Sonographic anatomy of scrotal region and its organs

VA Giagulli, MD, PhD

Outclinic patients for Endocrinology

And Metabolic Diseases

Conversano Hospital ASL Ba

Conflitti di interesse

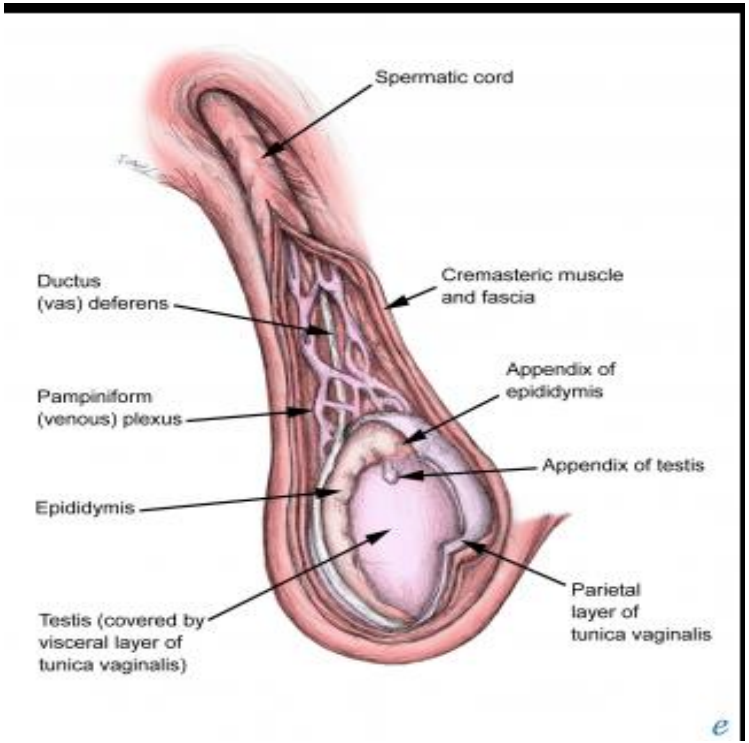
Ai sensi dell'art. 3.3 sul conflitto di interessi, pag 17 del Regolamento Applicativo Stato-Regioni del 5/11/2009, dichiaro che negli ultimi 2 anni ho avuto rapporti diretti di finanziamento con i seguenti soggetti portatori di interessi commerciali in campo sanitario: Bayer

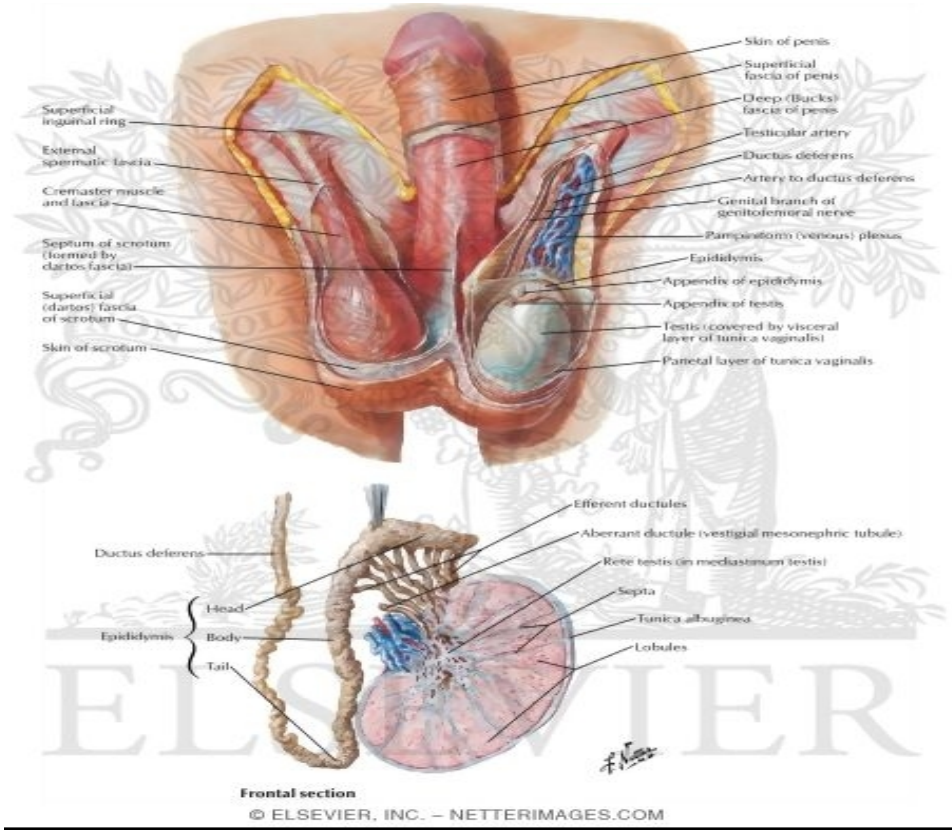
Layout of my speech

- Normal anatomy of scrotal region and its organs

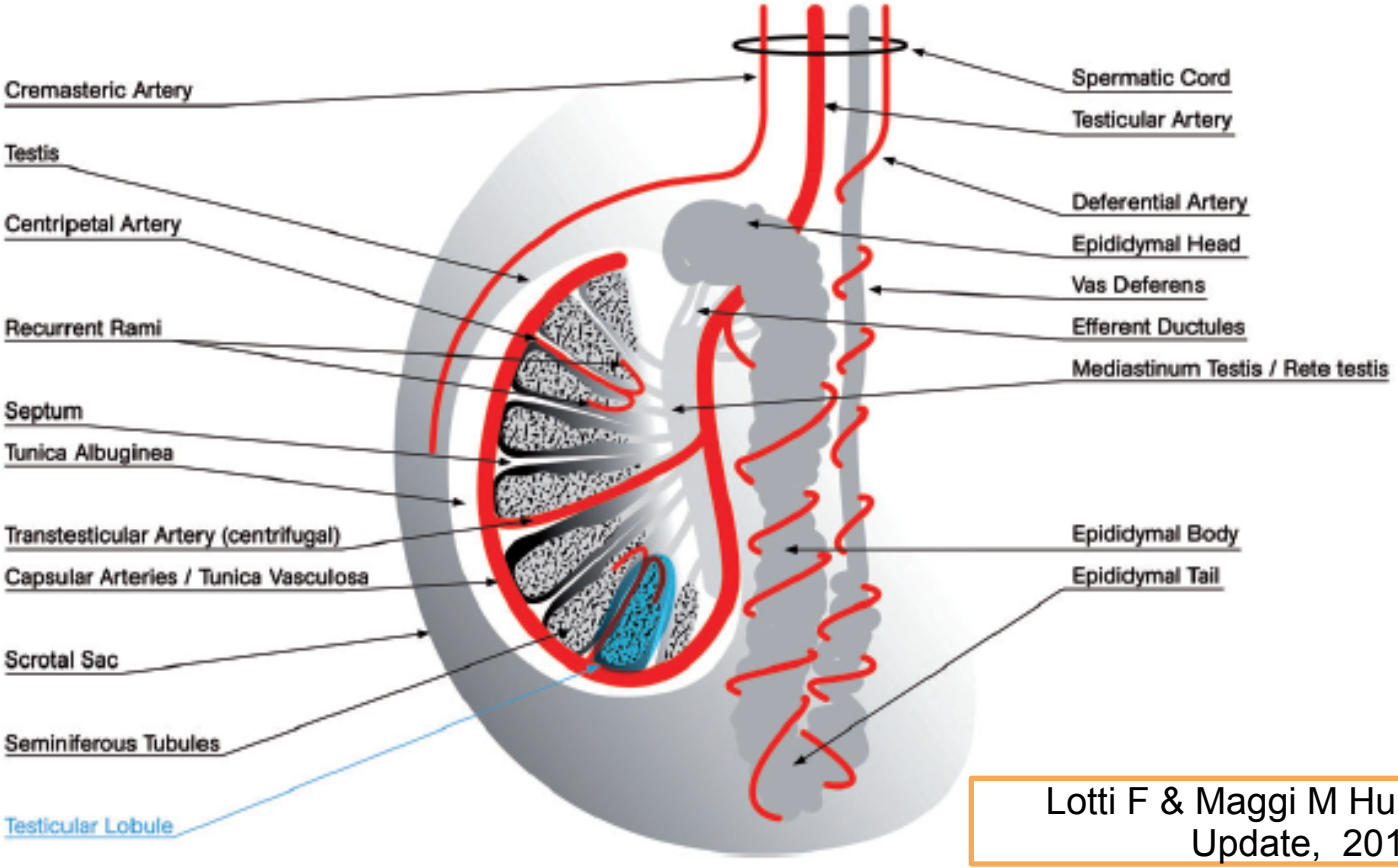
- Scrotal and testicular ultrasound in men

