ASIAN JOURNAL OF BIOMEDICAL & PHARMACEUTICAL SCIENCES

e-ISSN: 2249-622X

RESEARCH ARTICLE

Histological Changes In Mammalian Uterus IN Brucellosis

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Received:
11th July 2013
Received in revised form:
25th July 2013
Accepted:
30th July 2013
Available online:
10th Aug 2013

OPEN ACCESS

Online ISSN 2249–622X
http://www.ibiopharm.com

ABSTRACT

Brucella species is known to cause abortion in infected mammals. This has been attributed to the localization of infection in uterine and placental tissues. The present study was conducted on specimens taken from uterus of *Brucella* sp. culture positive cases of dogs and cows. The aim of the study was to establish the histological changes seen in uterine tissue in acute cases of brucellosis. Routine staining with hematoxylin and eosin (H&E) was done and the brucella positive samples were compared with normal uterine tissue samples, which were used as control specimens.The study revealed marked changes, in the form of mononuclear cell infiltrations, fibrosis, and calcification of tissue. It may be concluded from the findings that brucellosis causes marked histological changes in the uterine tissue of infected mammals.

Keywords: Brucellosis, histological changes, dogs, cows, uterus, reproductive disorders, fibrosis, calcification

1. INTRODUCTION:

Brucellosis is a highly contagious disease caused by *Brucella* sp., infecting a variety of mammals. The most common species along with their known host organisms are *B. melitensis* (goats), *B. abortus* (cattle), *B. canis* (dogs), *B. suis* (pigs), *B. ovis* (sheep), and *B. neotomae* (rats). Out of these, *B. melitensis*, *B. abortus*, *B. canis* and *B. suis* are known to cause brucellosis in humans. Recent studies involving marine mammals have shown that humans are also susceptible to infection by Brucella strains of marine origin [1]. It is mainly transmitted to humans via consumption of dairy products, like unpasteurized milk and soft cheese, obtained from infected animals. Slaughter-house workers and veterinarians exposed to infected animals and laboratory workers exposed to bacterial cultures are also susceptible to infection. Hence brucellosis is considered as a highly contagious zoonosis.

Brucella sp. are Gram-negative, rod-shaped, facultative intracellular bacteria. In cattle, bacterial transmission occurs by exposure to reproductive fluids, or products of abortion. Inhalation, conjunctival contamination, skin contaminations are some of the common mediums of transmission [2]. In dogs, apart from the above methods, transmission is known to occur through sexual contact [3, 4]. Contact with aborted fetuses or exposure to environment contaminated with abortion are the most common modes of transmission in animals. Transmissions to humans also occur by the methods mentioned above. But person-to-person transmission is extremely rare.

The symptoms in cases of acute brucellosis in humans involve undulant fever, fatigue, anxiety, anorexia, arthralgia etc. in later stages, it can become quite complicated since *Brucella* sp. are facultative intracellular bacteria and they can multiply within phagocytic cells of host. This results in localized infections in various organs such as liver, spleen, mammary glands, uterus etc. Chronic cases involve, osteoarticular, hepatobiliary, neurological, or cardiovascular complications [5, 6]. In cattle, the most common symptoms of brucellosis are abortions (usually during second half of gestation) and still-births. In infected males epididymitis and orchitis are common. In dogs also, abortion (in females) and scrotal inflammation and orchitis (in males) are the common symptoms. Along with that,

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infection of intervertebral discs and uveitis are seen in many cases [7].

Since abortions and still-births are the most common symptoms of brucellosis visible in mammals, it is safe to assume that bacterial infection of uterus is a significant result of brucellosis. It has not been proven whether brucellosis causes abortions more frequently than other bacterial infections [8, 9]. But study of histopathological changes in infected uterine tissue may help in understanding how *Brucella* evades intracellular phagocytosis and becomes localized in tissues.

2. MATERIALS AND METHODS

2.1 Selection of Specimens:

Permission from Institutional Ethical Committee was taken for this study. A total number of 6 samples suspected with brucellosis infection, were collected for conducting this study. Out of these, 2 samples were collected from cows that underwent late-gestation abortion. 4 samples were collected from bitches that underwent a similar stage of abortion. Uterus was removed surgically from the animals due to signs of pyometra.

