SonoAVC u humanoj reprodukciji

Ivan Bolanča
Klinika za ginekologiju i porodništvo
KBC Sestre milosrdnice

X hrvatski kongres o ginekološkoj endokrinologiji, humanoj reprodukciji i menopauzi. Brijuni 10.-13.09.2015.

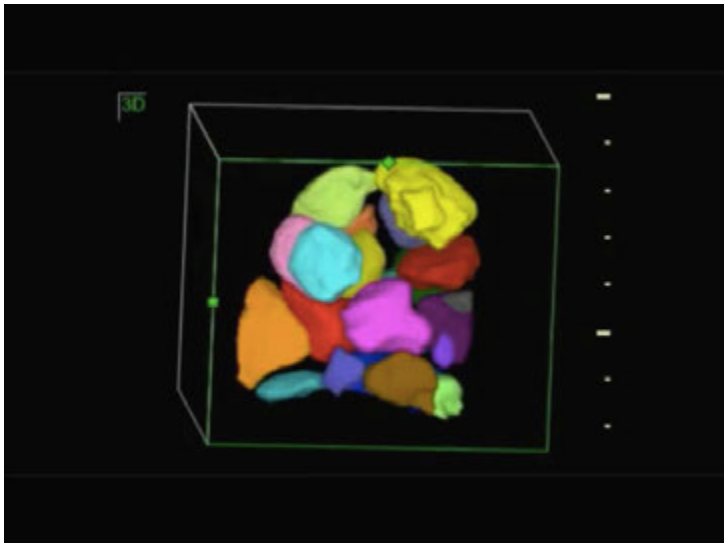
Povijest

Dr. Alfred Kratochwil working with the A-scan
on a pregnant patient in the mid 1960s**

SonoAVC (Sonography-based Automated Volume Calculation)

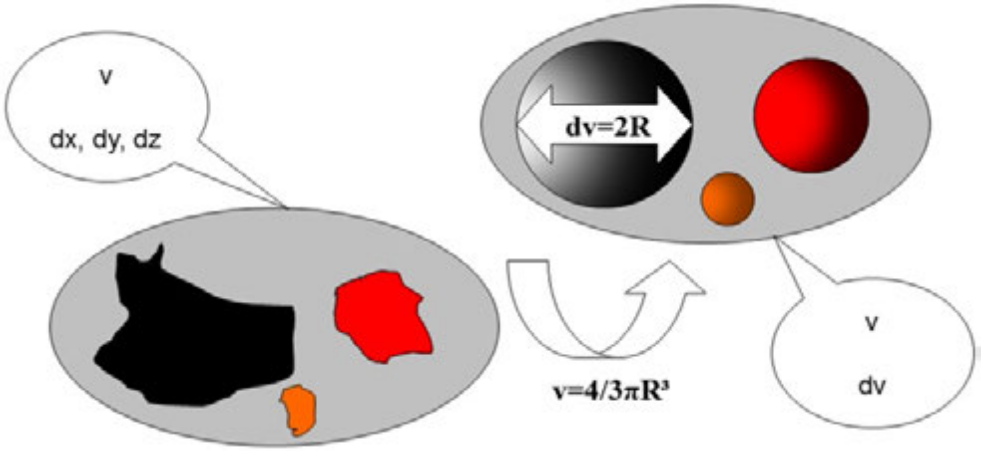
- GE Medical Systems, Zipf, Austria
- Identificira i kvantificira hipoehogene regije unutar zadanog volumena i omogućuje automatsku izmjeru

