Approach To Patient With Edema

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Intravascular , interstitial , intracellular 3 main Compartments

There is intravascular reserve from the intracellular and interstitial compartments in conditions such as: dehydration, diarrhoea, depletion, bleeding

Definition

- **Edema is defined as a palpable swelling produced by expansion of the interstitial fluid volume; when massive and generalized, the excess fluid accumulation is called anasarca.**

peripheral edema (pedal edema) , lymph , pulmonary edema . brain edema periorbital or generalised (anasarca)

- **A variety of clinical conditions are associated with the development of edema, including heart failure, cirrhosis, and the nephrotic syndrome, as well as local conditions such as venous and lymphatic disease**

DVT , thyroid (hypothyroidism) ↳ myxedema Non Pitting

LL Edema maybe unilateral (asymmetrical)or bilateral (symmetrical) in both legs

Some rare cases of unilateral even also bilateral edema can be caused by compression neaplasm in pelvis (uterus, vagina, fibroid uterus)

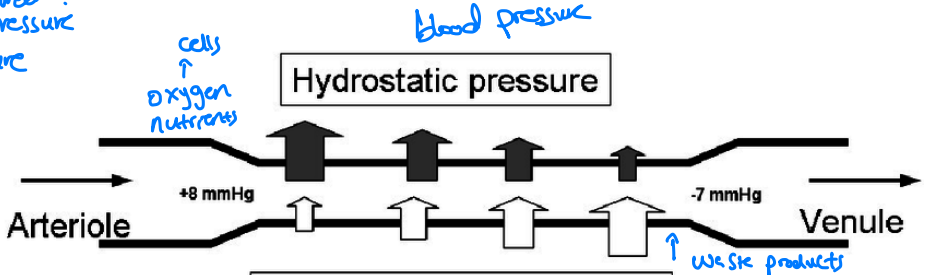
Edema is classified to pitting and non-pitting (myxedema of hypothyroidism and lymphedema)

- vasculitis , infectious , Medications

Overview Of Pathophysiology

- **An increase in interstitial fluid volume that could lead to edema does not occur in normal subjects because of the tight balance of hemodynamic forces along the capillary wall and the function of the lymphatic vessels.**

Starling forces
↳ Difference between:
↳ hydrostatic pressure
↳ oncotic pressure



At arteriolar part fluid pass from intravascular to extravascular
At venular part fluids pass from extravascular to intravascular

Starling forces are the difference between HP- OC
At arteriolar part HP>OP, at venue are part OP>HP

- **For generalized edema to occur, two factors must be present:**

1-An alteration in capillary hemodynamics that favors the movement of fluid from the vascular space into the interstitium.

- **Such movement requires a change in one or more components of Starling's law:**

1. **Increased capillary hydrostatic pressure,**
2. **Decreased capillary oncotic pressure (ie, hypoalbuminemia),**
3. **Increased capillary permeability.**

endothelium

inflammation either infectious or not cause ↑ permeability

cellulitis, trauma --

2- The retention of dietary or intravenously administered sodium and water by the kidneys.

- **The retention of sodium and water can either be:**

1. **A primary event, as in renal failure, or**

Hypotension, HF, liver failure lead to vasoconstriction of kidney for compensation retention of water and salt

2. **A secondary event resulting from a primary reduction in either cardiac output (as in heart failure) or systemic vascular resistance (as in cirrhosis).**

3- Excess of fluid especially normal saline cause also edema

- **In the latter settings, fluid retention tends to return the effective circulating volume toward normal.**
- **Diuretic therapy in such patients may have a deleterious effect on systemic hemodynamics even though it reduces the edema.**
- **Thus, careful monitoring is required.**

Clinical Manifestations And Evaluation

- **Edema in adults can be divided into :**

1. **Peripheral edema.**
2. **Pulmonary edema.**
3. **Ascites.**
4. **Other forms of edema, which include lymphedema, nonpitting edema, and periorbital and scrotal edema.**

Peripheral Edema

- Peripheral edema can be pitting or nonpitting.
- Pitting edema is more common and is defined by the presence of tissue depression after pressure is applied to the edematous area for at least five seconds. at dorsum of foot at lateral aspect against bone
- Pitting reflects movement of the excess interstitial water in response to pressure.
- Nonpitting edema suggests lymphatic obstruction or hypothyroidism. myxedema

