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RESEARCH ARTICLE
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Studies on rumen magnet usage to prevent hardware disease in buffaloes

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Abstract

Aim: To evaluate the rumen magnet given once a life as a prophylaxis of hardware disease in buffaloes.

Materials and Methods: In the present study, 3100 buffaloes were divided into two groups. In group I, 1200 hardware diseased buffaloes were surgically treated with rumenotomy, given reticular magnets and followed up to 7 years for a possible recurrent hardware disease. In group II, 1900 clinically normal buffalo heifers were given rumen magnets orally then followed up to seven years for a possible occurrence of hardware disease. All buffaloes showed signs of hardware disease were treated by rumenotomy. Data were statistically analyzed using chi-square test.

Results: Hardware disease was recorded in 110 animals (10.8%) and 155 animals (8.9%) in groups I and II. The incidence of developing a hardware disease during the first 4 years after the use of magnet was 0% in both groups. Starting from 5th year, a time dependent increase in the proportion of buffaloes developing a hardware disease was noticed in both groups ($P < 0.05$). The use of magnets in group I provided the same level of protection as that of group II since the overall proportions of the occurrence of hardware disease during 7 years post magnet use were not statistically different ($P > 0.05$).

Conclusion: Administration of a rumen magnet is an effective prophylaxis for hardware disease and reapplication of a second new magnet is recommended four years later in buffaloes at high risk.

Keywords: buffaloes, hardware disease, rumen magnet, rumenotomy, sharp foreign body syndrome.

Introduction

Buffaloes are an important part of livestock agriculture in Asia since 5000 years, producing milk, meat, hides and draft power [1]. Foreign body syndrome of bovine is still a matter of concern in different veterinary practices all over the world [2-4]. Hardware disease is an alternative term for bovine traumatic reticuloperitonitis and sharp foreign body syndrome. It is usually caused by the ingestion of a sharp object. These foreign objects settle in the reticulum, and can irritate or penetrate the reticular wall causing several complications [5]. Various serious complications originate from hardware disease such as traumatic reticulitis, traumatic reticuloperitonitis (local and diffuse), traumatic pericarditis, reticular abscess, diaphragmatic hernia, hepatic abscess, vagal indigestion, splenic abscess, rupture of left gastro-epiploic artery, pleurisy, traumatic pneumonia and mediastinal abscess [6]. The ingestion and lodgment of foreign bodies is common in bovine due to indiscriminate feeding habits. In addition, industrialization and mechanization of agriculture have further increased the incidence of foreign bodies in the foods of these animals [7]. The incidence of this disease is high in all developing countries especially in Iraq and Egypt, resulting in devastating economic losses. The disease was recorded in 25% of the examined buffaloes in Egypt [2] and in 87% of dairy buffaloes and 93% of buffaloes over 2 years of age in India [8]. This disease is of high economic importance and serious due to severe reduction in milk and meat production, treatment costs, potential fatalities and fetal losses in affected pregnant animals [3, 9, 10]. In addition, this condition may prove lethal for two reasons. First, the bacteria and protozoa can contaminate the body cavity resulting in peritonitis and second, the heart and diaphragm may be punctured causing cardiac failure [11].

Oral administration of a magnet before the age of one year is recommended as a preventive method for this disease [12-14]. After oral administration, most magnets drop firstly into the rumen then move to the desired location in the reticulum following ruminoreticular contractions [14]. In addition, keeping the animals away from construction sites and passing metal detectors or magnets over the animals feed were also recommended as preventive measures of this disease in bovine [5]. Although using of reticular magnets has become a popular preventive routine for hardware disease, especially in the dairy breeds of cattle and buffaloes, there is no report concerning its efficacy as a long term preventive measure of hardware disease in buffaloes.

Figure-1: (a): New rumen magnet, (b) Trapped metallic foreign bodies on retrieved magnets after rumenotomy in buffaloes.