2.2 Confirmation of Brucellosis:

Samples from the tissue received were inoculated in Brucella agar/broth and after 3-7 days incubation (37°C, 5% CO_2), the colonies formed were tested for presence of *Brucella* sp. using the routine staining and biochemical tests (Gram staining, oxidase test, catalase test, urease test, Triple sugar iron, TSI, test.); molecular test by brucella specific PCR.

1 sample out of 2, obtained from cows, tested positive for *Brucella* sp. While, 2 samples out of 4, obtained from dogs, tested positive for *Brucella* sp. The negative tested samples were used as control in the study.

2.3 Histopathological Analysis:

Tissue from the uterus samples underwent routine work for histopathological analysis. After grossing, tissue was processed in Yorco Automatic Tissue Processor-Electra (YSI-104). Processed tissue was embedded in paraffin and 4µm thick sections were produced using microtome (Leica RM 2135). The sections were stained using hematoxylin and eosin (H&E).

3. RESULTS

Microscopical analysis of the different uterus samples showed marked histological changes. Major changes seen were the infiltration of mononuclear inflammatory cells in uterine glands and lamina propria (Fig. 1.1).

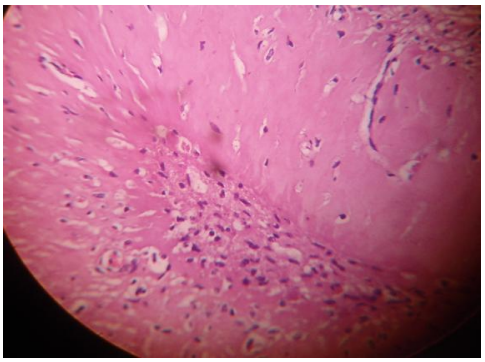

Figure 1.1 showing infiltration of mononuclear cells in lamina propria

This was accompanied by significant changes in blood vessels which involved dilation (Fig. 1.2)

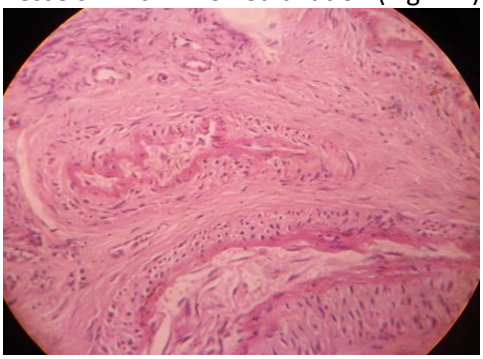

Figure 1.2 showing dilation of blood vessels

and thickening of vessels along with heavy congestion (Fig. 1.3).

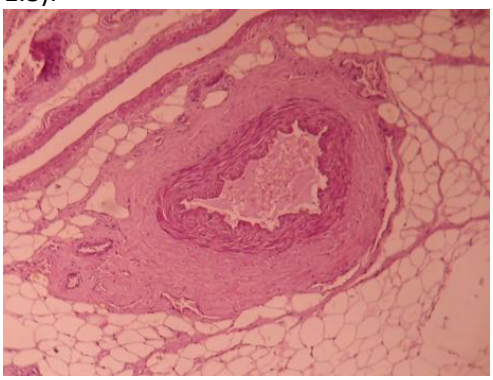

Figure 1.3 showing congestion of blood vessel

Regions of fibrosis and calcification (Fig. 1.4)

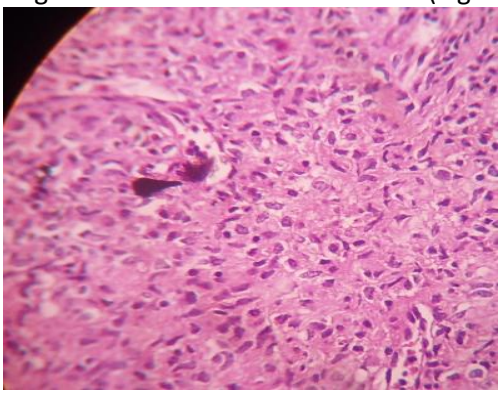

Figure 1.4 showing a region of calcification in endometrium

were also observed in all of the infected samples. Smooth muscles in the myometrium were vacuolated, along with infiltration of macrophages and plasma cells. Oedema formation was also observed in the endometrium as well

as in the myometrium. The results are summarized in the tables (Table 1.1 and Table 1.2) given below.

