

# Edema

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# Types of edema

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- Dependent bilateral edema (usually “pitting”)
- Lymphedema
- Localized edema
- Myxedema

# Pitting dependent edema: causes

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- Decreased serum protein
- Increased systemic venous pressure
- Capillary edema (increased permeability)

# Edema due to hypoalbuminemia: common causes

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- Impaired protein synthesis
  - Decreased protein intake: starvation, kwashiorkor
  - Decreased absorption of proteins: malabsorption
  - Impaired hepatic synthesis due to liver disease
- Increased loss of protein
  - Skin loss: burns, weeping skin diseases
  - Urinary loss: nephrotic syndrome
  - Fecal loss: bowel disease

# Edema due to ↑ venous pressure: common causes

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- Systemic venous hypertension
  - Congestive heart failure
  - Pericardial diseases, tricuspid valve disease
- Regional venous hypertension
  - Inferior vena cava syndrome
  - Venous thrombosis
  - Lower extremity venous insufficiency

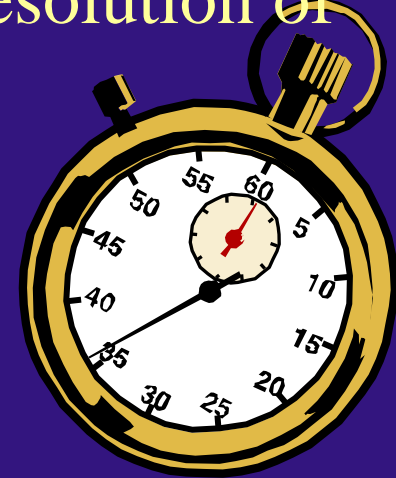
# Edema due to ↑ capillary permeability

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- Vasculitis
- Idiopathic cyclic edema of women
  - Varies with menstrual cycle
- Post-anoxic encephalopathy

# Pitting recovery time

- Technique:
  - Press firmly to bone
  - Shine light and determine time to resolution of shadow
- Interpretation
  - Acute edema (< 3 months)
  - < 40 seconds associated with low serum albumin



# Rapid pitting recovery: < 40 seconds

- ↓ protein synthesis
  - ↓ protein intake: dietary history
  - ↓ absorption of proteins: diarrhea
  - ↓ hepatic synthesis due to liver disease:
    - **History: alcohol, other hepatotoxins, hepatitis**
    - **Physical findings: spider angiomas**
- ↑ loss of protein
  - Skin loss: skin lesions such as burns, ulcers
  - Urinary loss: *foamy* urine with high protein
  - Fecal loss: diarrhea, sticky, oily stools



# Edema with rapid pitting recovery: evaluation of etiology

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- Impaired protein synthesis
  - ↓ protein intake: starvation, kwashiorkor
  - ↓ absorption of proteins: malabsorption
  - ↓ hepatic synthesis due to liver disease
- Increased loss of protein
  - Skin loss: burns, weeping skin diseases
  - Urinary loss: nephrotic syndrome
  - Fecal loss: bowel disease

# Slow pitting time (> 40 seconds) normoalbuminemic edema

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- Systemic venous hypertension
  - Congestive heart failure
  - Pericardial diseases, tricuspid valve disease
- Regional venous hypertension
  - Inferior vena cava syndrome
  - Venous thrombosis
  - Lower extremity venous insufficiency

# Venous hypertension & edema: systemic vs regional

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- Systemic venous hypertension
  - Elevated neck veins
  - Abdominojugular reflux and third heart sound in heart failure
- Regional venous hypertension
  - Neck veins not elevated
  - No abdominal reflux, third heart sound

# Regional venous hypertension: Venous insufficiency vs obstruction

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- **Venous insufficiency**
  - **Common**
  - **Bilateral**
  - **Chronic**
    - **Associated with hemosiderin deposition**
- **Venous obstruction**
  - **Often unilateral:**
    - **Baker's cyst, venous thrombosis**
  - **Acute (< 3 months)**
    - **Not associated with hemosiderosis**

