Original Research

Clinical Profile of Black Quarter in Cattle

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Rec. Date:	Apr 11, 2018 10:27
Accept Date:	Jun 15, 2018 13:41
DOI	10.5455/ijlr.20180411102732

Abstract

The present study was conducted on 42 clinical cases of black quarter to study the clinical profile of black quarter in cattle with reference to clinical parameters like frequency of various clinical signs, body parts affected, number of lesions, nature of swelling and pain reaction. The percent analysis of clinical signs revealed the abnormal gait (74%), recumbent posture (57%) and presence of lameness in 33% cases. Out of 42 cases, 43% cases showed affection of the heavy muscles of hind limb and 31% showed affection of heavy muscles of fore limb. The majority of affected cases showed presence of single lesion (74%). The highest number of cases (86%) revealed the presence of crepitating nature of swelling and presence of pain reaction (74%). The highly significant increase in rectal temperature, pulse rate and respiration rate was also observed in affected animals.

Key words: Black Quarter, Clinical Signs, Lesions Pattern

How to cite: Ambhore, S., Khan, M., Chavhan, S., Bhikane, A., Bhonsle, A., & Gaikwad, N. (2018). Clinical Profile of Black Quarter in Cattle. International Journal of Livestock Research, 8(11), 321-326. doi: 10.5455/ijlr.20180411102732

Introduction

In this era of global warming, when new animal diseases are predicted to emerge because of changing environmental factors, the knowledge of the changing dynamics of disease is important in instituting control measures (Useh *et al*., 2013). Knowledge and understanding of the epidemiological profile of contagious diseases is quite necessary in order to devise strategies to eradicate diseases of sporadic nature. Seasonal prevalence of Black Quarter in different areas can be proved as a useful tool to understand the pattern and mode of transmission of disease (Khan, 2010). The speed with which BQ kills usually makes individual

treatment useless. In some cases, however animals treated early with antibiotics may survive, although they often suffer permanent deformity due to partial or complete destruction of muscles. The disease is a cause of severe financial loss to cattle raiser in many parts of the world. When the disease occurs within a space, several numbers of cattle are affected within a few days and mortality rate in BQ approaches 100%. Quick post-mortem examination and submission of samples to the lab by veterinarian is essential to confirm the diagnosis of BQ. A preliminary diagnosis of black quarter or malignant oedema may be made in the living animal on the basis of clinical signs and the presence of typical muscle swellings (Sultana *et al*., 2008).

Hence the present study was conducted to study the clinical profile of black quarter in cattle with reference to parameters like frequency of various clinical signs, body part affected, number of lesions, nature of swelling, pain reaction and effect on body temperature pulse rate and respiration rate.

Materials and Methods

The present study was conducted on 42 clinical cases of black quarter in cattle admitted to Teaching Veterinary Clinical Complex, COVAS, Udgir and from the surrounding areas from onset of disease, treatment to complete recovery or death at Department of Veterinary Pathology, College of Veterinary and Animal Sciences, Udgir during period January 2016 to July 2016. The information pertaining to age, sex, breed, month of illness, vaccination status, any predisposing factor and clinical findings with respect to body temperature, heart rate, pulse rate, respiration rate, body condition, lameness, site of swelling (body part affected), nature of swelling (crepitating/non-crepitating), number of lesion, pain reaction, gait, posture, appetite and water intake were recorded in all black quarter suspected animals individually in specially designed protocol.

The samples such as emphysematous exudate, muscles pieces and swabs were collected aseptically in sterile vials from crepitating swelling of black quarter from live suspected clinical cases or during postmortem examination. These samples were subjected for isolation and identification of causative agent by cultural isolation as well as for histopathological evaluation (muscle pieces collected in 10% formalin). After growth on cultural media, the samples were stained by using Gram's Staining technique for identification & confirmation of causative agent. The data generated from different parameters in present the study were subjected to statistical analysis by using IBM SPSS Statistics (version 20.0) software.