Normal anatomy of genital tract and in particular of scrotal region





SCHEMATIC REPRESENTATION OF THE SCROTAL ORGANS AND RELATED ARTERIAL SUPPLY



Lotti F & Maggi M Hum Reprod Update, 2014

General data for scrotal and testicular ultrasound and ecodoppler examination

- The patients should be layed supine with the penis resting on the suprapubic region;
- A MHz high-frequency linear probe that can study the soft parts (7–15 MHz) should be used;
- Gel can be applied to the scrotum that is supported by a towel placed between the thighs;
- The testes are studied in transverse, oblique and longitudinal planes, being the images acquired in both gray-scale and color-Doppler modes, to measure the testicular blood flow.

Testis volume

-85% seminiferous tubules

-Clinically varies with age:

- First sign of puberty: > 3 ml (Prader)

The NEW ENGLAND JOURNAL of MEDICINE

CLINICAL PRACTICE

Delayed Puberty

Mark R. Palmert, M.D., Ph.D., and Leo Dunkel, M.D., Ph.D.

N ENGL J MED 366;5 NEJM.ORG FEBRUARY 2, 2012

- Increases during puberty, up to ten-fold max 20 y

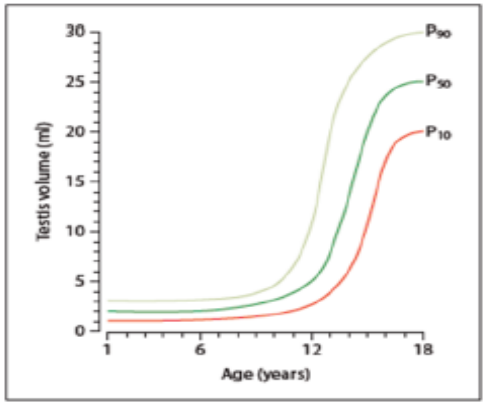
HORMONE RESEARCH IN PÆDIATRICS

Original Paper

Horm Res Paediatr 2011;76:56–64
DOI: 10.1159/000326857

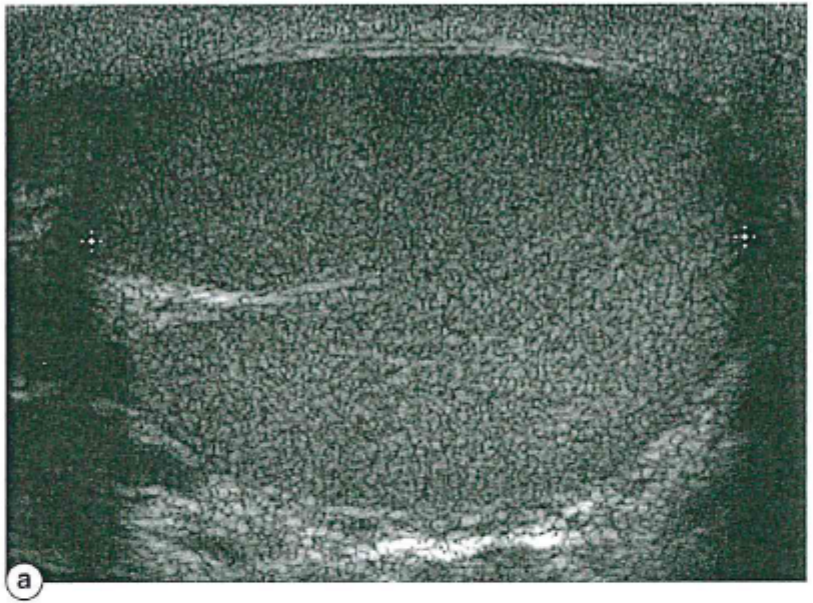
Normative Values for Testicular Volume Measured by Ultrasonography in a Normal Population from Infancy to Adolescence

J. Goede[a] W.W.M. Hack[a] K. Sijstermans[a] L.M. van der Voort-Doedens[b]
T. Van der Ploeg[c] A. Meij-de Vries[d] H.A. Delemarre-van de Waal[e]