# Characteristics of venous insufficiency

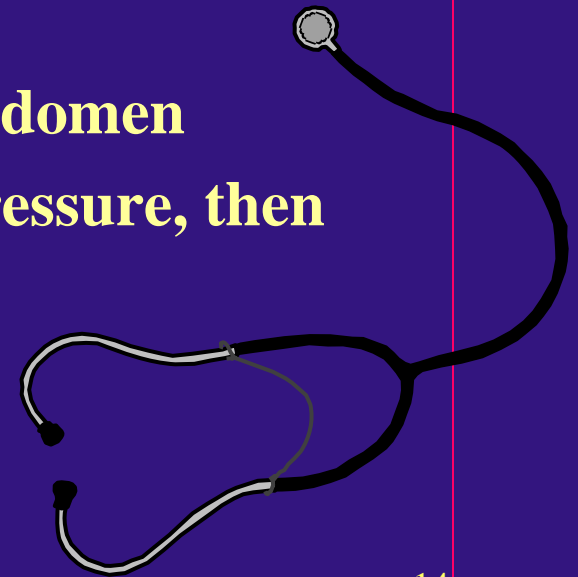
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- **Dependent edema: lower extremities, perineum**
  - May be asymmetric
  - Often tender
  - Usually chronic or recurrent
    - Associated with hemosiderin deposition
  - Ulceration often occurs
- **Treatment**
  - Elevation
  - Exercise to improve venous return
  - Diuretics
  - Compression +/- topical corticosteroids

# Signs of systemic venous hypertension

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- **Elevated neck veins**
  - **More than 3 cm above the angle of Lewis**
    - Angle of Lewis = sternal angle
  - **Abdominojugular reflux**
    - Suggests congestive heart failure
    - Press for 10 seconds firmly on abdomen
    - If neck veins *fall* after relief of pressure, then suggests congestive heart failure
  - **Third heart sound**
    - Listen with bell of stethoscope
    - Suggests congestive heart failure



# Overview of pitting edema

## Pitting edema

< 40 sec

hypoalbuminemia

Decreased protein synthesis  
Increased protein loss

> 40 sec

normoalbuminemia

Venous hypertension

Elevated neck veins

no

Venous insufficiency  
or obstruction

yes

Systemic:  
cardiac disease

# Treatment of fast-recovering pitting edema

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- **hypoalbuminemic (<40 seconds)**
  - **Treat malnutrition**
  - **Treat underlying cause of malabsorption**
  - **Treatment of edema due to cirrhosis**
    - **Judicious use of diuretics and aldosterone antagonist can alleviate edema**
  - **Treat protein loss**
    - **Skin or fecal loss: treat underlying disease**
    - **Urinary loss: angiotensin-converting enzyme inhibitor**



# Treatment of slow-recovering pitting edema

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- **normoalbuminemic ( > 40 seconds)**
  - **Treat congestive heart failure**
    - Bed rest and elevation of legs useful for acute edema
    - Loop diuretics, digoxin, angiotensin-converting enzyme inhibitor, beta blocker if tolerated
  - **Treat venous insufficiency**
    - Diuretics, compression, leg-elevating exercises
  - **Treat underlying obstruction of veins**
    - Anticoagulants, leg elevation for thrombosis

# Lymphedema: *nonpitting* edema

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- **Protein-rich edema due to abnormality of lymphatic drainage**
- **Characteristics**
  - **Nontender, painless**
  - **Does not vary much during the day**
  - **Ulceration rare**
  - **Hyperkeratosis, thickening of skin**

# Lymphedema: causes

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- **Upper extremity**
  - **breast cancer or surgery/radiation for breast cancer**
  - **Newborn baby, Turner's syndrome (X0)**
- **Lower extremity**
  - **Idiopathic: aplasia/dysplasia of lymphatics**
    - **3 types: congenital, praecox, form tarde**
    - **Associated with yellow nails, pleural effusions**
  - **Secondary**
    - **Inflammatory**
    - **Obstructive**

# Lymphedema: secondary causes

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- **Inflammatory**
  - **Tropical: filariasis + recurrent strep infection**
  - **Nontropical: recurrent streptococcal cellulitis**
- **Obstructive**
  - **Unilateral in 95%**
  - **Usually due to malignancy**
  - **Prostate cancer most common in men**
  - **Lymphoma most common in women**
  - **Any pelvic tumor or major pelvic surgery**

# Lymphedema: complications

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- **Infection**
  - **Recurrent cellulitis, lymphangitis**
  - **Lymphangiosarcoma**
    - **Starts as nonhealing bruise**

# Lymphedema: treatment

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- **Fluid mobilization**
  - **Diuretics**
  - **Elevation**
  - **Exercise**
  - **Compressive, elastic stockings**
  - **Massage**
- **Control of infection**
  - **Treatment of dermatophytes**
  - **Prophylaxis against streptococcal infections**
    - **Amoxicillin, amoxicillin/clavulanate**

# Lymphedema: treatment #2

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- **Other therapies**
  - **Coumadin**
    - **Stimulates cutaneous macrophages and local proteolysis**
    - **Might be effective with topical administration**
    - **Reduces edema ~55%**
  - **Flavenoids**
    - **Water soluble vitamin**
  - **Surgery**
    - **liposuction**

