SIEMENS

siemens.co.in/healthcare

i-trendz

sharing imaging ideas and innovations

Issue 03 | April 2016

Index

Page 1: Foreword

Page 2: Technology advancements

Page 3: Isolated Ventriculomegaly

Page 4: Ischemic Ventriculitis

Page 4: Agenesis of Corpus Callosum with normal ventricle dimensions

Page 5: Dandy Walker Malformation with Hydrocephalus with Tethered Cord

Page 6: syngo® Auto OB

Page 7: syngo® Velocity Vector Imaging™

Page 8: Quiz #3

Foreword

Dear Clinicians,

Greetings! Welcome to the new issue of *i-trendz*, your platform to keep track of the latest clinical trends and developments in the field of medical imaging. The current issue highlights the most recent technological advancements in the field of obstetric ultrasound from Siemens; including transducer innovations yielding ultra-high resolution images of fetus, syngo® Auto OB for automated fetal biometrics and syngo® Velocity Vector Imaging™ (VVI) for functional imaging of fetal heart.

We would be discussing the advanced technologies and their clinical value addition in obstetric practice by presenting clinical case studies in the subsequent sections. We would like to convey our gratitude to Dr. Chander Lulla from Ria Clinic/Jaslok Hospital, Mumbai for sharing his clinical case inputs and invaluable experience with us.

We hope you have an insightful reading and look forward to hearing from you for improving and enriching this clinical platform further.

Clinical Marketing Team
Siemens Healthcare

Ultrasound Advancements in Obstetrics

Figure: Fetal Spinal Cord

Ultrasound being easily accessible, affordable, safe and real-time has been the predominant modality for assessing pregnancy related disorders and fetal well being. We have deployed multiple innovations in strengthening this modality, including very high frequency imaging up to 9 MHz, enhanced crystal architecture based High Definition transducer 8C3 HD and Multi-D Array Matrix transducer 9L4, that produce ultra-high resolution views of the fetus.

In addition, our patented Hanafy lens technology for near to far-field uniformity, micro-pinless probes for highest signal to noise, thirteen lines of sight based Advanced SieClear™ Spatial Compounding, and Clarify™ VE for better visualization of fetal heart borders; all contribute to further enrichment of each ultrasound image from the materno-fetal examination, assisting you in precise and accurate sonographic diagnoses.

The 8C3 HD, High Definition transducer, specially designed for dedicated obstetric applications, has been built with 384 ultrafine crystal elements (fine pitch) and a small footprint for excellent image quality & scanning performance. Fine pitch allows higher degree of compounding, increased detail resolution, improved speckle reduction and contrast resolution. The probe also features a fifty percent larger field of view of 105 degrees that provides wider anatomical visualization, e.g. full third trimester head, neck and spine region improving measurement accuracy and correlation. Our Multi-D array matrix probe 9L4 is a unique linear transducer built with 576 crystal elements that gives excellent view of fetus, with particular strength at high frequencies and shallow depths. This allows the clinician to make a judicious choice of transducer for targeted evaluation of anomalies.

syngo® Auto OB is the Siemens' proprietary technology for automated fetal biometrics. It utilizes an advanced pattern recognition algorithm, which has been trained on a large database of expert annotated ultrasound images to auto-measure major fetal structures required for biometry. The only input requirements to the application being the representative grey scale image and the parameter to be measured (BPD, HC, AC, or FL), enable potential time saving, keystroke reduction and enhanced efficiency in a busy clinic. Studies have shown comparable performance of Auto OB when compared to the manual methods, while reducing the key-strokes and potential fatigue injuries in the users.

syngo® Velocity Vector Imaging™ (VVI) is another innovative technology from Siemens, that can add a novel dimension of information to the study of developing fetal heart. It is based on ultrasonic speckle tracking which directly analyzes myocardial mechanics by integrating frame-to-frame changes, and computes parameters like myocardial velocity, strain, and strain rate, reflecting myocardial motion and deformation during systole and diastole. Earlier methods like Doppler tissue imaging were angle dependent, only assessing the areas of myocardium parallel to the angle of ultrasound beam and thus ineffective in moving fetus. This offers a unique opportunity to gain an unprecedented insight into regional and global heart function of developing fetus. Preliminary studies have demonstrated its potential as an adjunct tool for monitoring the fetal heart in normal & high-risk pregnancies and emerging clinical prospects in near future.