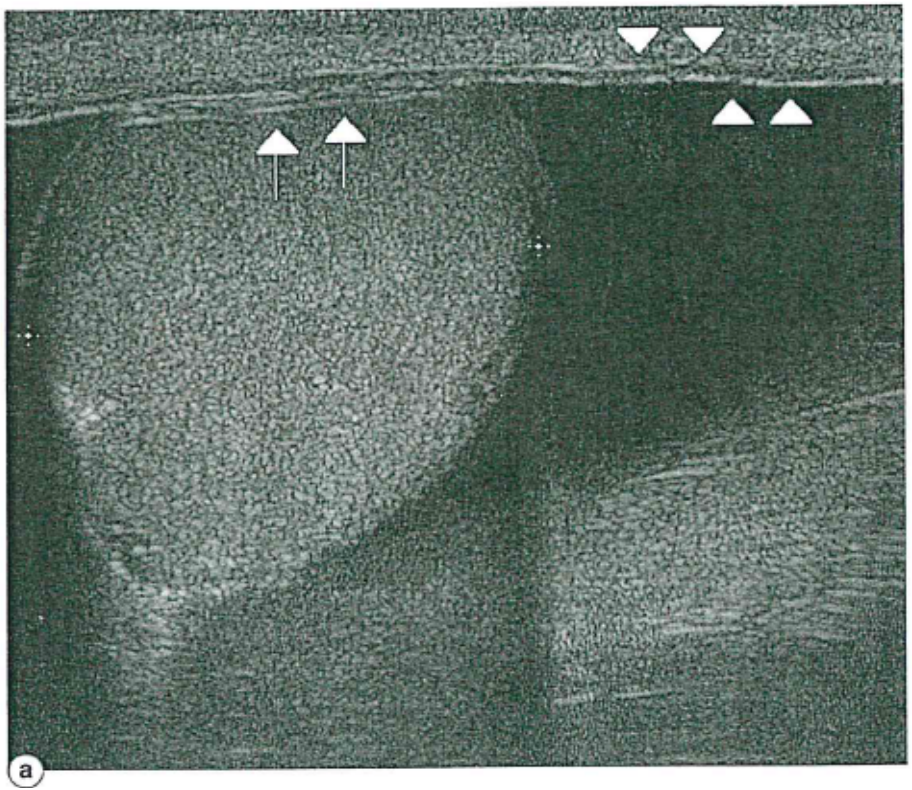
Courtesy of F Lotti

Testes and mediastinum



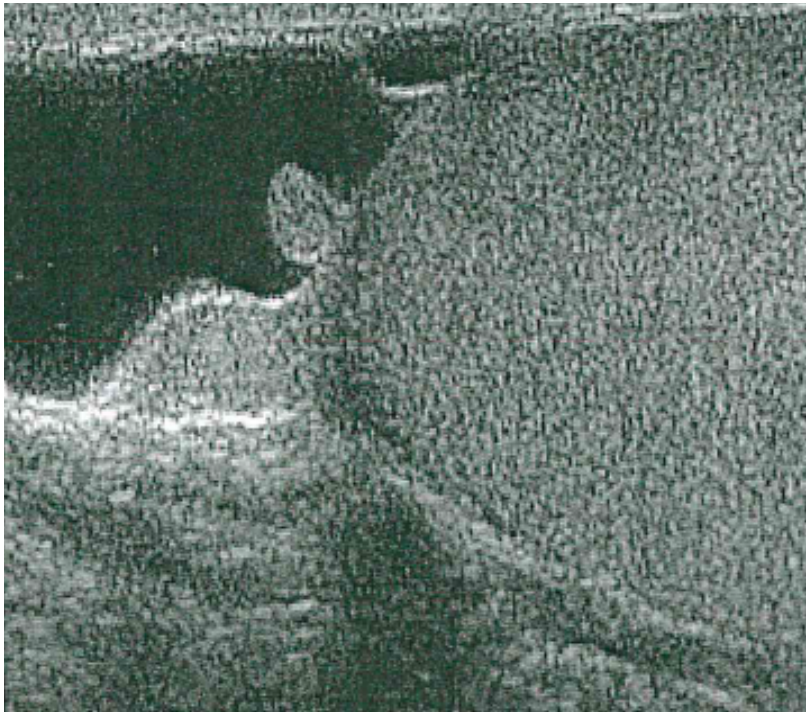
Isidori A & Lenzi A Atlas, 2008

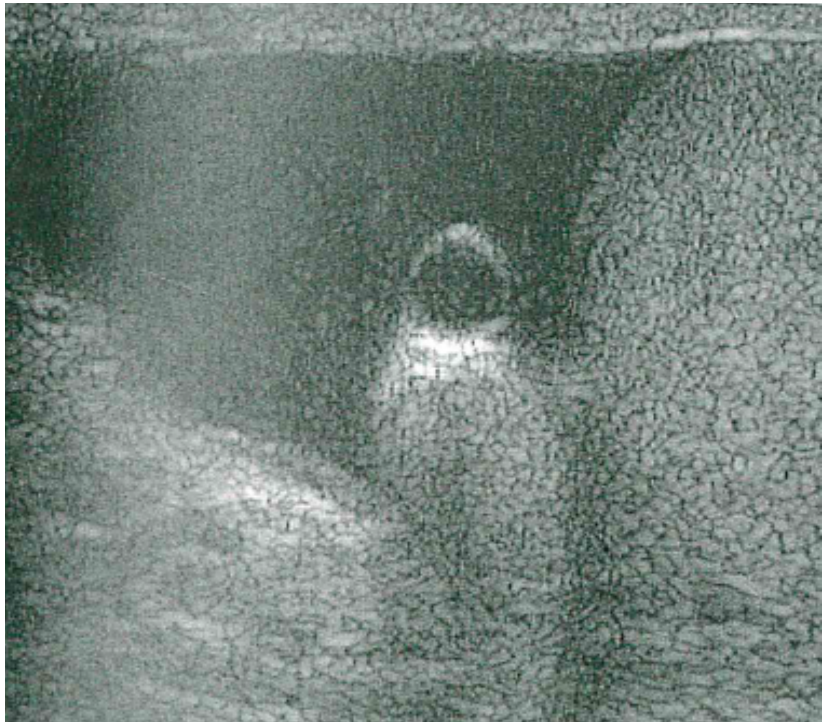
Tunica vaginalis, albuginea and testicular ligament



Isidori A & Lenzi A Atlas , 2008

Appendices and Cystis of Morgagni

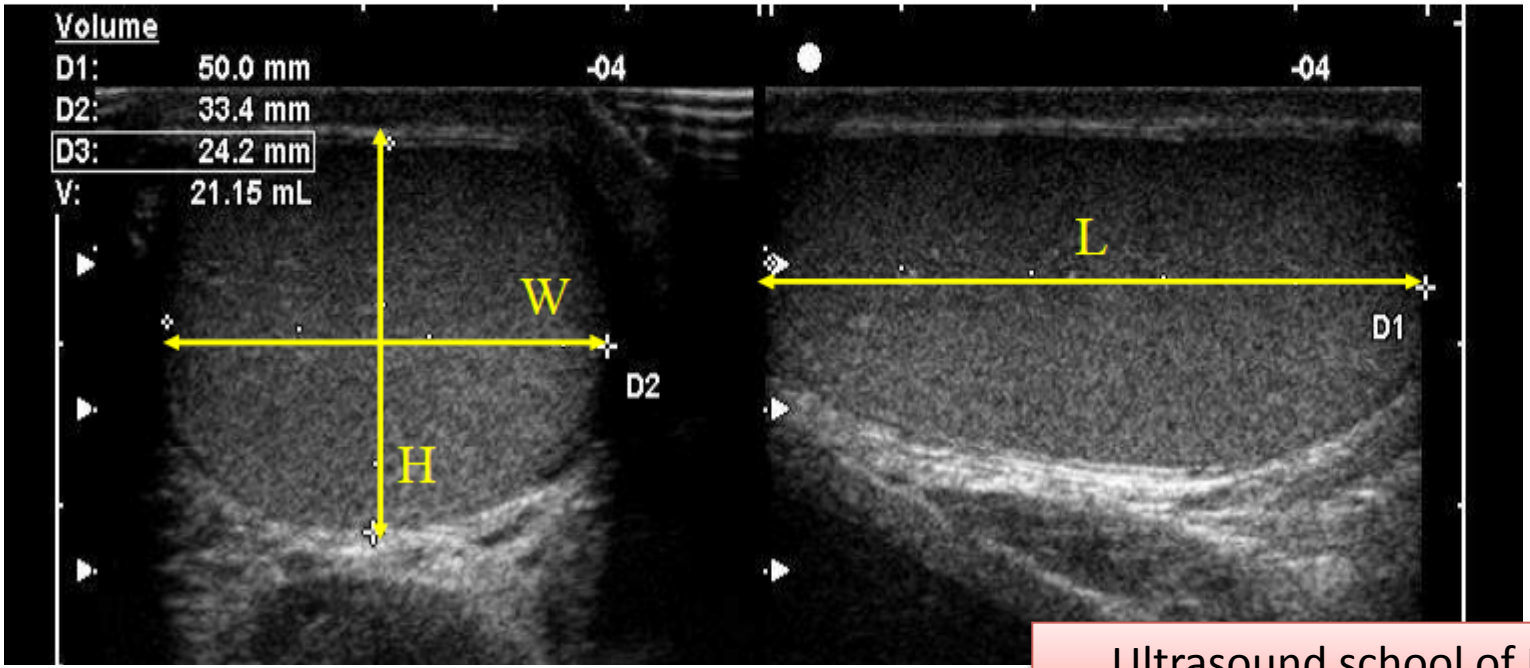




Isidori A & Lenzi A Atlas , 2008

Testis diameters

longitudinal	lateral-medial	anterior-posterior
(length)	(width)	(height)
L	W	H



EAA Multicentre Studies

Under the Patronage of the European Academy of Andrology (EAA)

