Journal of Animal and Veterinary Advances 8 (11): 2247-2250, 2009
ISSN: 1680-5593

Morphometric Study of the Cervical Canal in Karayaka Ewe

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Abstract: The cervical canal of the ewe does not allow for the transcervical passage of insemination instruments. The purpose of this study was to examine, the gross anatomy of the cervix in ewe lambs and adult ewes of Karayaka breed peculiar to Black sea Region. Reproductive tracts were excised immediately from carcass of Karayaka ewes and lambs at slaughterhouse in spring. The cervical canals were filled with silicone moulds were obtained consisting 31 ewe lambs and 16 adult ewes. The mean length of cervix of adult ewes (36.90±6.5 mm) were significantly different from ewe lambs (28.95±3.59 mm) ($p<0.001$). The diameter of cervical canal measured between external uterine ostium and first fold of ewe lambs and adult ewes were 2.58±0.76 and 3.11±1.4 mm, respectively. It was observed that the diameter of cervical canal became smaller from the second fold in both ewe lambs and adult ewes. Average number of folds of ewe lambs and adult ewes were 5.16±0.93 and 4.73±0.7. The distance of first fold from external uterine ostium of adult ewes and ewe lambs were not determined to be statistically important ($p>0.05$). The diameter of third fold of adult ewes was 8.20±2.01 mm, while it was 6.74±1.21 mm in ewe lambs ($p<0.01$). The results of this study would be beneficial to improve the lambing rate of Karayaka ewes following transcervical artificial insemination.

Key words: Anatomy, cast, cervix, karayaka, sheep, slicone moulds

INTRODUCTION

Artificial Insemination (AI) in the sheep did not develop unlike cattle due to low conception rates obtained after cervical insemination using frozen semen (Salamon and Maxwell, 1995a). Laparoscopic technique used for intrauterine insemination in the ewe resulted in acceptable lambing (Salamon and Maxwell, 1995b), but the cost and the skill required for the procedure limit its use. Transcervical Artificial Insemination (TCAI) technique as an alternative method resulted in success in lambing rate, but anatomy of sheep cervix limits the penetration of insemination catheter (Halbert *et al*., 1990). It is important to understand, the nature of sheep cervix as one of the factors affecting transcervical passage in the ewe is the anatomy of the cervical canal.

Sheep cervix is a sphincter-like structure and characterized by a thick wall. Cervical canal has three to four transversal prominences known as annular rings. These folds fit into each other to close the cervix securely and perform a barrier to TCAI (Hafez, 1993). To overcome the problems associated with TCAI, many researchers focused on the development of new TCAI catheter and cervix anatomy recently (Kaabi *et al*., 2006; Wulster-Radcliffe *et al*., 2004).

The aim of this study was to determine the morphology of the cervical canal of Karayaka breed which is a non-fat tailed sheep reared in Black Sea Region of Turkey and mainly kept for its meat and secondly for its wool in good quality.

MATERIALS AND METHODS

Reproductive organs of Karayaka ewes and lambs were collected in May from a slaughter house located at Samsun, which is a city in Northern Turkey, on the coast of the Black Sea. Samsun has a Humid, marine climate with cool winters and warm summers and high rainfall throughout the year.

Reproductive organs were excised with the aid of a scalpel within 15 min after slaughter. The organs were washed with saline solution and transferred to the laboratory in ice cubes inside a thermos flask. Pregnant and abnormal samples were discarded.

Silicone sealant (Sista, Henkel Ltd., Belgium) was used to cast the cervical moulds according to the procedure described by Halbert *et al*. (1990). Silicone was carefully injected through the incision made in the body of uterus, until it reaches to the vagina. Corpus uteri and vagina were tied after filling with silicon and the samples

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were kept on a flat surface at room temperature 24 h for polymerization. Then, cervical tissue was removed carefully beginning from ostium uteri externum using a scalpel and scissors. The fold numbers of total 47 moulds from 31 lambs and 16 ewes were determined. The length of cervix, diameter of folds, diameter of cervix between ostium uteri externum and the first fold and the other folds and the distance between the folds were measured using Mitutoyo Digimatic Vernier Scale 40 (150 mm) (code no: 500-311, Model CD-15D, serial no: 7175731, Mitutoyo Corporation, Japan). Statistical analyses were performed by SPSS 10.0 for Windows using one way Variance Analyses (ANOVA).

