Pitting Edema Assessment

Definition

- Pitting edema results from pressure applied over edematous subcutaneous tissue, resulting in a depressed area caused by the displacement of interstitial fluid

Techniques

1. **Clinical Assessment**
    a. Press firmly with your thumb for at least 2 seconds on each extremity
        i. Over the dorsum of the foot
        ii. Behind the medial malleolus
        iii. Lower calf above the medial malleolus
    b. Record indention recovery time in seconds
        - Scoring system
            - No clinical edema = 0
            - ≤ 2 mm indentation = 1+ edema
                - Slight pitting
                - No visual distortion
                - Disappears rapidly
            - 2-4 mm indentation = 2+ edema
                - Somewhat deeper pitting
                - No readably detectable distortion
                - Disappears in 10-15 seconds
            - 4-6 mm indentation = 3+ edema
                - Pit is noticeably deep
                - May last > 1 minutes
                - Dependent extremity looks fuller & swollen
            - 6-8 mm indentation = 4+ edema
                - Pit is very deep
                - Last as long as 2-5 minutes
                - Dependent extremity is grossly distorted

2. **Ankle Circumference** (helpful in presence of unilateral edema; bilateral difference of > 1 cm just above the ankle, in normal healthy people, indicates edema)
    a. Measure, in centimeters, the circumference of the ankle at the midpoint of the medial malleolus

3. **Water Displacement**
    a. Fill foot volumeter with water until water rushes out of the spout
    b. Place the patients foot in the volumeter
    c. Measure the amount of water displaced in mL (equals the foot's volume)

Causes

- Increased hydrostatic pressure (heart failure)
- Increased vascular permeability (inflammation)
- Decreased colloid osmotic pressure, due to reduce plasma albumin
    - Increased loss (nephrotic syndrome)
    - Decreased synthesis (liver disease, protein malnutrition)
- Lymphatic obstruction (inflammation or neoplasia)
- Sodium retention (renal failure)

Pearls

- Water displacement and ankle measurement more reliable methods
- Clinical assessment highly variable due to its subjective nature
- Bed-bound supine patients the interstitial fluid accumulates at the sacrum
- Assess how far up the body the edema goes (1+ pitting edema on the chest wall may be more significant than 3+ pretibial pitting edema)
- The indention recovery time (how long it takes for the indention to refill) can be helpful in determining diagnosis
    - There is a direct relation between the serum albumin concentration and the indention recovery time (hypoalbuminemic edema recover time is < 40 seconds)
- Focus assessment on: symmetry of swelling, pain, edema change with dependence, skin findings (hyperpigmentation, stasis dermatitis, lipodermatosclerosis, atrophie blanche, ulcerations), and history of venous thromboembolism

References

1. Bickley LS et al. Bates' Guide to Physical Examination and History Taking. 11th ed. Philadelphia, PA: Lippincott Williams & Wilkins. 2013;505-6.
2. Brodovicz KG, McNaughton K, Uemura N, et al. Reliability and feasibility of methods to quantitatively assess peripheral edema. Clin Med Res. 2009;7:21-31.
3. Kumar V et al. Robbins Basic Pathology. 9th ed. Philadelphia, PA: Elsevier Saunders. 2013;78
4. Orient, JM. Sapira's Art and Science of Bedside Diagnosis. 4th ed. Philadelphia, PA: Lippincott Williams & Wilkins. 2010;483-5