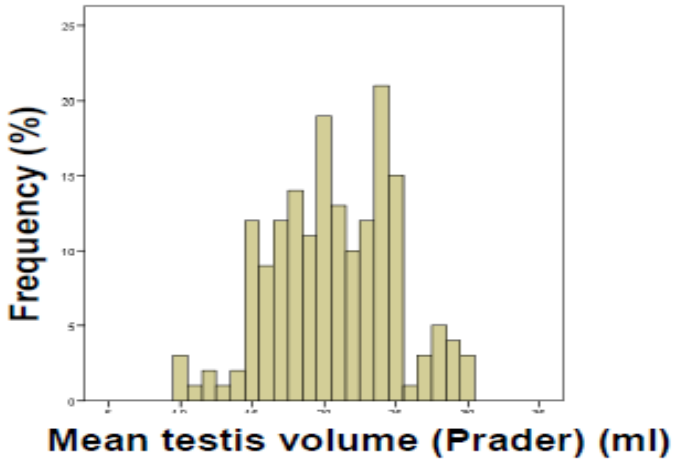
Standardization of the male genital tract colour-Doppler ultrasound parameters in healthy, fertile men

Preliminary data (n = 173 healthy, fertile men)

Menat testis volume (Prader): 20.5 ± 4.3 ml

right 21.2 ± 4.5 ml

left 19.8 ± 4.3 ml

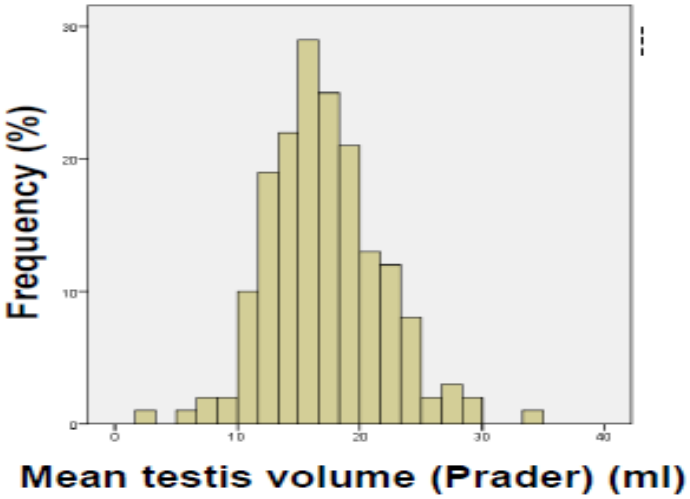


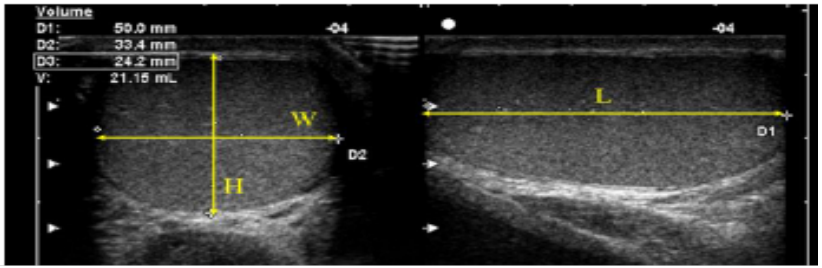
Courtesy of F Lotti

Testis Volume at US

- 'Ellipsoid' mathematical formula = 17.1 ± 4.7 ml (mean TV)
  right = 17.8 ± 5.0 ml,
  left = 16.5 ± 4.7 ml,

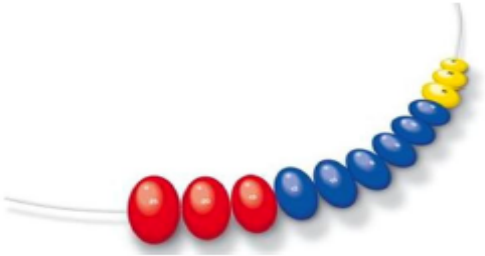
Median difference between Prader and US : 3.5 [2.3 – 4.5] ml





Courtesy of
F Lotti

Normal testicular volume, Prader: ≥ 15 ml



0021-972X/96/$03.00/0
Journal of Clinical Endocrinology and Metabolism

CLINICAL REVIEW 100

Evaluation and Treatment

GIANNI FORTI AND CSILLA KRAUSZ

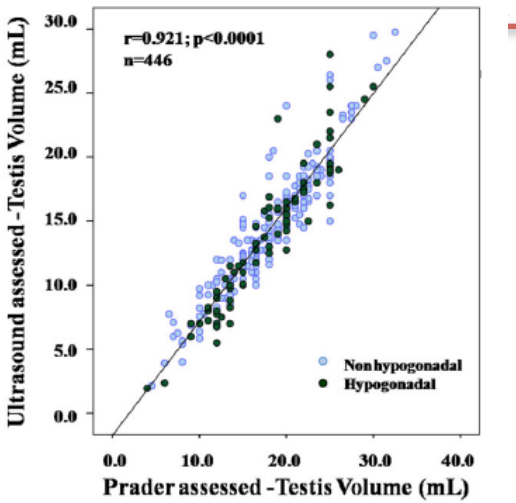
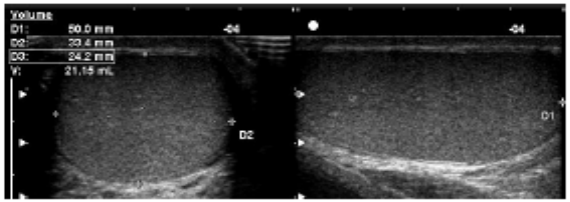


Figure 1 Relationship between clinical (Prader orchidometer) and ultrasonographic evaluation of mean testis volume, as assessed in a subset of patients who consulted for both sexual dysfunction and infertility. Light blue circles represent nonhypogonadal subjects (total testosterone ≥12 nmol/L) and dark green circles represent hypogonadal subjects (total testosterone <12 nmol/L).

