

TRANS-VAGINAL ECHOGRAPHIC APPROACH TO EARLY PREGNANCY DIAGNOSIS IN SMALL RUMINANTS

APPROCCIO TRANS-VAGINALE ALLA DIAGNOSI DI GRAVIDANZA PRECOCE NEI PICCOLI RUMINANTI

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SUMMARY

The A.A. relate about preliminary results from a total of 79 echographic sessions for trans-vaginal pregnancy diagnoses performed on adult pluriparous sheep (48) and goats (3), in late autumn 2004. Each female was subjected to: a) a simple trans-vaginal examination, b) a trans-vaginal examination with lifted abdomen and c) a classic trans-abdominal trans-cutaneous pregnancy diagnosis. In many cases a confirmatory echographic follow-up was repeated a week later or more. For trans-vaginal examinations a 5 MHz, lubricated, convex probe was inserted in the vaginal cavity of the sheep, held in a standing position, and the results were always compared with those obtained by trans-cutaneous examination, in the sitting constrained animal (Tab. Ia and Ib). At first TVAL, on the 51 examined animals 28 resulted pregnant; 18 not-pregnant (two with pathologic uterine collections) and 5 dubious. In spite of our still limited experience, the method including abdominal lifting resulted rapid, early, safe, reliable and easy, therefore the main target of this preliminary note has been to highlight the possibility of checking early pregnancies in small ruminants by TVAL. Smaller echographic probes and more on field experiences are still required for better evaluation of the method and for its extension to younger nulliparous ewe-lambs.

Key words: trans-vaginal ultrasonography; pregnancy diagnosis; small ruminants.

RIASSUNTO

Gli autori riferiscono i risultati ottenuti nel corso di 79 esperienze di diagnosi di gravidanza ecografica per via trans-vaginale effettuate nell'autunno 2004 su 51 soggetti (48 pecore e 3 capre adulte e pluripare) mediante una sonda convessa da 5 MHz. La tecnica per via vaginale applicata in soggetti mantenuti in stazione quadrupedale, è risultata più semplice e veloce di quella trans-addominale ed igienicamente più accettabile di quella trans-rettale. Qualche

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difficoltà diagnostica si è osservata in condizioni di gravidanza avanzata o di rilassamento legamentoso dell'utero, connesso all'età ed alla carriera riproduttiva del soggetto, per cui, nei casi in prima istanza negativi, è apparso sempre indispensabile il ricorso al sollevamento della parete addominale.

Parole chiave: ecografia trans-vaginale; diagnosi di gravidanza; piccoli ruminanti.

INTRODUCTION

Trans-abdominal echotomography actually represents the best available method for a sure, easy and reliable pregnancy diagnosis in the sheep (Cela et al., 1988; Doizè et al., 1997; Garcia et al., 1993), even if its economic on field applicability always requires a) some complementary reproductive management (scheduled male intromission, oestrous synchronizations, A.I....) b) a relatively late systematic examination of the whole flock (not earlier than 40-60 days of presumptive pregnancy) (Lèvy et al., 1990; Mialot et al., 1991). The ultrasonographic scan in these cases also requires a relatively prolonged food-water deprivation and manual labour to keep the female in the correct position. Earlier diagnostic examinations have been also suggested by trans-rectal techniques, but with relatively poor applicability owing to care and labour connected to fecal repletion and rectal brittleness (Gonzalez et al., 2004; Karen et al., 2004; Kaulfuss et al., 1996; Padilla-Rivas et al., 2004; Viñoles et al., 2004). Our previous experiences on trans-vaginal pregnancy diagnosis in cattle (Aria et al., 2004) suggested its application also in adult small ruminants, in which our probe could be inserted in the vagina, excluding the nulliparous ewe-lambs, characterized by a very thin vaginal lumen. Hence, aim of this work has been the evaluation of the on-field practicability of trans-vaginal diagnosis in mature sheep and goats.

MATERIALS AND METHODS

Pregnancy diagnoses have been carried out in advanced reproductive season (november-december 2004) on adult Massese-sheep (48) and goats (3), reared in continuous male presence. Scansions have been performed with a Falco, ESAOTE, Pie Medical Equipment B.V., Maastricht, Paesi Bassi, ultrasound scanner, provided of a T shaped, 5MHz probe (12x2x4cm) connected to a common video recorder. According to the stage of pregnancy, positive findings have been considered the evidence of: a) multiple anechogenic fluid filled cavities (other than bladder), lined by well defined walls, b) amniotic vesicle and/or embryo, c) placentomes and d) foetus. Trans-vaginal approach (TV) has been carried out holding the right flank of the standing animal along a wall by an assistant, while the technician, squatted on the left posterior side, worked with the probe in the right hand and the tail of the animal in the left. If needed, the squatted position also allowed the operator to lift the abdominal wall of the animal

with his left knee (TVAL). The probe, lubricated and protected with a disposable sheath, was gently introduced in the vulvar rim, easily gaining the pelvic cavity. Simple TV results have been always compared with those obtained a) by TV plus lifted abdomen (and/or dorsal recumbence) and b) by classic trans-cutaneous trans-abdominal technique (TC).

