

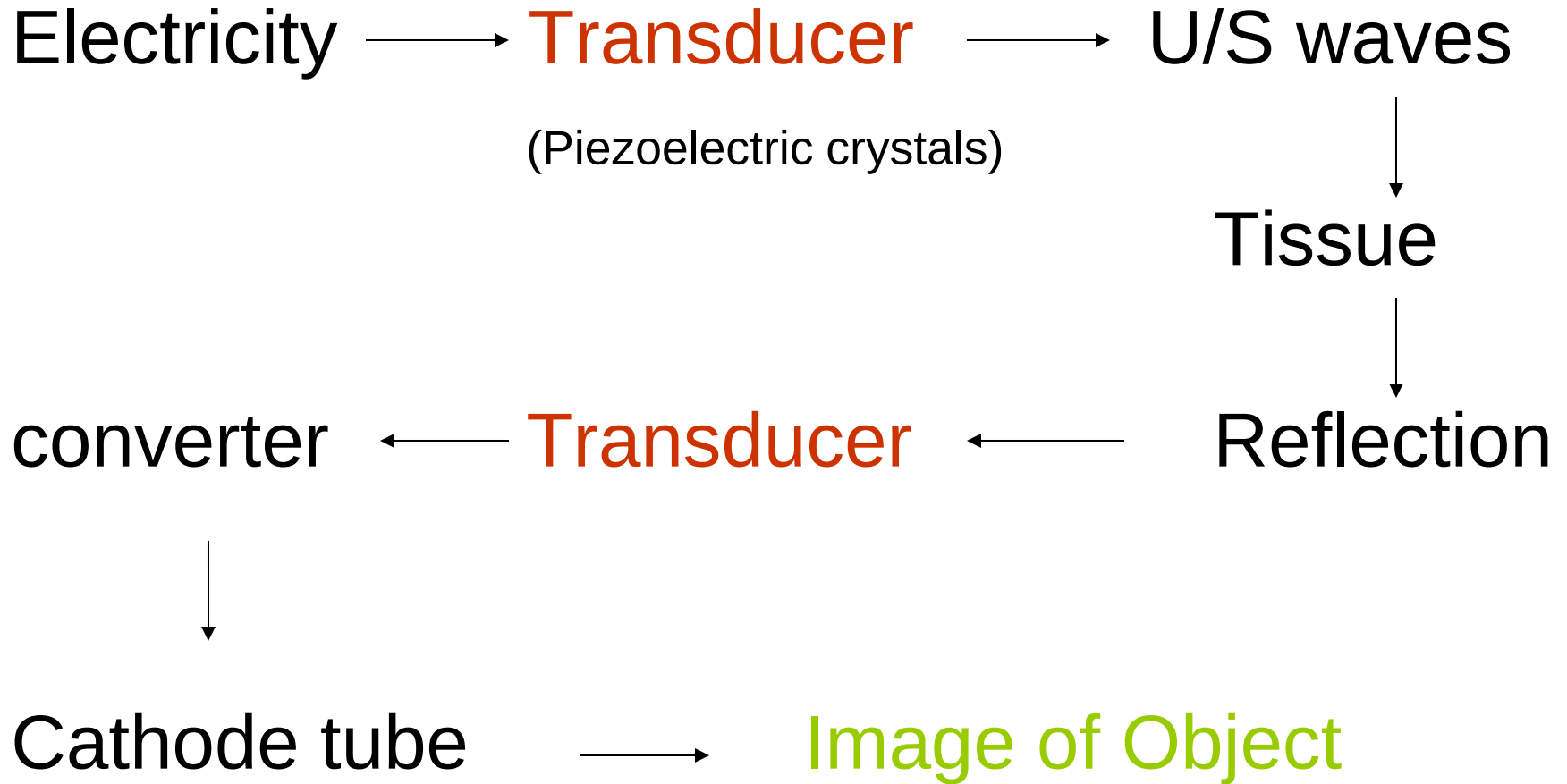
REPRODUCTIVE ULTRASONOGRAPHY

21.10.15

What is Ultrasound?

- High frequency, inaudible sound waves
 - of 1-10 MHz
 - Audible frequency is 20-20,000 Hz
- Sound waves passage
 - unable to pass through vacuum
 - transmission in air is poor

Principle of Ultrasound



How is interpretation done?

- Anechoic Black (Follicle)
- Hypoechoic Grey (CL)
- Hyperechoic White (Bones)

Image quality

- Frequency and wavelength inversely proportional
- Higher the frequency
 - better the details (better differentiation)
 - poor penetration (depth)
- Lower the frequency
 - poorer the details
 - better penetration

Parts of a Machine

- Video Monitor
- Transducers
 - Transrectal
 - Transcutaneous



Bovine Reproductive U/S

- Ultrasound is solution to problems in reproduction
- One should have Equipment and technique knowledge
- Artifacts knowledge