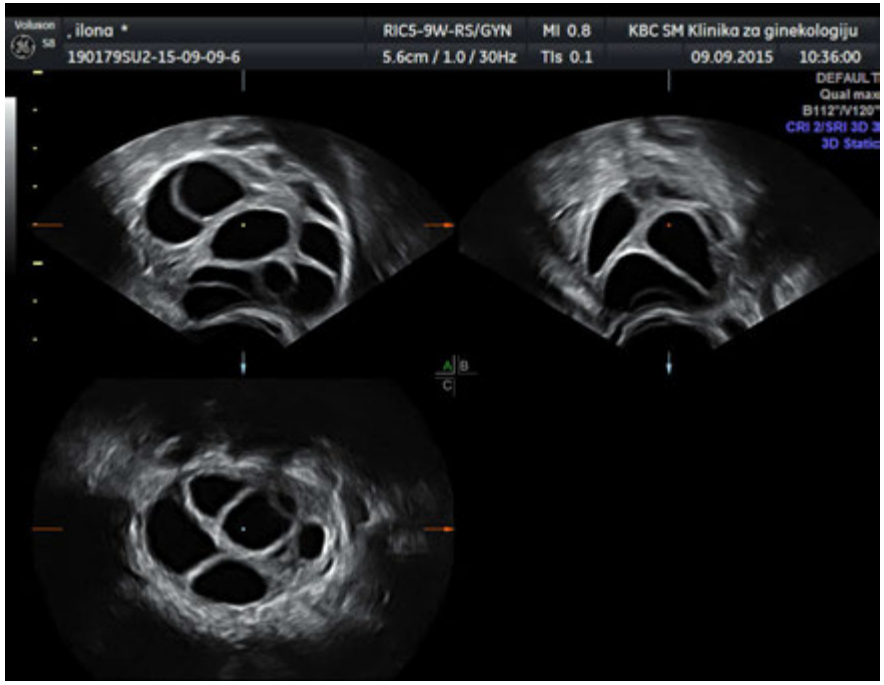
N. Raine-Fenning et al. SonoAVC: a novel method of automatic volume calculation. Ultrasound Obstet Gynecol 2008; 31: 691–696



SonoAVC : Tehnologija

- Tekućinom izmjereni folikuli predstavljaju hipoehogeni odjek unutar hiperehogene strome
- Nakon snimanja volumena jajnika softver (polu)automatski identificira granice folikula i procjenjuje njihove dimenzije
- Mjere – najveći promjer u 3 ortogonalne ravnine, srednji promjer folikula, volumen folikula i tzv. promjer idealne sfere




, ilona *
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MI 0.8
KBC SM Klinika za ginekologiju
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5.6cm / 1.0 / 30Hz
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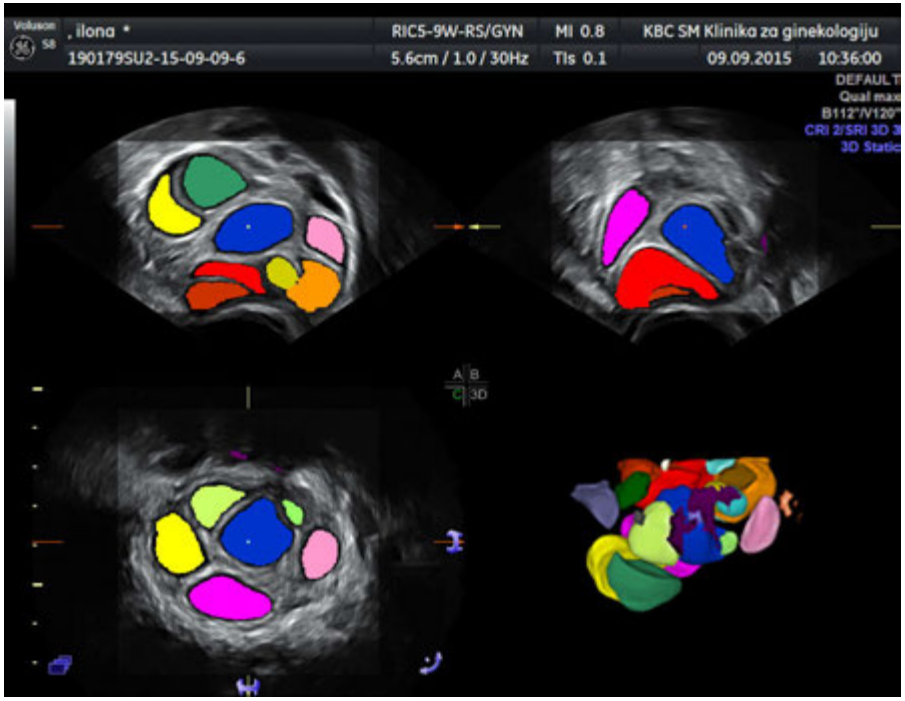
Qual max
B112°/V120°
CRI 2/SRI 3D 3
3D Static


