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Treatment of equine sarcoids using intratumoral Bleomycin in combination with Tumour Specific Electroporation - TSE™

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Tumour Specific Electroporation - TSE™

TSE™is a patented technology for tumour electroporation and combines a **Dynamic Field** with **Multi-dimensional electroporation**.

A **Dynamic Field** is obtained by gradually decreasing the applied voltage in a pulse train of eight pulses, designed to **spare healthy tissue** and reduce the risk of ablation (Figure 1). The voltage configuration is specific to the positioning of the electrodes (Table 1).

Multi-dimensional electroporation is a four-electrode electroporation with the pulse direction changing multiple times within the pulse train; horizontally, vertically and diagonally (Figure 2). The technique is designed to **avoid "cold spots"** of low or no pulse-penetration encountered in conventional electroporation.

Electrode position	Interval (V)
12 mm	1000 - 600
8 mm	800 – 400
8 mm oral	600 - 400

Table 1. Dynamic field configuration

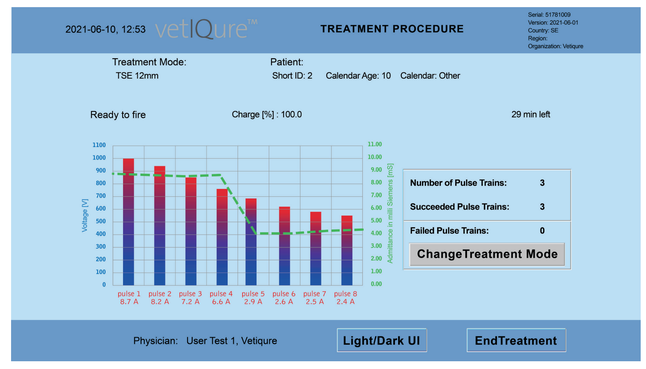

Figure 1. Example of Dynamic Field

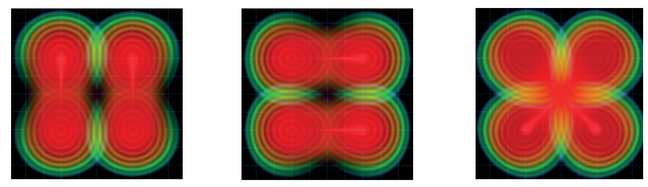

Figure 2. Multi-dimensional electroporation

Electroporation of nine sarcoids in one Equine

One equine (15 yo SWB Gelding) with nine cutaneous/infiltrative sarcoids underwent one treatment session. General anaesthesia was selected due to the inguinal location of several of the sarcoids.

An intratumoral injection of Bleomycin, with a concentration of 1500IE/cm^3, followed by a 29 minute TSE treatment session, starting 30 seconds after completed injection; 8 brief electrical pulses starting at 1000V and then gradually decreasing to 600V delivered by 4 needle electrodes in a square configuration, 12mm distance. Median tumour volume was 1.8 cm^3 (0.7-13.1 cm^3).

Results

For eight of 9 lesions the maximum current in a single pulse train was within the interval 3.8-11A. One, mandibular located lesion achieved a maximum of 3.4A. Complete remission was achieved in 9/9 sarcoids within the current observation period of 30 weeks. Toxicity was limited, with two lesions exhibiting grade 3 toxicity and seven lesions exhibiting grade 1-2 toxicity.

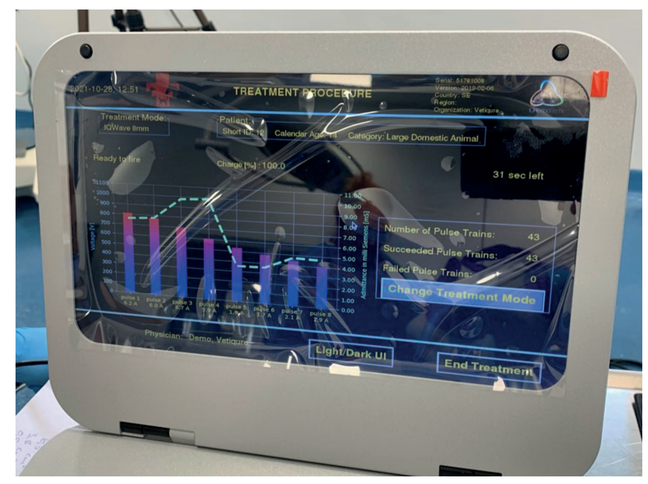

Figure 3. Pulse train during TSE with Bleomycin, patient Hercules 28.10.2021

Conclusion

One session of intratumoral Bleomycin followed by TSE was adequate to achieve CR of all treated sarcoids within the observation period of 30 weeks. This is the first reported successful treatment of equine sarcoids with ECT and Bleomycin, and first reported treatment with TSE in companion animals.

