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Review article

Management of corneal ulcer in a British bull dog by telemedicine

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ABSTRACT

The delivery of healthcare services, where distance is a critical factor, by all healthcare professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, are still poorly practiced for advancing the health of the animals at distant remote areas. Corneal ulcer continues to be a common ophthalmic condition in dogs that originates mostly due to trauma resulting in break in the continuity of underlying corneal stroma, that become contaminated with bacteria in complicated cases. A British bull dog received telemedicine such as eye drops containing Betensol and Neomycin 3 drops thrice daily for 5 days followed by gatifloxacine eye drop for a week, acyclovir at the dose rate of 100mg twice daily for a week. There was very good improvement and the ulcer got completely healed by 15 from start of the therapy.

Keywords: Corneal ulcer, Dog, Telemedicine, Acyclovir, Gatifloxacine.

INTRODUCTION

Telemedicine is a means of providing remote clinical services through real-time two-way communication between the patient and the healthcare provider, using electronic audio and visual means, and facilitates outpatient monitoring [1]. It offers the convenience to patients, patient owners and practitioners by precluding the necessity for a physical visit to get medical advice or treatment. Such practice is more convenient for veterinary healthcare, particularly when the animal is at distant remote areas. It is cost-effective in comparison to the process of waiting to see a doctor or other healthcare provider [2]. The COVID-19 pandemic has consolidated the trend and transformed the society towards greater digitization [3]. Digitalization has gained weight with slow historical adoption of telemedicine [4]. Advances in computing and the acceptance of the internet, provide the average person with the facility to rapidly transmit text, images, video and sound in digital format, over great distances [5].

Corneal ulceration is one of the most common ophthalmic conditions seen in equine general practice, which is attributed to trauma to the cornea due to the prominence of the equine eye globe, as well as their intense physical activity [6]. Corneal ulcer is also one of the most common ocular disorders in dogs and cats [7]. Corneal ulcers in dogs usually have a traumatic origin. They cause a break in the continuity of underlying corneal stroma, and become rapidly

contaminated with bacteria [8]. Elevation of air quality index (AQI) from wildfires has been reported to increase prevalence of infected corneal ulceration in dogs [9]. The association of corneal ulcerations with naturally occurring canine herpes virus (CHV) -1 infection, representing local ocular recrudescence of latent CHV-1 infection has been established earlier. The viruses isolated were identified as CHV-1, and the morphology, antigenicity and genotype were similar to those for CHV-1 isolates obtained from a puppy that died from systemic CHV-1 infection [10]. Canine herpesvirus-1 (CHV-1) is a varicello virus of the subfamily Alpha herpesvirinae with a host range restricted to domestic and wild canids. Clinical manifestations and disease severity during primary infection with many alpha herpes viruses, including CHV-1, is host age-dependent [11]. The family, Herpesviridae includes large, linear, double stranded DNA viruses (120-290 kilo bases) that replicate within cell nuclei. Phylogenetic analyses suggest existence of herpes viruses for over 400 million years, prior to the reptilian–mammalian divergence [12]. Herpes viruses exhibit a high degree of host specificity and sequence conservation and are often thought to have co-diverged with their host species. The endemic hosts may only experience a mild disease despite lifelong infection, whereas non-adapted individuals can develop rapidly fatal fulminating disease [13].

Case History and observations

A British bull dog was presented on 22nd August 2023 (Day 1) through whatsapp images and video. A clear and deep hole was observed through the cornea (Figure 1, 2, 3, 4). There was cloudiness of the anterior chamber, lacrymation from the affected left eye. Eye lids were wet and caseous white purulent eye discharges were sticking on the eye lids. Ulcer on cornea was clearly visible.

The progress of the case was monitored and discussed on day 3 and 5, after receiving few more photos through whatsapp. The cloudiness of anterior chamber was reduced to almost negligible following treatment, and thr size of the ulcer on cornea was also diminished by day 3 (Fig 5, 6, 7) and Day 5 (Fig 8, 9, 10). The patient owner was asked to send day 9 (11 and 12) and 15 pictures (Figure 13). There was complete recovery by day 15 with cessation of lachrymation or pus formation.

Treatment and follow up

The owner was advised to instill 3 drops of eye drops containing Betensol and Neomycin (Betensol N eye drop) thrice daily. Antiviral drug acyclovir was prescribed (Zovirax tab 200mg x7) for oral administration at the dose rate of 100mg twice daily for 7 days. The owner was advised to clean the surroundings of eyes using a soft cloth dipped in water to clean the purulent eye discharges. On Day 5, it was advised to continue medication and the eye drop was changed to Gatifloxacin eye drop for one more week.

Discussions

Telemedicine refers to the use of electronic information to communicate technologies in an effort to provide and support healthcare when distance separates the participants [14]. Telemedicine has the potential to bridge this distance and facilitate healthcare in the remote areas [15]. This is more true in animal practice where transport of sick animals to doctor is a real challenge for the owners [16]. Telemedicine has immense potential in delivering healthcare facilities to patients at a distant remote villages separated by long distance, even after the closure of the doctor's clinic and for the follow-up of patients with chronic diseases and those require help with dosage adjustments, prescription refills, or even just access to group support [17]. There are many procedures of ophthalmic examinations in veterinary medicine to investigate ulcerative corneal disease including fluorescent staining, a common, simple means of diagnosing a corneal ulcer [18]. The diagnosis in the present case was made through telecommunication by receiving photographs and observing clearly ulcers through the keratin layers (Figure 1 to 4), which is the most commonly encountered ocular diseases in veterinary ophthalmology [19]. Superficial unilateral ulceration in two dogs and deep bilateral corneal ulceration with keratoconjunctivitis sicca in one dog aged between 2–18 months were tentatively diagnosed based on clinical symptoms like ocular pain, corneal opacity, exophthalmic eyes with purulent discharge, photophobia, conjunctival hyperemia that was confirmed by fluorescent dye, and were due to trauma because of pawing or by foreign bodies [20].