, ilona *
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Qual max
B112°/V120°
CRI 2/SRI 3D 3
3D Static
3D

KBC SM Klinika za ginekologiju

Date of Exam: 09.09.2015 Page 1 / 3
Exam Type:

Name ilona DOB Sex Female
Pat. ID 190179SU2-15-09-09-6 Perf. Phys.
Ref. Phys.
Indication Sonogr.

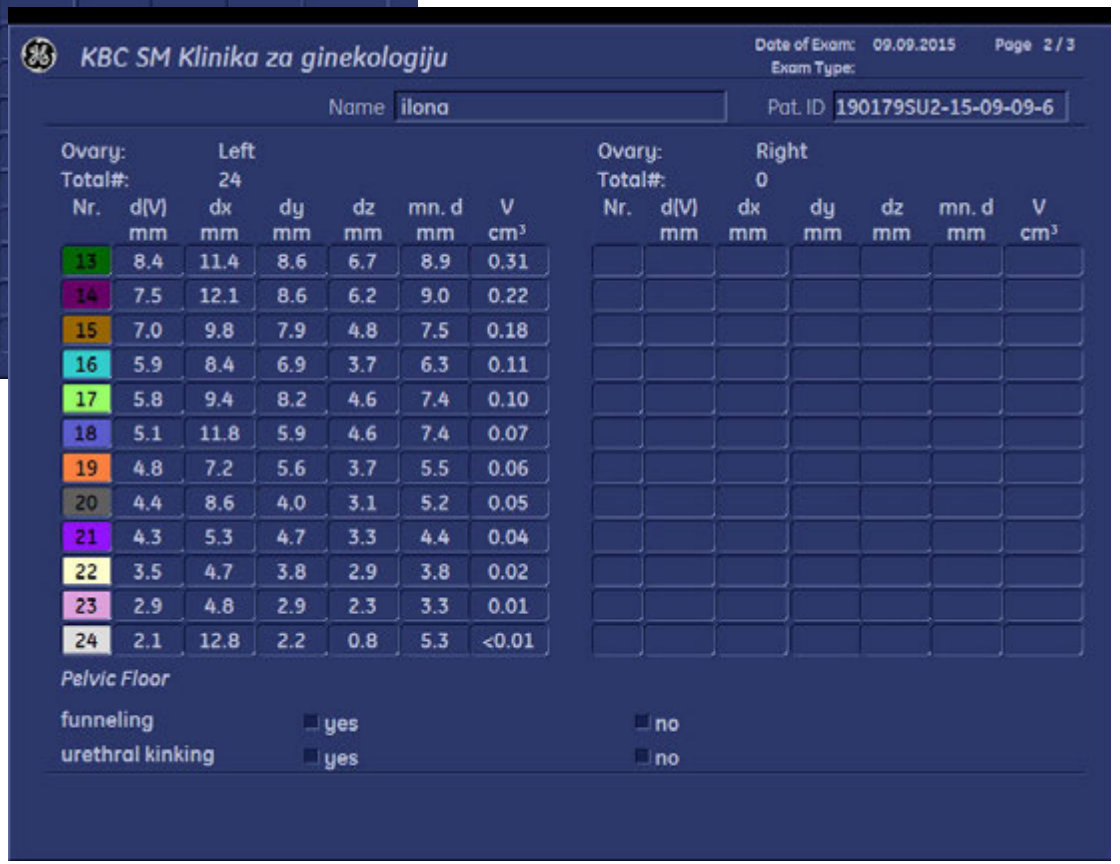
LMP Day of Cycle Gravida AB
Day of stim. Expected Ovul. Para Ectopic