Figure: Fetal cerebellum

ACUSON S Family of Ultrasound Systems, HELX™ Evolution with Touch Control

The new ACUSON S Family™ of ultrasound systems, HELX™ Evolution with Touch Control are designed with a dedicated focus on the user experience. These new ultrasound systems are working to create new levels of workflow efficiency, imaging performance, and sustainability; powered by intuitive, user-focused technologies. They promote streamlined processes for improved exam quality with less effort. Utilizing latest ultrasound imaging technologies and diagnostic tools that expand the clinical capabilities, HELX™ Evolution with Touch Control delivers sharp, clear images so that you can make the first diagnosis the right one. From usability to technical compliance standards, Siemens has worked to ensure that the system one invests in today will be up-to-date and ready to integrate the most advanced technologies for years to come. This manages the costs without compromising the quality of care.

Case studies courtesy:

Dr. Chander Lulla
Ria Clinic/Jaslok Hospital, Mumbai
riadc@hotmail.com

Figure: High Definition B mode image showing dilated lateral ventricle

Case 1: Isolated Ventriculomegaly

A 30-year old primigravida was referred for a sonography for fetal well being assessment.

Real time ultrasound examination was performed on ACUSON S3000 system.

High resolution neurosonogram with 8C3 HD probe revealed moderately dilated lateral ventricles (1.5 cm and 1.4 cm, left and right resp.). The ventricular margins were normal and contents were clear. Corpus callosum was visualized completely to rule out dysgenesis. The cavum septum & cerebellum were normal. Fetal spine appeared normal. No other abnormalities were detected. A follow up fetal MRI was found to be consistent with isolated ventriculomegaly.

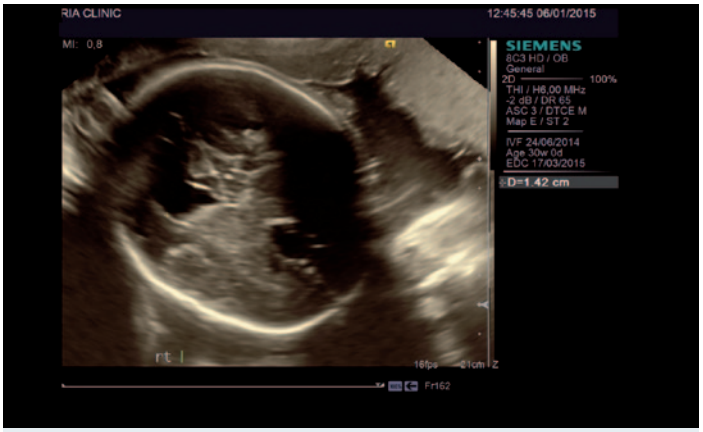


Figure: High Definition B mode image showing dilated right ventricle

Figure: High Definition B mode section of fetal brain - Normal appearing Corpus Callosum, visualized in entire course

Comments:

Ventriculomegaly is a sonographic sign common to several pathological entities with varied prognosis. Thus the identification of the cause & associated brain anomalies is very crucial clinically; as it guides parental counseling & reassurance regarding post-natal outcome. Here, 8C3 HD probe aided in obtaining an ultra-high resolution scan of the fetal brain structures with stellar details. Ventricular size, margins and contents were optimally assessed. Corpus callosum was visualized in its entire course which was important to rule out dysgenesis. Posterior fossa was also visualized to be normal.

Case 2: Ischemic Ventriculitis

A 28-year old woman, G4P2A1 was referred for anomaly scan, Doppler blood flow and gestational age assessment.

Real time ultrasound was performed showing a single live fetus in vertex presentation.

High resolution ultrasound of fetal brain revealed borderline ventriculomegaly with right lateral ventricle measuring 1.5 cm and the left lateral ventricle measuring 1.1 cm. Right ventricle occipital horn showed moderate level echoes with minimal septations. Lateral ventricular margins were echogenic. A small lucent focus ~0.9 x 0.4 cm was depicted in right basal ganglion suggestive of leukomalacic changes. No other abnormalities detected.

These abnormalities suggest post haemorrhagic/ischaemic. Sonographic fetal growth was less than LMP estimates suggesting probable IUGR/wrong dates. Amniocentesis for karyotyping & TORCH PCR as performed later were found to be normal. No maternal thrombocytopenia was identified. Fetal MRI confirmed a haemorrhagic/infarctive pathology.

Comments:

8C3 HD High Definition probe helped in ultra-high resolution visualization of fetal brain. The precise depiction of echogenic ventricular margins and septations inside the ventricular cavities proved valuable in reaching to the diagnosis.