RESULTS AND DISCUSSION

Mean length of cervix of lamb and ewe were 28.95±3.59 and 36.90±6.5 mm, respectively ($p<0.001$). Number of folds was 5.16±0.93 mm in the lamb while, it was 4.73±0.7 in the ewe ($p>0.05$). Folds of cervix resembled to jellyfish and each jellyfish shaped fold was attached to each other with cervical canal exceeds through the center (Fig. 1 and 2). Diameter of folds decreased through cranial part. The most distinct difference of the fold diameters was observed in the third fold both in the ewe and lamb ($p<0.01$). The diameter of cervicial canal also became narrow cranially. There was no significant difference between the diameter of cervicial canal of the ewe and lamb ($p>0.05$). It was stated that the main factor determining the cervix length is the distance between the folds more than the length of folds. The distance from os to first-fold was 6.01±1.66 mm in the lamb and 5.19±2.33 mm in the ewe indicating no significant statistical difference. The distances from first to second-fold and from second to third-fold were longer in the ewe than the lamb ($p<0.05$). The most distinct difference existing between the lamb and ewe was found to be the distance from third to fourth fold and it was 2.63±0.78 and 3.96±1.44 mm, respectively ($p<0.001$). The morphometric data of the cervix in Karayaka lambs and ewes are shown in Table 1.

In the present study, length of cervix was shorter than tropical breeds studied by Naqvi *et al*. (2005). Kaabi *et al*. (2006) stated in the study performed in postmortem ewe cervix that length of cervix showed breed-dependent variations and mean length was 6.86±0.47 cm in Merino, Castellena, Asaf and Surra breeds. Karayaka ewe, which is a small breed weighing 35-40 kg has a shorter cervix length compared to breeds mentioned above.

Mean number of fold was 4.73±0.70 in the study while, it was determined as 4.16±0.36 in four different breeds (Kaabi *et al*., 2006) and 3.48±0.20 in tropical ewe (Naqvi *et al*., 2005). Since, number of fold in the ovine cervix is one of main causes of low penetrability during artificial insemination (Naqvi *et al*., 2005;

Fig. 1: Cervical cast of Karayaka ewe lamb

Fig. 2: Cervical cast of adult Karayaka ewe

Table 1: The effect of age on cervical morphometric data of Karayaka ewe and lamb (mm, mean± SD)

Parameters	Lamb	Ewe
Length (mm)	28.95±3.59	36.90±6.5***
Number of folds	5.160±0.93	4.730±0.7
Diameter of fold (mm)		
First	7.34±1.65	8.31±2.35
Second	7.43±1.52	8.28±1.42
Third	6.74±1.21	8.20±2.01**
Forth	6.65±0.98	7.29±1.56
Fifth	5.87±1.10	7.01±1.06
Diameter of canalis cervices (mm)		
Os to first fold	2.58±0.76	3.11±1.40
First to second fold	2.57±0.82	2.63±0.78
Second to third fold	2.12±0.54	2.28±0.62
Third to forth fold	2.05±0.73	2.06±0.66
Forth to fifth fold	1.84±0.53	1.95±0.44
Distance between folds (mm)		
Os to first fold	6.01±1.66	5.19±2.33
First to second fold	3.01±0.67	3.90±1.16*
Second to third fold	2.95±0.83	3.78±1.45*
Third to forth fold	2.63±0.78	3.96±1.44***
Forth to fifth fold	2.57±0.63	3.08±1.03

*$p<0.05$, **$p<0.01$, ***$p<0.001$

Kaabi *et al*., 2006), it was thought that Karayaka ewe has disadvantage, in which high number of folds makes difficult cervical penetration as the distance between folds would be short. On the other hand, the fact that length of cervical canal is shorter in Karayaka ewe might improve successful artificial insemination.

Distances from os to first-fold and from first to second-fold of Karayaka breed were similar with tropical breeds (Naqvi *et al*., 2005) though the length of cervical canal was shorter compared to the other breeds (Kaabi *et al*., 2006). Besides, the fact that diameters of first and second folds of Karayaka ewe were bigger than tropical breeds (Naqvi *et al*., 2005) might be an obstacle for catheter penetration, while bigger diameter of cervical canal is an advantage.

Taken into account that anoestrus ewes were studied in May, diameter of cervical canal determined in this study would be a little bigger in breeding season. Kershaw *et al*. (2005) investigated cervical canal of ewes during both non-breeding and breeding season and determined that penetration or inseminating pipette was deeper in non-luteal cervices. This result was presumed to be caused oestradiol concentration in non-luteal phase stimulating cervical relaxation (Kershaw *et al*., 2005). In the present study, non-breeding and breeding ewes were not able to be compared as breeding ewes are not preferred to slaughter.

Kaabi *et al*. (2006) indicated that the mean diameter of cervical canal was 1.36±0.08 cm in four different breeds after postmortem investigation performed without using silicon mould. Naqvi *et al*. (2005) determined that diameter between first and second fold was 0.21±1.0 cm after silicon mould application and the results of the present study are similar with the results of Naqvi *et al*. (2005). Therefore, silicon mould method might be thought more effective in order to obtain accurate anatomic information.

CONCLUSION

The cervix is an important organ for semen transport as well as transcervical passage of insemination instruments. In conclusion, this study will be a guide for future studies to choose suitable catheter for successful penetration and artificial insemination in Karayaka ewe.

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