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Short communication

Ultrasound diagnosis and surgical treatment of coenurosis (GID) in bengal goat (*Capra hircus*) at chittagong metropolitan area, Chittagong, Bangladesh

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ABSTRACT

Coenurosis is a fatal disease of goats unless surgical relief is provided. A total of 2,055 goats were brought to teaching veterinary hospital, Chittagong Veterinary and Animal Sciences University since January-September/2012, of which four (0.19%) cases of gid disease were recorded based on a neurological examination. Cysts were located by ultrasound examination. Of the four cases, three goats were successfully cured surgically. The remaining goat had a cyst that was located so deep that removal was not possible. In conclusion, the use of ultrasound examination in association with a detailed neurological examination may provide a credential efficiency to locate and surgically remove coenurosis cysts in goats.

1. Introduction

Cerebral coenurosis is a usually fatal disease of the central nervous system of sheep and goats unless surgical relief is provided (Nooruddin *et al.*, 1996). This disease is caused by the larval stage of *Taenia multiceps* and has also been reported in cats (Smith *et al.*, 1988; Huss *et al.*, 1994), dogs (El-Shehabi *et al.*, 1999), and humans (Review from Joseph *et al.*, 2008). The adult worm lives in the small intestine of dogs, foxes, coyotes, and jackals (Soulsby, 1982). This disease was first described by Hippocrates in sheep (Himonas, 1979) and the diagnosis and treatment of coenurosis in goat were described by elsewhere (Razig and Magzoub, 1973; Ahmed *et al.*, 1974). The

surgical procedures for removing cysts in sheep were described in detail by Komnenou *et al.*, (2000); however, the pathological, molecular and biochemical characterization was performed in the Iranian native goat (Oryan *et al.*, 2010). In Bangladesh, coenurosis has become one of the most important and fatal diseases of goats, with an incidence of 5.2% (Hossain, 1991). The diagnosis is based on presenting clinical manifestations and softening of the skull. Diagnoses have been made in human cases using other modalities such as computed tomography and magnetic resonance imaging and costly. The position of the cyst in the brain is the most important information required to remove a cyst, and ultrasonography is useful for locating the cyst within the brain. However, ultrasonography provides very limited information about the positioning of cysts. Therefore, we describe here the diagnosis of this disease using ultrasonography and the surgical procedure for complete removal of a cyst. Control of *T. multiceps* is very difficult because of the large number of feral dogs present in Bangladesh and the food animals are slaughtered openly, and dogs are often fed viscera contaminated with cysts. The average mortality rate is 8%, but in highly infested areas it can reach 80% of animals intended for breeding (Himonas, 1979).

2. Materials and methods

A total 2055 goats were brought to SAQ teaching veterinary hospital from different part of the Chittagong metropolitan area since January to September/2012 with different complains and examined. Of those, goats suffering from nervous manifestations and staggering gait with or without blindness were categorized as having gid disease. These animals were examined physically and general information on breed, age, sex, success of the operation, and housing pattern was obtained.

A protocol for the neurological examination outlined by Mayhew (1989) and Clarkson and Faull (1990) was used to try to locate the cysts in the brain.

2.1. Neurological examination

2.1.1. General behaviour

The goats were observed first for behavioural disturbances *eg.* Standing apart from other members, disorientation, easy to catch, depression indicates the cyst was located in the rostral or temporal region of the cerebrum.

2.1.2. Visual deficits

The affected animal walked among obstacles and press his/her head on the wall or some hard object. In most cases unilateral or bilateral blindness was found indicated the cyst was located in the contralateral caudal cerebrum (occipital lobe) or cortex or the cerebellum or the presence of more than one cyst. Blindness in the right eye indicates that the lesion is in the left hemisphere and vice versa.

2.1.3. Postural deficits

Postural reactions were assessed by applying the wheelbarrow and hemistanding and hemiwalking tests for detecting to locate the presence of cyst either the cerebrum or cerebellum. Unilateral problems suggested a contralateral cerebral cyst and bilateral deficits were more likely to indicate cerebellar cysts.

2.1.4. Circling

Circling movement was a frequent and most important clinical sign of coenurosis. Wide circling indicated that the cyst was present in the more superficial location of the cerebrum (ipsilateral) whereas a tight circling within 1 to 2 meters in diameter suggested deep location of cysts within the forebrain (contralateral). The direction of the circling was not a reliable guide to the location of the cyst, but the animals tended to circle towards the side of superficial cysts and away from the side of deeply sited cysts. A head incline towards the affected side may result if the cyst involves either the vestibular or cerebellovestibular pathways.

