

Full Length Research Paper

Study on distribution and type of cardiac lesions in aborted lambs

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Histopathological lesions in the hearts of 44 aborted lambs were investigated 1) to determine the percentage of injured hearts following abortion, 2) to determine the distribution and percentage of lesion types in the hearts of aborted lambs and 3) To clarify the probable cause of abortion on the base of histopathological cardiac lesions in Urmia, Iran. Of 44 lambs' heart, 10 aborted lambs have had normal hearts and 34 lambs revealed one or more lesions in their hearts. The percentages of normal and injured hearts were 22.7 and 77.3%, respectively. Types of lesions in aborted lambs' heart were hyperemia, myocardial necrosis, interstitial edema, watery degeneration, haemorrhagia, hyaline degeneration and Purkinje degeneration. The distribution and percentage of lesions in the injured hearts were 20 (26.7%), 20 (26.7%), 12 (16%), 9 (12%), 8 (10.7%), 4 (5.2%) and 2 (2.6%), respectively. The percentage of lesions in the injured hearts were 58.8%, 58.8%, 35.3%, 26.5%, 23.5%, 11.8%, 5.8% and in whole lambs' heart were 45.5%, 45.5%, 27.3%, 20.5%, 18.2%, 9.2% and 4.6%, respectively. The highest distribution and percentage of lesion types in the injured hearts were hyperemia and myocardial necrosis and the lowest was Purkinje cell degeneration. In another words, up to half of the aborted lambs revealed hyperemic and myocardial necrosis in their hearts. The distribution and percentage of injured hearts appeared one, two, three and four lesions were 10 (29.4%), 18 (52.9%), 4 (11.8%) and 2 (5.9%), respectively. According to the cardiac lesion types, the majority of aborted lambs have had primarily of secondary cardiac lesions in that foot and mouth disease is the primary one and vitamin E&Se deficiency could be the second one. It is concluded that types of cardiac lesions would be useful in diagnosis, control and treatment of diseases if local history diseases support them.

Keywords: Lamb, abortion, heart, histopathology, hyperemic, myocardial necrosis.

INTRODUCTION

Animal population and economic life of farmers depends on the conducting of successful reproduction

performance mainly having a normal parturition. Several factors influence the normal lambing, death after birth, stillbirth and abortion. The major causes of abortion in the ewes would be bacterial, viral, nutritional, parasitic and toxicological diseases (Kennedy and Rice 1988). One of the most important

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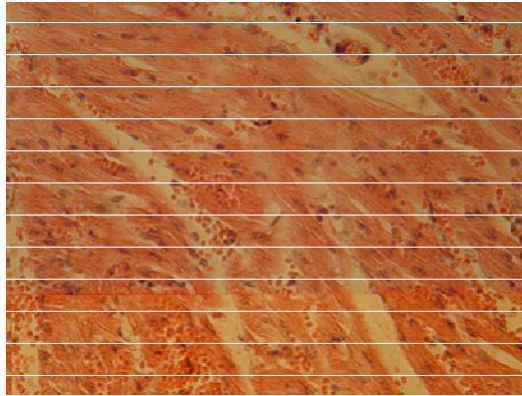


Figure1. RBCs spread on myocardium and interstitial tissue, haemorrhage and hyperemia (H&E \times 400).

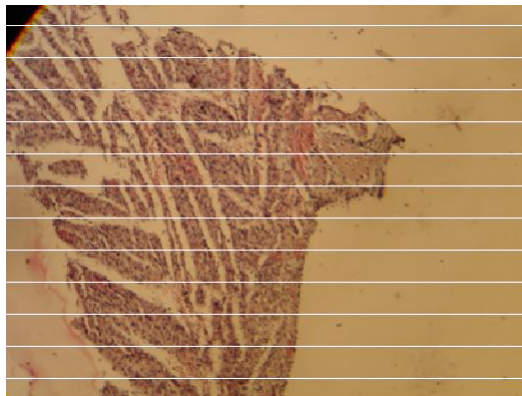


Figure2. Watery degeneration in Purkinje fibers and haemorrhage in the myocardial fibers (H&E \times 100).