# Miscellaneous causes of edema

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- **Hot days: bilateral edema due to venous pooling + compensatory salt and water retention (aldosterone)**
- **Localized edema**
  - **Facial edema**
    - **Trichinosis, hypothyroidism, allergies, nephrotic syndrome**
    - **Pretibial myxedema from Graves' thyrotoxicosis**
- **Neurogenic edema**
- **Lipedema**
  - **↑ ↑ adiposity of the legs**
- **Pseudothrombophlebitis**
  - **A form of unilateral edema with elevated venous pressure due to a popliteal cyst**



# Summary of lower extremity edema

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- Key questions:
- Are both legs edematous?
- Is it pitting edema?
- Is the edematous area tender or painful?
- Are the neck veins elevated?



# Overview of bilateral pitting edema

## Pitting edema

< 40 sec

hypoalbuminemia

Decreased protein synthesis  
Increased protein loss

> 40 sec

normoalbuminemia

Venous hypertension

Elevated neck veins

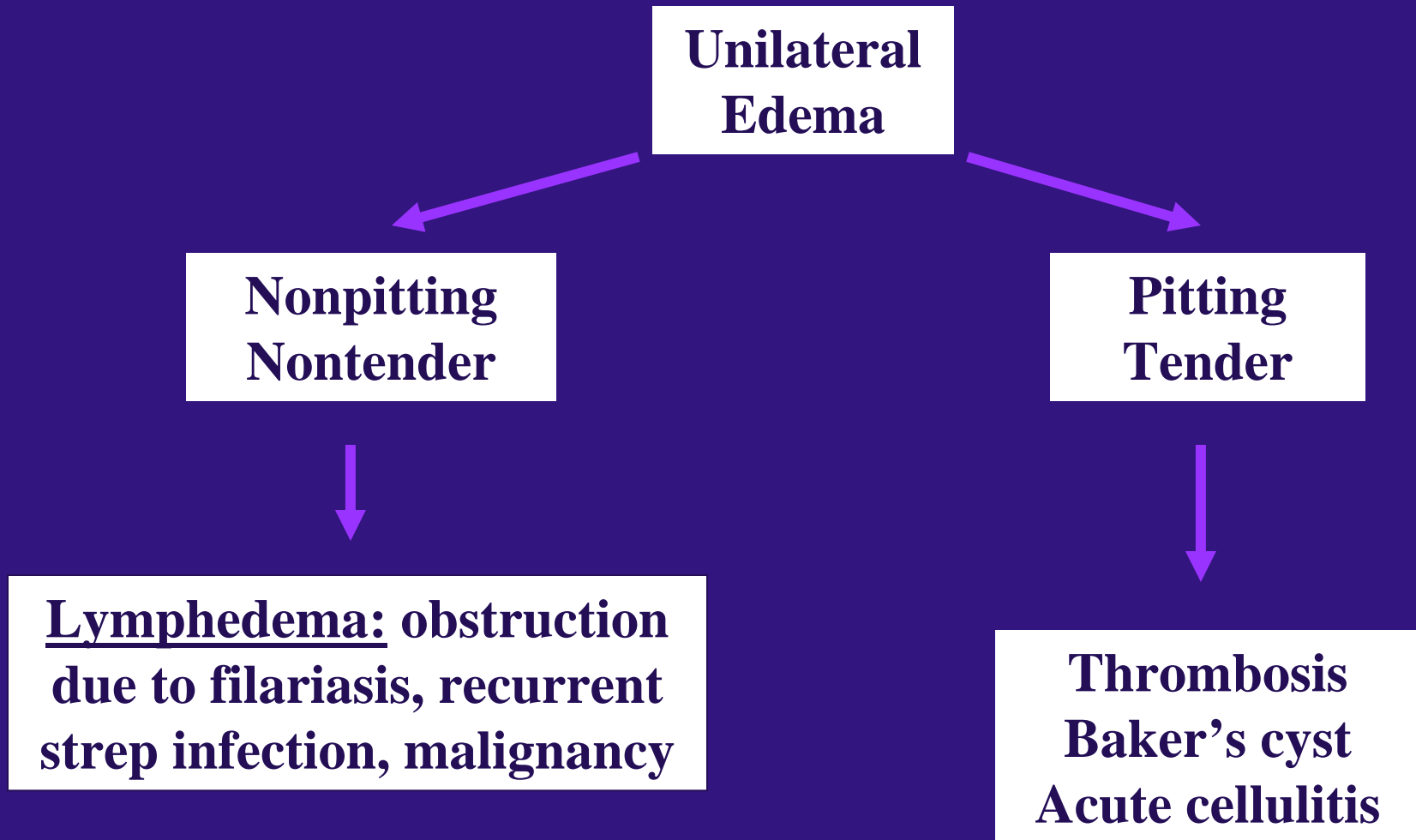
no

Venous insufficiency  
or obstruction

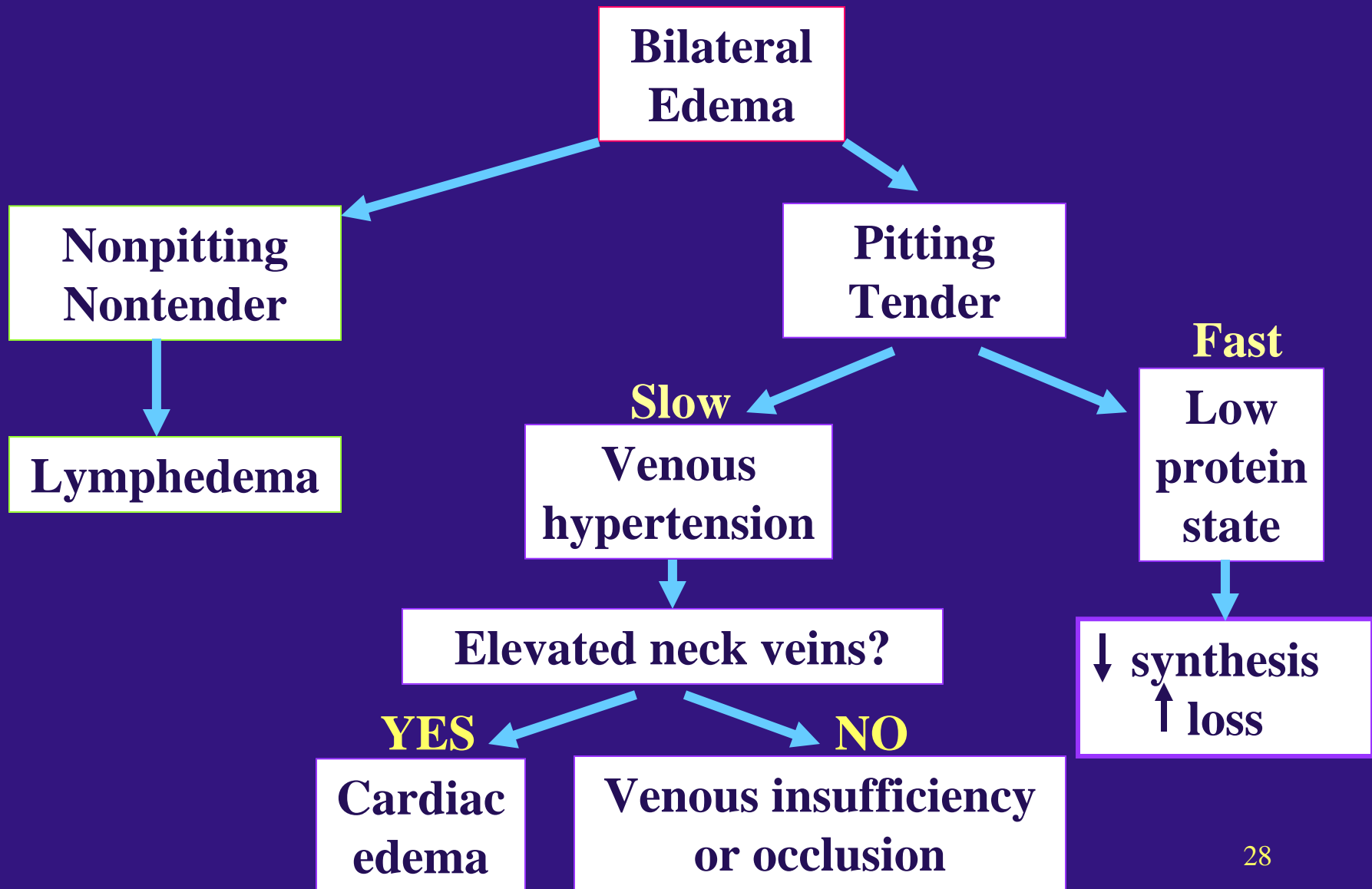
yes

Systemic venous  
hypertension:  
cardiac disease

# Unilateral lower extremity edema



# Bilateral lower extremity edema



# Case #1

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**A 55 year old man with a history of heavy alcohol use complains of unilateral edema for one week. On exam he has pitting edema of his left leg below the knee. His left leg is tender. The skin of legs is not hyperpigmented.**

**The likely diagnosis is**

- a. Cirrhosis**
- b. Filariasis**
- c. Deep venous thrombosis**
- d. Prostate cancer**
- e. Congestive heart failure**

# Case #1 answer

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A 45 year old man with a history of heavy alcohol use complains of unilateral edema for one week. On exam he has pitting edema of his left leg below the knee. His leg is tender. The skin of legs is not hyperpigmented.