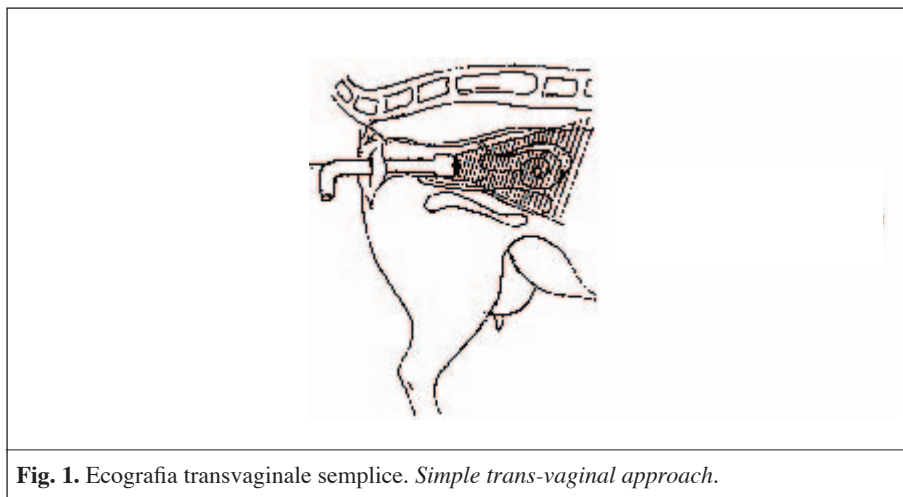


Fig. 1. Ecografia transvaginale semplice. *Simple trans-vaginal approach.*

RESULTS

On many of the 51 multiparous females of known and unknown natural mating dates the diagnostic procedure has been repeated (for a total of 79 echographic examinations). The confirmative re-checks have been carried out at at-least a week of interval a) in all negative cases, to confirm the previous result, and b) in some early positive diagnoses, to evaluate their reliability and evolution (detailed list of records is reported in Tab. Ia and Ib).

Of the 30 trans-abdominally positive subjects, 24 pregnancies resulted yet evident at the first simple vaginal scan, while in other 3 animals (15-22-5) the correct location of the fluid filled uterus required a careful lifting of the ventral abdominal wall. Two females, dubious at trans-vaginal plus lifted abdomen technique (16-21), resulted positive at trans-abdominal scan, and one sheep (1), uncertain at first session (21st day), gave positive finding at 27th and 34th days.

On the other side, of the 21 not pregnant females, 17 were correctly diagnosed by trans-vaginal technique plus abdominal lifting; 2 (40-41) showed pathologic uterine collection, and 2 (31-32), dubious at first session (respectively at 17th and 21st day from mating), resulted still negative at following examinations.

Tab. Ia. Pregnancy diagnoses: synoptic result.											
N°	M-DAY	TV	TVAL	TA	notes	N°	M-DAY	TV	TVAL	TA	notes
1	21	?	?	?	*	26	?	pos	pos	pos	
	27	pos		pos		27	?	pos	pos	pos	
	34	pos		pos	5 ut. sect.	28	59	pos		pos	goat, em.
2	24	pos		pos	φut. 1,82cm	29	30	pos		pos	goat, em.
	27	pos		pos	φut. 2,02cm	30	45	pos		pos	goat, pl.
	41	pos		pos		31	17	?	?	?	heat?,*
3	26	pos	pos	pos			29	neg	neg	neg	no lumen
4	28	pos	pos	pos	3 ut. sect.		34	neg	neg	neg	no lumen
	68	pos		pos	column	32	21	?	?	?	*
5	29	neg	pos	pos	**		27	neg	neg	neg	
	36	neg	pos	pos		33	23	neg	neg	neg	
	56	neg	pos	pos	head φ2,1cm	34	24	neg	neg	neg	
6	40	pos	pos	pos	CRL 2,9cm		27	neg	neg	neg	
7	41	pos	pos	pos	twins?		41	neg	neg	neg	
8	61	pos	pos	pos	5 and 7,5MHz	35	24	neg	neg	neg	
9	65	pos	pos	pos	em., pl.		27	neg	neg	neg	
10	75	pos		pos	pl.		41	neg	neg	neg	
	81	pos		pos	pl.	36	24	neg	neg	neg	
	88	pos		pos	column		27	neg	neg	neg	

DISCUSSION

In many positive early-pregnancy cases, virtual lumen of the vagina and fluid filled uterus guaranteed clear images of the whole inner genital apparatus, even before reaching the vaginal fornix. It means that, in absence of air penetration, the narrow adherence of the vestibular and vaginal walls plays like a uniform surface in front of the probe. In a few more advanced pregnancies and/or in older females, the full and heavy growing uterus dropped earlier toward abdominal cavity and pregnancy has been found only after gentle lifting of the inguinal wall or putting the animal in dorsal recumbency (subjects 5-15-22).