Table-1: Total number of examined, discarded, followed up and hardware diseased buffaloes

Numbers of animals	Group I	Group II
Total examined buffaloes	1200	1900
Discarded buffaloes	185	154
Followed up buffaloes	1015	1746
Hardware diseased buffaloes during 1st- 4th. year post magnet use	0[a]	0[a]
Hardware diseased buffaloes during 5thyear post magnet use	23 (2.3%)[b]	35 (2.0%)[b]
Hardware diseased buffaloes during 6th year post magnet use	39 (3.8%)[b]	43 (2.5%)[b*]
Hardware diseased buffaloes during 7th year post magnet use	48 (4.7%)[c]	77 (4.4%)[c]
Total hardware diseased buffaloes	110 (10.8%)	155 (8.9%)

Different alphabets indicate significant difference within the same group. a - b; $P < 0.05$ and a-c; $P < 0.01$
*Asterisks denote a statistical difference within the same raw at $P < 0.05$

Therefore the aim of the present study was to assess the efficacy of rumen magnet given once in a life as a permanent preventive measure for hardware disease in buffaloes.

Materials and Methods

Ethical approval: Not necessary. All the clinical cases under this research were examined and treated as per standard examinations and treatment procedures.

Animals: This study was carried out on 3100 buffaloes during a period of 8 years in Iraq. The studied animals were divided into two groups as follows:

Group I: It had 1200 buffaloes suffered from hardware disease. Confirmation of the hardware disease depended upon; case history, clinical signs, clinical examination, ferroscopy and ultrasonographic examination. Rumenotomy was carried out for the treatment of these buffaloes and rumen magnet (Bovivet Ruminal magnet®, Kruus Company, Denmark) was dropped into the reticulum of each operated buffalo (Figure-1a). All of the operated buffaloes were followed up for seven years for a possible recurrence of hardware disease. Repeated rumenotomy was done in all buffaloes that had recurrent hardware disease.

Group II: It had 1900 buffalo heifers given prophylactic ruminal magnets orally at the age of 6-9 months. Oral administration of magnets was carried out according to the manufacture company instructions. The heifers were fasted for 12 hours and vicious ones were sedated with Xylazine HCl (Xylaject®, ADWIA Comp., Egypt) given intramuscularly at a dose of 0.1 mg / kg body weight. In herds, the heifers were numbered by ear tag and the magnets were numbered by firing. These animals were followed up for seven years for any complications and possible occurrence of hardware disease. Rumenotomy was carried out as a treatment for hardware diseased buffaloes.

Rumenotomy: It was carried out in all affected buffaloes under inverted L regional analgesia using 80 ml of Lidocain hydrochloride 2% solution (Xylocain®, Asefoc, Belgium). Weingarth' s ring rumenotomy was carried out according to Hofmeyr [15] in all diseased buffaloes.

Statistical analysis: Proportions of buffaloes which developed hardware disease during the first 4 years and at 5th, 6th and 7th year after the use of magnet were compared using chi-square test in IBM SPSS (version 20) within and between group I and group II and all data were reported.

Results

The data of both groups are described in Table-1. In group I, the affected animals were 1195 females and 5 buffalo bulls. The age of affected animals ranged between 2-9 years. No complications were reported after dropping of magnets into the reticulum in all operated animals. Out of 1200 operated buffaloes, 185 could not be followed up. Recurrent hardware disease was recorded in 110 animals (10.8%).

In group II, out of 1900 buffalo heifers, 1746 could be followed up. Regurgitation was the only complication after oral administration of rumen magnet. It was recorded in 30 heifers representing 1.5% of the total examined heifers. Hardware disease was diagnosed in 155 animals (8.9%).

The incidence of developing hardware disease during the first 4 years after the use of magnet was 0% in both groups. Starting from 5th year, a time dependent increase in the proportion of buffaloes developing a hardware disease was noticed in both groups ($P< 0.05$). The use of magnets in heifers provided the same level of protection as that observed in treated-buffaloes with previous history of hardware disease since the overall proportions of the occurrence of hardware disease during 7 years post magnet use were not statistically different ($P > 0.05$).