Probe Handling

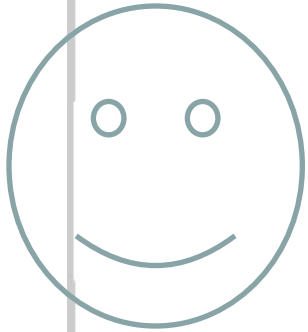
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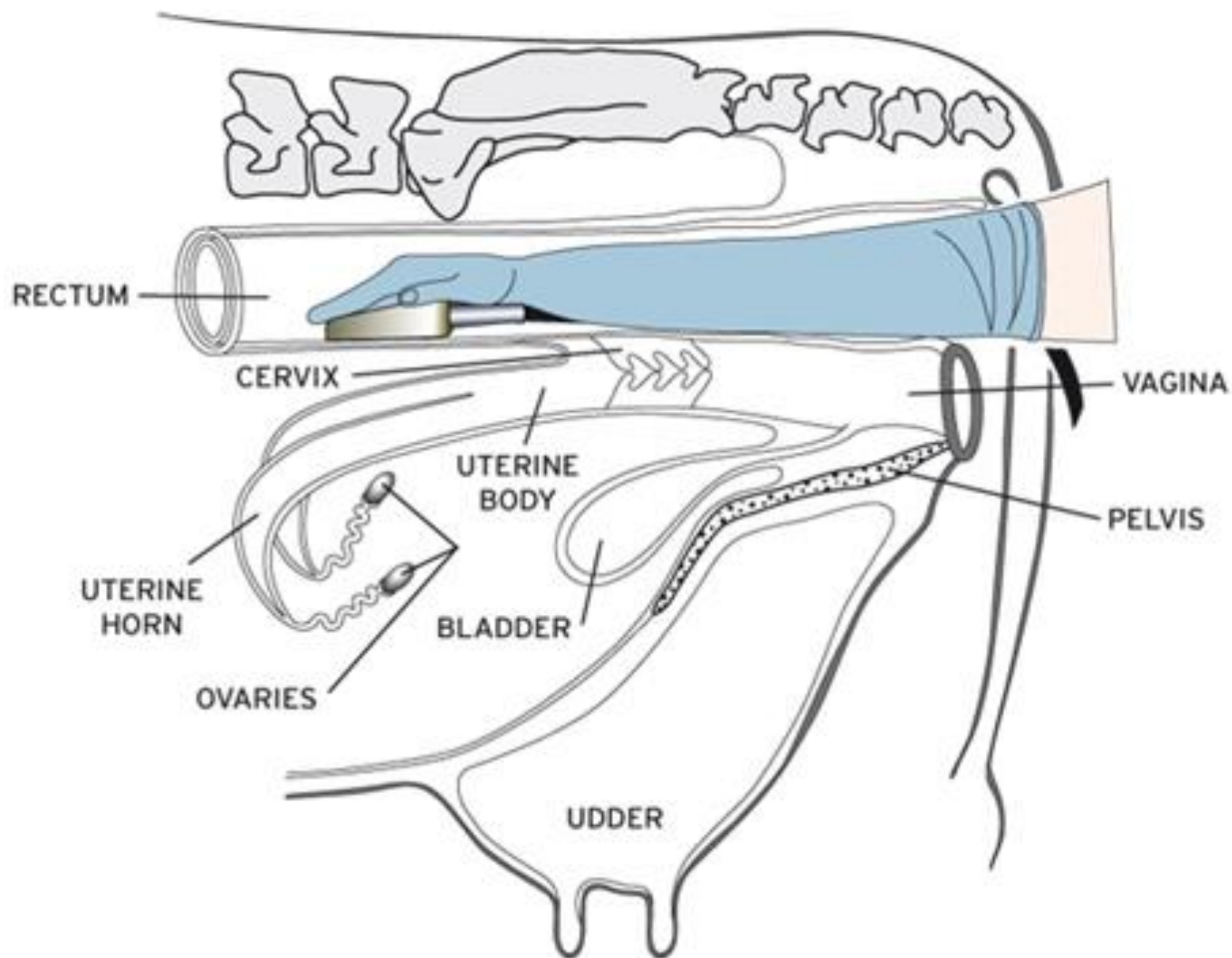


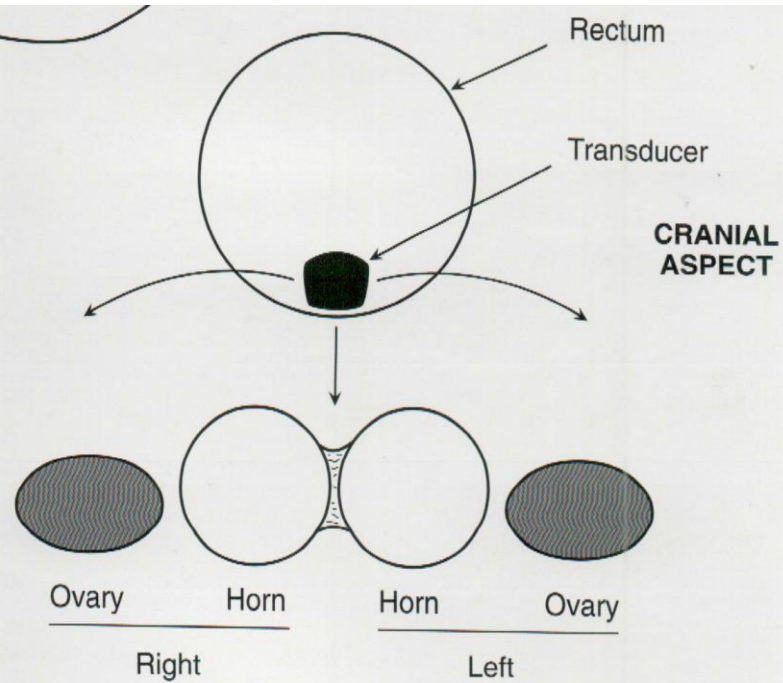
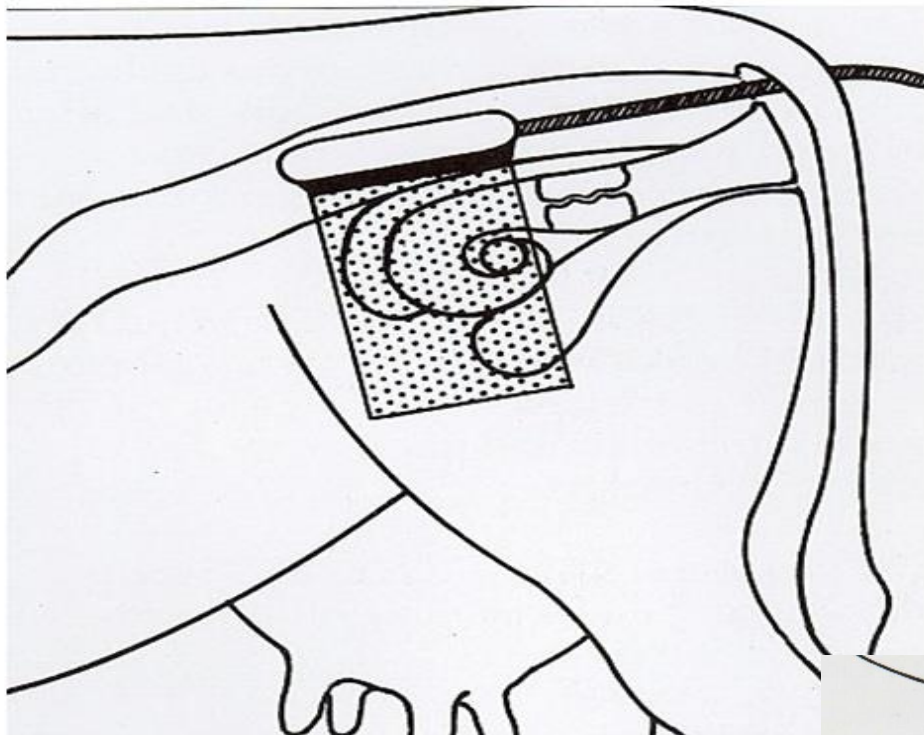
2



