

Dept. of Surgery,
Faculty of Vet. Med., Assiut University,
Head of Dept. Prof. Dr. N.A. Misk.

STUDIES ON COENUROSIS CEREBRALIS IN SHEEP
(With 1 Table & 11 Figs.)

By
M.T. NASSEF; M.S. YOUSSEF*; M.S. TAHA*; LAILA S. AHMED**
and A.H. BAYOUMI*
(Received at 27/12/1989)

دراسات على الحويصلات الشريطية في الأغنام

محمود طنطاوي ، محمد صلاح يوسف ، مختار طه ، لهلى صلاح الدين ، عبداللطيف بيومي

لوحظ إضطرابات عصبية يمكن أعرؤها إلى الحويصلات الشريطية في ثلاثة عشرة من الأغنام
وصفت الأعراض وأمكن تشخيص وجود الحويصلات الشريطية بالأشعة في الحيوانات المصابة ،
وكذلك أخذت عينات دم وبراز للفحوص الدموية والباراسيتولوجية. تم إستئصال الحويصلات جراحياً
من سبعة أغنام ووصفت الطريقة الجراحية وصفاً دقيقاً . أجريت الصفة التشريحية على ستة
حيوانات مذبوحة ، كما أخذت عينات للفحص الهستوباثولوجي وتم وصف ومناقشة النتائج .

SUMMARY

Nervous disorders related to coenurus cerebri infestation were observed in 13 sheep. Radiographical diagnosis of the disease was done and the haematological findings were reported in all affected animals. Surgical removal of the parasitic cysts was only carried out on 7 sheep and the surgical procedure adopted for removal of the cysts was given. In addition, post-mortem and histopathological findings observed in 6 moribund, slaughtered sheep were fully described and discussed.

INTRODUCTION

Coenurosis; Gid or Sturdy is a primary disease of sheep and occasionally cattle (INNES and SAUNDERS, 1962; GREIG and HOLMES, 1977 and TIRGARI, et al. 1987). The disease is caused by the metacestode of the larval stage of *Taenia multiceps*, the tapeworm of dog. Cattle, buffalo, monkey, cat and man have been also affected (MCKENZIE, et al. 1978; SOULSBY, 1982; SKERRITT and STALLBAUMER, 1984).

Invasion of the brain and spinal cord with the intermediate larval stage of the parasite has been reported by BLOOD, et al. (1983). However, the extraneural migration

* Dept. of Pathology, Faculty of Vet. Med., Assiut University.

** Dept. of Animal Medicine, Faculty of Vet. Med., Assiut University.

M.T. NASSEF, et al.

was also recognized (EDWARDS and HERBERT, 1982).

The clinical signs and the necropsy findings in ovine coenurosis were reviewed by many authors (JENSEN, 1974; GREIG and HOLMES, 1977; DYSON and LINKLATER, 1979). Haemogram picture of the infested animals revealed leucocytosis, eosinophilia and monocytosis (AMER, et al. 1986). As regard to the surgical treatment of the disease, few reports were described (SKERRITT and STALLBAUMER, 1984 and TIRGARI, et al. 1987).

In the present article, the mandatory surgical manipulation dealt with coenurosis affected sheep was fully described. Histopathological illucidation of lesions induced by migration of *coenurus cerebrialis* was lacking in the literature and text books. Hence, it is worthwhile to wide-spectrum studies and investigations.

MATERIAL and METHODS

The present investigation dealt with 13 sheep naturally-infected with *coenurus cerebrialis*. The animals were submitted to the Veterinary Clinic, Assiut University at different intervals during the two-year period, 1988-1989. Faecal samples were collected and examined by the use of floatation sedimentation method. Blood samples from the diseased animals and 5 healthy ones were taken and studied for the total leucocytic count (T.W.B.Cs), total erythrocytic count (T.R.B.Cs), packed cell volume (P.C.V), haemoglobin content and differential leucocytic count (COLES, 1986). Animals were radiographically examined to ensure diagnosis. Seven sheep were subjected for surgical treatment. The rest of animals were sacrificed for post-mortem and histopathological examinations.

Radiographic procedures:

Radiographs were taken under Xylazine (Rompun; Bayer) sedation. Xylazine was intramuscularly injected in a dose level of 0.5 mg/kg body weight. Urographin was bilaterally injected into the carotid arteries using plastic catheters. Radiographs were obtained at different angles to establish the best view for demonstration of the intracranial parasitic cysts.

