Edema

Definition:
- A local or generalized condition in which the body tissues contain an excessive amount of tissue fluid. (Taber’s Medical Dictionary)

Etiology:
- May result from:
  - Increased permeability of the capillary walls
  - Increased capillary pressure due to venous obstruction or heart failure
  - Lymphatic obstruction
  - Disturbances in renal functioning
  - Chemical substances such as bacterial toxins, venoms, caustic substances, histamine
  - What else?
Edema

- Lymphatic and Venous System
  - “the fluid and transport systems in the body”

Edema

- **Pathophysiology**
  - Accumulation of excess fluids in the spaces between the cells of tissues (interstitial spaces)

- **Examples**
  - Accumulation of fluid in the interstitial spaces of the lungs =
  - Excessive fluid in the abdominal cavities =
  - Fluid accumulation in the feet and lower extremities =

Pitting & Non-Pitting

- Edema found in the periphery can be pitting or non-pitting
- A thumb if pressed into the edematous area and then removed
  - **Pitting** – a visible indentation remains for a period of time
  - **Non-pitting** – the area does not remain indented once pressure is removed
Pitting Edema continued

**Causes**
- Heart disease, kidney disease, liver disease, chronic venous insufficiency, DVT

**Scale**

<table>
<thead>
<tr>
<th>Descriptor</th>
<th>Description &amp; Rebound Time</th>
</tr>
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<tbody>
<tr>
<td>Trace (1+)</td>
<td>Barely perceptible indent, skin rebounds quickly</td>
</tr>
<tr>
<td>Mild (2+)</td>
<td>Easily identifiable indent, skin rebounds in &lt; 15 sec</td>
</tr>
<tr>
<td>Moderate (3+)</td>
<td>Easily identifiable indent, skin rebounds in 15-30 sec</td>
</tr>
<tr>
<td>Severe (4+)</td>
<td>Easily identifiable indent, skin rebounds in &gt; 30 sec</td>
</tr>
</tbody>
</table>

**Edema**

**Localized**
- Tends to be limited to one area of the body
  - May be bilateral
  - May be the result of trauma, infection or obstruction
  - Venous or lymphatic obstruction
  - Increased vascular permeability

**Generalized**
- Systemic process that occurs with chronic illnesses
  - Advanced cardiac disease
  - Kidney failure
  - Liver disease
- Usually apparent in both LE, groin and abdomen
  - May exhibit whole body edema
Edema

- **Generalized**
  - Congestive heart failure
  - Retention of both sodium and water
  - Spreads from the distal LE and spreads proximally

Edema

- **Lymphatic**
  - Plasma proteins in the tissues stagnate and a mechanical insufficiency of lymph drainage

Lymphedema

- **Lymphatic System**
  - Removes excess proteins that have escaped from blood vessels returning it to the blood
  - Main lymph ducts
  - Removes waste excreted from body tissue
  - Fluid contains phagocytes and lymphocytes
    - Both trap and destroy invading cells
Lymphedema

**Lymphatic Considerations**
- Without phagocytosis and lymphocytes
  - The individual is susceptible to infection
  - The immune system is compromised
  - Extreme vulnerability to disease

**Characteristics of Lymphedema**
- Pitting edema
  - Due to accumulation of thick proteins in interstitial space
  - Returns to pre-pit within 30 seconds
- Turgor
  - Tone of edematous tissue
  - Hard = more chronic

**Characteristics of Lymphedema**
- Hard turgor (chronic)
  - Contributes to loss of ROM
  - Loss of function
  - Sensory impairment
  - Pain
Edema

- A symptom, not a disease!
  - It is a safety valve to displace fluids into the interstitial space rather than overloading the heart
  - Treating its cause can alleviate the problem

Edema

- Edema becomes apparent when the interstitial fluid has reached a level at least 30% above normal

Signs & Symptoms of Edema

- Acute Edema
  - Rapid onset after known injury
  - Redness
  - Warmth
  - Painful to palpation or movement
  - Localized
Signs & Symptoms of Edema

- **Chronic Edema**
  - Hard turgor
  - Skin changes
    - Loss of hair growth
    - Loss of normal skin creases
    - Loss of tissue elasticity

- **Venous Edema**
  - Slowly progressive
  - Moderate warmth
  - Dusky color or brownish staining of skin
  - Achy pain as day progresses
  - Normal contours of leg are lost

- **Lymphatic**
  - Slowly progressive
  - Mild warmth
  - Color changes are rare
  - Usually painless
  - Sensation of fullness or heaviness in limb
  - Soft & pitting or hard
  - Asymmetrical in comparison of limbs
Edema Assessment

Key Components

- Infection
  - Assess with a skin thermometer
  - Compare affected and unaffected sides
  - Comparisons must be performed at room temperature
  - Note pre-existing conditions that may affect skin temperature

- Circumferential measurements
  - Must be taken at designated landmarks
  - Taken at the same time of day
    - With the same tool
    - By the same person
  - Compare affected and unaffected sides

- Range of Motion and Muscle Testing
  - Assess baseline function of involved limb
  - Note if any limitations are due to pre-existing conditions
  - Note if limitations are due to excessive weight or edema of body part
Edema Assessment

Key Components

- **Neurologic Assessment**
  - Assess sensation including:
    - Hot/cold
    - Sharp/dull
    - Localization
    - Light touch