Ovary: Left
Total#: 24

Nr.	d(V) mm	dx mm	dy mm	dz mm	mn. d mm	V cm³
1	19.4	35.3	23.3	14.6	24.4	3.85
2	18.0	30.5	17.5	15.0	21.0	3.03
3	17.6	26.0	18.6	12.9	19.2	2.84
4	16.3	25.0	19.9	10.2	18.4	2.26
5	15.6	20.7	16.7	13.2	16.9	1.97
6	15.5	23.7	14.2	12.2	16.7	1.95
7	15.2	24.5	18.3	8.7	17.2	1.84
8	14.2	19.4	14.1	12.4	15.3	1.49
9	13.2	22.6	13.4	8.7	14.9	1.20
10	13.0	18.9	14.8	9.4	14.3	1.16
11	11.7	14.8	12.1	10.4	12.4	0.85
12	8.9	13.9	9.3	5.7	9.6	0.37

Ovary: Right
Total#: 0

Nr.	d(V) mm	dx mm	dy mm	dz mm	mn. d mm	V cm³



KBC SM Klinika za ginekologiju

Date of Exam: 09.09.2015 Page 2 / 3
Exam Type:

Name ilona Pat. ID 190179SU2-15-09-09-6

Ovary: Left
Total#: 24

Nr.	d(V) mm	dx mm	dy mm	dz mm	mn. d mm	V cm³
13	8.4	11.4	8.6	6.7	8.9	0.31
14	7.5	12.1	8.6	6.2	9.0	0.22
15	7.0	9.8	7.9	4.8	7.5	0.18
16	5.9	8.4	6.9	3.7	6.3	0.11
17	5.8	9.4	8.2	4.6	7.4	0.10
18	5.1	11.8	5.9	4.6	7.4	0.07
19	4.8	7.2	5.6	3.7	5.5	0.06
20	4.4	8.6	4.0	3.1	5.2	0.05
21	4.3	5.3	4.7	3.3	4.4	0.04
22	3.5	4.7	3.8	2.9	3.8	0.02
23	2.9	4.8	2.9	2.3	3.3	0.01
24	2.1	12.8	2.2	0.8	5.3	<0.01

Ovary: Right
Total#: 0

Nr.	d(V) mm	dx mm	dy mm	dz mm	mn. d mm	V cm³

Pelvic Floor

funneling yes no
urethral kinking yes no

Točnost – *in vitro* studije

- Deutch et al (FS, 2009)
  - Mjerenja na ultrazvučnom fantomu (anehogene sfere)
  - Maksimalna greška – 0.00, 0.01 i 0.02 ml za sfere volumena 0.03, 0.12 i 0.53 ml (3-8%)
- Rousian et al (BJOG 2009)
  - 10 balona različitih volumena 1-3ml unutar suspenzije čestica grafita u mješavini sterilne vode i glicerina
  - SonoAVC sistematski podcjenjuje volumen sa srednjom greškom od -0.63ml

