Advances in ultrasound imaging

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MREH
Instrumentation

- Ophthalmic
- General radiology
Transducer characteristics

- Single
- Phased array
Transducer characteristics

- **Single**
  - ‘Monolithic’
  - Emit beam in a fixed direction
  - Mechanically moved to sweep beam through tissue
  - 2 D Sector scan

- **Phased array**
  - Multiple elements
  - Pulsed individually at very high speed
  - Timed to produce a high speed sweep
  - 2 D sector, linear, curvilinear
Transducer arrays

- **Sector 4-10 MHz (Neonatal head, paed abdomen)**
  - Optic nerve
  - Orbit
  - Small footprint

- **Linear 6-14 MHz (breast, thyroid)**
  - Anterior segment
  - Retina/choroid detail
  - Vitreous
Multi Hertz arrays

- Linear array
  - 14 - 6MHz
Multi Hertz arrays

- Linear array
  - 14 - 6MHz
Multi Hertz arrays

- Linear array
  - Trapezoidal
Multi Hertz arrays

- Linear array
  - 14MHz

- Anterior segment
  - Focus beam anteriorly
  - Zoom
Multi Hertz arrays

- Linear array
  - 14MHz

- Vitreous
  - Focus beam
  - Time gain control
  - Kinetic
Multi Hertz arrays

- Sector array
  - 10-4 MHz

- Orbit
  - Reduce MHz
Spatial compounding

- This technology sub-divides the receive aperture into two smaller overlapping apertures in order to provide *some speckle reduction* and *boundary enhancement*.
- Increases contrast, resolution and border detection
- Improves differentiation of subtle lesions
- Maintains subtle clinical markers – e.g. posterior acoustic enhancement and acoustic shadowing
Spatial compounding

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4 D ultrasound

- 3 D - image reconstructed from 2D
- 4D – real time 3D
4D ophthalmic ultrasound
4 D ophthalmic ultrasound

Future uses...

- Topographical information
- Volume measurements
- Monitoring of suspicious/treated lesions
Thank you

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