The diagnosis is likely to be **deep venous thrombosis (c)** or cellulitis. The edema is *unilateral* (congestive heart failure and cirrhosis are unlikely) and *tender* (lymphedema from malignancy or filariasis is unlikely).

## Case #2

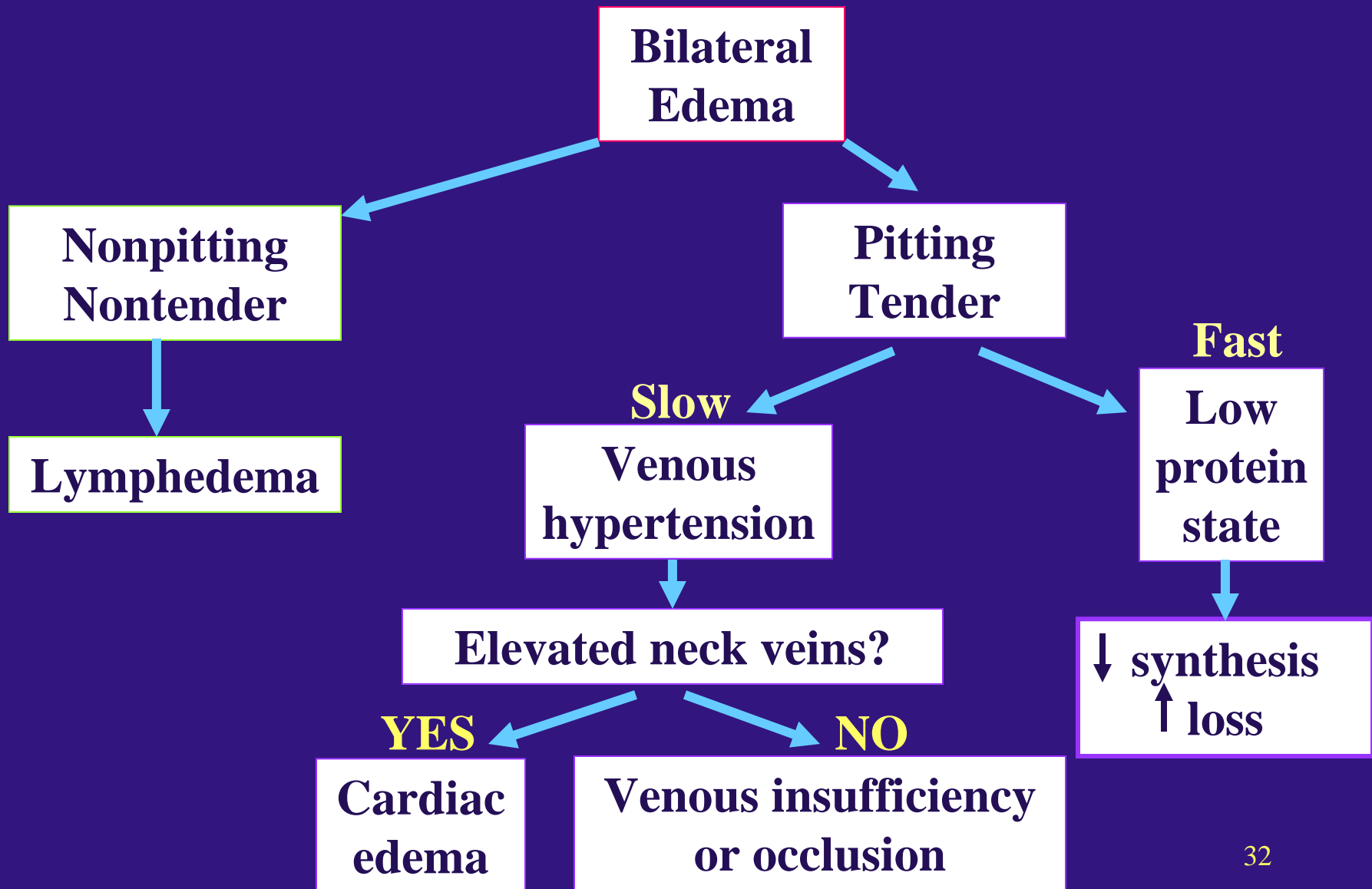
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**A 45 year old man with a history of heavy alcohol use and hepatitis complains of bilateral edema for two months. On exam he has pitting edema of his legs below the knee. Pitting resolves in 1 minute. His neck veins are elevated.**

