 50% lifetime risk of progression from MIS to invasive melanoma,⁴ and hence an urgency to treat histologically confirmed MIS before it becomes invasive, especially in the immunosuppressed.⁵

Surgery is often curative but is associated with tissue loss,⁴ and MIS often occurs in areas where tissue loss can cause morbidity.⁵ Radiotherapy (RT) is recommended for the treatment of MIS when surgical margins are inadequate, or surgery is not possible.⁶ RT is effective in MIS.⁷ RT is also tissue conserving and can therefore treat a larger volume of tissue with less morbidity.⁸ MIS is a superficial disease and so is ideally treated with superficial X-ray radiotherapy. Treatment delivery with an Xstrahl[®] machine (Xstrahl Ltd, Camberley, Surrey, UK) is fast, easy to set up, and does not require extra immobilization devices, which maximises patient comfort and case throughput. We present here the case of a middle-aged woman with melanoma in situ (MIS) involving the external and conjunctival surface of the lower eyelid treated with superficial X-ray radiotherapy. After 24 months, the patient had a continuing complete response and did not exhibit any treatment-related side effects.

Case study

A 52-year-old woman presented with progressive pigmentation of the right lower eye lid over several years which had significantly

worsened over the previous twelve months. Examination revealed a lesion involving the cutaneous and conjunctival surface of the lower eyelid (Figure 1). Histopathology of multiple incisional biopsies (both cutaneous and conjunctival) is confirmed melanoma-in-situ, which is also known as lentigo maligna (LM) or Hutchinson's melanotic freckle (HMF). Given the extent of the lesion and the likely morbidity from surgical excision and reconstruction, the patient was referred to radiation oncology for an opinion. At the initial consultation, she was considered suitable for radiotherapy treatment. She consented to treatment and underwent planning immediately following her initial consultation (Figure 2).

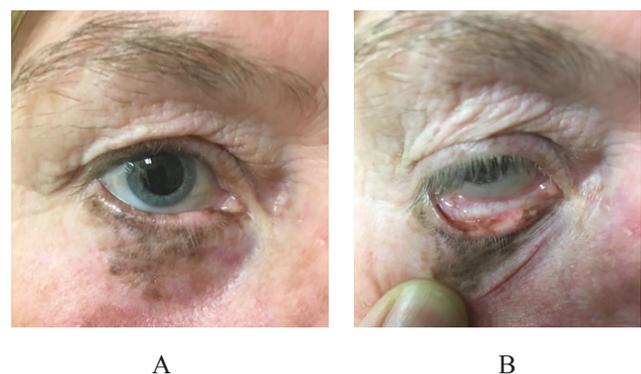


Figure 1 Pre-radiotherapy. Lentigo maligna involving. (A) The external. (B) The internal surface of the right lower eyelid.

The patient was treated with superficial X-ray radiotherapy delivered by an Xstrahl[®] (Xstrahl Ltd, Camberley, and Surrey, UK) machine. The prescription was 60 Gray (Gy) in 30 fractions dosed to the surface using a 100KvP beam and at 30-centimetre source to surface distance with a custom made five-centimetre lead cut out placed on the skin. A two-millimetre tungsten internal eye shield

(NL-Tec Pty Ltd, Willetton, Western Australia) was used daily. The patient had an excellent response to treatment with no demonstrable melanoma in situ on biopsies performed 12 months post RT. Other than a mild dry eye, which was effectively managed with lubricant eye drops, the patient did not report any other side-effects and had normal visual acuity at 24-months post treatment (Figure 3).



Figure 2 Radiation planning. The inner dotted line marks clinically apparent lentigo maligna. The outer dashed line is a 5mm expansion on the inner line to the field edge. The two lines enclose the penumbra of the beam.