Results

In present study, the black quarter affected cases showed clinical signs like reduction in appetite, water intake and body condition, abnormality in gait and posture, fever, dullness along with marked lameness of either forelimb or hind limb and reluctance to move. The pronounced hot, painful, crepitating or non-crepitating swellings most commonly of heavy muscles of forelimb (on shoulder) or hind limb (on thigh),

 DOI 10.5455/ijlr.20180411102732

neck, brisket, thorax and back was evident. Few cases showed crepitating swellings all over the body (generalized appearance). The affected muscles frequently showed marked edema, emphysema and stiffness along with discoloured, dry and cracked overlying skin. Out of 42 cases, 10 (24%) cases were died while 32 (76%) cases were recovered after treatment.

Microscopic examination of smears prepared from exudate/emphysematous fluid obtained from swellings cultured on Clostridial agar and stained by Gram's stain, revealed numerous short, thick, straight, round ended, gram positive rods occurring singly or in short chain. The spore of the bacilli were elongated, oval, sub terminal and wider than the cell, appear like pear-shaped or spindle shaped confirming the presence of *Clostridium chauvoei*. The histopathological lesions observed in affected skeletal muscle tissue obtained either from live clinical cases (biopsy) or from necropsy included extensive haemorrhages and marked inflammatory response predominantly containing neutrophilic infiltration in spaces between muscle fibers indicating haemorrhagic necrotizing myositis leading to architectural disruption of myofibrils. Focal coagulative necrosis of muscle bundles was also observed. Frequently, many empty spaces within muscle bundles were evident indicating presence of gas bubbles (emphysema) and edema.

Frequency (Percent Analysis) of Clinical Signs in Black Quarter

The percent analysis of clinical signs revealed that the 64% and 57% cases showed complete absence of appetite and water intake respectively while 74%, 57% and 67% cases showed abnormal gait, recumbent posture and absence of lameness respectively (Table 1).

Table 1: Frequency (percent analysis) of clinical signs in black quarter

S. No.	Clinical Sign	Observations	No. of Cases (n=42)	Percentage (%)
1	Appetite	Reduced by 25%	3	7
		Reduced by 50%	4	10
		Reduced by 75 %	8	19
		Absent	27	64
2	Water intake	Reduced by 25%	2	4
		Reduced by 50%	4	10
		Reduced by 75 %	12	29
		Absent	24	57
3	Body condition	Thin	13	31
		Emaciated	6	14
		Good	23	55
4	Gait	Normal	11	26
		Abnormal	31	74
5	Posture	Standing	18	43
		Recumbent	24	57
6	Lameness	Present	14	33
		Absent	28	67

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Frequency of Body Parts Affected in Black Quarter

Out of 42 cases, in 18 cases (43%) the heavy muscles of hind limb (muscles of thigh region) found affected while in 13 cases (31%) the heavy muscles of fore limb (muscles of shoulder region) found affected. The muscles of other body parts also found affected including neck, brisket or thoracic region (n=9, 21%). The generalised involvement of muscles all over the body was evident in two cases (5%) (Table 2).

Table 2: Frequency of Body Parts Affected in Black Quarter

S. No.	Body Part Affected	No. of Cases	Percentage (%)
1.	Fore limb muscle	13	31
2.	Hind limb muscle	18	43
3.	Neck, brisket or thorax muscle	9	21
4.	Generalized involvement	2	5

Number of Lesions in Black Quarter

The majority of affected cases showed presence of one lesion (n=31, 74%). The remaining cases showed presence of either two lesions (n=9, 21%) or generalized pattern of lesions (n=2, 5%) (Table 3).

Table 3: Number of lesions in black quarter

S. No.	No. of Lesion	No. of Cases (n=42)	Percentage (%)
1.	One	31	74
2.	Two	9	21
3.	Generalized	2	5

Nature of Swelling in Black Quarter

The nature of swelling present on affected body parts was divided into two categories (i.e. crepitating or non-crepitating) depending upon its crepitating/crackling feel on palpation or on pressure. The highest number of cases (n=36, 86%) revealed the presence of crepitating nature of swellings (Table 4).

Table 4: Nature of swelling in black quarter

S. No.	Nature of Swelling	No. of Cases (n=42)	Percentage (%)
1.	Crepitating	36	86
2.	Non-crepitating	6	14

Pain Reaction in Black Quarter

The presence or absence of reaction in affected animal to pain caused by palpation or pressure on affected body part was recorded. The highest number of affected cases (n=31, 74%) revealed presence of pain reaction (Table 5).