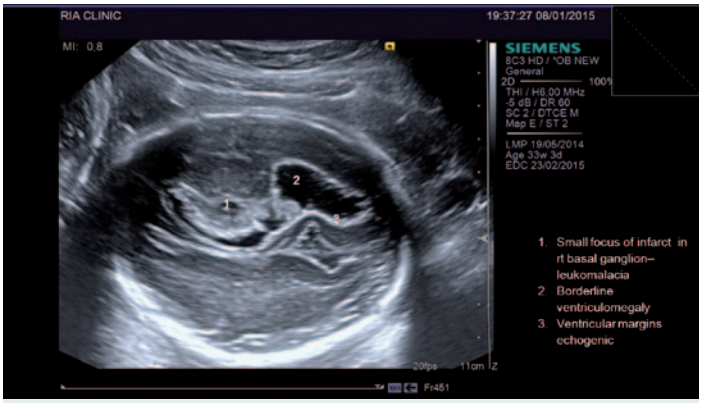


Figure: High Definition Scan with 8C3 HD showing dilated ventricles[2], echogenic margins[3] and a paraventricular leukomalacic focus[1]

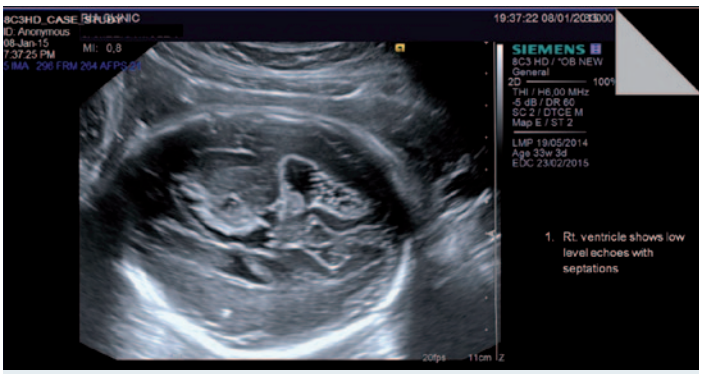


Figure: High Definition Scan with 8C3 HD showing moderate level echoes within ventricular cavities suggesting haemorrhage

Case 3: Agenesis of Corpus Callosum with normal ventricle dimensions

A 29-year old primigravida was referred for anomaly scan at 22 weeks of gestation.

Sonography was performed showing a single live fetus in breech presentation.

High Resolution fetal structural scan of CNS revealed frontal horns of lateral ventricles separated from the midline. The cavum septum was not visualized. Ventricles were shown to have tear drop appearances and were normal in calibre (no colcocephaly). These changes suggested agenesis of corpus callosum. No other abnormalities were detected.

