Dual-Energy Computed Tomography for the Evaluation of Gout and Calcium Crystal Deposits

**Objectives**

1. To describe the clinical performance of dual-energy CT (DECT) in the detection of uric acid and calcium crystal deposition.
2. To describe the clinical application of this technique and its potential in patients with idiopathic inflammatory arthropathies.
3. To describe the outcome of patients imaged with this technique.

**Background**

- Determination of articular crystals within joints remains the gold standard for the diagnosis of gout.
- At times, clinicians cannot be sure whether uric acid crystals can be detected, as the technique is operator dependent.
- Diagnostic accuracy may be limited, as different techniques have similar capabilities when compared to the gold standard.
- Brewery awakens may not be visible, and even then, may be difficult to distinguish from other soft tissue densities.

**Protocol**

- 55 DECT scans were performed on 54 patients.
- Diagnostic accuracy may be limited, as clinicians base the diagnosis on clinical findings only and do not rely on additional imaging modalities.

**Protocols**

- **Uric Acid**
  - Color-coded as green, corresponding to a high density of uric acid.
  - High density uric acid is typically found in crystals in tophaceous gout.
  - This can be useful for procedures, as it has a small field of view, is operator dependent, and cannot accurately diagnose, monitor progression, or treatment response.

**Patient Examples**

- **Positive Case - #1**
  - Uric acid deposition within the skin's surface.
  - 3D reconstruction clearly conveys uric acid quantity and distribution.

- **Positive Case - #2**
  - Uric acid deposition about multiple joints, as depicted in a green color-coded rendering.
  - The distribution of uric acid is accurately diagnosed, allowing for the differentiation of gout from other inflammatory arthropathies.

- **Negative Case - #1**
  - A negative radiograph (left) and only subtle uric acid deposition seen on DECT (right) in a patient with less severe symptoms.

**Results**

- 26/54 subjects had DECT positive for uric acid.
- Compared with final clinical diagnosis:
  - No False Positives
  - No False Negatives

**Conclusions**

- DECT remains superior in demonstrating uric acid deposits.
- Differentiating gout from other inflammatory arthropathies.
- Determining the distribution of uric acid in multiple joints.
- Monitoring therapy response and disease burden in tophaceous gout.
- Further studies are required to determine the sensitivity and specificity of the technique and the development of a diagnostic algorithm.

- Limited clinical availability will likely continue to limit the use of DECT for routine multidetector CT imaging.
- DECT may become a valuable tool in the diagnosis and management of gout and other inflammatory arthropathies.

**References**

7. Schlesinger N, Baker DG, Schumacher HR Jr. Serum uric acid levels. Bony alterations occur in 45% of patients with gout.