Negative and doubtful findings from simple TV method, have been, therefore, constantly followed by gentle abdominal lifting and by trans-abdominal confirmation (dorsal recumbence was progressively left out for its poor practicability) and has to be remembered that in 3 cases (out of 30 positive females) pregnancy has been detected

Tab. Ib. Pregnancy diagnoses: synoptic result.											
N°	M-DAY	TV	TVAL	TA	notes	N°	M-DAY	TV	TVAL	TA	notes
11	90	pos		pos	pl.		41	neg	neg	neg	
	96	pos		pos		37	24	neg	neg	neg	
	103	pos		pos			27	neg	neg	neg	
12	140	pos		pos	pl.		41	neg	neg	neg	
13	?	pos		pos	advanced P.	38	29	neg	neg	neg	coiled ut.
14	?	pos		pos	advanced P.		36	neg	neg	neg	coiled ut.
15	?	neg	pos	pos	3 ut. sect.,**	39	33	neg	neg	neg	
	?	pos	pos	pos	pl.	40	?	neg	neg	neg	dense coll.,#
16	?	neg	?	pos	***		?	neg	neg	neg	no pl.
17	?	pos	pos	pos	head ϕ 2,7cm	41	?	neg	neg	neg	dense coll.,#
18	?	pos	pos	pos	head ϕ 1,8cm	42	?	neg	neg	neg	no lumen
19	?	pos		pos		43	?	neg	neg	neg	no lumen
20	?	pos		pos	twins?	44	?	neg	neg	neg	no lumen
21	?	neg	?	pos	***	45	?	neg	neg	neg	
22	?	neg	pos	pos	pl.	46	?	neg	neg	neg	
	?	pos	pos	pos	head ϕ 2,8cm	47	?	neg		neg	
23	?	pos	pos	pos	3 ut. sect.	48	?	neg	neg	neg	
	?	pos		pos	em., pl.	49	?	neg	neg	neg	
24	?	pos		pos	pl.	50	?	neg	neg	neg	
	?	pos		pos		51	?	neg	neg	neg	
25	?	pos		pos	pl.						

M-DAY = Day After mating; TV = Trans-vaginal diagnosis; TVAL = Trans-vaginal lifted abdomen diagnosis; TC = Trans-abdominal diagnosis; ut.= uterine; em.= embryo; sect.= section; CRL = Crown-Rump Length; P.= pregnancy; coll.= uterine collection; pl.= placentoma; *,# = problem animal.

27	0	27
21	3	24
48	3	51

Sensitivity = $a/a+d*100 = Se(\%) = 90\%$; Specificity = $c/c+b*100 = Sp(\%) = 100\%$;
PositivePredictiveValue = $a/a+b+100 = 100\%$;
NegativePredictiveValue = $c/c+d+100 = 87.5\%$;
Reliability = $pos+neg/100 = 94.1\%$.

only after an abdominal lifting.

Of the 5 females dubious at first TV, the 2 sheep in more advanced pregnancy (16-21) became TVAL positive in the same session, while the other 3, examined between 17th and 21st day from mating (31-32-1) required a further examination for their definitive diagnoses. Considering that very early pregnancies raised dubious results both at TVAL and at TC examination, comparing TVAL and TA results we reported only two cases (16-21) of erroneous negative diagnosis, probably due to incorrect abdominal lifting and/or initial operative inexperience. Even if the limited number of patients does not still allow any complete and exhaustive statistic judgment on the real

sensitivity, accuracy and applicability of the method, from our findings TV approach seems particularly useful and reliable at least after 25th-26th day of pregnancy.

The relatively low proportion of pregnancies among observed animals could be surely related to the advanced reproductive-season and to the owners' scepticism toward trans-vaginal examination. On this matter we can emphasize that although the owners feared pregnancy damages, up-to now we did not found any evidence of overt abortions or embryo losses after the diagnostic procedure.

In conclusion, given that trans-vaginal approach has long been neglected in Veterinary Medicine, while it has been largely adopted in human obstetric and gynaecology (Poulsen et al., 2000; Morrow et al., 2004; Timor-Tritsh et al., 1990; Veronesi et al., 2002) and that vagina it-self represents a natural strong sheath in narrow contiguity with uterine and ovarian organs, trans-vaginal ultra-sound scanning could represent a precocious, easy and alternative method to the actually, more diffuse, trans-abdominal one. Moreover, it also looks more hygienic and safe than the trans-rectal technique (lower risks of fecal contamination and injury to internal epithelial linings). As for trans-rectal examinations, gentle lifting of the inguinal wall (in front of the mammary gland) resulted very effective on reliance an reliability of both positive and negative pregnancy diagnoses in small ruminants. Significant improvement will certainly rise from technical designing of more suitable probes (smaller and longer in size and with adequate inclination of crystal surface), similar to those for human beings.

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