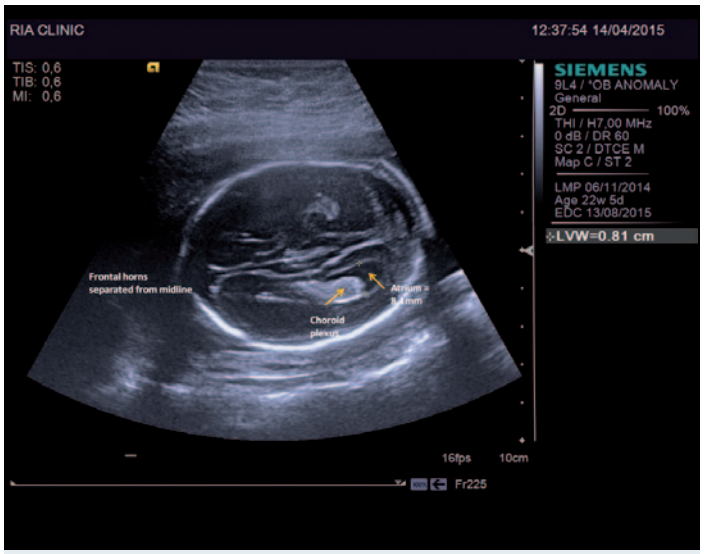


Figure: Neurosonogram showing widely spaced ventricles from midline

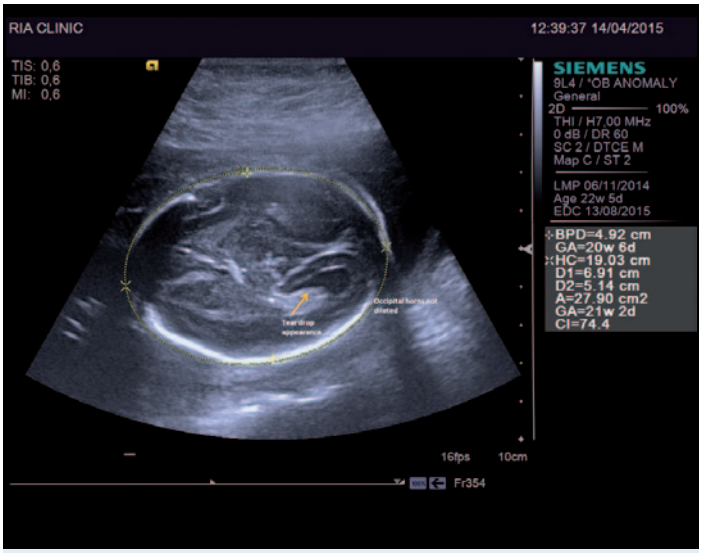


Figure: Tear drop appearance of lateral ventricles, ventricular dimensions WNL

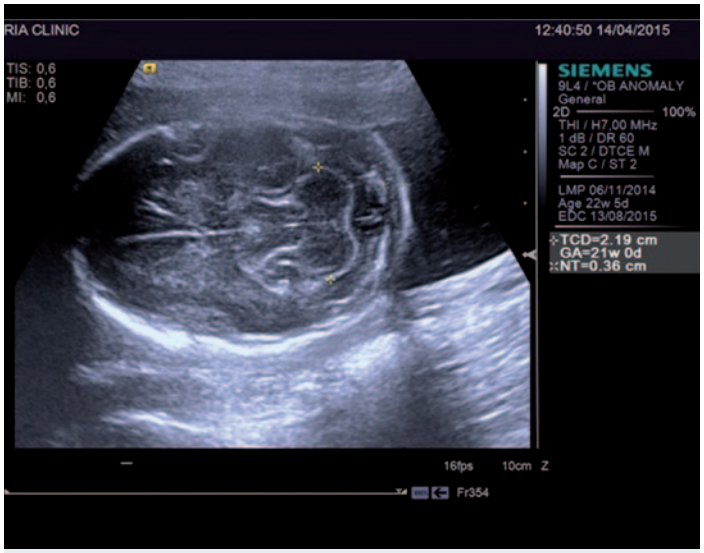


Figure: Normal cerebellar anatomy, vermis visualized

Comments:

High resolution ultrasound imaging with 9L4 transducer helped in adequate visualization of the fetal brain including widely spaced ventricles from the midline, absent cavum septum, normal cerebellum; and aided the prenatal diagnosis of dysgenesis of corpus callosum.

Case 4: Dandy Walker Malformation with Occipital Cephalocele with Tethered Cord

A 22-year old primigravida was referred for an antenatal anomaly scan at 18 weeks of gestation.

Real time sonography showed a single live fetus in vertex presentation.

High Resolution fetal structural scan revealed a gross fetal anomaly in form of hydrocephalus, with lateral ventricle measuring 1.1 cm. A large fluid filled space ~1.5 cm was visualized in the posterior cranial fossa (distended cistern magna) communicating with fourth ventricle. The cerebellum appeared small. The changes suggested Dandy Walker Malformation.

A large posterior occipital cephalocele was also detected with CSF contents measuring 2.4 x 2.3 cm. The spinal cord was inserted low suggesting tethering of the cord.