Točnost – *in vivo* studije

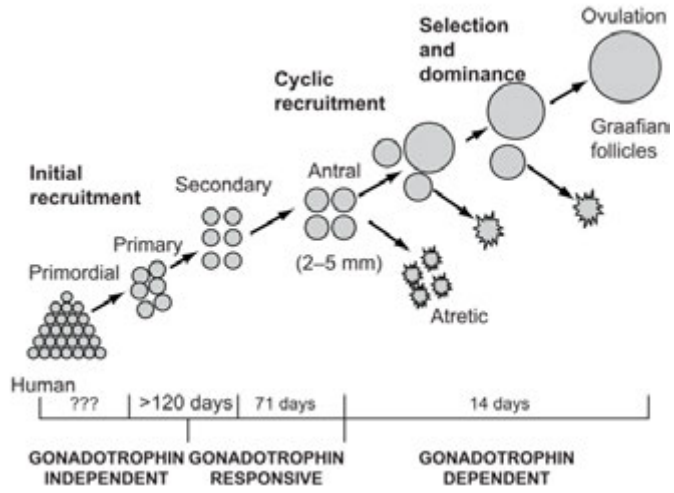
- Raine-Fenning et al. Ultrasound Obstet Gynecol 2008
  - 51 pacijentica sa COH – uspoređivan volumen mjeren SonoAVC-om sa volumenom folikularne tekućine dobivene apiracijom
  - Srednja razlika 0.04ml, točnost zadržana u različitim veličinama folikula
- Salama et al. Fertil Steril 2010
  - „good agreement" između stvarnog i izmjerenog volumena (±1ml u rasponu 2.9-8.0ml)
- Lamazou et al. Fertil Steril 2010

Klinička primjena

- AFC – Antral follicle count
- Monitoring rasta folikula – COH
- SonoAVC u trudnoći
  - Mjerenje gestacijskog obruča
  - Volumen želuca
  - Volumeni ventrikula
  - Studije fetalnog srca
  - ….

Klinička primjena - AFC

- **Klasično 2D UZV**
- Brojimo folikule ≤ 9mm
  - Khairy M et al. Reprod Biomed Online 2008
- Ili 2-10 mm ?
- Nužna standardizacija
  - Broekmans et al. Fertil Steril. 2010 Aug;94(3):1044



AFC

TABLE 1

The basic clinical and technical requirements for assessment of the antral follicle count in clinical practice.

Clinical considerations

Select patients with regular menstrual cycles with no coexisting pathologic condition that could technically affect the counting of follicles, such as ovarian endometriosis or previous ovarian surgery

Count follicles between days 2 and 4 of a spontaneous menstrual or oral contraceptive cycle to avoid the effect of intra-cycle variation

Include all antral follicles of 2–10 mm in diameter

Technical considerations

A limited number of personnel, appropriately trained in transvaginal sonography should perform AFCs in each unit

Real-time two-dimensional imaging is adequate

Use a transvaginal transducer

Use a probe with a minimum frequency of 7 MHz, which is maintained in an adequate condition and able to resolve a structure of 2 mm in diameter

Use a systematic process for counting antral follicles:

1. Identify the ovary
2. Explore the dimensions in two planes (perform a scout sweep)
3. Decide on the direction of the sweep to measure and count follicles
4. Measure the largest follicle in two dimensions
   - ■ If the largest follicle is ≤10 mm in diameter:
     - o Start to count from outer ovarian margin of the sweep to the opposite margin
     - o Consider every round or oval transonic structure within the ovarian margins to be a follicle
     - o Repeat the procedure with the contralateral ovary
     - o Combine the number of follicles in each ovary to obtain the AFC
   - ■ If the largest follicle is >10 mm in diameter:
     - o Further ascertain the size range of the follicles by measuring each sequentially smaller follicle, in turn, until a follicle with a diameter of ≤10 mm is found
     - o Perform a total count (as described) regardless of follicle diameter
     - o Subtract the number of follicles of >10 mm from the total follicle count

Broekmans. Standardization of AFC in ART. Fertil Steril 2009.

AFC vs. AMH ?