Suggested normal testicular volume, US ≥ 12 m



The Infertile M

Evaluation

Francesco Lotti, Gio
Gianni Forti, and Ma

Hindawi Publishing Corporation
International Journal of Endocrinology
Volume 2013, Article ID 145792, 6 pages
http://dx.doi.org/10.1155/2013/145792

Testis hypotrophy (US) < 12 ml

Research Article

Relationship between Testicular Volume and Conventional or Nonconventional Sperm Parameters

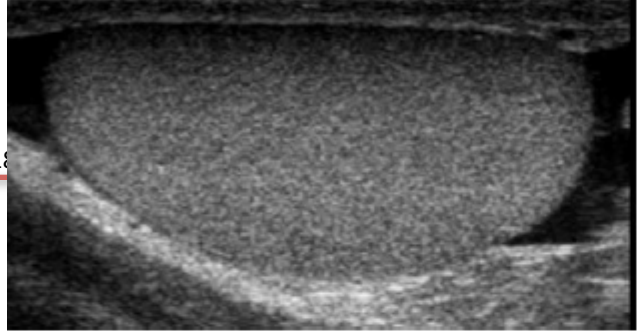
Rosita Condorelli, Aldo E. Calogero, and Sandro La Vignera

Courtesy of Lotti F

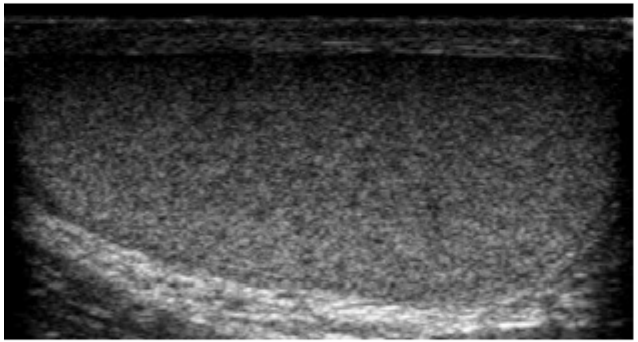
Testis volume evaluation

- Prader's orchidometer (PO) overestimates testis volume (TV) (2-4 ml). However, there is a direct relationship between TV measured by PO and the one assessed by ultrasound (US).
- The TV is inversely correlated to the age of the subject.
- The TV determined by PO is 20±5 ml, while in infertile men is 18±3 ml.
- To calculate TV by US one can use the ellipsoid formula: L x W x H x 0.52; while the 3 diameters can be multiplied by 0.71. Applying ellipsoid formula TV in fertile adult men is 18±5 ml (EAA study). These results are very close to the ones obtained by PO.

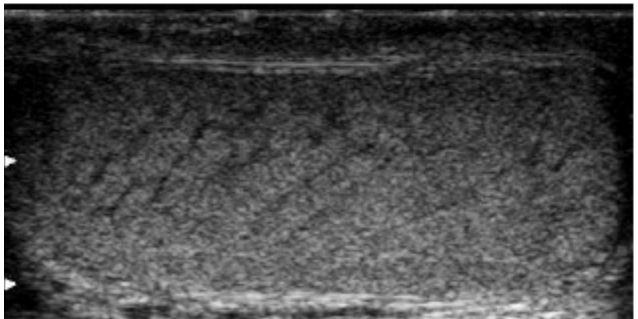
Testis homogeneity



0.Homogeneous

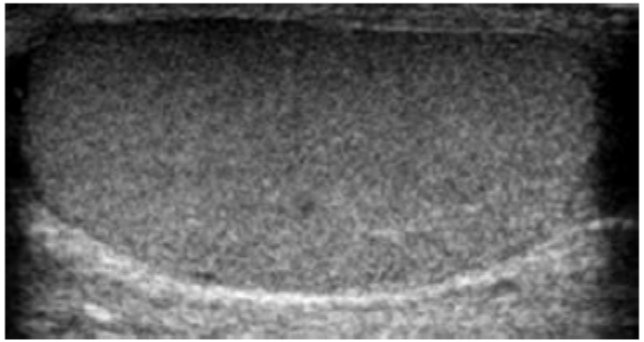


1.Mild
inhomogeneity
(little hypoechoic areas)

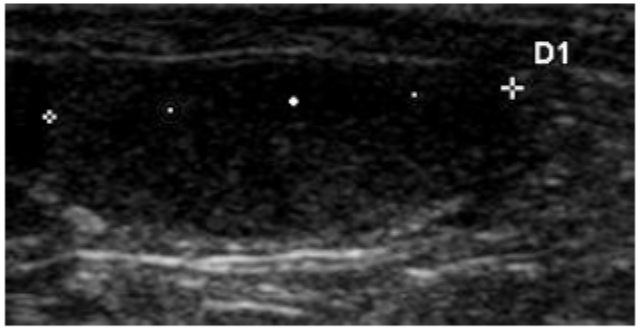


2.Moderate-severe
inhomogeneity
(hypoechoic striae)

Testis echogenicity



0.Normal echogenicity

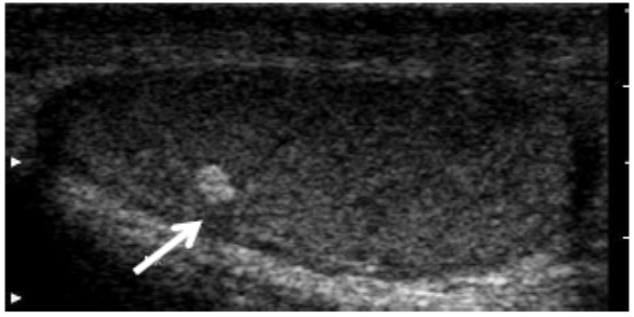


1.Hypoechoic

2.Hyperechoic

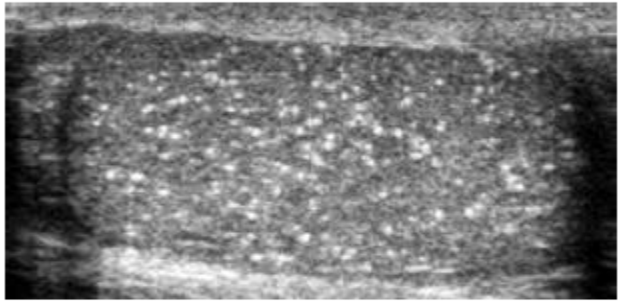
Testis calcifications

A



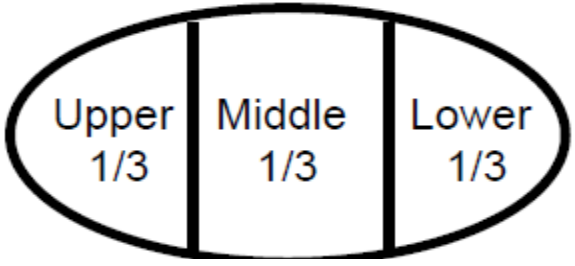
Single calcification,
macro-calcification (> 3 mm),
one calcification/US field