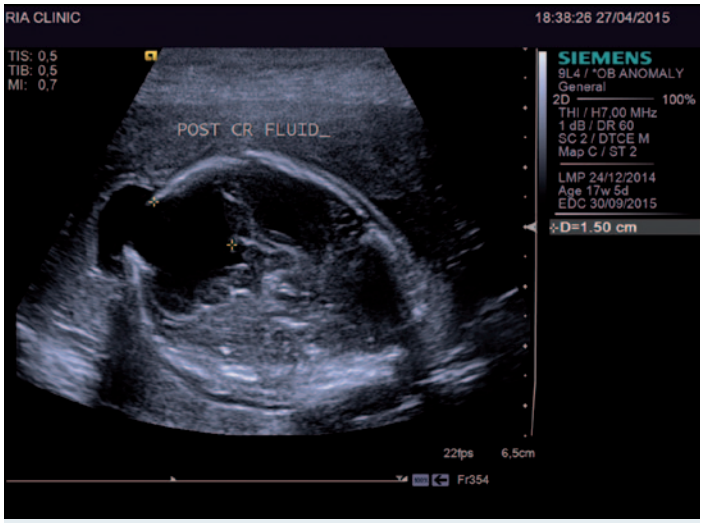


Figure: Enlarged posterior cranial fluid space with markedly atrophic cerebellum

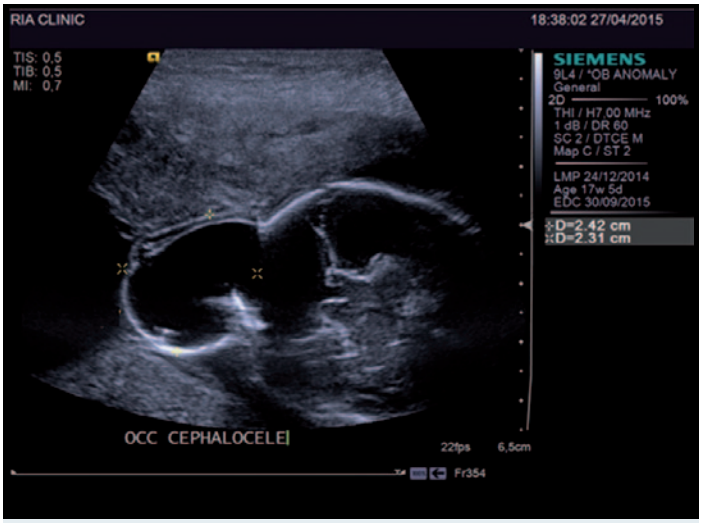


Figure: High Resolution scan with 9L4 probe showing an occipital cephalocele

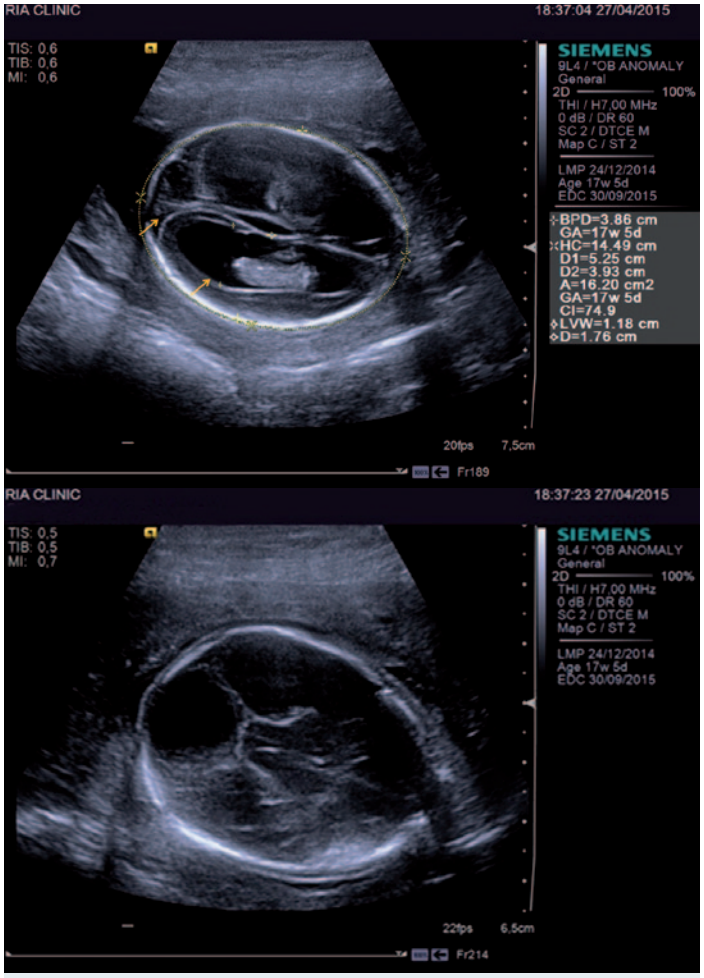


Figure: High Resolution neurosonogram with 9L4 probe

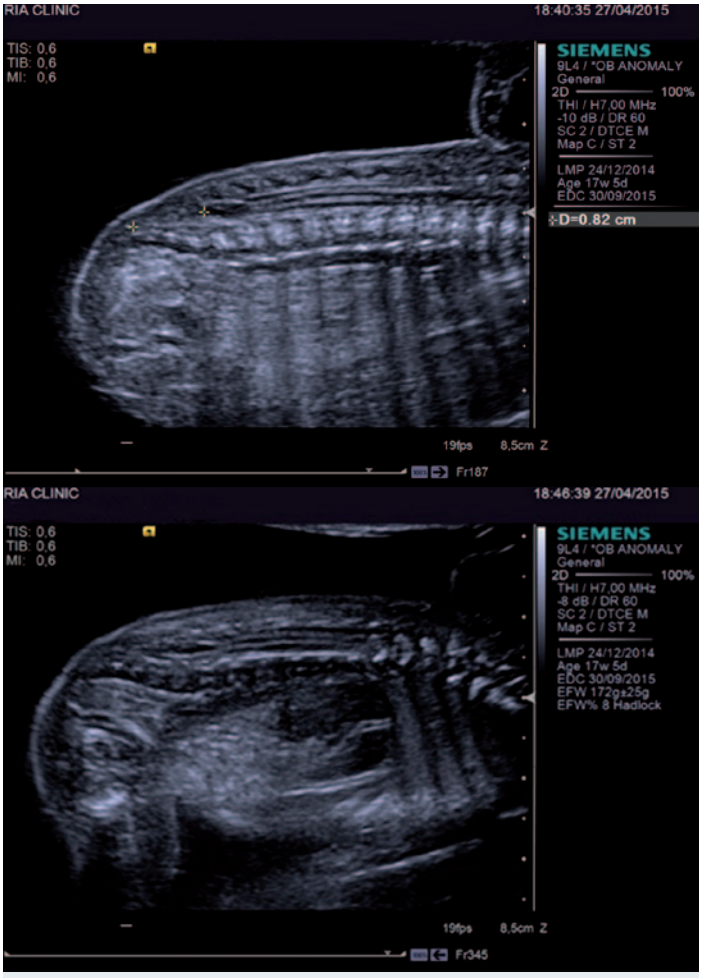


Figure: High Resolution scan of spine showing tethering of cord

Comments:

High resolution scan with 9L4 Multi-D array matrix probe provided stellar views of fetal brain and spine. Spinal cord and vertebral elements could be clearly depicted with low level of cord insertion (tethering).

syngo® Auto OB

Accurate assessment of gestational age via biometric measurements is important to determine the expected delivery date, assess size and monitor growth of a fetus. This includes head and abdominal circumference (HC and AC), femur and humerus length (FL and HL), crown rump length (CRL) and bi-parietal diameter (BPD).

Conventional approach involves the users to perform the entire measurement process manually on the ultrasound equipment, which is time consuming and amenable to intra- and inter-operator variations. Moreover, multiple keystrokes needed for each manual measurement increase the operator fatigue and the risk of repetitive strain injury (RSI).

syngo® Auto OB measurements, an exclusive tool developed by Siemens utilizes an advanced statistical pattern recognition algorithm, trained on more than 3,000 expert annotated clinical images, to identify the precise anatomical landmarks from the user selected section for accurate automated measurement of the biometric parameters at a click away.

syngo® Auto OB measurements work seamlessly with your routine obstetric workflow, so you can focus on other essential aspects of comprehensive obstetric examination.

Faster exams

- Work smarter not harder
- Accomplish higher productivity and patient throughput

Consistent results

- Add more confidence to your results and their clinical relevance
- Ensure reproducible results, minimizing intra and inter-operator variability

Ease of operation

- Minimize repetitive stress injury
- Achieve up to 75 % reduction in keystrokes

Versatile operation

Available on a wide product range from the premium end ACUSON S HELX™ Evolutions family (S1000, S2000, S3000) to ACUSON X family™ (X300PE, X600 and X700) and ACUSON NX3™ ultrasound systems.

