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Clinical Commentary

High dose rate brachytherapy for the treatment of skin tumours in humans and animals

A. R. Hollis

Department of Veterinary Medicine, Cambridge Equine Hospital, University of Cambridge, Cambridge, UK
Corresponding author email: arh207@cam.ac.uk

High dose rate brachytherapy (HDRB) is an established technique for the treatment of skin tumours in human medicine. Squamous cell carcinomas and basal cell carcinomas respond especially well, with 96–98% cure rates and excellent cosmetic outcomes, which compares extremely favourably to surgery for these patients (Delishaj et al., 2016; Skowronek, 2015; Tagliaferri et al., 2021). Indeed, in human non-malignant skin cancer, HDRB is often the treatment of choice for lesions that cannot be surgically removed without serious defects, which require cosmetic and/or reconstructive procedures (Delishaj et al., 2016; Skowronek, 2015). Compared to external beam radiotherapy (EBRT), brachytherapy has favourable dose distribution, with improved tumour radiation coverage and better protection of the surrounding normal organs and tissues at risk of secondary radiation damage due to the rapid dose fall-off. It, therefore, has a lower complication rate than EBRT, making it an attractive option (Delishaj et al., 2016). The ability to treat large tumours with minimal detrimental effects to the surrounding normal tissues and a high probability of cure with HDRB makes it an interesting option for equine skin tumours. Interstitial brachytherapy is theoretically the ideal technique for radiation treatment of equine tumours because a high radiation dose can be delivered precisely and safely to the tumour in a relatively short time (Theon, 1998).

The technique is relatively simple; interstitial catheters or needles are placed into the tumour at equally spaced intervals and using a remote afterloader, HDRB is delivered to the tumour without the need for any operator exposure, rendering it much safer and more practical than traditional low dose rate brachytherapy techniques (Hollis, 2017). In humans, CT imaging is performed as the standard once the applicators are in situ to allow for accurate treatment planning. However, in horses, this is unlikely to be possible, financially viable or practical in the vast majority of cases. A technique of orthogonal radiography has been developed to allow for accurate 3D planning for the treatment of periocular tumours in horses using a commercially available brachytherapy planning system (Hollis & Berlato, 2017b), but computer-assisted planning following catheter or needle placement is also possible using orthogonal photographs as described (Conti et al., 2021) or via hand planning methods, although this will have reduced accuracy compared to computer-assisted methods. This may be more appropriate in locations where the underlying tissues are less radiosensitive; the cornea is far more radiosensitive than bone (Hollis, 2017), so the accuracy of dose distribution is more critical in periocular locations compared to treatments over the distal limb.

HDRB has been briefly described for the treatment of equine skin tumours (Theon, 1998) and two small case series of its use in the treatment of equine sarcoids with a reasonable length of follow-up have been published (Hollis & Berlato, 2017a, b). The author has also used HDRB in horses with good success rates in over 140 sarcoids and squamous cell carcinomas (A. Hollis, unpublished data 2021). A variety of other tumours in dogs have been treated with HDRB, including carcinomas, various sarcomas, mast cell tumours, lymphoma and melanoma (Watkins, 2019). However, to the author's knowledge, there is only one report of HDRB for the treatment of dermal hamartomas in any veterinary species (Conti et al., 2021). Interestingly, in humans, hamartomas in various locations have been successfully treated with different forms of radiotherapy including radiosurgery, stereotactic brachytherapy and HDRB (Mittal et al., 2013; Romanelli, 2018). In the majority of veterinary reports of hamartomas, including those in horses, surgery was performed as the treatment of choice (Corzo-Menendez et al., 2001; Gualtieri et al., 2009; Nolf et al., 2014; Prudic et al., 2020; Saifzadeh et al., 2006; Sanders et al., 2002). However, in the case of recurrent lesions or those in which surgical excision is not possible due to their location, HDRB appears to be a safe and successful method of treatment, where this technique is available.

Author's declaration of interests

No conflicts of interest have been declared.

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