Surgical procedure:

Sheep were fasted 24 hours before operation. They were anaesthetised with intramuscular injection of Rompun (Bayer) in a dose level of 0.7 mg/kg body weight. The animals were placed in ventral recumbency, and the wool of the head and neck was shaved. After washing, cleaning and preparation of the surgical location, an U-shaped incision was made in the frontal region. The skin flab was caudally reflected (Fig. 1). A similar incision was made through the periosteum, but in an opposite direction. The latter was reflected with an orthopaedic chisel. The cortex of the bone was removed using a 20 mm. diameter trephine with thorough care of penetration of the sagittal

COENUROSIS

sinus. A slight circular groove was made by the trocher of the trephine to avoid dural penetration. The loosened bone was removed with the base of a scalpel handle. The incision was widened with a bone nibbler. The dura was incised by the use of a pair of fine, sharp-pointed scissors. The cyst was extracted from its occupying cavity by gentle aspiration of the outer membrane with a sterile syringe without needle (Fig. 2). The dura was sutured with a simple interrupted suture using 4/0 chromic catgut. Similarly, the periosteum was returned and sutured. The skin was also sutured by No. 1 silk threads. Oxytetracycline ointment was applied locally, and penicillin streptomycin was injected.

RESULTS

Clinical findings:

The observed clinical signs varied among the affected animals. The mild clinical manifestations were represented by lateral deviation of the head and profuse salivation. Progressive depression, aimless wondering and incoordinated movements were evident in severely affected animals. Some sheep suffered from paresis of the hind limbs, convulsions and impaired vision (Fig. 3).

Faecal examination revealed negative results. The haematological findings were given in the following table:

Differential leucocytic counts and haematological parameters.

Parameter	Unit	Healthy animals	Diseased animals
D.L.C.:			
Neutrophils	%	26.7 \pm 0.6	33.1 \pm 0.4
Eosinophils	%	13.0 \pm 0.2	7.2 \pm 0.2
Lymphocytes	%	43.9 \pm 0.8	50.1 \pm 0.1
Monocytes	%	12.2 \pm 0.1	8.5 \pm 0.3
Parameter:			
T.R.B.Cs	T/L	8.15 \pm 0.1	9.23 \pm 0.9
T.W.B.Cs	G/L	14.1 \pm 0.2	9.8 \pm 0.7
P.C.V.	%	36.3 \pm 0.8	35.0 \pm 0.1
Hb	gm%	12.1 \pm 0.3	11.5 \pm 0.3

D.L.C. : Differential leucocytic count.

T/L : Tera/Liter ($\times 10^{12}$).

G/L : Giga/Liter ($\times 10^9$).

Radiosurgical evaluation

Examination of different radiographic views for the parasitic cysts revealed that the dorsoventral position was the best diagnostic image (Fig. 4). Gross inspection of the wounds at the site of operation showed complete healing process after 2 weeks. Animals manifested locomotory disturbances were completely recovered (Fig. 5). However, blindness persisted in two sheep. The success rate of such surgical treatment could achieve 71%.

Morphological findings

On necropsy, the thin-walled parasitic cysts varied in size and could be found in different locations at the external surface of the cerebral hemispheres. In most of cases, the coenurus cerebralis cysts occupied varying sized areas at the cerebrum. The adjacent brain tissue showed atrophy, and the meningeal capillaries were congested (Fig. 6). The aspirated fluid from the cyst ranged from 10-30 ml. The diameter of the collapsed cyst after removal reached 3 cm.

On microscopical examination of the brain tissue, endvasculitis with prominent endothelial proliferative changes and perivascular cuffing were constant findings. Many capillaries showed intimal destruction and microthrombosis (Fig. 7). In addition, erythrocytic extravasations in the brain tissue were infrequently seen.

Serial sectioning of the brain tissue revealed the presence of multiple degenerated parasitic embryos (Fig. 8). Moreover, shrunk, necrotic and calcified embryos could be also recognized (Fig. 9). The neuropathic alterations of the deep brain tissue included focal areas of necrosis surrounded by severe inflammatory cellular reaction. Such tissue response consisted of abundant microglia-cell infiltration and significant numbers of astrocytes. The latter were closely adherent to the necrosed tissue (Fig. 10). Occasional presence of eosinophils was also noticed. Sections examined near the surface of the cerebral cortex showed cyst-like structures. These cysts contained necrotic tissue debris and accompanied with slight inflammatory cellular reaction (Fig. 11). The nearby brain tissue exhibited slight atrophic and cytolytic changes.

DISCUSSION

Coenurus cerebralis infestation had worldwide distribution among sheep. The disease occurred in all breeds, sexes and ages (JENSEN, 1974 and WILLIAMS, 1979). Recently, AMER, et al. (1986) reported the presence of the disease in Egypt.

In the present study, 13 sheep were submitted to the Veterinary Clinic, Assiut University with nervous symptoms related to coenurosis. Such clinical manifestations may be considered an approach for diagnosis (GREIG and HOLMES, 1977; MARTIN, 1983). However, similar nervous troubles are expressed in other diseases (JUBB, et al. 1985). Leucocytosis associated with eosinophilia and monocytosis in the diseased animals were related to the parasitic infestation (COLES, 1986).

COENUROSIS

Although the dorso-ventral view of cystography in our findings proved efficiency for diagnosis (TIRGARI, et al. 1987), such radiological methodologies seemed valuable as predictors for diagnosis.