**The likely diagnosis is**

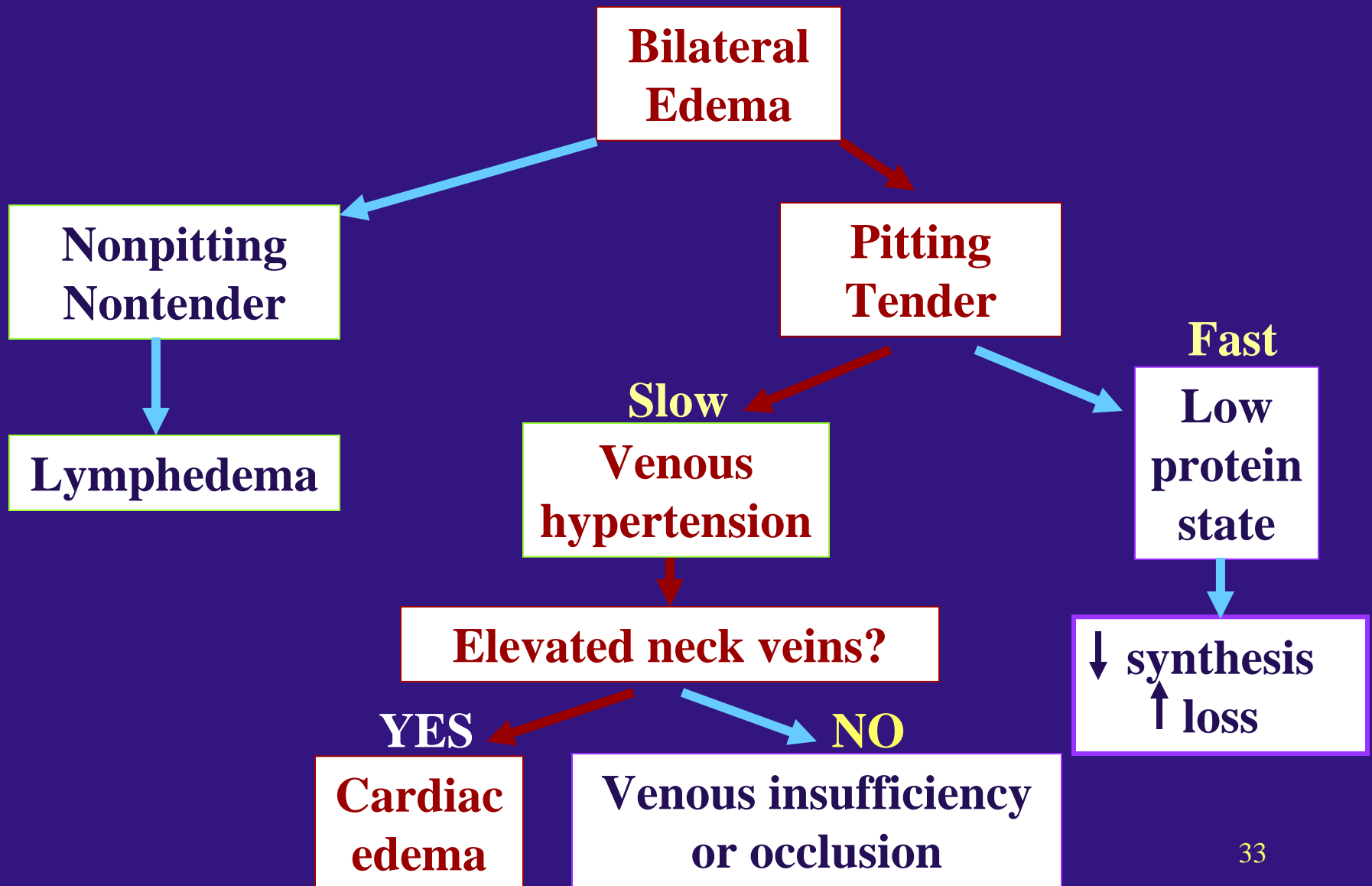
- a. Cirrhosis**
- b. Filariasis**
- c. Inferior vena cava obstruction**
- d. Prostate cancer**
- e. Congestive heart failure**