- **Neurological Assessment**
  - Check reflexes
  - Look for:
    - Muscle wasting
    - Changes in hair growth
    - Patterns of skin
    - Skin texture

- **Assess Tissue Quality**
  - Check for color, temperature, wounds, rashes, and texture changes
  - Palpate for sensitive areas, changes in muscle bulk, tissue resistance, temperature changes
Edema Assessment

- **Key Components**
  - **Photograph**
    - Take a pre-treatment photograph of affected and unaffected body parts

- **Conditions that may Skew Circumferential Measurements**
  - Use of a diuretic
  - 10 pound weight gain or loss
  - Additional medical problems
  - Change in treatment regimen

Edema Management

- Patient education is critical to success
- Patient compliance is critical to success
- Duration of treatment may consist of many months for lymphedema
Edema Management

- **RICE**
  - Intervention of choice in the first 24-72 hours after injury
  - Rest
  - Ice
  - Compression
  - Elevation

Edema Management

- **Massage**
  - Assistance in lymphatic return
  - Psychological benefits
  - Natural enhancement of the movement of fluid

Edema Management

- **Retrograde massage**
  - Not for lymphedema management
  - Clear proximal areas before distal areas
  - Should be comfortable and relaxing for the patient
Edema Management

- **Retrograde Massage**
  - Time consuming
  - One on one therapy

- **Lymphatic Massage (as part of CDT)**
  - 20-30 mmHg of pressure
  - More may block lymphatic vessels

Edema Management

- **Exercise**
  - Enhances venous & lymphatic flow
  - Can do exercise in combination with compression
    - Isometric exercise during intermittent compression pumping
    - Walking with compressive bandage on LE
  - Elevating the limb during exercise enhances edema reduction
Edema Management

- **Exercise**
  - Aerobic exercises often prescribed for patients with edema
  - Aquatic exercise beneficial for patients with LE edema & a stable CV system
    - Be aware of excessive warmth

- **Non-mechanical Compression**
  - Required to maintain benefits of edema reduction level
    - Compression bandaging
    - Compression garments

- **Compression Bandaging**
  - **Short stretch**: provides low pressure @ rest & high pressure when limb is moving
  - **Long stretch**: provides high pressure @ rest & low pressure when limb is moving
  - Short stretch is preferred to reduce edema b/c they provide a better pumping effect in combo with the patient's muscle when they move
  - Long stretch bandages should always be removed at night
Edema Management

- **Contraindications** for bandaging
  - Active infection
  - Recent thrombophlebitis
  - Pulmonary embolus
  - CHF

- **Precautions**
  - Arterial disease
  - DM
  - Decreased sensation
  - Metastatic disease

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Edema Management

- **Compression Garments**
  - Used to MAINTAIN a limb size & prevent re-accumulation of fluid during the day when the limb is dependent
  - Cannot be expected to reduce a chronic edema
  - They provide gradient pressure to the limb
  - Off-the-shelf sizes or custom made

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Edema Management

- **Compression Garments** continued
  - **Contraindications**
    - Acute thrombophlebitis/infection
    - Cardiac edema
    - Acute vascular blockages
  - **Precautions**
    - Active cancer
    - Decreased sensation
    - Arterial compromise
Edema Management

- **Mechanical Compression Devices**
  - **Pneumatic Pump**
    - Most commonly filled with air, otherwise water
    - Fills in a sequential or non-sequential pattern
    - (One chamber or many chambers)
    - If sequential, then fills distal to proximal
    - Parameters commonly controlled by PT/PTAs include:
      - Inflation pressure
      - On-time/off-time cycle
      - Total treatment time

- **Inflation pressures**
  - Set pressure below patient's diastolic BP to avoid occluding the arteries
  - Recommend 30-60 mmHg for UE
  - Recommend 40-80 mmHg for LE

- **On-time/Off-time cycle**
  - No research
  - Unable to adjust this on some devices

- **Total treatment time**
  - 30 minutes up to 6-8 hours

- **Intermittent pressure can**
  - Facilitate edema reduction
  - Normalize tissue texture
  - Increase patient comfort
Edema Management

- Mechanical Compression Devices
  - Intermittent pressure
    - Apply an orthopedic stockinette
    - Then the appliance
    - Patients may need to urinate frequently
      - This is to be expected

- Contraindications
  - Patients with:
    - Active infection
    - Long standing, hard, unremitting edema
    - Cardiac disease (CHF)
    - Altered cognitive status
    - Active malignancies
    - Unstable fractures
    - Recent thrombophlebitis
    - Pulmonary embol

- Follow with compression garments to maintain reduction
- May require lifelong monitoring
Edema Management

- **Electrical Stimulation**
  - #1. Can achieve rhythmic contraction of muscles in an area of localized edema, enhancing the musculoskeletal pump
  - #2. Used below the threshold to elicit muscle contraction can be used to repel proteins
    - Most easily used for hand edema

Edema Management

- **Reduction in Edema**
  - Increases the patient’s mobility
  - Softens soft tissue
  - Improves skin integrity
  - Generally makes the patient feel more comfortable

Wrap Up

- Share one new thing you learned today with the class (make sure everyone can hear you)
- Call on the next classmate to do the same
- You MAY NOT repeat what someone has already said
Recap of Lecture

- Definition of Edema
- S&S of edema
- Management of Edema
  - RICE
  - Massage
  - Exercise
  - Non-mechanical compression
  - Mechanical Compression device
  - E-slim

References