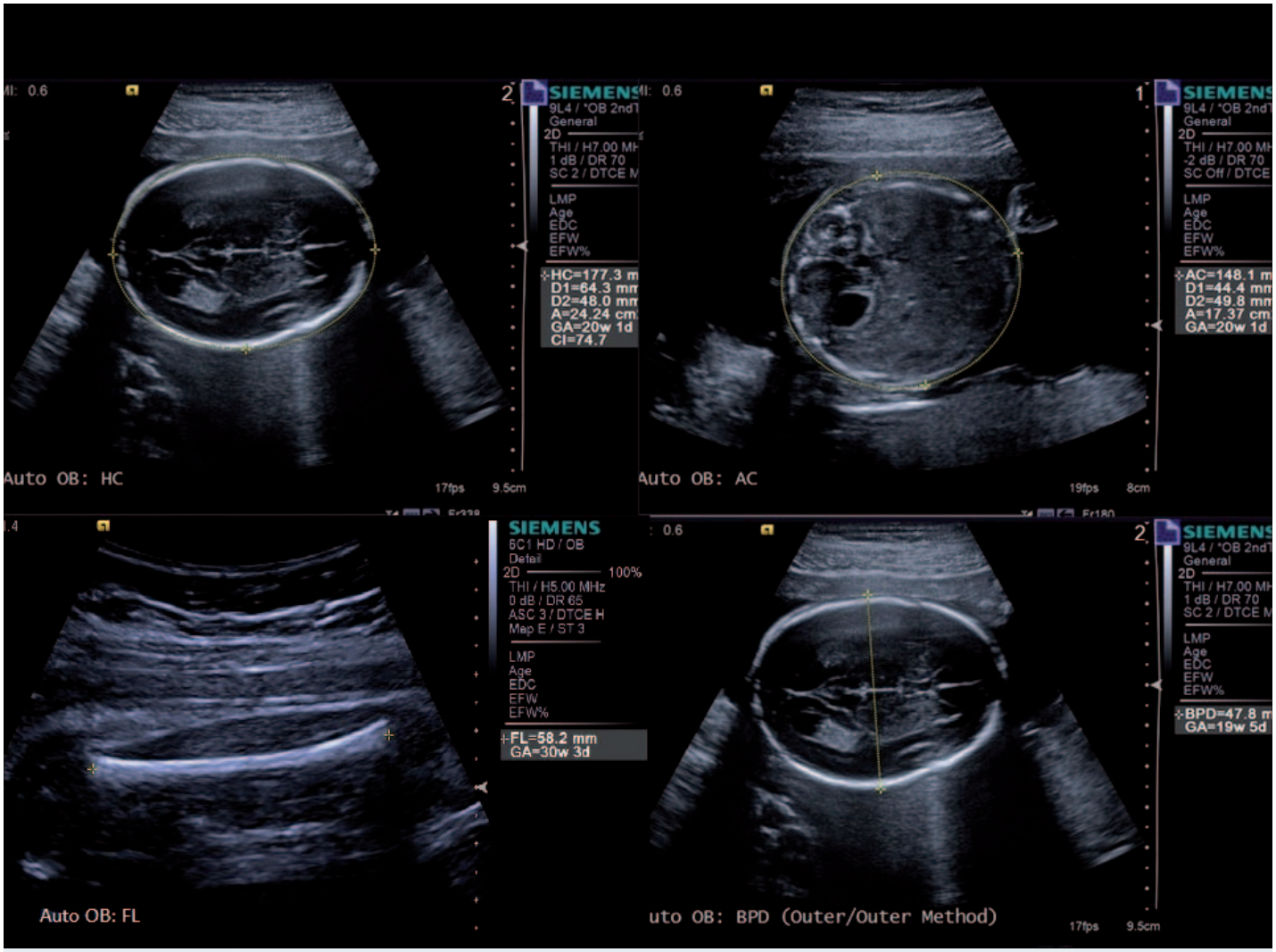


Figure: syngo® Auto OB based auto-measurements of biometric parameters

syngo® Velocity Vector Imaging™

syngo® Velocity Vector Imaging ™ (VVI) technology is a state-of-the-art technology that enables clinicians to examine the mechanical functions of the myocardium to determine possible myocardial dysfunctions such as dyssynchrony and fetal heart dysfunction. It uses individual vectors to display direction and relative velocity of frame-to-frame tissue movement, delivering motion measurement at any point in the cardiac cycle. This unique graphical presentation enables visualization, measurement and display of myocardial mechanics as never before.