2.1.5. Frontal bone softening

Softening of the frontal bone as a consequence of an increase in intracranial pressure, may be palpable but is not a reliable guide to the precise location of the cyst. Softening is due to bone rarefaction. The bone softening may be either ipsilateral or contralateral according to the cyst location and in some cases, there is softening on

both sides in the presence of only a unilateral cyst. Palpable softening of the frontal bones just behind the horn buds was occasionally found in goat showing signs of coenurosis. However, it was the least reliable guide to the location of the cyst, because it was an uncommon sign.

2.1.6. Ultrasound scanning

After clipping and shaving a 6.0 **MHZ** sector transducer (Medison SV 6000) was applied on the soft bony part with coupling gel. It was directed in a transverse plane in a ventral direction and then angled rostrally and caudally. After finding a clear ultrasound picture it was fixed and same to memorize.

2.1.7. Surgical technique

The surgical site was determined on the basis of the result of neurological findings. The surgical procedure was done according to Komnenou *et al.* (2000) with some modification. Briefly, the affected goats were fasted from the evening before surgery. Premedication was done by atropine sulphate 0.44 mg/ml body weight (Atrovet®, Techno Drug, Dhaka, Bangladesh) followed by sedation with diazepam at the rate of 0.88 mg/ml (Sedil®, Square Pharmaceutical, Dhaka, Bangladesh) intramuscularly. The goats were placed in ventral recumbency and the selected surgical area was shaved thoroughly. Local anaesthetic lignocaine HCl (Jasocaine®, Jeson Pharmaceutical, Dhaka, Bangladesh) was used to the selected area before washing. After washing, cleaning and aseptic preparation of the area, a semilunar-shaped incision was made on the skin overlying the frontal region and the flap was reflected caudally. After retracting the subcutaneous tissue and the periosteum, the bone was then exposed. A surgical blade was used to remove the soft bone less than 1 cm in diameter carefully. Care was also taken to avoid penetrating the sagittal sinus in the midline. The pressure associated with a cyst usually caused the underlying brain to bulge through the hole. The membrane of the dura was incised and finds the cyst with the help of probe according to ultrasonic examination. On caudal angulation a large fluid-filled cavity was found. The dimensions of this cavity were approximately 4 cm x 3 cm (Figure 4). If the cyst was immediately beneath the dura, it usually protruded through the small dural incision. (Figure 1). A syringe was used to aspirate most of the fluid and the cyst wall with protoscolices was then removed gently with haemostatic forceps (Figure 2). The skin incision was closed (Figure 3) with simple interrupted sutures using a non-absorbable suture (silk 2/0 or nylon 2/0). Systemic antibiotic penicillin 20,000 IU/kg body weight and streptomycin 10 mg/kg (Streptopen®, 2.5 gm, Renata Limited, Dhaka, Bangladesh) was administered for seven days and dexamethasone 4 mg/kg body weight (Dexavet, Techno Drug, Dhaka, Bangladesh) for two days postoperatively for decreasing the brain inflammation. Recovery after successful surgical cyst removal is rapid and there is a return to full neurological function within one week.

Fig. 1. The cyst was found after removing a piece of brain tissue with probe.

Fig. 2. Huge number of scholex inside the cyst (fluid was removed during expulsion of cyst from the cavity).

Fig. 3. Skin was sutured with nylon after removal of cyst from brain.

Fig. 4. Ultrasound scanning of goat brain indicate a cyst (c) was present beneath the skull.

Table1
Incidence of gid disease and its' successfulness after surgery.

Total number of goat entered to hospital	Gid disease affected animal (%)	Age of the animal (Month)	Sex of the animal	Breed	Successful of the operation	Housing pattern
2055	4 (0.19)	12	Female	Jamunapari	Yes	Intensive
		5	Female	Jamunapari	Yes	Intensive
		4	Female	Jamunapari	Yes	Intensive
		8	Female	Jamunapari	No	Intensive

3. Results

Of the 2,055 cases that were presented to teaching veterinary hospital, CVASU only four were gid disease (0.19%). It was not possible to remove the cyst in one of these four cases, and only fluid was removed. The remaining three (75%) goats improved immediately after the operation. Full skull softening was found in all three cases; however, in one case the skull was mildly softened and the clinical symptoms (circling movement) were more prominent.