B

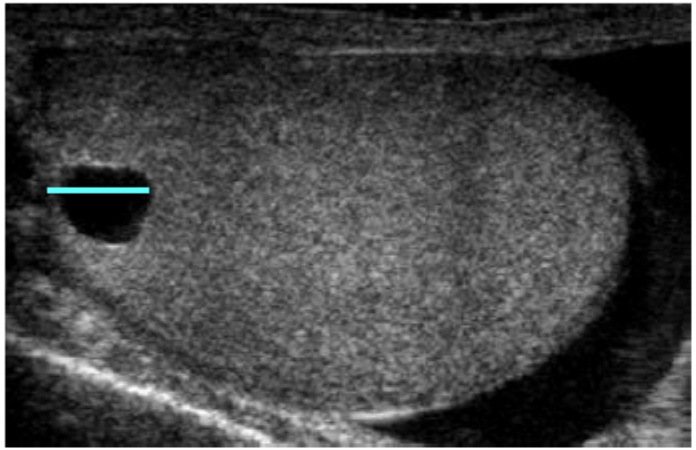


Diffuse micro-calcifications

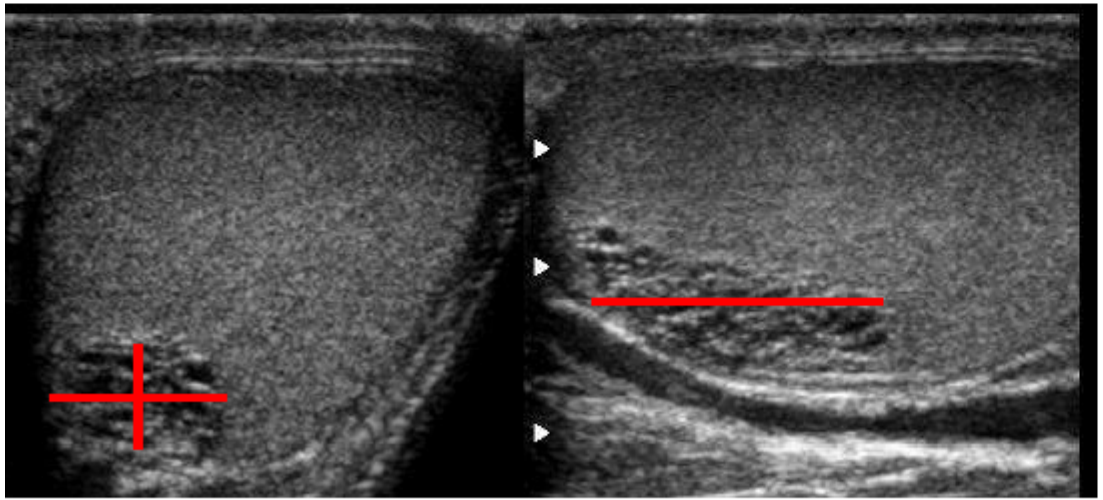
C



Arbitrary division of the testis
in three areas,
to localize the calcification

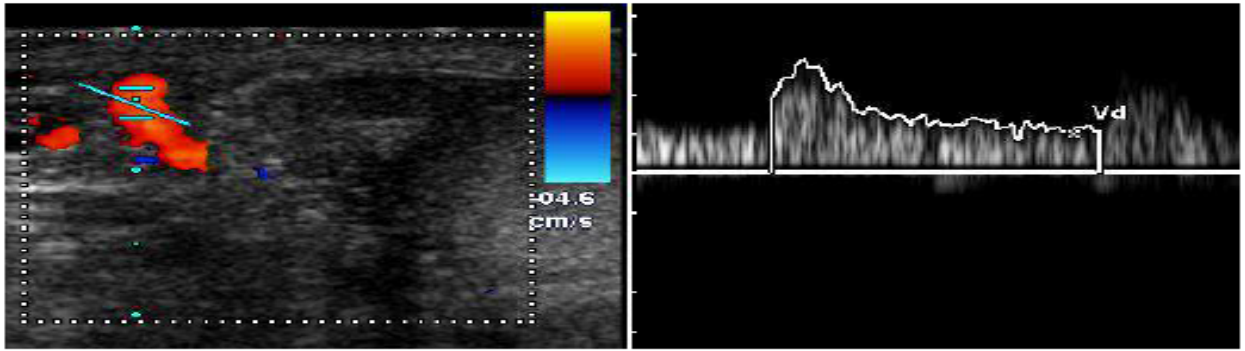


A. Testicular **cyst**,
upper lobe,
longitudinal diameter

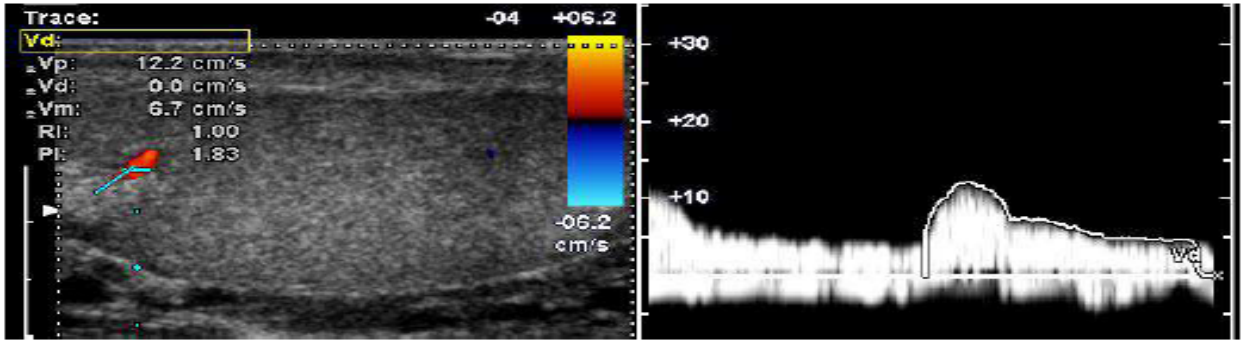


B. Dilated
rete testis,
3 diameters

Testis vascularization



A. Testicular **artery**,
in the spermatic cord
-peak systolic velocity
-RI

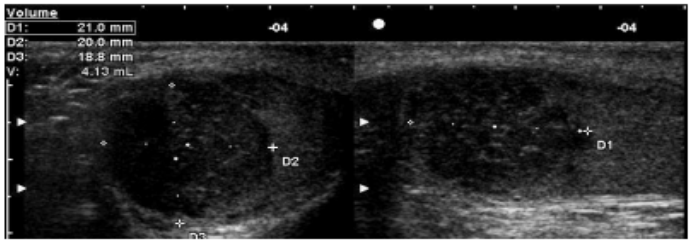


A. Intratesticular **artery**,
-peak systolic velocity
-RI

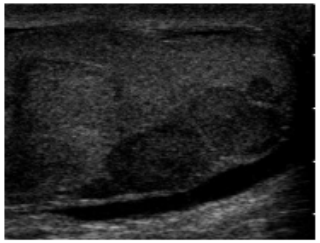
At least 2 Doppler spots

Nodules:

-3 diameters



-Homogeneity *(left)* or
inhomogeneity/cysts *(right)*

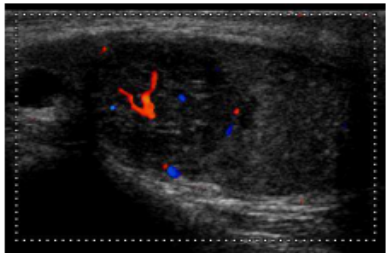


-Echogenicity (normal, hypo or hyper)