For local treatment of neoplasia in equines, cisplatin has been reported as intratumoral treatment alone and in combination with electroporation[1,2,3]. Bleomycin may be a more efficacious agent in electrochemotherapy in equines than Cisplatin[4]. With the lower toxicity profile of Bleomycin compared to Cisplatin, the combination of Bleomycin and TSE will allow for a much wider use as the primary option for treating sarcoids.

References

[1]Long-term outcome associated with intratumoral chemotherapy with Cisplatin for cutaneous tumors in equidae: 573 cases (1995–2004). Theon et al, JAVMA 2007
[2]Successful treatment of equine sarcoids with Cisplatin electrochemotherapy: A retrospective study of 48 cases. Tamzali et al, Equine Vet. J 2012
[3]Electrochemotherapy as a single treatment or adjuvant treatment to surgery of cutaneous sarcoid tumours in horses: a 31-case retrospective study. Tozon et al, Vet. Record 2016
[4]Enhanced cytotoxicity of Bleomycin, Cisplatin and Carboplatin on equine sarcoid cells following electroporation-mediated delivery in vitro. Souza et al, J.vet. Pharmacol. Therap 2016

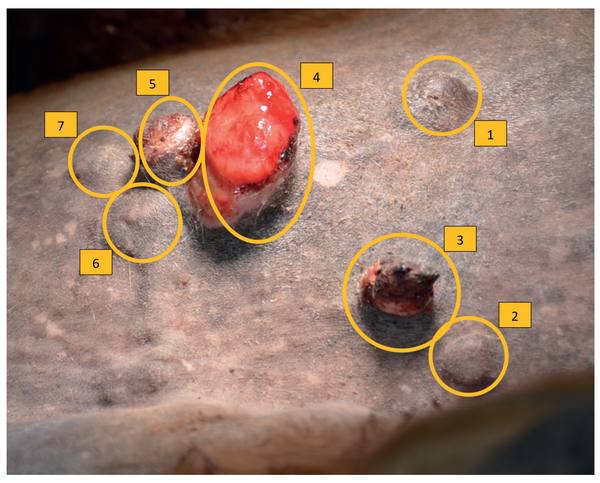

Figure 4. Pre-treatment 28.10.2021

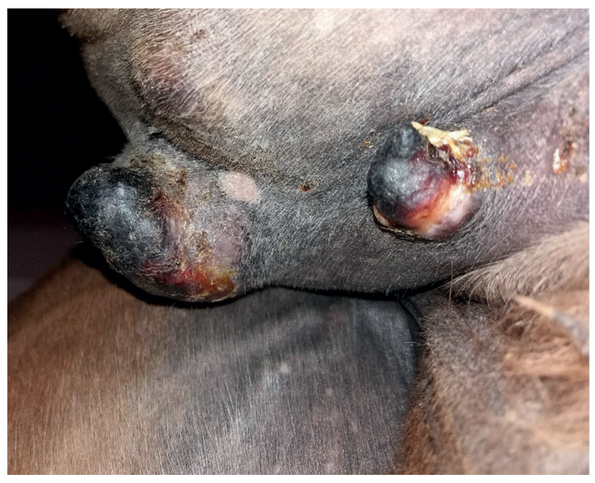

Figure 5. 4 days post-treatment 01.11.2021

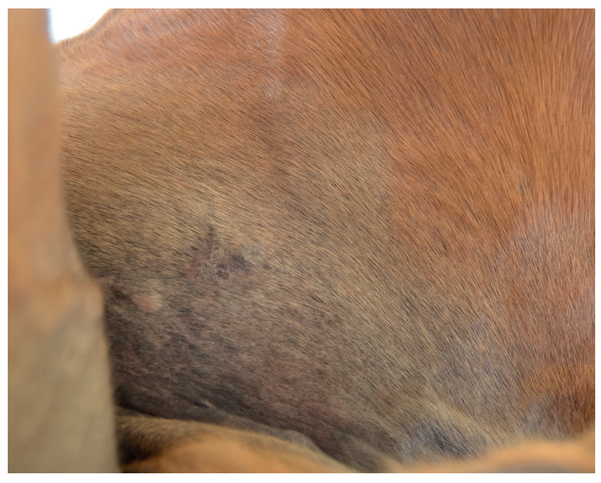

Figure 6. 20 weeks post-treatment 28.03.2022

Acknowledgements

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