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Management of knee joint swelling induced lameness in an Asiatic elephant; Use of Therapeutic Ultrasounds as a pain management tool along with the routine treatment

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Abstract

One of the adult bull elephant which was rescued and brought to our 'Elephant Conservation Care Centre' at Mathura was showed symptoms of limping in right leg and mild swelling noticed on knee joints as well as fetlock joint. The symptomatic treatment were provided but no improvement noticed, the swelling at the knee joint further increased in size. Hence the animal showing severe lameness and reluctant to move, the attempt was made to collect the fluid for microbiological and antibiotic sensitivity test and drained the fluid from the edematous swelling by apply trochar & canula. However 300 ml of clean watery fluid evacuated from the swelling, not much improvement noticed. The culture report also not revealed any bacterial infection. After hemato-biochemical analysis the treatment decided with therapeutic ultrasound aided physiotherapy with dose of 3 MHz, continuous, with the intensity of 2 W/cm² for 15 minutes after applying liquid paraffin as a conducting medium. After the sonation Iodine ointment with Methyl Salicylate and Di-Methyl sulfoxide (DMSO) mixed past applied on swelling. The therapy was followed twice daily for 10 days. From second day onwards the animal started responding to the treatment. The mahout advised to make the elephant walk slowly by Positive Reinforcement Training Techniques (Laule *et al*) to provide mild exercise. The physiotherapy stopped after 10th day and advised to continue the topical application and exercise till complete healing. The swelling and limping reduced on 15th day.

Keywords: Asian elephant, Knee joint, Limping, Physiotherapy, Therapeutic ultrasound.

1. Introduction

Asian elephant can be trained to perform tricks as well as to haul heavy loads of logs. A large bull typically weighs 6 tons and is 10 feet high at the shoulder. An elephant in good health has soft, almost black skin which is felt hard and erect at the touch. The mucous membranes of the mouth and tongue are bright pink without any dark patches. The eyes are bright and clear. There is slight moistness above and around the nails of feet (due to high density of sweat glands). This must not be confused with offensive exudate which accompanies laminitis. The animal is continually in motion, either moving about or swinging its trunk and tail and flapping its ears. It eats well and sleeps from 2 to 4 hours during night (usually 11 pm to 3 am). It is to be noted that an elephant like a horse which can sleep while standing. The normal body temperature of an elephant is 97.4 – 99°F. Any temperature above or below this must be regarded as evidence of illness [3, 13, 22].

The average healthy elephant defecates about once every hour, usually dropping from 4 to 11 boluses, each weighing about 1 kg. Frequent groaning is an indication of pain [3, 22]. The average amount of urine discharged at a time is about 5.5 liters. The normal urine is straw-colored and without any obnoxious or distinctive odor. The elephants are very susceptible to sunstroke or heatstroke. They can tolerate cold far better than direct sunlight and heat [3, 22]. A wide variety of fruit and vegetables, fodders, hay and sugarcane generally constitute the daily diet of the ration which is generally offered 5 times a day. At least 60 grams of common salt should be fed daily to each animal. Vitamins and mineral supplements (180-200 grams) should be provided on daily basis [3, 22]. When animal not in musth or suffering from a very painful complaint, the elephant is an easy animal to treat, provided it has been trained to obey

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orders. At the word of command, the animal will lie down on the ground and remain motionless while wounds are being dressed or injection is given [3, 22]. Hobbles and chains are used for controlling elephants of uncertain temperament and males thought to be coming in musth. However, chaining may lead to degenerative joint disease due to restricted movement of the animal. In standing elephants, the angle between femur and tibia, which is close to 180°, differs to the half-bent posture in most mammals. A similar 'extended' knee posture occurs only in the bipedal humans [28]. Elephants should not be forced to stand on ground or cement soiled by their urine; whenever possible, dry straw should be provided as bedding. The feet should be examined regularly for any sign of inflammation of the sensitive tissue under the sole and nails, for any necrosis of the horny layer and for any excess exudates above the nails. Degenerative joint disease and Foot problems are common in captive elephants, resulting from poor hygiene and inadequate exercise [8]. In elephants of greater age, the knee joint is affected frequently by osteoarthritis, degenerative joint disease or arthrosis [9, 10, 11]. The kinematic patterns of the graviportal hindlimb in elephants are more similar to those in humans than to those in cursorial quadrupeds [28].

Therapeutic ultrasound (US) is a physical agent modality that has been used in hand clinics for the management of various musculoskeletal injuries for over 50 years [17, 24]. The use of ultrasound energy as a form of therapy was first suggested by Wood & Loomis in human beings [29]. Ultrasound has since been used to treat a wide variety of disorders, from skin wounds to malignant tumors [19, 30] and is thought to accelerate tissue repair and help with pain reduction via its thermal and non-thermal effects [12, 17, 20, 24, and 27]. The tissue response to non-thermal ultrasound includes acceleration of tissue healing through cavitation and its associated effects, while the responses to thermal ultrasound include increases in tissue temperature at superficial and deep levels such as tendons, ligaments, joint capsules, and fascia without overheating underlying fat [1, 23]. Therapeutic ultrasound is one of the most common treatments used in the management of soft tissue lesion, which constitute the majority of rheumatic complaints [24]. The evidence on physiological effects of ultrasound on both sensory and vascular functions in humans was reported by Shaik *et al* [23]. But such reports are rare in veterinary especially in wildlife medicine.