3







Use of Ultrasonography

- Pregnancy status
- Fetal sex
- Ovarian function
- Ovarian Pathology
- Uterine Pathology

Transrectal Transducer

- 7.5 MHz----- Early pregnancy diagnosis
- 5 MHz ----- Pregnancy diagnosis after 40 days
- 3.5 MHz-----Late pregnancy diagnosis

Pregnancy Diagnosis



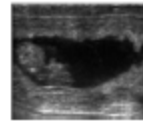
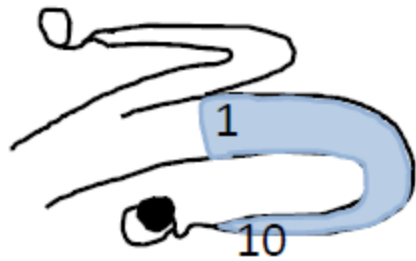
- **Uterine Horn**

- Scan both cross and longitudinal section
- Outlined by dark ring which is a vascular coat
- Changes due to physiological states
- Cruncles on the endometrial size

- **Uterine Body**

- Longitudinal axis view; rotate the probe in clockwise and anti clock wise direction to see the bifurcation

Where a fetus located?



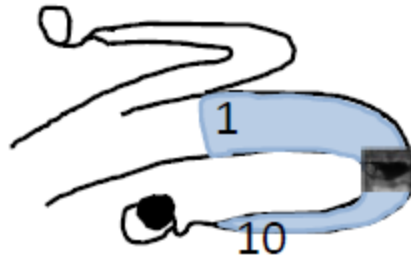
Located in which number ?

1	2	3	4	5	6	7	8	9	10

Uterine body ←————→ Uterine horn

(Kitahara 2015, J Clinic Vet Med, 33:18-23, In Jpn)

Where a fetus located?



Uterus horn of pregnancy side



1	2	3	4	5	6	7	8	9	10
			38%	56%					

94%

Uterine body



Uterine horn

Characteristics of fetal growth

Days after insemination	Diameter or size (mm)			Minutely heat beat
	Amniotic cavity	Crown rump length	Uterine with/without fetus	
25	10	5-7		140-150
30	18-20	8-12	32 / 31	160-180
35	20-25	13-17		170-190
40	30-35	17-24	38 / 35	170-190
45		23-26		170-190
50		35-45	47 / 38	180-200
55		45-60		180-200
60		60-70	53 / 37	
90		140-150		

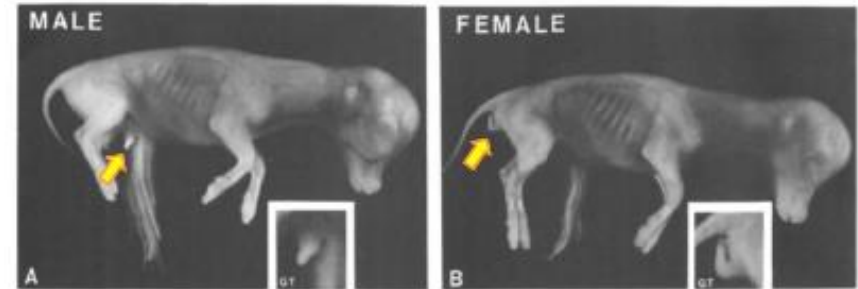
≥26 days



(Adapted from Kitahara 2015, J Clinic Vet Med, 33:18-23, In Jpn;
Tatami 2015, J Clinic Vet Med, 33:12-17, In Jpn)

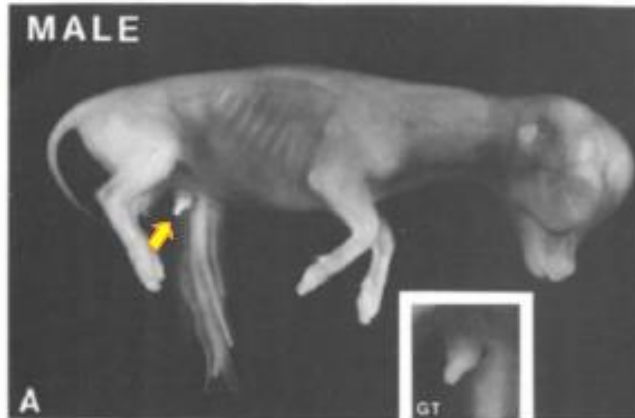
Sex determination

- Genital tubercal
- Future Penis or Clitoris
- High ecogenic (white)
- No difference between male and female
- Location is key feature of diagnosis
 - Genital tubercle which located in the umbilical cord on day 40, has initiated to move to the definite position.