# Bilateral lower extremity edema





# Bilateral lower extremity edema



## Case #2 answer

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**A 45 year old man with a history of heavy alcohol use and hepatitis complains of bilateral edema for two months. On exam he has pitting edema of his legs below the knee. Pitting resolves in 1 minute. His neck veins are elevated.**

**The likely diagnosis is congestive heart failure (e). He has bilateral edema with slow pitting (> 40 seconds) and neck veins are elevated.**

**Bonus: What additional physical findings would be useful to elicit?**

## Case #3

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**A 55 year old woman complains of right lower extremity edema for one month. The leg was previously normal. On exam she has nonpitting edema of the right leg. It is nontender, and there is no hyperpigmentation.**

**The most likely diagnosis is**

- a. Baker's cyst**
- b. Inferior vena cava obstruction**
- c. Chronic venous insufficiency**
- d. Lymphoma**
- e. Congestive heart failure**

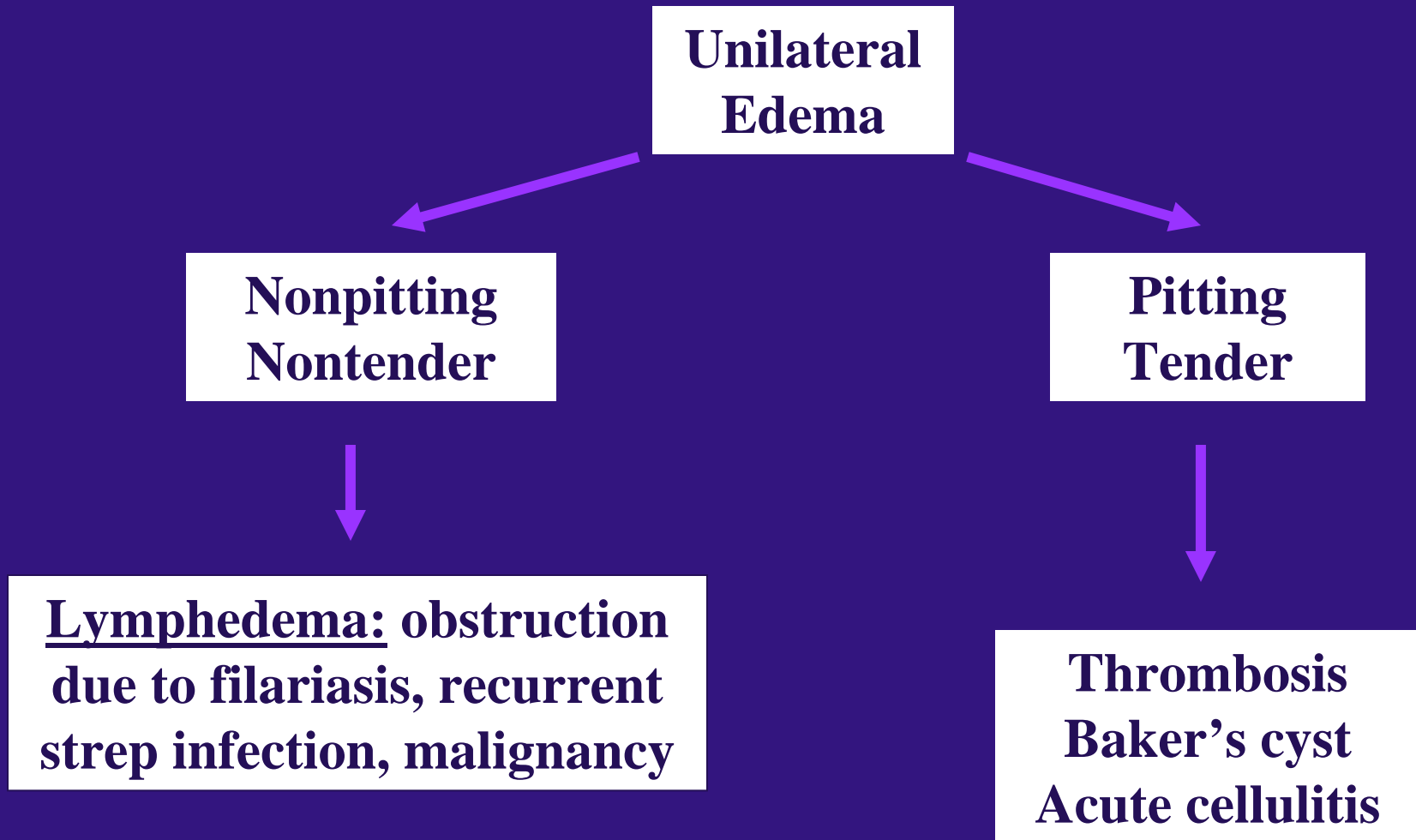
## Case #3 answer

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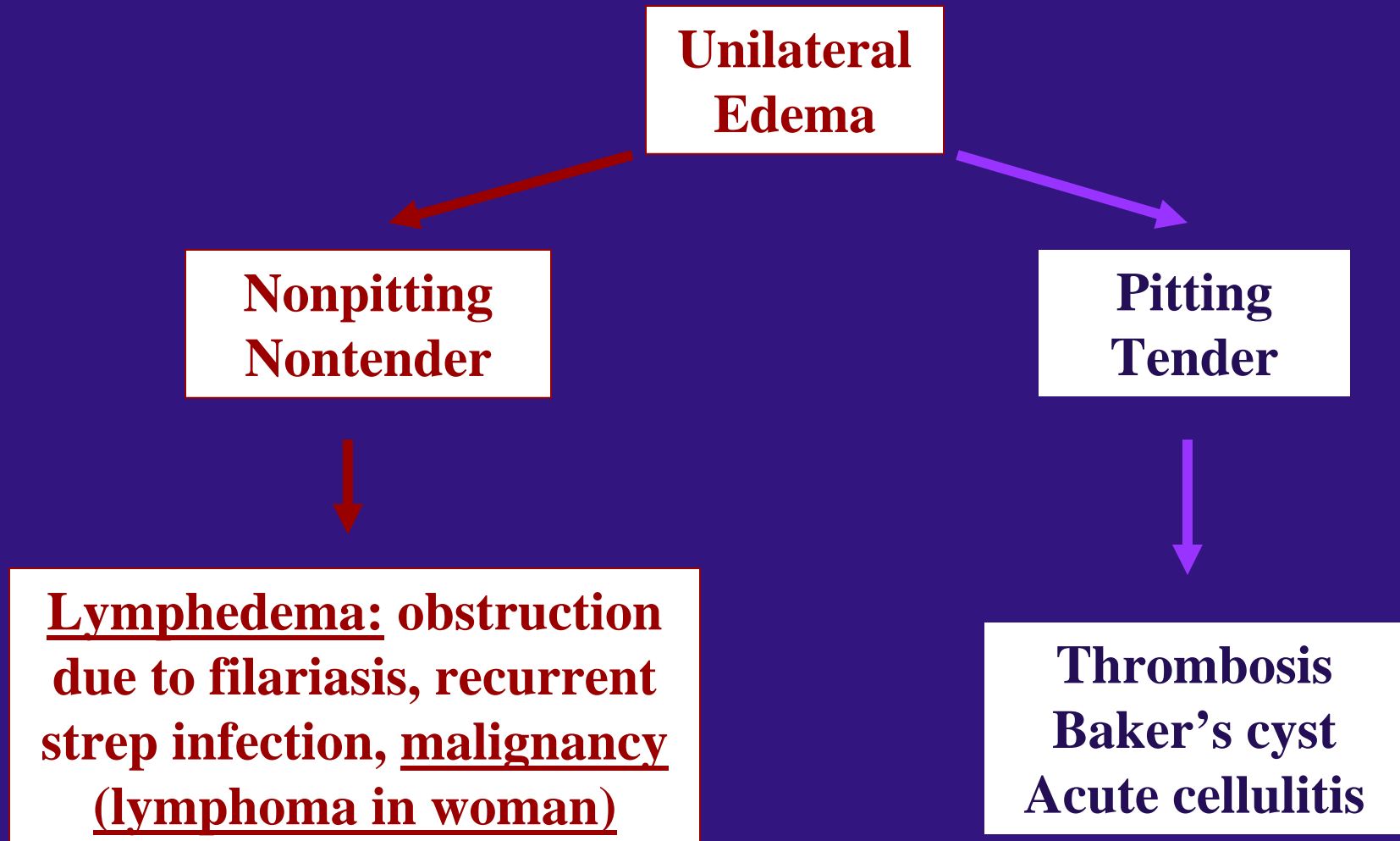
A 55 year old woman complains of right lower extremity edema for one month. The leg was previously normal. On exam she has nonpitting edema of the right leg. It is nontender, and there is no hyperpigmentation.

The most likely diagnosis is lymphedema due to **lymphoma (d)**. She has nontender unilateral edema. Therefore, causes of bilateral edema (congestive heart failure and inferior vena cava obstruction) are unlikely. A Baker's cyst will cause *tenderness* and pitting edema. Chronic venous insufficiency is unlikely given the acute presentation and is usually associated with hyperpigmentation.

# Unilateral lower extremity edema



# Unilateral lower extremity edema



# Edema references

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