Vascular Dual Energy

DENNIS FOLEY
MEDICAL COLLEGE
WISCONSIN
Dual Source Dual Energy

- **SPECTRAL SEPARATION**
  - DUAL TUBE TECHNOLOGY WITH DIFFERENTIAL BEAM FILTRATION

- **DIFFERENTIAL TUBE CURRENT**
  - LOW / HIGH KVP TUBE DETECTOR COMBINATION
Single Source Dual Energy

- **FULL DFOV**
- **< 5 MS TEMPORAL REGISTRATION**
  - MATERIAL DECOMPOSITION IN PROJECTION SPACE
  - MONOCHROMATIC IMAGES WITH BEAM HARDENING CORRECTION
  - QUANTITATIVE MATERIAL DENSITY IMAGES
CT Angiography

*SINGLE VS DUAL ENERGY (DE)*

- CONTRAST SENSITIVITY
- DOSE REDUCTION
- CALCIUM AND BONE REMOVAL
Dual Energy CTA

**DOSE REDUCTION**

- REPLACEMENT OF PRE CONTRAST IMAGES WITH VIRTUAL NON CONTRAST (VNC) IMAGES

- RADIATION DOSE OF DE POST CONTRAST ACQUISITION EQUIVALENT TO 120 KVP SE PRE AND POST CONTRAST ACQUISITION
Dual Energy CTA

**CONTRAST SENSITIVITY**

- SINGLE SOURCE DUAL ENERGY CT WITH MONOCHROMATIC DISPLAY
- SCALES SENSITIVITY TO Kev

70Kev MONOCHROMATIC IMAGE INCREASES IODINE ATT BY 25% ~

77 Kev POLYCHROMATIC IMAGE (120 Kvp)
Dual Energy CTA

**CONTRAST SENSITIVITY**
- 25% IMPROVEMENT

**CONTRAST LOAD**
- 25% REDUCTION
Dual Energy CTA

Aorta

- **THORACO ABDOMINAL AORTA**
  - ANEURYSM
  - B DISSECTION

- **AORTO ILIAC**
  - AAA
  - STENT GRAFT
VIRTUAL NON CONTRAST VNC
SINGLE SOURCE DUAL ENERGY
MONOCHROMATIC 70 KEV

CONTRAST VOLUME
75 ML ISOVUE 370
POLYCHROMATIC 120 KVP

AORTIC ATTENUATION 450 HU

Patient ID: 00104108
Exam Description: CT ANGIO CHEST W PPI

Dose Report

<table>
<thead>
<tr>
<th>Series</th>
<th>Type</th>
<th>Scan Range (mm)</th>
<th>CTDIvol (mGy)</th>
<th>DLP (mGy·cm)</th>
<th>Phantom cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Scout</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Helical</td>
<td>130.250–1270.250</td>
<td>12.07</td>
<td>367.89</td>
<td>Body 32</td>
</tr>
<tr>
<td>3</td>
<td>Axial</td>
<td>1105.000–1105.000</td>
<td>54.15</td>
<td>27.07</td>
<td>Body 32</td>
</tr>
<tr>
<td>4</td>
<td>Axial</td>
<td>1605.750–1605.750</td>
<td>50.54</td>
<td>25.27</td>
<td>Body 32</td>
</tr>
<tr>
<td>5</td>
<td>Helical</td>
<td>54.750–1622.750</td>
<td>23.31</td>
<td>1558.75</td>
<td>Body 32</td>
</tr>
</tbody>
</table>

Total Exam DLP: 1978.98

CONTRAST VOLUME

130 ML ISOVUE 370
SINGLE SOURCE DUAL ENERGY

AORTIC ATTENUATION 550 HU

Patient ID: 00104108
Exam Description: CT ANGIO CHEST W PPI

<table>
<thead>
<tr>
<th>Series</th>
<th>Type</th>
<th>Scan Range (mm)</th>
<th>CTDIvol (mGy)</th>
<th>DLP (mGy·cm)</th>
<th>Phantom cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Scout</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Helical</td>
<td>14.750–1214.750</td>
<td>10.87</td>
<td>298.52</td>
<td>Body 32</td>
</tr>
<tr>
<td>3</td>
<td>Axial</td>
<td>189.750–189.750</td>
<td>46.93</td>
<td>23.46</td>
<td>Body 32</td>
</tr>
<tr>
<td>4</td>
<td>Axial</td>
<td>1580.000–1580.000</td>
<td>68.59</td>
<td>34.29</td>
<td>Body 32</td>
</tr>
<tr>
<td>5</td>
<td>Helical</td>
<td>836.500–1598.500</td>
<td>25.53</td>
<td>1738.69</td>
<td>Body 32</td>
</tr>
</tbody>
</table>

Total Exam DLP: 2094.97

CONTRAST VOLUME
130 ML ISOVUE 370
DUAL ENERGY

TYPE 1 ENDOLEAK
RUPTURED SUB RENAL AAA
Dual Energy CTA

**CALCIUM AND BONE REMOVAL**

- CAROTID AND LOWER EXTREMITY CTA
  - CALCIFIED PLAQUE REMOVAL FOR STENOSIS SIZING
  - BONE REMOVAL (SKULL BASE, EXTREMITIES)
    - COMPARISON TO CONVENTIONAL CTA WITH CURVED PLANAR REFORMATION
Dual Energy CTA
Carotid

- **CAROTID ARTERY STENOSIS**
  - CALCIUM REMOVAL
    - IODINE – CALCIUM MD IMAGE
    - CURVED PLANAR REFORMATION
Dual Energy CTA Extremity

- **STENO OCCLUSIVE DISEASE**
  - CONTRAST SENSITIVITY
    - IODINE MINUS WATER
  - CALCIUM REMOVAL
    - IODINE - CALCIUM MD IMAGE
  - STENOSIS SIZING
    - CURVED PLANAR REFORMATION
AORTA LT LE 70 KEV

AORTA LT LE IODINE MINUS WATER
Vascular Dual Energy

- CONTRAST SENSITIVITY
- RADIATION DOSE
- STENOSIS SIZING
  - CALCIFIED PLAQUE