Determining sex by Genital tubercle

A, C;
Day-62



B, D;
Day-67

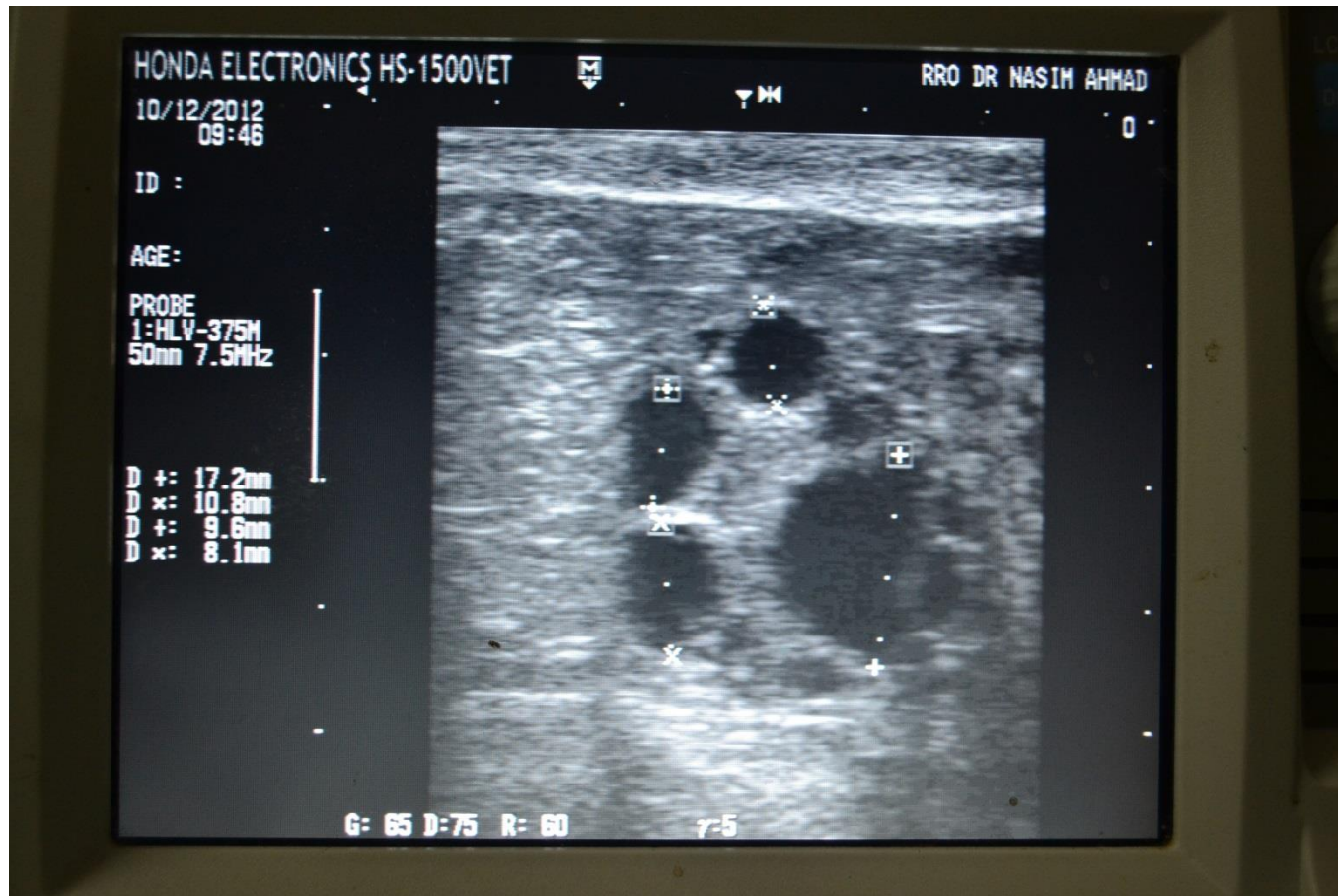


AR, anogenital raphe; GS, genital swelling (forerunner of scrotum); GT, genital tubercle (forerunner of penis in male and clitoris in female); MP, mammary papillae.