In this article we documented the successful use of therapeutic ultrasound along with the medication for treatment and management of severe painful edematous swelling at the knee joint and associated lameness in a recently rescued bull elephant from the poor husbandry background.

2. Materials and methods

One adult bull elephant (Age 50 years, Body weight 3350 kg) was rescued and brought to our 'Elephant Conservation Care Center' (ECCC) with poor history of nutrition and husbandry background. The preliminary examination was revealed debilitated and emaciated body with developing abscess on left shoulder region and swelling on both the hind limbs. Limping was evident in the right hind limb and severe pain was evinced on the right knee on palpation. However the animal was housed in cool dry soft floor and provide necessary treatment with turpentine liniment, hot fomentation and also application of hygroscopic mixture (Epsom salt with glycerin) on the swelling and anti-

inflammatory (meloxicam & serratiopeptidase) tablet provide orally with food there is no marked improvement noticed. After few week the animal condition deteriorated suddenly where he went off feed, regurgitated food, had in coordinated gait and the knee joint swelling also increased (6.8 feet in circumference) the body temperature was measure from freshly voided fecal bolus also below normal (hypothermia) [8]. The Immediate treatment was taken to overcome the situation by shifting the elephant in to covered enclosure and wrapping of the animal with warm winter blankets (Figure 1), exposed to halogen lights and born-fire as a heat source to keep warm.



Fig 1: Elephant covered with winter coat and recording body temperature from fecal bolus

Owing to further enlargement of the edematous swelling and pain the animal was reluctant to move and unable to bear the weight and the swelling gradually spread to inguinal region and reached prepuce. So decision was made to aspiration of fluid from the joint in order to reduce the pressure as well as for the culture analysis of the fluid (Figure 2). The fluid was clear and watery in consistency and 400 ml of fluid collected first day, but no improvement noticed.



Fig 2: Severe swelling at knee joint and evacuating fluid by using trochar and cannula

Therapeutic ultrasound aided physiotherapy treatment decided with dose of 3 MHz, continuous, 2 W/cm² for 15 minutes after applying liquid paraffin as a conducting medium (Figure 3). The transducer was gently moved over the swelling in a circling manner in order to spread the thermal effect uniformly and to avoid overheating of any focused area⁶. After the sonation Iodine ointment with Methyl Salicylate and Di-Methyl sulfoxide (DMSO) mixed past applied on swelling. The therapy was followed twice daily for 10 days. The mahout advised to make the elephant

walk slowly by Positive Reinforcement Training Techniques to provide mild exercise [15]. The physiotherapy stopped after 10th day and advised to continue the topical application and exercise till complete healing.



Fig 3: Elephant receiving physiotherapy with therapeutic ultrasound

3. Result and discussion

The bacterial culture not revealed any bacterial growth, thus confirmed the fluid is sterile and not infected with bacteria and swelling due to mechanical injury. The animal started response to the treatment from the second day onwards (Figure 4), the swelling started reduced gradually on inguinal and prepuce, on 5th day 40% of the swelling reduced around the knee joint and showed marked improvement in weight bearing and walking. On 10th day 90% of the swelling reduced and the complete reduction in swelling and walking without lameness noticed on 15th day.



Fig 4: Gradual reduction in the swelling

Ultrasound demonstrates the ability to evoke a broad range of therapeutically beneficial effects which may provide safe and effective applications in the management of osteoarthritis [25]. Both continuous and pulsed ultrasound are thought to show non-thermal effects and accelerate tissue repair [4, 14, 16, 26], while continuous ultrasound is thought to add additional therapeutic effects due to heating [5, 18]. Maintenance of the equilibrium between biological function and resistance to compression seems to be crucial in the elephant knee joint cartilage. Any disturbance that interferes

with this equilibrium appears to lead to arthritic alterations, as particularly seen in captive elephants [7]. Infectious agents are also strongly suspected as causes of degenerative joint disease in elephants; of these, *Mycoplasma* is of foremost concern [2]. Treatment of degenerative joint disease can include warm-water hosing of the affected joints or application of rubefacient liniments to promote circulation, aspirin given in a dosage of 6.50-13gm/500 kg body weight two or three times per day, and anti-inflammatory drugs [8]. Schmidt reported that use of DMSO for treating swelling and inflammatory condition in elephant [22].

4. Conclusion

The knee joint swelling is the pain full condition in elephant, so any mild injury may leads to sever problem to this mega herbivores. Hence it needs to be treated with caution without any delay. The therapeutic ultrasound aided physiotherapy can be used as a pain management tool along with the routine anti-inflammatory medication to get the desired effect at the earliest.

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