DOI 10.5455/ijlr.20180411102732

Table 5: Pain reaction in black quarter

S. No.	Pain Reaction	No. of Cases (n=42)	Percentage (%)
1.	Present	31	74
2.	Absent	11	26

Changes in Body Temperature, Pulse Rate and Respiration Rate

In present study, the highly significant increase (P<0.01) in rectal temperature (102.65±0.27 *vs* 100.94±0.16), pulse rate (77.24±1.58 *vs* 10.78±1.32) and respiration rate (29.93±0.98 *vs* 12.87±1.29) was observed in black quarter affected cattle as compared to healthy animals (Table 6).

Table 6: Changes in body temperature, pulse rate and respiration rate (mean ± SE)

S. No.	Parameters	Affected (n=41)	Healthy control (n=30)	't' value
1.	Temperature	102.65 ± 0.27	100.94 ± 0.16	5.4**
2.	Pulse rate	77.24 ± 1.58	70.78 ± 1.32	2.8**
3.	Respiration rate	29.93 ± 1.29	23.87 ± 1.29	3.8**

*NS-Non Significant; *Significant (P<0.05);**Highly significant (P<0.01)*

Discussion

There is no consensus on the pathogenesis of blackleg infection but toxins and neuraminidase produced by the causative bacteria are believed to play a significant role. So, the mechanisms by which blackleg occur need to be thoroughly investigated for effective treatment, prevention and control (Singh *et al*., 1993; Useh *et al*., 2003 and Useh *et al*., 2013).

The detailed pathogenesis of blackleg is still somewhat uncertain but many of the critical points in the following proposed sequence of events have been confirmed in the natural disease and in experimental infections in cattle. The infection is acquired by the ingestion of spores and either these spores or spores produced following one or more germinative cycles in the gut are taken across the intestinal mucosa in some way. Spores are distributed to tissues including muscle where they may survive for long periods. The latent spores in muscle are stimulated to germinate when a local event creates muscle damage or low oxygen tension. It appears that all that is required to establish a medium for the organisms to multiply is a small intramuscular hemorrhage or a hypoxic degenerative focus initiated by traumatic damage to muscle. Additional tissue damage is due to various bacterial exotoxins including neuraminidase (Jubb *et al.*, 2015). The organism produces lethal toxins like hyaluronidases (gamma-toxin), deoxyri-bonucleases (beta-toxin) and oxygen labile hemolysins (Mousa, 1958; Useh, 2003). Toxin formed by the organism produces a severe necrotizing myositis locally in skeletal muscles and a systemic toxemia that is usually fatal. If the animal is observed before death there is severe lameness, usually with pronounced swelling of the upper part of the affected leg. On closer examination the animal will be found to be very depressed and have complete

DOI 10.5455/ijlr.20180411102732

anorexia and ruminal stasis and a high temperature (41°C, 106°F) and pulse rate (100-120/min). Pyrexia is not present in all cases (Radostits *et al.*, 2006). In the early stages the swelling is hot and painful to the touch but soon becomes cold and painless, and edema and emphysema can be felt. The skin is discolored and soon becomes dry and cracked. Although the lesions are usually confined to the upper part of one limb, occasional cases are seen where the lesions are present in other locations such as the base of the tongue, the heart muscle, the diaphragm and psoas muscles, the brisket and the udder. Lesions are sometimes present in more than one of these locations in one animal. The condition develops rapidly and the animal dies quietly 12-36 hours after the appearance of signs. Many animals die without signs having been observed (Radostits *et al., loccit*).

Conclusion

The clinical findings in present study closely mimics the pathogenic mechanisms elaborated by various authors as mentioned above. The presence of lesions at multiple locations might be due to wide distribution and lodging of spores in different muscles while the pain reaction, change in body temperature, pulse rate and respiration rate might be due to muscle damage, inflammatory mediators and systemic toxemia. Sultana *et al.* (2008) also reported more or less similar findings in black quarter in cattle.

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DOI 10.5455/ijlr.20180411102732