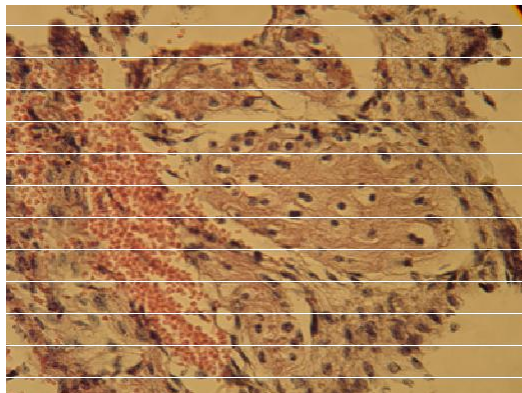


Figure3. Watery degeneration in Purkinje cells and presence of many extravascular RBCs in the interstitial spaces of myocardium and Purkinje fiber (H&E \times 400).

histopathological findings in abortion or death of lambs is considered as cardiac lesions. In foot and mouth disease (Muz et al., 1999), white muscle disease (Dubey et al., 1990), congenital abnormalities (Bostedt and Schramel 1990) and some poisonings (Newsholme and Coetzer 1984; Otter et al., 1997;

Radostits et al., 2007) there were approved cardiac lesions that might be induced abortion. Types of cardiac lesions in those diseases were myocarditis, necrosis, degeneration, calcification, haemorrhage, hyperemia and edema. According to the numerous cases of abortion, stillbirth and loss of lambs during

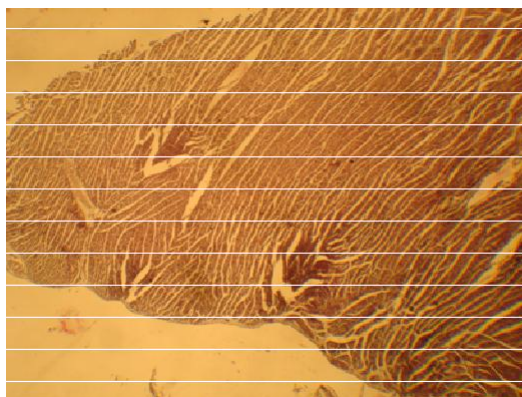


Figure4. Increase extent of interstitial area, distension of lymphatic vessels and distance of myocardial fibers with themselves indicate Edema (H&E \times 100).

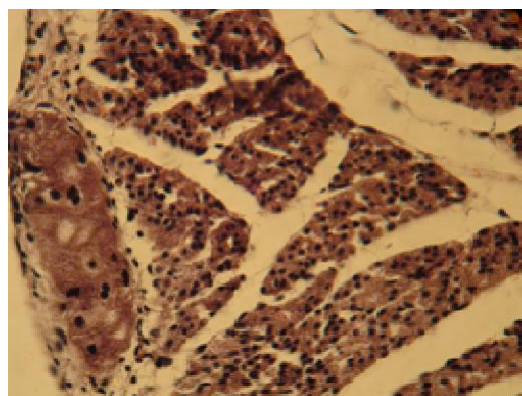


Figure5. Necrotic foci and one purkinje fiber with degeneration and necrosis, nuclei are dense and picnotic (H&E \times 400).

pregnancy and parturition, the most of the studies has been focused on brucellosis, sheep pox (Kennedy and Rice 1988), foot and mouth disease (Ferrans and VanVleet 1985) and nutritional deficiencies (Bacigalupo et al., 1985). Principles of prevention and treatment were accompanied with some success, but still large extent losses of lambs due to the huge causes of abortion were remained unclear yet. Many reports have mentioned the causes of abortion in the United States of America, which are infectious agents, non-infectious, miscellaneous and unknown reason. The latter two factors made up more than 50% of cases of abortion (Dubey and Kirkbride 1989). In this regard, plant (Radostits et al., 2007), inorganic toxins (Newsholme and Coetzer 1984), infectious agents (Ferrans and VanVleet 1985) and nutritional deficiencies (Jubb et al., 2007) were the most causes of myocarditis. These results show that the studies conducting on abortion were based on the investigation of the cause and type of lesions, especially on the heart would be important. To acquire the appropriate

diagnosis, prognosis and control of lamb losses, it is necessary to classify cardiac lesions in various parts of the animal breeding centers. In the northwest of Iran, the Urmia city, in that considered as the main part of sheep breeding abortion in sheep flocks is remained the main problem and must be urgently recognized for control and prophylactic objectives. The goals of this study are: 1) Determination of the distribution and percentage of heart with lesion in aborted lambs, 2) To find the percentage and distribution of the types of cardiac lesions in aborted lambs, and 3) To understand the probable cause of abortion based on the histopathological cardiac lesions in Urmia ewes.