Human Reproduction, Vol.29, No.5 pp. 1035–1041, 2014
Advanced Access publication on February 26, 2014 doi:10.1093/humrep/deu036

human reproduction

ORIGINAL ARTICLE *Reproductive endocrinology*

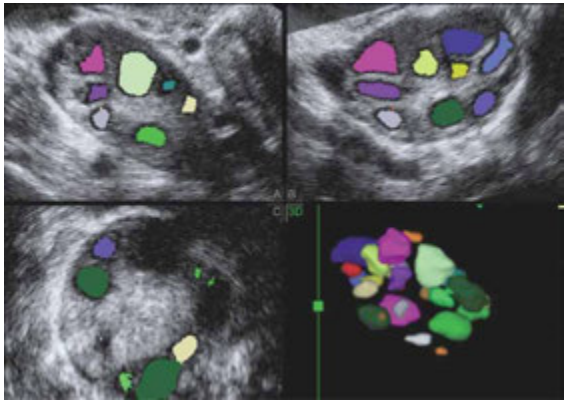
A single-centre evaluation of two new anti-Müllerian hormone assays and comparison with the current clinical standard assay

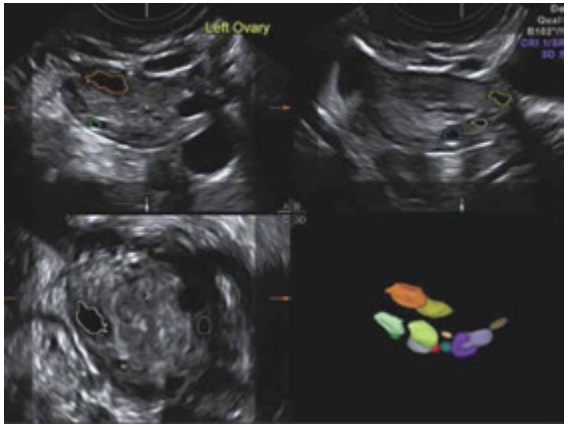
Paul Welsh[1,*], Karen Smith[2], and Scott M. Nelson[3]

„To definitely assess assay performance over time and lot-to-lot reliability for all manufacturers, an AMH international standard is urgently required”

Klinička primjena SonoAVC - AFC

- Mjerenje AFC-a metodom SonoAVC UVIJEK zahtijeva „postprocessing”
- Poluautomatski postupak
- Vrlo visoka reproducibilnost
  - Deb et al. Ultrasound Obstet Gynecol 2009





Klinička primjena SonoAVC - AFC

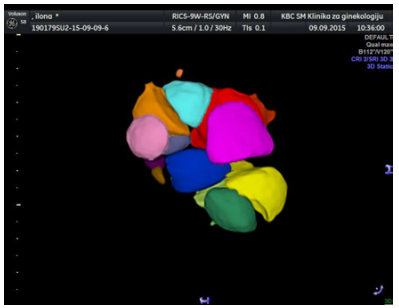
- Jayaprakasan et al. Fertil Steril 2010
  - 113 pacijentica – broj AF 2-6 mm korelirao je s brojem zrelih oocita
  - Broj AF > 6mm nije korelirao s brojem zrelih oocita
  - Broj AF 2-4mm – neovisni prediktor trudnoće
- Deb et al. Ultrasound Obstet Gynecol 2010
  - Srednje vrijeme za mjerenje AFC-a metodom SonoAVC u odnosu na 2D značajno manje (132.05±9.71 vs 324.47±162.22 s)
  - Ukupni AFC mjeren SonoAVC-om značajno manji u odnosu na 2D (17.16 vs 19.89)
- Pitanje vremena nije konzistentno
  - 2D-RTE – „Real-time equivalent examination”

Klinička primjena SonoAVC - AFC

- Deb S et al. Ultrasound Obstet Gynecol 2013
  - Mali antralni folikuli ≤ 6mm i AMH pokazuju minimalne intracikličke varijacije i možda se mogu mjeriti neovisno o fazi ciklusa u procjeni ovarijske rezerve

Klinička primjena SonoAVC – rast folikula

- Raine-Fenning et al. Reprod Biomed Online 2009
  - 89 pacijentica u postupku IVF
  - Folikuli podijeljeni u 3 grupe (>10, >14, >18) i mjereni s obje metode
  - Nije bilo statistički značajne razlike u broju folikula
- Ata B et al. Hum Reprod 2011
  - 100 pacijentica
  - Nije bilo ekskluzijskih kriterija
  - Srednja vrijednost zbroja folikula 14-17 i >18mm u obje metode manja od 1
  - Razlika u promjeru vodećeg folikula kod obje metode manja od 1mm
- Singh N et al. Int J Gynaecol Obstet. 2015