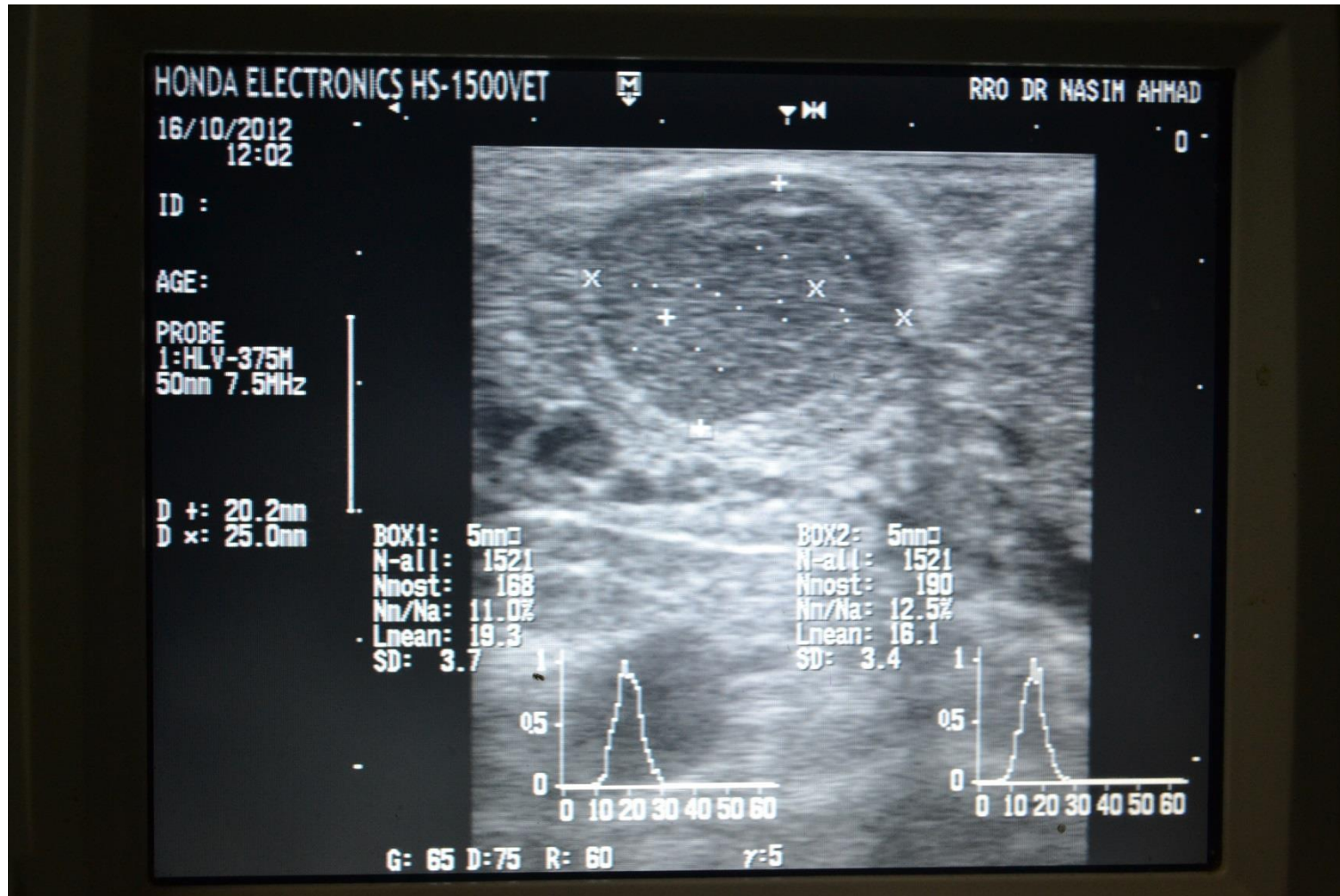
Ovarian scanning

- Ovary
 - Mix of **hyper and hypo** echoic signals
- Follicles
 - **Anechoic** round/oval structures with clear borders
- CL
 - Different from ovarian stroma
 - **Hypo** echoic relative to the ovarian stroma
 - CL with **cavity in pregnancy**
 - Undefined borders