MATERIALS AND METHODS

Sample collection

Table 1: Distribution and types of cardiac lesions in injured heart of aborted lambs and in heart of entire aborted lambs

Type of lesions	Frequency of cardiac lesions	Percent of cardiac lesions	Percent of lesions in positive lambs	Percent of Lesions in total aborted lambs
hyperemia	20	26.7%	58.8%	45.5%
Myocardial necrosis	20	26.7%	58.8%	45.5%
Interstitial edema	12	16%	35.3%	27.3%
Watery degeneration	9	12%	26.5%	20.5%
haemorrhagia	8	10.7%	23.5%	18.2%
Hyaline degeneration	4	5.2%	11.8%	9.2%
Purkinje degeneration	2	2.6%	5.9%	4.6%

Forty-four aborted lambs from different regions of sheep units were located around Urmia city was investigated in year 2010 in Iran. Aborted lambs were aged 2 to 4 months old. Necropsies were performed freshly soon after getting the aborted lambs and then whole hearts were separated from the carcass and carried out on the container to the histopathological department of the veterinary college, Urmia University. The samples of hearts were collected after washing of the hearts from different parts either healthy or injured areas of pericardium, myocardium and endocardium of the left and right arterium and ventricum into the plastic containers with 10% buffered formalin (Khodakaram et al., 2008). The macroscopic lesions of heart aborted lambs were included -) petechia and echymotic hemorrhagia on the surface of ventricles, -) pallor areas on the epicardium surface of heart like white bands and -) hydropericarditis with accumulation of serum fluid between hydropericardium and heart. The period of collecting aborted hearts were around 4 months started from February to June 2010.

Histopathology

Overall, 500 histopathological slides were prepared from formalin-fixed samples of hearts, in that they were dehydrated in graded dilutions of ethanol and embedded in paraffin. Thin sections (5 µm) of the tissues obtained on glass slides were stained with Hematoxylin and Eosin (Khodakaram et al., 2008). Stained sections were tested for histopathological changes. Histopathological lesions observed in the hearts were classified as hyperemia changes in the tissues, myocardial necrosis, interstitial edema, watery degeneration, haemorrhagia, hyaline degeneration and Purkinje degeneration.

RESULTS

Of 44 lambs' heart, 10 aborted lambs have had normal hearts and 34 lambs revealed one or more lesions in their hearts (Figs. 1 to 5). Therefore, 22.7% of the lambs have had healthy hearts and 77.3% revealed injured ones.

The highest distribution and percent of cardiac lesions were hyperemia and myocardial necrosis and the lowest was degeneration of Purkinje cells (Table 1). In other words, nearly 50% of aborted lambs' heart in this study have revealed hyperemia and necrosis. The number and percentage of aborted lambs' heart with 1, 2, 3 and 4 lesions were 10 (29.4%), 18 (52.9%), 4 (11.8%) and 2 (5.9%), respectively.

DISCUSSION

Many authors have concluded that with the exception of some clear and known factors of abortions, the most causes of this disorder in animals are unclear or unknown and called as miscellaneous category or unclassified group. Diagnosis, treatment and prevention of these sorts of abortions will be difficult in animal breeding industry (Dubey and Kirkbride 1989). In contrast, in cases of parasitic, fungal, non-infectious and infectious diseases that they have a recognizable signs, treatment and control would also be easier than unclassified group (Chavez and Henze 1995; Dubey JP 2009; Mearns 2007; Muz et al., 1999). Researchers have reported the cardiac lesions as a main signs in the lambs aborted following FMD (Ferrans and VanVleet 1985), E&Se deficiency (Glastonbury et al., 1988; Dubey et al., 1990; Beytut et al., 2002), poisoning (Gulbahar et al., 2007), fungi (Mearns 2007) and congenital abnormalities originate from heart problems

(Bostedt and Schramel 1990). Types of cardiac lesions are specific in Purkinje cell degeneration and general in myocardial necrosis (Glastonbury et al., 1988).

In this study 77.3% of hearts in aborted lambs had revealed cardiac tissue lesions. Cardiac lesions would be originate from congenital or acquired problems. The original of congenital myocarditis can be genetic, nutritional or infectious disease (Newsholme and Coetzer 1984). Congenital cardiac abnormalities with infectious disease can be seen in FMD and sheep pox. FMD induces viremia during the late pregnancy and fetal anoxia and in aborted fetus produce plasmocytic lymphocytic myocarditis, edema, myocardial necrosis and hyaline degeneration (Ferrans and VanVleet 1985; Muz et al., 1999; Radostits et al., 2007). Since the causes of infectious abortion in Iranian ewes are not documented, so at least FMD, brucellosis and smallpox can be mentioned. Infections causes the lamb's abortion in America are reported as *Campylobacter*, *Chlamydia* and *Toxoplasma* (Deger et al., 2008), in England, *Chlamydia*, *Toxoplasma*, and *Campylobacter* (Javed et al., 2009) and in Turkey *Brucella*, *Campylobacter*, *Salmonella* and *Listeria* (Jeffery and Roeder 1987). *Neospora* (Hamidinejad et al., 2008), *Campylobacter* (Kennedy and Rice 1988) and *Toxoplasma* (Giadinis et al., 2009) infections have been reported in other countries. From congenital cardiac abnormalities with nutritional origin, vitamin E deficiency, Se deficiency and E&Se deficiency has mentioned. The abortion mechanism would be probably related to the prohibition of the E&Se passing into fetus by placenta barrier and/or injured Se metabolism in placenta (Bostedt and Schramel 1990). Vitamin E&Se deficiency has been severally reported in Urmia sheep and whether it is the cause of abortion need to be further investigation too.