Klinička primjena SonoAVC – rast folikula

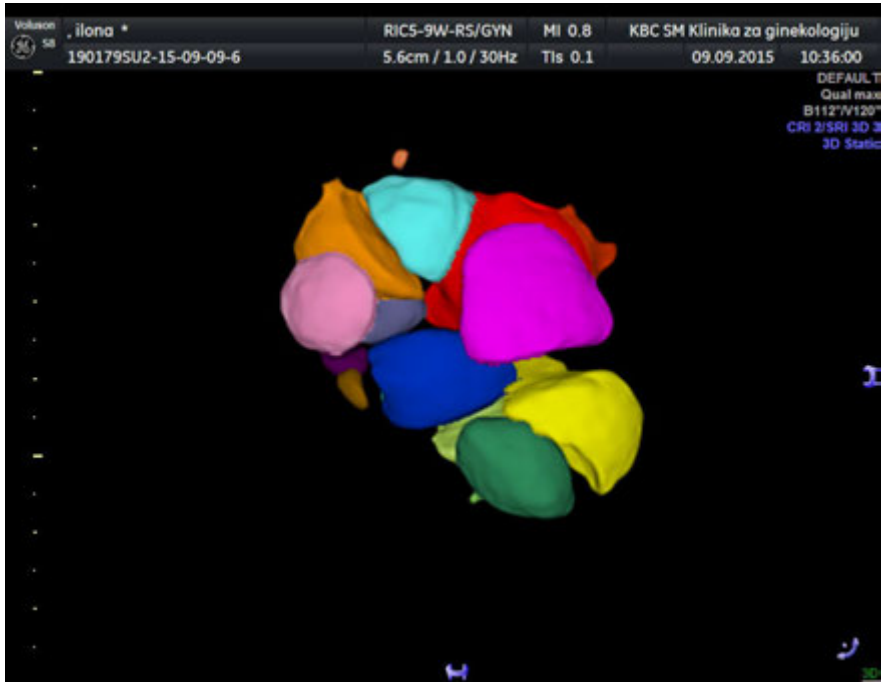
- Vrijeme mjerenja
  - Deutch TD et al. Fertil Steril 2009.
  - Raine-Fenning N et al. Fertil Steril 2009.
  - Rodriguez-Fuentes A et al. Fertil Steril 2010.
  - Upotreba SonoAVC skratila je vrijeme mjerenja
- Utjecaj kvalitete slike
  - Rodriguez-Fuentes A et al. Fertil Steril 2010.
  - Kvalitetna slika >90% folikula automatski prepoznato i izmjereno
  - 42% slika nije zadovoljilo kriterije

Klinička primjena SonoAVC – rast folikula

- Utjecaj na ishod postupka
  - Raine-Fenning N et al. Fertil Steril 2010.
  - RCT – 68 pacijentica u postupku COH
  - Broj zrelih oocita - 10.7 vs 11.4 (2D vs SonoAVC)
  - Stopa kliničke trudnoće – 42 % vs 43% (2D vs SonoAVC)
  - Nema značajne razlike
- Budući RCT – volumen folikula kao kriterij za hCG

Klinička primjena SonoAVC

- Prednosti u odnosu na 2D
  - Skraćivanje vremena pregleda
    - Ubrzanje mjerenja
    - Kraća nelagoda
  - Kontrola kvalitete
    - 2D RTE
    - SonoAVC
  - Telekonzultacije
- Nedostatci
  - Jako ovisi o kvaliteti 2D slike
  - Često zahtijeva naknadnu obradu
  - Ne utječe na ishod postupka



HVALA NA PAŽNJI