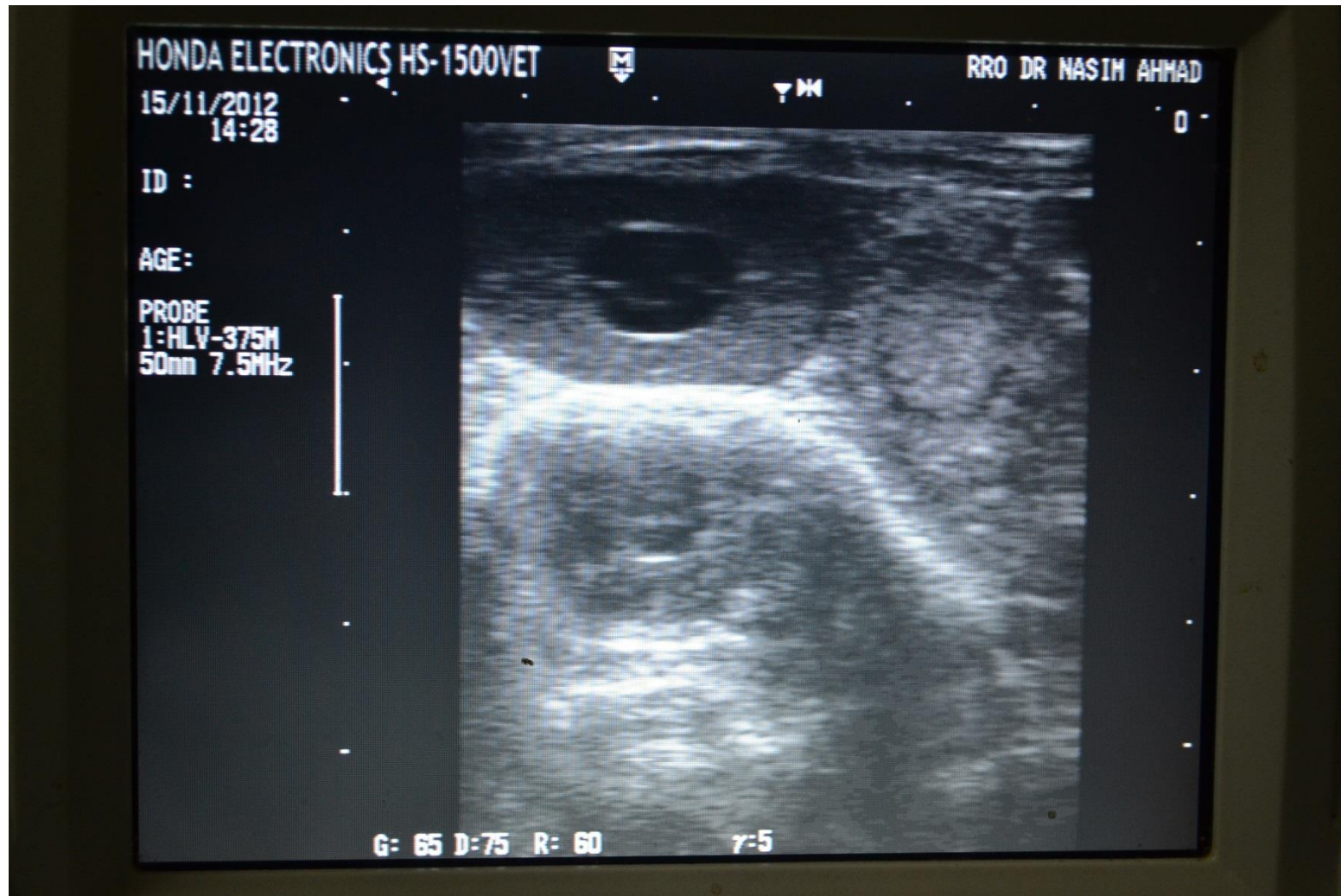
FOLLICLE



Corpus Luteum

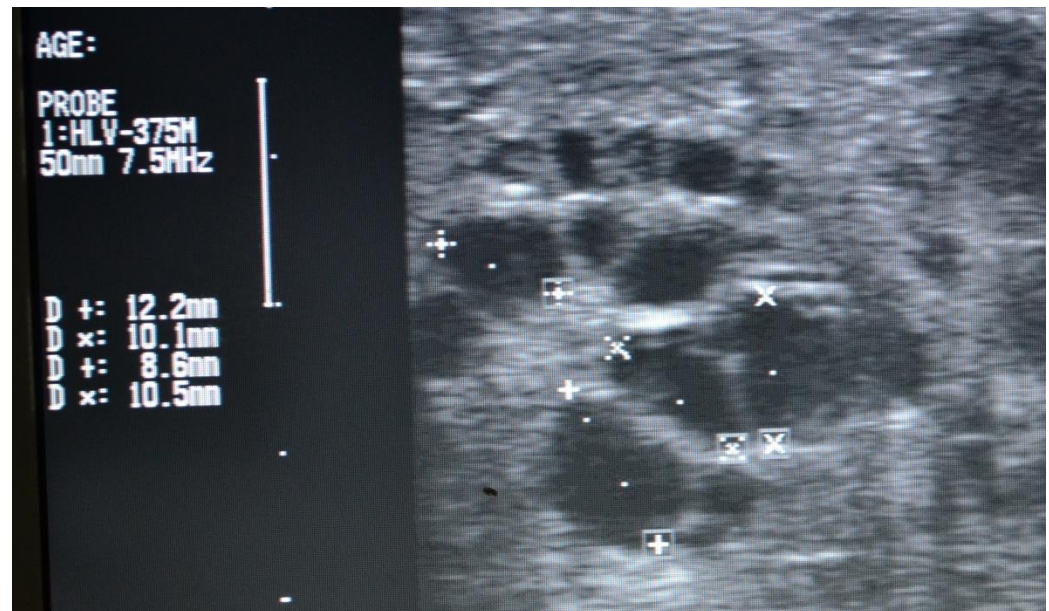


CL with Cavity

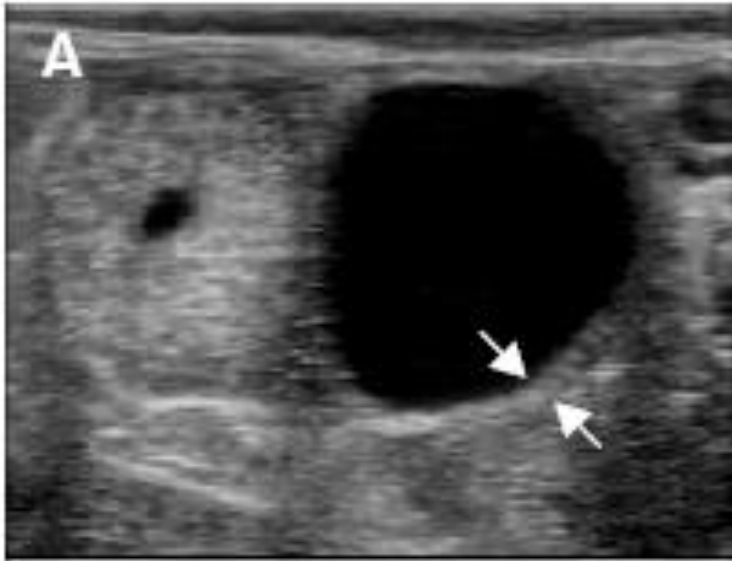


Possible applications

- Synchronization protocols
- Follicular wave pattern
- Ovulation
- Embryo transfer