Frequent detection of replicating CHV-1 or its DNA in the conjunctiva and corneal surface of dogs with ocular lesions consistent with infection by this virus is highly suggestive of a causal role for CHV-1 in an outbreak that occurred in a group of young dogs with no previous history

of ocular disease and no identifiable shared reactivation stimulus, and it was most consistent with an outbreak of primary CHV-1 infection [21]. In susceptible population of domestic dogs, CHV-1 may be associated with outbreaks of highly contagious ocular infection in the absence of concurrent overt systemic disease. In this naturally-acquired outbreak of primary ocular CHV-1 infection, conjunctivitis was the most frequent ocular lesion detected, ulcerative and non-ulcerative keratitis were less prevalent, and ulcerative corneal lesions were variable in clinical appearance [22]. The clinical and virological findings of the outbreak of ocular disease were attributed to naturally-acquired primary canine herpesvirus-1 (CHV-1) infection in a closed domestic dog colony. The ocular samples collected for CHV-1 polymerase chain reaction during complete ophthalmic examinations of 27, 10 to 16-week-old laboratory Beagles revealed 100% virus isolation and morbidity in examined dogs [23]. The suppression of herpes simplex virus (HSV) was achieved by phosphonoacetic acid (PAA) in tissue cultures, in herpetic dermatitis in mice, and in herpetic keratitis in rabbits [24]. Cidofovir has been reported to decrease viral load significantly from day 1 to day 8, compared with placebo ($p = .024$) in feline herpes virus type 1 (FHV-1) ocular surface disease. Neither famciclovir nor ganciclovir decreased viral load compared with placebo ($p = .14$, $p = .41$). There was no significant improvement of ocular scores for any drug group compared with placebo ($p = .62$) [24]. In all groups, 65%–75% of cats improved from Day 1 to Day 8. Significant ($p \leq 0.05$) reduction in the size of corneal ulcer has been reported from day 10 in the group instilled with eye drops containing Moxifloxacin and Flurbiprofen and in the group after instillation of homologous platelet rich plasma (PRP) [25]. The topical medical management of corneal melting includes administration of antimicrobials and protease inhibitors to counteract the collagenolytic processes. Several factors, such as advanced state of the disease at the time of referral, the inability of owners to adequately administer the topical therapy as well as antibiotic resistance can negatively influence the course of the disease, and often limit the efficacy of the currently available therapeutic options [26]. Surgery is indicated in advanced corneal melting, caused by keratomalacia and corneal perforation, to avoid vision loss [27]. Such surgical procedures include conjunctiva or biomaterial grafts, which lead to variable degrees of corneal opacity and, therefore, are unable to restore corneal transparency and vision [28]. Corneal thermal cutlery (CTC) has been reported to be safe and effective treatment for spontaneous chronic corneal epithelial defects (SCCEDs) in dogs, and can be performed without general anesthesia. Additional diamond burr debridement (DBD) does not bring any significant value to CTC. A temporary tarsorrhaphy alone has been documented as an aid to heal bullous keratopathy in felines and corneal ulceration and bullous keratopathy in equines and zebra. However, in the present case acyclovir oral administration along with antibiotic eye drop could heal the ulcer following one week treatment.

Uncomplicated superficial ulcers heal at a faster pace but traumatic origin corneal ulcers may become rapidly contaminated with bacteria. Bacterial growth was observed in 100% of the samples collected from corneal ulcers, and Staphylococcus spp. was isolated and characterized by culture, gram staining and various biochemical tests. Antibiogram pattern revealed that gatifloxacin and moxifloxacin antibiotics were found to be highly effective in the treatment of corneal ulcers in dogs. Fourth generation fluoroquinolones have been proved to be ideal in combating both gram positive and gram negative microbes due to their capability of low bacterial resistance. The antibiotic Neomycin was used for first five days in this study, followed by gatifloxacine for the next one week. It is concluded that telemedicine can be a useful tool for animal healthcare, and antibiotic eye drop along with antiviral oral therapy can successfully heal corneal ulcer in dog.

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Conflict of Interest: No conflict of interest.

Ethics

The dog was treated ethically, using knowledge and skill acquired through professional education and healthcare practices. The consent of the owner was obtained for publishing the data and figures.

Data Availability statement

Data generated from the present telecommunication for providing healthcare has been used for this manuscript with the consent of the owner

Author Contributions

Ramesh Chandra Patra- Planned, designed and conducted the experiments, analysed the input.

Sudhamayee Meher- Conducted the experiments, analysed the input.

Tapan Beura- Analysed the input and participated in suggesting telemedicine.
Bikas Das- Analysed the input and participated in suggesting telemedicine.
Dibya Panda- Wrote the manuscript.
Biswa Ranjan Jena- Wrote the manuscript.
S. K. Senapati- Analysed the input and participated in suggesting telemedicine.

Figure 1: Serial observations of left eye ball in a British bull mastiff dog following treatment

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