Changes	Sample 1*	Sample 2**	Sample 3+	Sample 4+	Sample 5++	Sample 6++
Infiltration of mononuclear inflammatory cells in uterine glands	1+	0	2+	2+	0	0
Infiltration of in mononuclear inflammatory cells lamina propria	1+	0	2+	2+	0	0
Destruction of epithelial cells of uterine glands	0	0	0	0	0	0
Sloughing of cells	0	0	0	0	0	0
Necrosis	0	0	0	0	0	0
Atrophy of uterine glands	0	0	0	0	0	0
Ulcerative endometritis	0	0	0	0	0	0
Oedema	0	0	1+	1+	0	0
Dilation of blood vessels	2+	0	2+	2+	0	0
Congestion of blood vessels	2+	0	2+	2+	0	0
Thickening of blood vessels	2+	0	2+	2+	0	0
Granulomatous endometritis	0	0	0	0	0	0
Caseatic necrosis	0	0	0	0	0	0
Fibrosis	2+	0	1+	1+	0	0
Calcification	2+	0	1+	1+	0	0

Table 1.1: showing endometrium changes in the uterus samples. (Scoring: 0, 1+, 2+, 3+)

*positive sample of cow's uterus. **control sample of cow's uterus.
+positive samples of bitch's uterus. ++control samples of bitch's uterus

Changes	Sample 1*	Sample 2**	Sample 3+	Sample 4+	Sample 5++	Sample 6++
Vacuolation of smooth muscles	2+	0	2+	2+	0	0
Infiltration of macrophages and plasma cells	2+	0	2+	2+	0	0
Oedema	2+	0	2+	2+	0	0

Table 1.2: showing myometrium changes in uterus sample. (Scoring: 0, 1+, 2+, 3+)

*positive sample of cow's uterus. **control sample of cow's uterus.
+positive samples of bitch's uterus. ++control samples of bitch's uterus

4. DISCUSSION

The histopathological examination of infected uterine tissue revealed significant changes in the form of mononuclear inflammatory cells infiltration in uterine glands and lamina propria, along with regions of fibrosis and calcification. Similar observations were found in cows naturally infected with *Brucella melitensis* [10]. Infiltration of the mononuclear inflammatory cells may provide a clue to the nature of localization of the infection in the uterine tissue. *Brucella* sp. escapes phagocytosis and undergoes

intracellular multiplication which develops into the localized infection. Presence of high amounts of erythritol in uterine tissue of cows and other ungulate mammals has been suggested as a probable factor assisting the growth of *Brucella sp.* [11, 12]. This leads to the formation of granuloma and inflammation of the uterine tissue. An evidence of granulomatous disease in its chronic stage is suggested by the presence of fibrosis and calcification. Blood vessels were thickened, dilated and congested in all brucella positive cases. Myometrial changes were also prominent in all brucella positive cases. Thus histopathological examination of uterine tissue infected with *Brucella* sp. may help in revealing the distribution of infection in the tissue and aid in the diagnosis of brucellosis, along with other confirmatory tests [10, 13, 14].

5. AKNOWLEDGMENT

We would like to thank the authorities of Peerless Hospital and B. K. Roy Research Centre for giving us the opportunity to work on this research project. We would also like to thank the lab technicians for their help in conducting the study.

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Conflict of Interest: None Declared

Cite this article as:
Pranav Preman, Sugat Sanyal, Satadal Das. HISTOLOGICAL CHANGES IN MAMMALIAN UTERUS IN BRUCELLOSIS. Asian Journal of Biomedical and Pharmaceutical Sciences, 2013, 3: (22), 58-61.