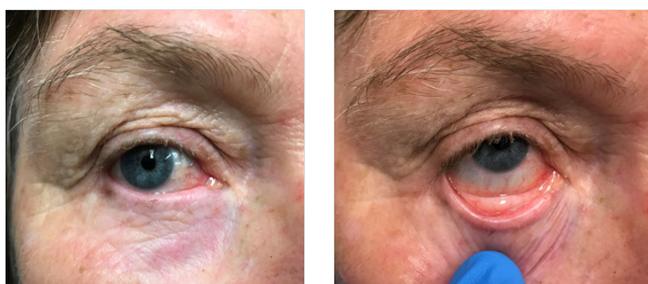


Figure 3 One-year post superficial X-ray radiotherapy. (A) The external. (B) The internal surface of the right lower eyelid. Note the continuing epilation.

Discussion

Melanoma in situ (MIS) is a form of melanoma that occurs on exposed sun-damaged skin of elderly people.¹ Australia has the highest incidence of melanoma in the world and with an aging population, MIS rates are increasing.² Given that the lifetime risk of progression from MIS to invasive melanoma is up to 50 percent,⁴ there is an urgency to treat histologically confirmed MIS before it becomes invasive, especially in the immunosuppressed.⁵ Surgery is often curative but is associated with tissue loss.⁴ MIS often occurs in areas where tissue loss can cause morbidity.⁵ RT is recommended for the treatment of MIS when surgical margins are inadequate, or when surgery is not possible.⁶ RT is effective in MIS.⁷ RT is also tissue conserving and can therefore treat a larger volume of tissue with less morbidity.⁸

In this patient with MIS involvement of both skin and conjunctival surfaces of the eyelid, surgery would have involved the loss of the full

thickness of her eyelid. RT can be successfully used in this area, but the technique requires significant care as there are radiation sensitive structures around the eye that need to be taken into consideration. All modalities require an internal eye shield. An electron modality could be used; however, electrons have a greater penumbra effect at depth⁹ that may cause unnecessary irradiation of orbital structures, resulting in unacceptable late side-effects. Electrons require a thermoplastic mask, which takes around 20 minutes to make in the planning session and can intensify claustrophobia. The planning session usually also entails a planning CT scan which is used to determine treatment parameters for the linear accelerator. This additional amount of radiation is hard to justify as the shield, being metal, cannot be in position during the planning CT. Therefore, the eye lid is not in the same position for the planning scan as it would be during daily treatment setup. Most departments do not have a 'simulation' internal eye shield, which is a similarly shaped eye shield device made of materials that do not cause artefact on the CT scan.

An alternative is to use a brachytherapy mould modality. However, this modality depends on the experience of the mould maker. The strength of the brachytherapy source must be calibrated regularly during treatment due to decay, and small variations in daily application can lead to large differences in dose delivery between fractions. The complexity of this technique also entails a longer treatment time. Superficial X-ray radiotherapy using an Xstrahl[®] machine was easy to deliver by all staff regardless of their level of experience. No mask or CT scan was needed, which minimised claustrophobia-induced stress and avoided unnecessary radiation. The mobility of the head of the Xstrahl[®] machine also allowed the patient to be in a comfortable position throughout daily treatment. The positioning of the internal eye shield was the most time-consuming part of the setup, taking usually between five to ten minutes, depending on the staff member's level of experience. However, the positioning of the treatment applicator and the delivery time was much quicker with the Xstrahl[®] machine compared to electron and brachytherapy techniques. Treatment was usually completed within seven minutes following positioning of the eye shield.

Conclusion

This case demonstrates how melanoma in situ, involving the cutaneous and conjunctival surface of the lower eyelid, can be successfully treated with superficial X-ray radiotherapy using an Xstrahl[®] machine. At 12 months, the patient continued to have a complete biopsy-proven response, and after 24 months this response was maintained with no side-effects. The Xstrahl[®] solution was preferable over electrons and brachytherapy in terms of ease of set up, reproducibility of treatment position, ease of verification, time on machine, patient comfort and the level of staff expertise required.

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Ethical consent

None.

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None.

Conflicts of interest

Author declares that there is no conflict of interest.

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