4. Discussion

Coenurosis is a parasitic disease of central nervous system caused by the larval stage of *Taenia multiceps* which affects various ruminant species particularly sheep and goats and occasionally humans (Review from Joseph *et al.*, 2008). This disease was also recorded worldwide in cattle (Özkan *et al.*, 2011) cat, (Smith *et al.*, 1988; Huss *et al.*, 1994) and dog (El-shehabi *et al.*, 1999). In Bangladesh, this disease is found mainly in goats at an incidence of 5.2-6.32% (Hossain, 1991; Islam *et al.*, 1995). In Britain, coenurosis is one of the most common disease of the central nervous system in sheep (Brewer, 1983) in the United Kingdom and has a particularly high incidence in

certain areas. In the USA, this disease has apparently been eliminated (Skerritt, 1991). Cysts can reach maturity subcutaneously, intramuscularly, and in other organs, particularly in goats (Sing and Sing 1972; Sharma *et al.*, 1995). Cysts located in muscles may cause muscular pain or impair functions of the organs involved. However, most animals remain asymptomatic and the condition is usually diagnosed only after death of the animal (Sharma and Chauhan, 2006).

This study was carried out from January to September/2012 and the result was differed from a previous report because the data were obtained from different locations in Bangladesh eg. Mymensingh. The grazing grass in Mymensingh where most of the goats were reared, was contaminated with dog feces. In contrast, most of the goats at the Chittagong metropolitan area were reared, was infrequent. Feed contamination with dog feces was very limited and the incidence was low in that region. The number of feral dogs that coexist with livestock in most villages in developing countries such as Bangladesh constitutes a potential risk for livestock infection. It is well known that adult stage of *T. multiceps* lives in the small intestine of dogs and other canids (Soulsby, 1982, Güçlü *et al.*, 2006; Christodoulopoulos, 2007). After shading the larval stage through feces, infection occurs as a result of consumtion of eggs spread via feces of intermediate hosts (Sharma and Chauhan, 2006). The incidence of this disease depends on the presence of feral dogs on grazing land as well as in paddocks. Dogs are frequently fed on the viscera, trimmings and heads containing cyst of *T. multiceps* and they are not treated with anthelmintics. In our study, all cysts were found in the left cerebral hemisphere, similar to previous report elsewhere (Abo-Shehada *et al.*, 2002; Scala *et al.*, 2007; Uslu and Guclu, 2007; Tavassol *et al.*, 2011). In our study, we identified a small number of affected cases, all of which were females. Furthermore, the ages of the animals varied from 4-12 months. Only three of the infected goats were below 12 months of age. Adult sheep are more resistant to the disease than younger sheep, which may be due to acquired immunity. One study reported that only 7% of taenid eggs are capable of developing into cyst and the remaining eggs stimulate immunity (Gemmell, 1987). This is believed to occur with *T. multiceps*.

Accurate diagnosis including location and surgical removal of *T. multiceps* cysts is relatively easy when softening of the overlying cranium is identified. Before a final diagnosis is made listeriosis, louping-ill, sarcocystosis and polioencephalomalacia and brain abscessation should be considered in the differential diagnosis (Scott, 2012). Treatment is based on surgical removal of the coenurosis cyst after general anaesthesia of the animal, and this approach has a very good success rate, especially after accurate localization of the lesion. Nevertheless, many farmers choose to slaughter their affected animals for economic reasons and euthanize those in poor condition (Scott, 2012). Without softening of skull, clues as to the location of the cyst may be obtained from a detailed neurological examination (Skeritt and Stallhauiner, 1984) and skill of the clinician; however, the success rate varies from 54 to 81% (Skeritt and Stallbaumer, 1984). The use of radiography to aid in locating a cyst was described by Tirgari *et al.* (1987), but, unfortunately, interpretation of the radiographic findings is difficult. The frontal bone of our study was very soft and location of the cyst was easily diagnosed by ultrasound. A large (4 x 3 cm) fluid-filled cavity was found on caudal angulation. The classical neurological signs, including unilateral blindness, circling, lowering of the head, and softening of the skull, were found in all cases; this, in combination with location of the cyst using ultrasound resulted in a good prognosis (Doherty *et al.*, 1989). Percussion of the skull is also an accurate method of locating the cyst. Establishing a reliable technique to locate a cyst in the brain is important (Skerritt and Stallbaumer, 1984). After solving this problem, surgical removal of the cyst is a simple procedure that can be performed quickly (Tirgari *et al.*, 1987; Skerritt, 1991). Surgical treatment of coenurosis does not always result in a good outcome (Soulsby, 1982), but several reports have indicate that surgery can be an effective for coenurosis and that the success rate is as high as 74% (Skerritt and Stallbaumer, 1984). In this study the success rate was 75% and was supported by other study elsewhere (Skerritt and Stallbaumer, 1984; Komnenou *et al.*, 2000). In the present study, our goat cases showed significant clinical improvement after surgical removal of the cyst, and ultrasound was effective for diagnosis.

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