Pitting edema increases during nights

Clinical Grading

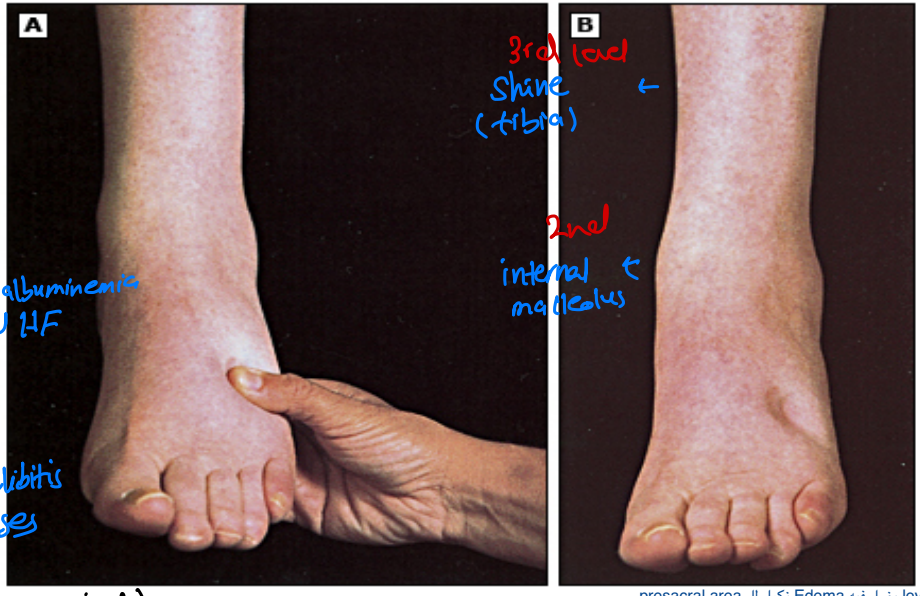
- Although clinicians commonly grade pitting edema from 1+ to 4+ (mild to severe), there is no agreed-upon definition of these grades. differential diagnosis الـ خ ٤ + حسب + ١ ما بتغرجه
- However, this type of grading scheme may help the clinician record relative changes in edema (eg, less edema after diuretic therapy).
- Documenting weight loss is another component of monitoring the efficacy of diuretic therapy.
- Since peripheral edema locates preferentially in the dependent areas, it is primarily found in the lower extremities in ambulatory patients and over the sacrum in patients confined to bed rest.

Clinically we comment on:

- Uni or Bi
- pitting or Non
- level of edema
  لحد وين
  below knee
  above knee
  anasarca
  Lin sens hypoalbuminemia or advanced HF

No anasarca in for ex DVT thrombophlebitis local causes

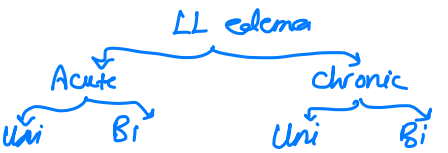
- Grading (Not required)



لحد وين edema نظل نزل ال level
& once there is no edema we can detect the level of edema

first level
for 5 sec at dorsum of foot

لو وصلنا في level above the knee وضل فيه Edema نكمل لل presacral area
and once there is presacral area Edem then we talk about anasarca
وهتلاقي ع الاغلب abdominal wall edema لو بدنا نفحصه نقرص ال abdominal wall بياخذ ال skin شكل قشرة البرتقال



Leg Edema

- **Our approach to the differential diagnosis of leg edema in adults depends upon whether the patient has:**

1. **Unilateral /asymmetric edema or bilateral edema, and**
2. **The acuity of the edema : acute versus chronic .**

- **Acute onset of unilateral leg edema raises concern for deep vein thrombosis (DVT), which must be addressed promptly.**
- **Bilateral edema is particularly frequent in older adults and is usually chronic rather than acute.**
- **It is often due to chronic venous disease, heart failure, venodilating medications, or pulmonary hypertension (the most commonly missed cause of bilateral edema).**

- **Certain infiltrative conditions may be mistaken for edema, such as pretibial myxedema seen with thyroid disease and lipedema**

↳ proteinous material not fluid in the interstitial space

↳ obese

lipedema elephantiasis

Bilateral

unilateral myxedema

Patients with unilateral or asymmetric leg edema

- Further classified as:

1. **Acute unilateral or asymmetric edema**
2. **Chronic unilateral or asymmetric edema**

Acute Unilateral Or Asymmetric Edema

during 48h - 1 week max

- The main concern is to consider the possibility of DVT SO :
- Check calf tenderness, pain or firmness along the course of a vein, or unilateral warmth or erythema. A larger calf circumference in the affected leg is the most useful finding,
- Note : Homans' sign (calf pain upon passive dorsiflexion of the foot) is not a reliable sign of DVT.
- Calculate wells score and give the patient pretest probability to determine the next step (D-dimer versus CUS) doppler us

↳ if low Probability ↳ if high

Patient present to ER with chest pain we should consider 6 lethal causes of chest pain : MI , PE, rupture esophagus, tension pneumothorax, Acute coronary syndrome , Acute Aortic dissection, pericardial temponade

- If DVT has been ruled out based upon the results of testing, it is important to evaluate for other causes of acute unilateral or asymmetric leg edema Mostly other causes not DVT are not lethal

1. Muscle strain, tear, or twisting injury to the leg – 40 percent or superficial thrombophlebitis (superficial venous system of LL saphenous system)
ما بيخوف وشبه بينتقل لل deep sys 10٪ و بعض 10٪ منهم بعملوا PE
2. Leg swelling in a paralyzed limb – 9 percent
3. Lymphangitis or lymph obstruction – 7 percent
4. Venous insufficiency – 7 percent
5. Popliteal (Baker's) cyst – 5 percent at popliteal fossa
6. Cellulitis – 3 percent
7. Knee abnormality – 2 percent arthritis as gout or rhematoid arthritis
8. Unknown – 26 percent