One of the acquired or non congenital infectious diseases which directly affect the lamb's heart is known as FMD. The virus replaces in skeletal muscle and heart tissue and creates plasmocytic lymphocytic myocarditis as mentioned by Mus et al (1999). The main cardiac histopathological lesions in FMD were reported by Gulbahar et al (2007) and Jubb Kennedy (2007) were including edema, hyaline degeneration and myocardial necrosis. Their findings were consistent with the results of this study including myocardial necrosis (26.7%), edema (16%) and hyaline degeneration (5.2%) in which could be the reason of FMD among Urmia sheep and their fetuses. That was the reason of farmers to administer the FMD vaccine for sheep before lambing. Secondary cardiac lesions such as myocarditis, necrosis and petechia would be reveal following border disease (Jeffery and Roeder 1987), septicemia due to *Fusobacterium* infection (Ramos-Vara et al., 1997), BVD-MD (Scherer

et al., 2001), *Neospora* infection (Otter et al., 1997), *Hemophilus* infection (Radostits et al., 2007), *Clostridial* infection (Glastonbury et al., 1988), entrotoxemia (Javed et al., 2009), fungal myocarditis (Rouby et al., 1998) and medical or plant poisoning (Simpson and Bruss 1979). These are could not be including this study due to the circumstances of this study to the time of birth and not so far.

The most obvious form of acquired heart lesions with nutritional origin is vitamin E&Se deficiency which causes lameness in adult sheep (Kennedy and Rice 1988) and myocardial lesions in lambs (Beytut et al., 2002). It is considered as the factor in the loss of lambs (Hamidinejad et al., 2008; Giadinis et al., 2009). The most prominent cardiac lesions in the white muscle disease are necrosis, myocardial degeneration and calcification (Giadinis et al., 2009; Beytut et al., 2002), hyaline degeneration of the myocardium (Bacigalupo et al., 1985), hemorrhage and petechiae in the myocardium (Ferrans and VanVleet 1985), Zenker's degeneration of the myocardium (Beytut et al., 2002) myocardial coagulation necrosis (Otter et al., 1997) and cardiac purkinje cells necrosis (Giadinis et al., 2009). Cervical hyperextension in a lamb with nutritional myo-degenerescence secondary to vitamin E deficiency. *Revue de Med. Vet.*, 160: 370-373.

11(Glastonbury et al., 1988). Based on these results, myocardial necrosis was the highest lesion and hyaline degeneration, calcification and Purkinje cells degeneration are the most specific. In our study, percentage of cardiac lesions was as necrosis (58.5%), watery degeneration (26.5%), hyaline degeneration (11.8%) and degeneration of Purkinje cells (5.9%). This results increase the probability of E&Se deficiency in abortion of lambs in Urmia region.

In this study 22.7% of hearts were not showed cardiac lesions, it means that probably different causes in the brain, kidney, lung, liver or intestines are operating were participated in the abortion of such lambs. According to available resources, the causes of over 53% of abortions are unclear or miscellaneous factors in that the follow-up of them is still problem (Dubey and Kirkbride 1989). Therefore, the same problems were still exist in this study and despite the extent of cardiac lesions in aborted lambs, it is impossible to determine the real causes of abortion and rely on the possibilities and miscellaneous group.

Based on the results of this study the presence of cardiac lesions such as hyaline degeneration, calcification and degeneration of Purkinje cells, which specifically noted in FMD and E&Se deficiencies and an appropriate response to preventive methods against those diseases, it is indicates that should be pay more attention to the recent two diseases in Urmia region as the causes of abortion in the lambs population. In conclusion, the majority of aborted lambs in this study

have had cardiac lesions in that concerning the type of lesions and history of local diseases would be useful in the diagnosis and prevention of them.

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