Pathological conditions in female



FOLLICULAR CYST

HONDA ELECTRONICS HS-1500VET



RRO DR NASIM AHMAD

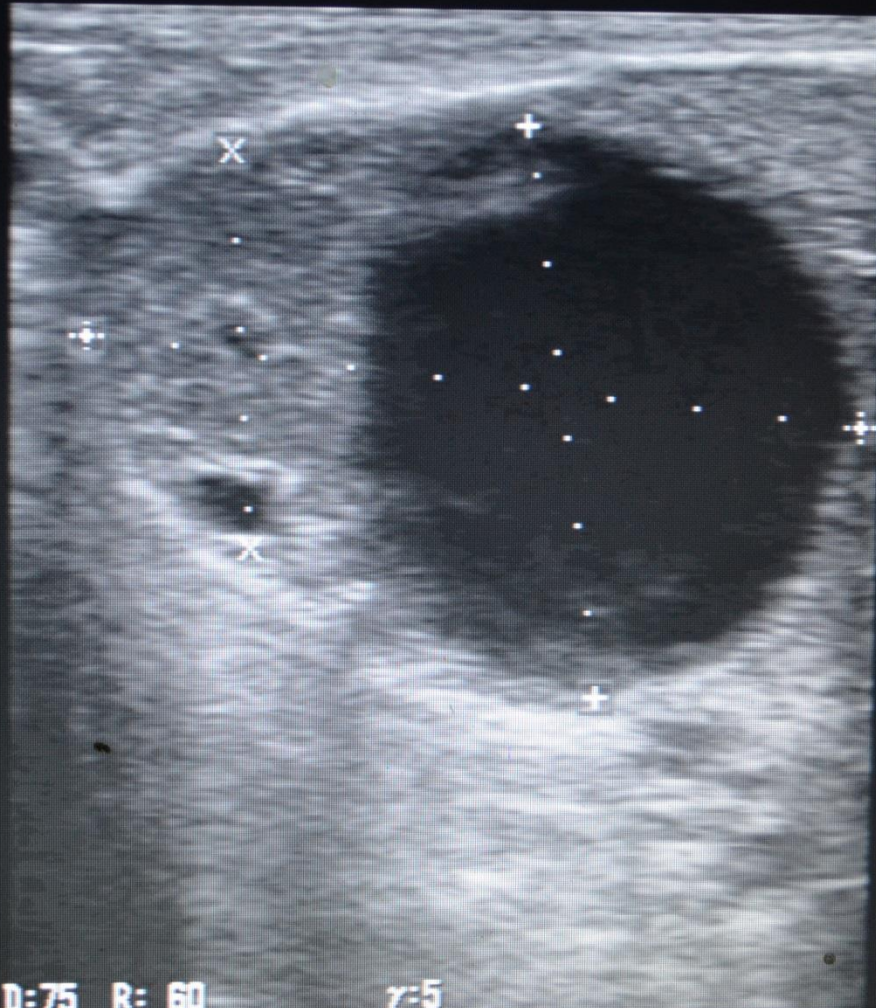
16/10/2012
12:40

ID :

AGE:

PROBE
1:HLV-375M
50mm 7.5MHz

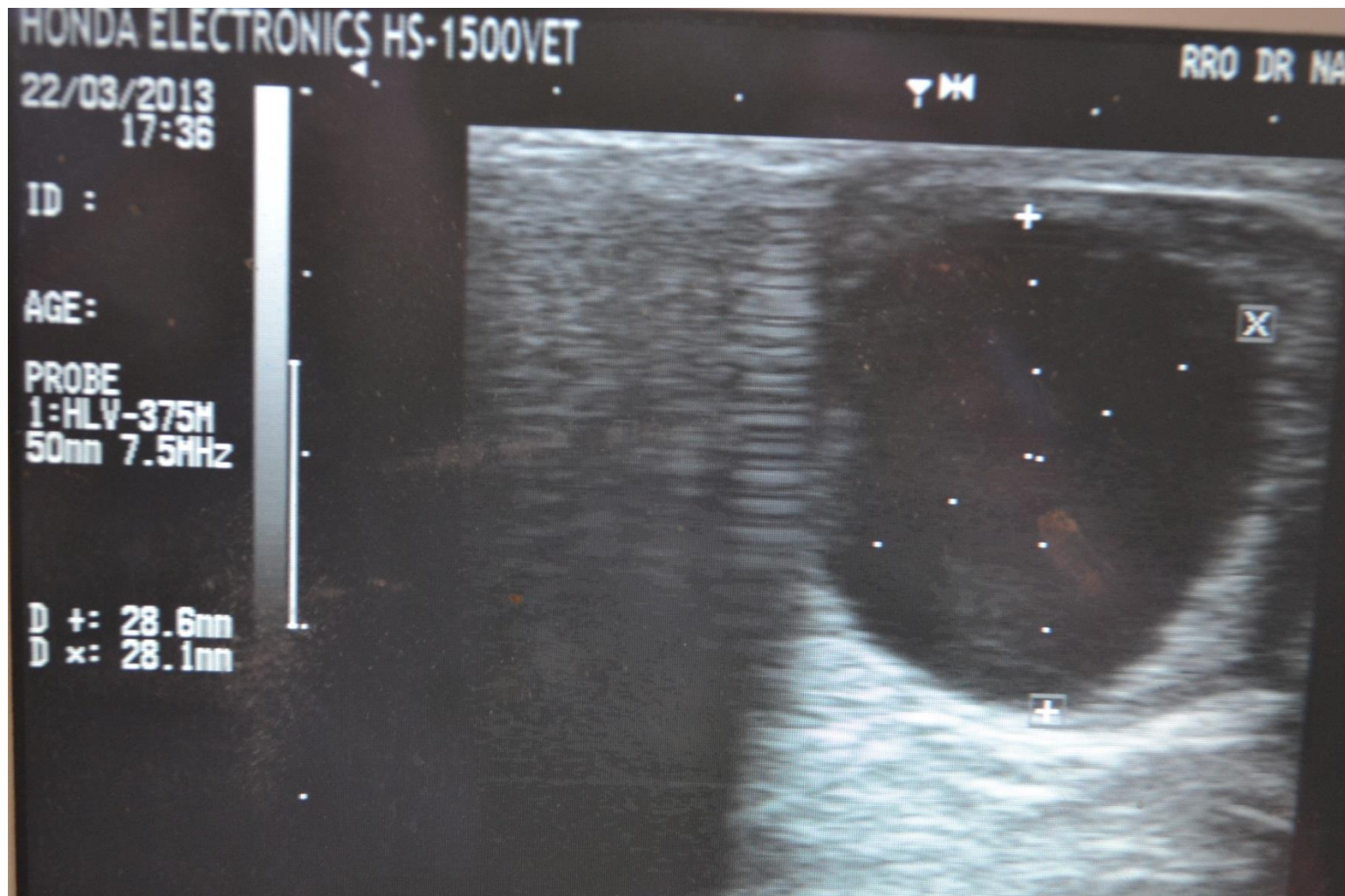
D +: 32.6mm
D x: 22.3mm
D +: 44.6mm



G: 65 D:75 R: 60

γ:5

LUTEAL CYST



Luteal cyst

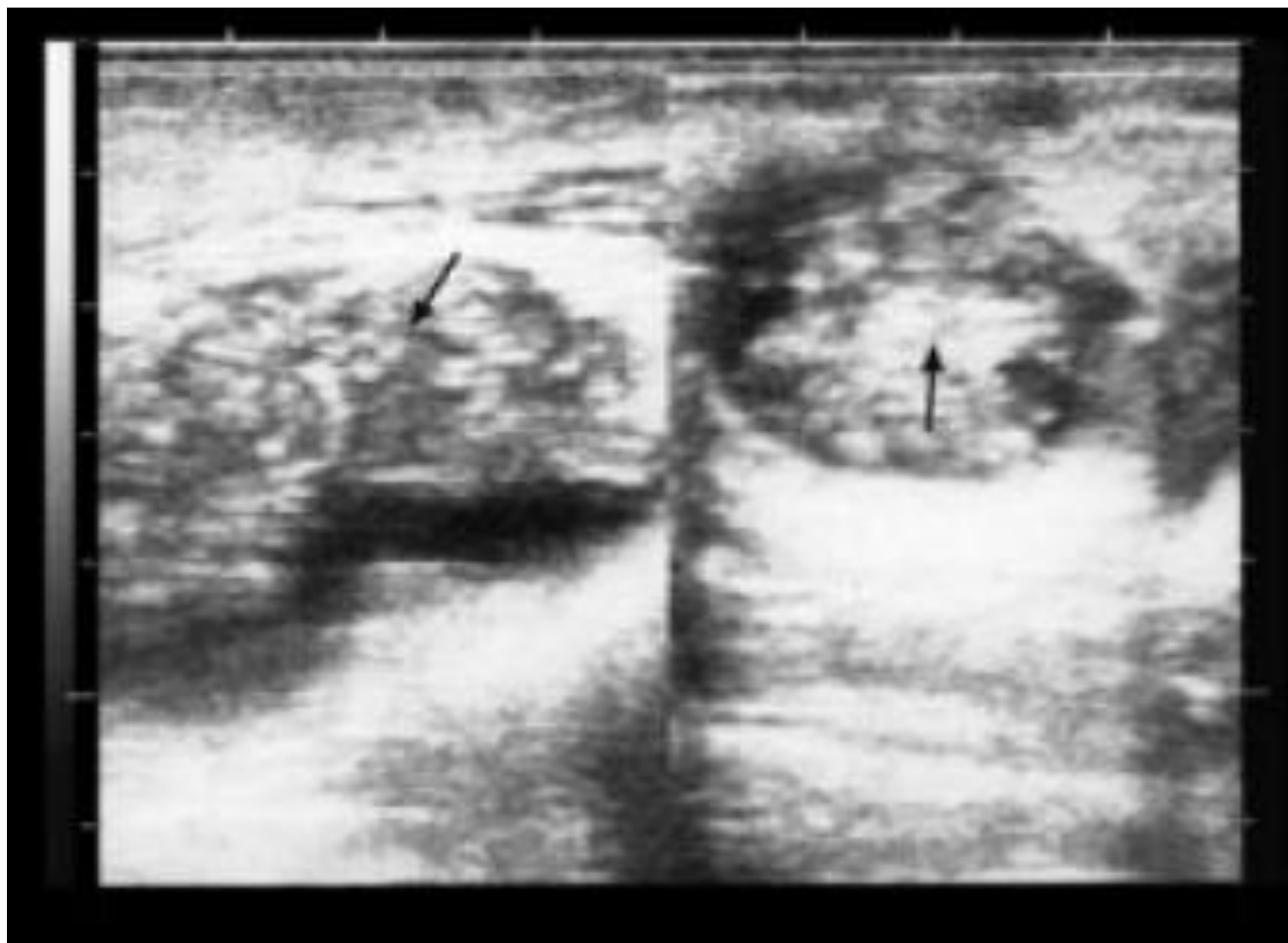


Early metritis



Pyometra





HONDA ELECTRONICS HS-1500VET



RRO DR NASIM AHMAD

08/12/2012
10:44

0

ID :

AGE:

PROBE
1:HLV-375M
50nm 7.5MHz

D +: 10.9nm
D x: 11.8nm



G: 65 D:75 R: 60

γ:5

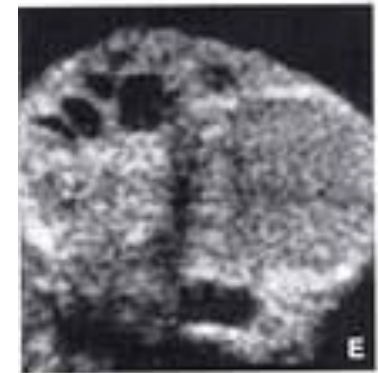
Normal Ultrasound Anatomy

- **Ovary**

- Mix of hyper and hypo echoic signals
- Difference can be made between small inactive and large active ovaries.

- **C.L**

- Different from ovarian stroma
- Hypo echoic relative to the ovarian stroma
- Undefined border
- Vary according to the stage of pregnancy and development
- C.L of pregnancy usually have the cavity in it, appears anechoic



Normal Ultrasound Anatomy

- **Follicles**

- Waves of follicles can be followed for their development and regression.
- 2mm follicles are considered to be smallest one; anechoic structures as they grow
- Shape: can be Oval, asymmetrical, round.

- **Ovulation**

- Appearance of large follicle and then disappearance
- Timing of the ovulation can be determined as size increases
- Ovulation seen as pear shaped structure with pointing
- 4 min period for evacuation of fluid from follicle



Normal Ultrasound Anatomy

- **Cervix**
 - **Hyper**echoic image
 - External os can be seen
- **Vagina**
 - **Hyper**echoic
- **Urinary bladder**
 - **Anechoic**
 - Confusion with pregnancy

Early Pregnancy Diagnosis

Days	Structures Seen
17-19	➤ C.L and Little anechoic lumen in ipsilateral horn
22-24	➤ Anechoic lumen increases ➤ Heart beat

Early Pregnancy

Days	Structures Seen
30	➤ More pronounced changes present ➤ Membranes
35	➤ Uterine caruncles ➤ CRL

Late Pregnancy

- Difficult and confusing, due to increase fetal size



25 Day Pregnancy



30 Day Pregnancy



35 Day Pregnancy



43 Day Pregnancy



50 Day Pregnancy



100 Day Pregnancy

Artifacts

- Refraction
- Reverberations
- Shadowing

Thanks