-Calcifications

-Shape
- -regular
- -irregular

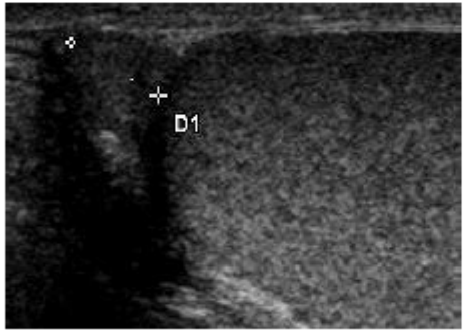
-Vascularization
- -absent
- -peripheral/«basket»
- -intranodular



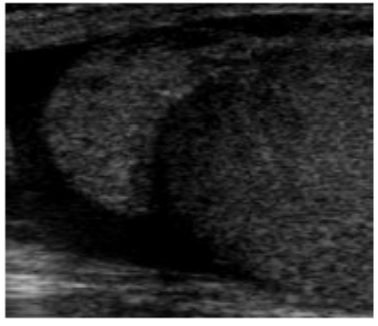
Courtesy of F Lotti

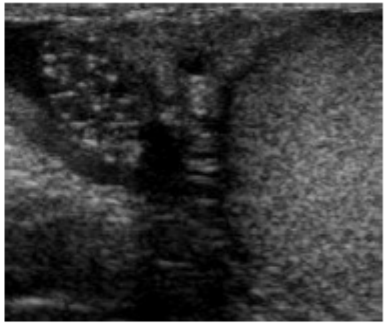
Epididymal head

D_1 0.7-1.2 cm



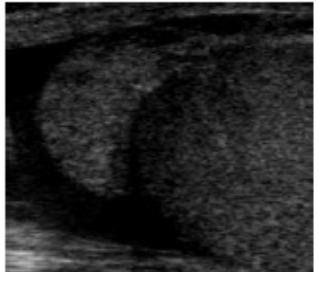
A. Longitudinal diameter

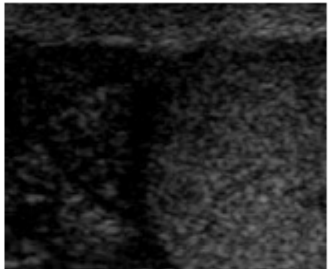


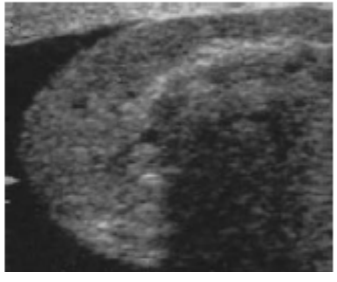


B. Homogeneous *(left)*

Inhomogeneous *(right)*







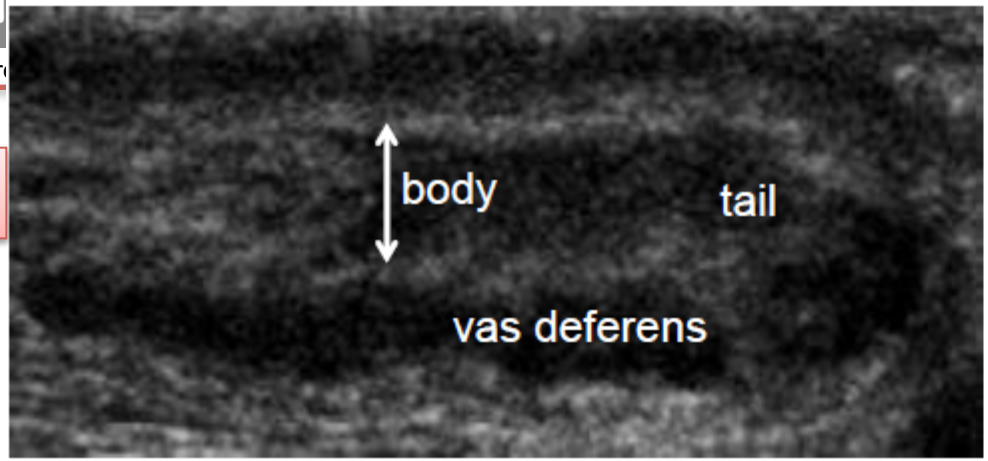
C. Normal echogenicity *(left)*

Hypoechoic *(middle)*

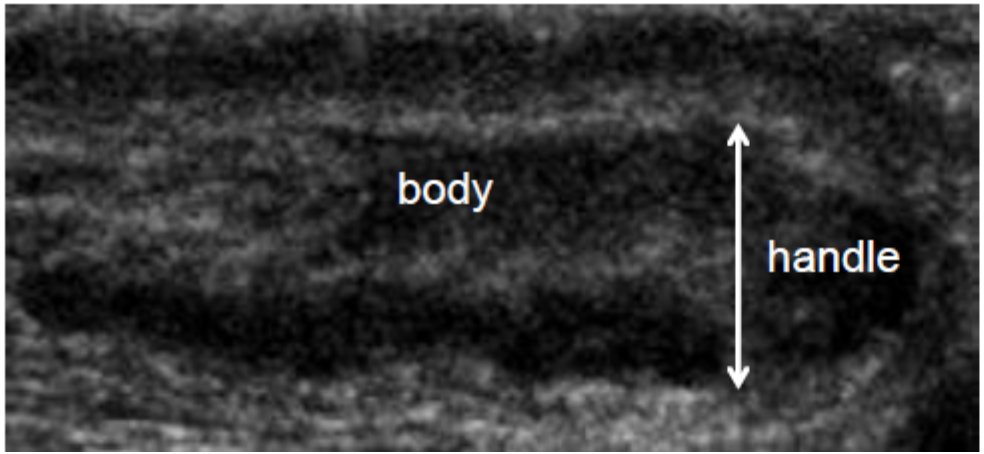
Hyperechoic *(right)*

Epididymal body, tail, vas deferens

D: 2-4 mm



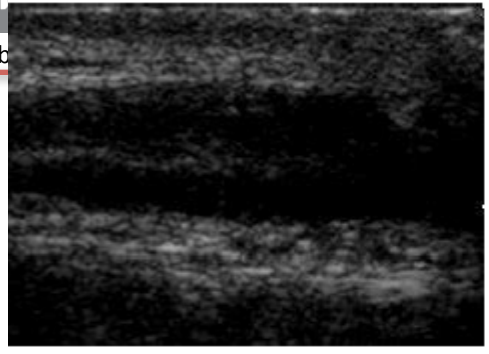
A. anterior-posterior diameter of the body



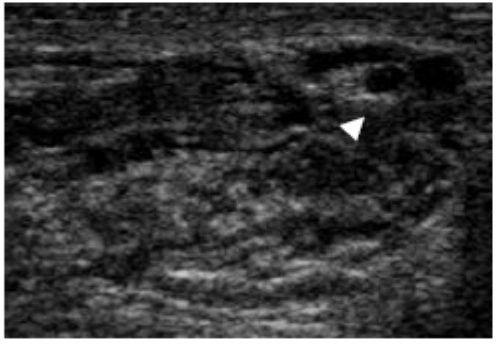
B. anterior-posterior diameter of the handle (tail +proximal vas deferens)