Repeated rumenotomy and rumenotomy of the diseased buffaloes in group I and II revealed complete filling of cage magnets with foreign bodies (Figure-1b). The magnetic power of the retrieved reticular magnets was similar to the new one. Therefore, the magnets were cleaned then reused.

The trapped metallic foreign objects included wires, nails, needles, knives, keys, coins, screws, rings, can-openers and iron pieces of various sizes. In addition, other foreign bodies as bones, feathers, gravels, stones, sand, pieces of rubber, glass and clothes, shoes, ropes and plastic bags were also removed during rumenotomy.

In the present study, various surgical complications of hardware disease were recorded in the examined buffaloes. These complications included traumatic reticultitis (n=608), local traumatic reticuloperitonitis (n=461), reticular abscess (n=191), diffuse traumatic reticuloperitonitis (n=96), traumatic pericarditis (n=68), diaphragmatic hernias (n=32) and splenic abscesses (n=9).

Discussion

Hardware disease synonymously known as sharp foreign body syndrome (SFBS) is a serious and common disease of bovine especially in developing countries where the standard of animal management is unsatisfactory [16]. Therefore the prevention of this disease constitutes a challenge for veterinarians in these countries.

Although one source does not believe magnets are an effective preventative measure [17], the majority of clinicians agree that all cattle over one year of age should have a prophylactic magnet placed in the reticulum [12-14].

In the present study, out of 3100 examined buffaloes, 339 animals could not followed up due to various reasons such as death due to other diseases, slaughter or loss of owner's contact.

Oral administration of rumen magnet in heifers was safe. The only complication was regurgitation in 1.5% of examined heifers. Numbering of both rumen magnet and heifers in herds facilitated the identification of the regurgitated one and consequently facilitated the reapplication of magnet.

The results of the present study showed that the rumen magnet was an effective prophylaxis for buffaloes especially during the first 4 years after its use. Other authors recommended rumen magnets as a prophylaxis for hardware disease [12-14].

It is worthy to report that there is a time dependent increase in the proportion of buffaloes developing a hardware disease in both groups after 4 years of magnet use. Therefore, administration of a new rumen magnet every 4 years is recommended to permanently prevent hardware disease in buffaloes at high risk.

In addition, occurrence of a hardware disease in buffaloes with a rumen magnet was not due to loss of magnetic power but to complete filling of cage magnet with foreign bodies which obscured the magnetic power. Therefore, reusing of the retrieved magnets after cleaning was carried out in this study.

Regarding the removed foreign objects, both sharp and blunt metallic and non-metallic objects were removed during rumenotomies. Similar findings were previously mentioned [5, 16]. Interestingly, three buffaloes in the present study showed signs of hardware disease but rumenotomy revealed non-metallic penetrating foreign objects including sharp bony pieces and feathers causing local traumatic reticuloperitonitis.

Concerning the etiology, both animal and human factors were encountered in this study as predisposing factor for SFBS including mode of animal prehension, indiscriminate feeding habits, loss of green foods, bad nutritional management, heavy industrialization and human habits as burning of tires inside farms for lighting which resulted in huge amounts of wires. Some of these factors were mentioned before [3, 7, 16].

Various surgical complications of hardware disease in the operated buffaloes were reported. These complications depended upon the nature, size and direction of the swallowed foreign bodies. This is in agreement with a previous study [16].

Conclusion

Administration of a rumen magnet is an effective prophylaxis for hardware disease and reapplication of a second new magnet is recommended four years later in buffaloes at high risk.

Authors' contributions

OSA and SMA, performed the fieldwork, carried out rumenotomy and followed up animals in Iraq. AMA analyzed the data, drafted and revised the manuscript. All authors read and approved the final manuscript.

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Competing interests

The authors declare that they have no competing interests.

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