Advanced Motion Assessment

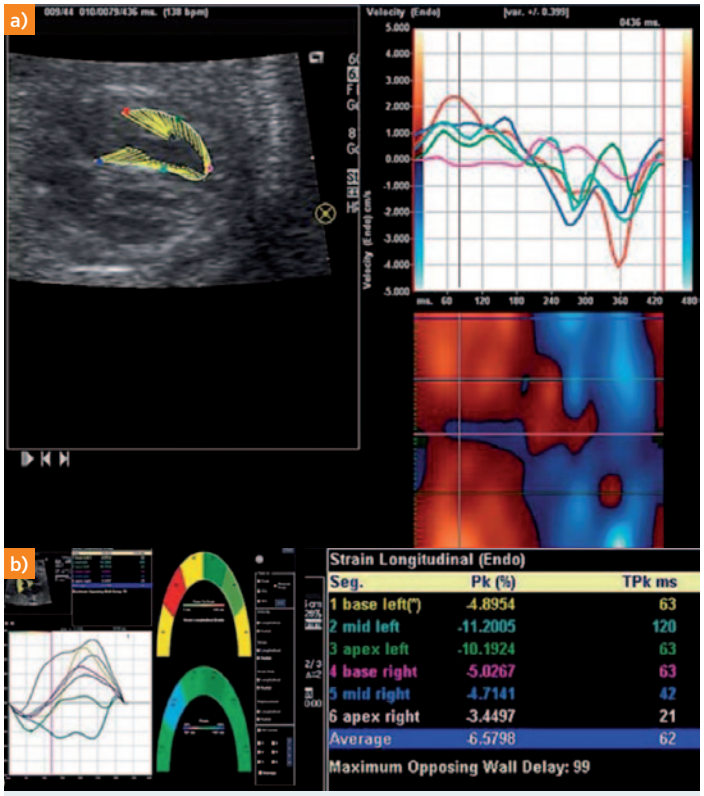
- Displays myocardial tissue motion, direction, rotation and relative velocity in the left ventricle, right ventricle, left and right atria and aortic root
- Utilizes high frame rates to deliver superior spatial and temporal resolution clarifying subtle wall motion abnormalities
- Displays trajectory mapping of the physical location of the traced region over the cardiac cycle
- Sophisticated 2D tracking algorithm provides accurate strain and strain rate calculations (longitudinal, circumferential, and radial) of myocardial mechanics
- Provides dynamic assessment of mechanical synchrony without the limitations of Doppler

Intuitive Visualization

- Enables simple and intuitive visualization through the use of moving vectors
- Provides graphical display of segmental and regional velocity information
- Aids identification of wall motion changes in serial studies of the same patient

Convenient and Versatile Operation

- Facilitates study of all heart chambers across all clinical applications from any angle and any transducer position
- Displays velocities for longitudinal, tangential and radial motion
- Available off the system on syngo® US Workplace 3.0
- Operates on DICOM clips from select Siemens and non-Siemens ultrasound systems



VVI Analysis in Fetal Heart:
a) Velocity Vector map of the right ventricle through the cardiac cycle
b) Longitudinal Strain values computed across different segments
The analysis indicates a likely myocardial motion abnormality in mid left segment, segment 2 (prolonged time to peak strain - 120ms)

Quiz #3

1. Siemens offers the following transducer technologies for obstetrics
   a. Hanafy Lens technology
   b. 8C3 HD, High Definition probe
   c. 9L4, Multi-D array matrix probe
   d. Micro-pinless probe connection
   e. All of the above
2. All of the following are true for syngo® Auto OB application, except
   a. it is a Siemens patented pattern recognition based application for automated fetal biometry
   b. its algorithm is trained on large database of expert annotated images
   c. it can auto-measure abdominal circumference
   d. it is available exclusively on ACUSON S family of systems
   e. it helps reduce operator fatigue and risk of repetitive stress injuries
3. All of the following are true except
   a. 8C3 HD is a special probe designed for obstetric imaging
   b. 8C3 HD has very fine crystal elements that yield high density of information, better compounding and speckle reduction
   c. 8C3 HD offers 105 degrees of field of view
   d. 9L4 has 384 crystal elements in the array matrix
   e. 8C3 HD features a slip resistant elastomeric surface and palmer grip design to reduce operator fatigue
4. syngo® VVI
   a. is a Siemens proprietary technology
   b. provides information on myocardial motion and deformation
   c. is angle independent analysis
   d. can be used in fetal echocardiography
   e. holds all of the above true

Please send your answers along with your contact details and the lucky winners will receive a special prize.
E-mail to **hc_contact.india@siemens.com**

Read further on Siemens Ultrasound:
http://www.healthcare.siemens.com/ultrasound#

If you have interesting cases to be shared, please e-mail us at hc_contact.india@siemens.com

Our next edition will be equally exciting with other modalities/ applications.

Technological innovations spur new clinical applications. This gives the medical community an edge in diagnosis and helps detect / treat diseases at an early stage. This in turn will help the society at large. These are the primary objectives with which we developed *i-trendz*. We would like to know how we can make this initiative more valuable for your practice and the wellbeing of patients.

Compiled by Clinical Marketing Team, Healthcare, Siemens Ltd., 130, P. B. Marg, Worli, Mumbai - 400 018.
Tel.: 91 22 3967 7000. Fax: 91 22 3967 7500. www.siemens.co.in/healthcare
For Business Enquiries: 1800-209-1800 Download *i-trendz* issues from siemens.co.in/healthcare