In the present article, post-mortem examination of the sacrificed animals demonstrated the intracranial presence of varied sizes cysts contained scoleces. These findings could ensure the diagnosis (EDWARDS and HERBERT, 1983; THOMSON, 1988).

The surgical procedure adopted for such intracranial affections appeared valuable. The infested sheep showed significant improvement and the locomotor disturbances disappeared. However, two animals died 24 hours post-operatively and the success rate reached 71%. Similar results were also reported by SKERRITT and STALLBAUMER (1984) and TIRGARI, et al. (1987).

The micromorphological picture of the brain alterations in coenurosis included vasculitis, cerebral necrosis, and degenerated; necrosed and calcified larvae. It was obvious that the parasitic embryos migrated via the brain vasculature, here they resulted in angiopathic changes (BECKLUND, 1970; EDWARDS and HERBERT, 1982). In addition, the presence of degenerated and/or calcified parasites deeply within the brain tissue did confirmed the migratory phenomenon. Brain necrosis was associated with inflammatory cellular reaction. Such necrosis could be assumed either to the pressure evoked by the encysted metacystode, migration of the embryos or even a sequellae for the angiopathic changes. The tissue response consisted of focal microgliosis and astroglial proliferation with the occasional presence of eosinophils.

REFERENCES

- Amer, A.A.; Abdel-All, Th.S. and Mourad, I.M. (1986): Clinical, haematological and some biochemical variations in sheep infested with coenurosis. *Assiut Vet. Med. J.*, Vol. 17, No. 34: 177-180.
- Becklund, W.W. (1970): Current knowledge of the gid bladder worm *Coenurus cerebralis* (*Taenia multiceps*) in North American sheep. *Proceedings of the Helminthological Society of Washington*, 37: 200-203.
- Blood, D.C.; Radostits, O.M. and Henderson, J.A. (1983): *Veterinary Medicine*, 6th ed., pp. 394-395. Bailliere Tindall, London.
- Coles, E.H. (1986): *Veterinary Clinical Pathology* 4th. ed., W.B. Saunders company, Philadelphia, London.
- Dyson, D.A. and Linklater, K.A. (1979): Problems in the diagnosis of acute coenurosis in sheep. *Vet. Rec.*, 104: 528-529.
- Edwards, G.T. and Herbert, I.V. (1982): Observations on the course of *Taenia multiceps* infections in sheep: Clinical signs and post-mortem findings. *Br. Vet. J.*, 138: 489-500.

- Innes, J.R.M. and Saunders, L.Z. (1962): Insect larval infections and helminthic infections. In: Comparative Neuropathology, pp. 527, Academic press, New York.
- Jensen, R. (1974): Diseases of Sheep. Lea Febriger, Philadelphia.
- Jubb, K.V.; Kennedy, P.C. and Palmer, N. (1985): Pathology of Domestic Animals. 3rd ed., Academic press, New York.
- Martin, W.B. (1983): Diseases of Sheep. Blackwell Scientific publications, Oxford, pp. 93-98.
- Mckenzie, B.E.; Lyles, D.J. and Clinkscales, J.A. (1978): Intracerebral migration of cuterebra larvae in a kitten. J. Am. Vet. Med. Assoc., 172: 173-175.
- Skerritt, G.C. and Stallbaumer, M.F. (1984): Diagnosis and treatment of coenuriasis (gid) in sheep. Vet. Rec., 115: 399-403.
- Soulsby, E.J.L. (1982): Helminths, Arthropodes and Protozoa of Domestic Animals. 7th ed., Bailliere Tindall, London, pp. 117.
- Thomson, R.G. (1988): Special Veterinary Pathology. B.C. Decker, Inc. Toronto, Philadelphia.
- Tirgari, M.; Howard, B.R. and Boargob, A. (1987): Clinical and radiographical diagnosis of coenurosis cerebri in sheep and its surgical treatment. Vet. Rec., 120: 173-178.
- Williams, B.M. (1979): Coenurosis: a historical review. State Vet. J., 32: 235-239.

DISCRIPTION OF FIGURES

- Fig. (1): Showing U-shaped skin incision with caudal reflection.
- Fig. (2): Showing aspiration of the cyst membrane by a sterile syringe.
- Fig. (3): Sheep showing symptoms of nervous disorders.
- Fig. (4): Dorsoventral radiography of the parasitic cyst.
- Fig. (5): Recovered sheep after surgery.
- Fig. (6): Gross appearance of the parasitic cyst.
- Fig. (7): Brain showing angiopathic changes. H & E stain, X 400.
- Fig. (8): Brain showing degenerated parasitic embryo. H & E stain X 250.
- Fig. (9): Brain showing dystrophic calcification of the necrosed embryo. H & E stain, X 400.
- Fig. (10): Brain showing acute non-purulent encephalitis. H & E stain, X 250.
- Fig. (11): Brain showing cyst-like structure accompanied with slight inflammatory reaction. H & E stain X 250.





6



8



5



7