D: 4-6 mm

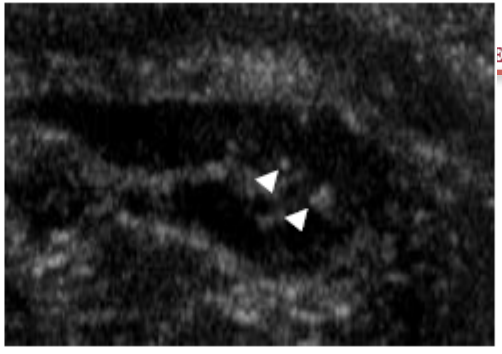
Epididymal tail homogeneity



Homogeneous

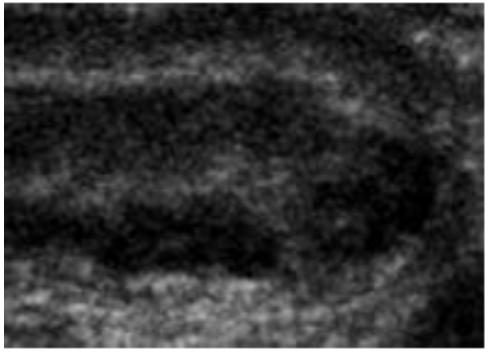


Inhomogeneous

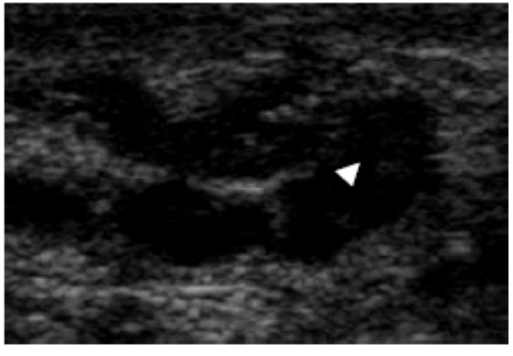


Course calcifications

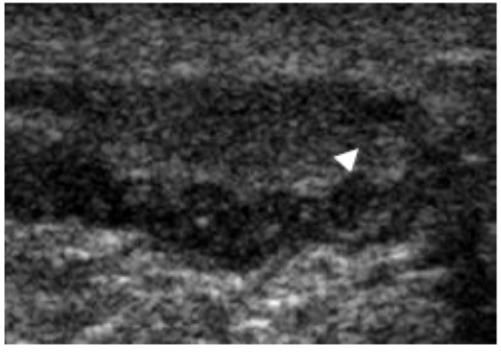
Epididymal tail echogenicity



Normal echogenicity



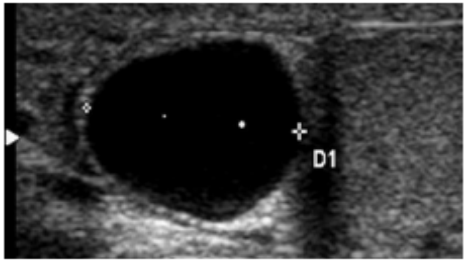
Hypoechoic



Hyperechoic

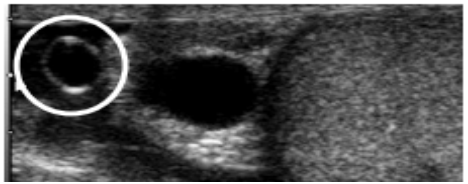
Epididymal body, tail and vas deferens in young fertile men

Epididymal head cysts and appendices



A. Epididymal head, longitudinal diameter of a cyst

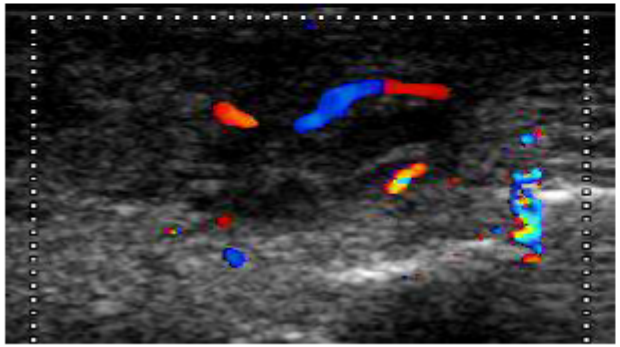
B. Epididymal head, policystic pattern



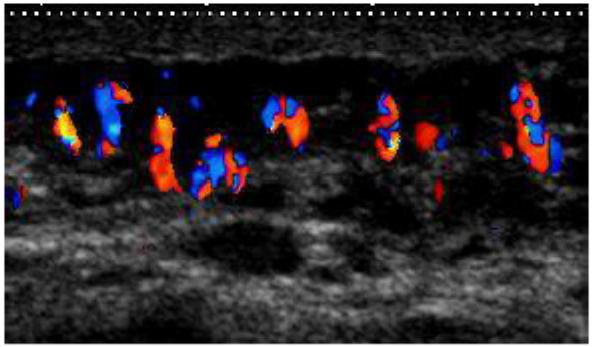
C. Cyst of the epididymal head and cystic appendix *(white circle)*

Courtesy of F Lotti

Epididymal vascularization



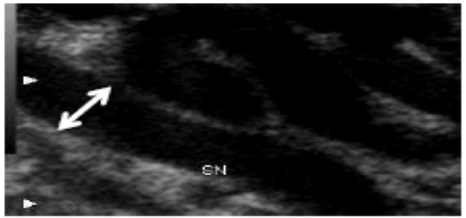
Normal vascularization



Hyperaemia (diffuse Doppler spots)

A

D: 2 mm

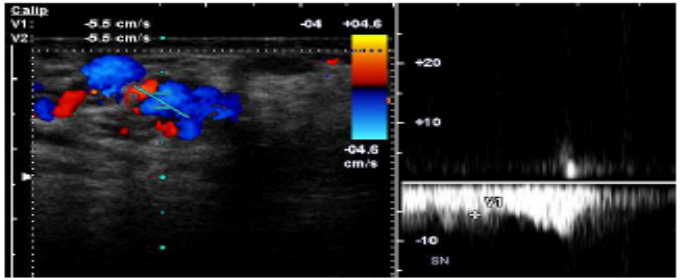


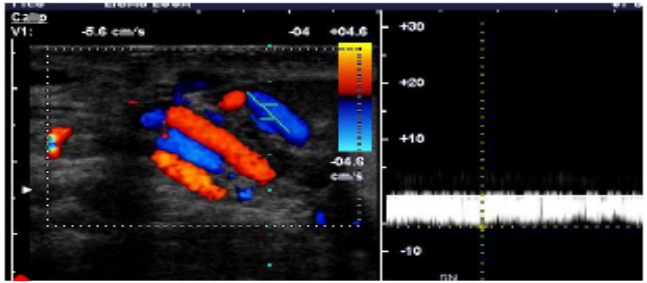
Internal spermatic vein: diameter (gray scale)

Pampiniform plexus

Retrograde venous flow (colour-Doppler)

B





Conclusions

- For a correct volume estimate it is crucial to take the required time to scan the maximum diameter: the correct formula is L x W x H x 0,51.
- The hypoechogenicity of immature testis is normal, as its echogenicity increases during puberty owing to growth of the seminiferous tubules.
- All segments of epididymis can be normally detected. Any enlargement or changes in reflectivity can point to a pathological conditions. Other anatomic structures (ie vas deferens) should be detected and their absence must be interpreted on the basis of clinical history.
- Intratesticular blood flow as well as the pampiniform plexus should be evaluated quantitatively and their regular distribution.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