1-Muscle strain, tear, or twisting injury to the leg

- **An inciting injury may be identified in the history, and there may be signs of bleeding (if ultrasonography is performed) or bruising at the ankle.**

عكسه اللون الازرق ما بيبين اولا
وبشك انه DVT واول ما
نعطيه الـ Heparin صار
رجله زرقة وزود الـ Hematoma
& Bleeding

eccymosis

2-Cellulitis

in general: old age, previous cellulitis, diabetic, fever, anorexia
↑WBC ⇒ cellulitis

- **In bacterial cellulitis, the warmth and redness often skip areas and may be associated with constitutional symptoms including fever.**
- **Some patients with venous insufficiency develop a low-grade, nonbacterial cellulitis, which resembles infectious cellulitis, but without constitutional symptoms.**

3-Superficial thrombophlebitis

- **Superficial vein thrombophlebitis classically presents with palpable, tender superficial veins. However, since superficial thrombophlebitis is a risk factor for DVT, many such individuals also undergo ultrasound to exclude DVT.**

tender cordon like lesion
زي حبل تحت الجلد أول ما نضغط
عليه يصير ألم

Press the venous system and cause stagnation and congestion then edema بتصير الناس اللي بتقف لفترات طويلة وما تتحرك

4-Popliteal (Baker's) cyst

- **The majority of popliteal cysts are due to either distention of a bursa by fluid originating from a knee joint or posterior herniation of the joint capsule due to increased intraarticular pressure.** Typical scenario for rupture Baker's cyst is sever tearing pain, sudden in onset, associated with later 24h ecchymosis
- **A popliteal cyst that causes calf symptoms is usually leaking or has ruptured. It is often distinguished from DVT by posterior knee pain, knee stiffness, swelling or a mass behind the knee (especially with the knee in extension), and bruising around the ankle.**
- **However, calf symptoms are common; in addition, compression of the popliteal vein may cause leg swelling or secondary DVT**

5-Inflammatory Pathology Of The Knee

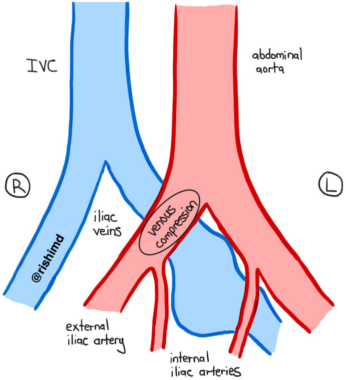
- **Pain, inflammation, and swelling can accompany any knee joint pathology and may be confused with a popliteal cyst or DVT.** Osteoarthritis , gout arthritis

sever pain with locked joint يحسوا ب passive or active movement مجرد ما تحرك المفصل

6-May-Thurner syndrome

No DVT on doppler US

- May-Thurner syndrome occurs in younger females (second or third decade) who present with acute pain and swelling of the entire left lower extremity, with or without venous thrombosis.
- The syndrome is most often caused by a compression of the left iliac vein between the overlying right common iliac artery and the fifth lumbar vertebrae.



Chronic Unilateral Or Asymmetric Edema

- **The most common cause of chronic unilateral or asymmetric edema is lower extremity chronic venous disease.** varicose vein , recurrent DVT → chronic venous insufficency
- **Less common causes include:**

1. **Primary or secondary lymphedema,**
2. **A pelvic neoplasm compromising venous return,** tumor
3. **Complex regional pain syndrome.**

insufficiently

1-Chronic Venous Disease

- There may be an antecedent history of thrombophlebitis in the affected leg.
- If the edema is longstanding, it often leads to characteristic pigmentary changes and skin ulceration

tortous vein

→ late → trophic changes

thin, hyperpegmented skin

shiny, loss of hair

-trophic ulcer at internal malleolus & its difficult to heal due to ischemia

Uni, chronic, Non-pitting

2-Lymphedema

- **Patients with lymphedema may have a history of an ipsilateral inguinal or pelvic lymph node dissection, or of radiation therapy.** → fibrosis of lymphnode / lymphoma
- **The edema is initially pitting, but becomes non-pitting as cutaneous fibrosis occurs.**

- Not responsive to diuretics

3-Complex regional pain syndrome

- **Complex regional pain syndrome usually occurs four to six weeks after limb trauma and is characterized by pain, edema, and alteration in skin color and temperature**

trauma affect nervous system of LL → cause irritation
pain
swelling & edema
trophic changes sweating of limb . redness --

treatment: antipsychotic + antidepressent
anticonvulsant

Clinical approach

- **If the history and examination are not consistent with venous insufficiency, lymphedema, or complex regional pain syndrome, compression ultrasonography (CUS) with Doppler should be obtained. CUS can provide the following information:**
- **Confirmation of lower extremity chronic venous disease**
- **Suggestion of pelvic outflow obstruction** → serious Uterine, ovarian, Colon Cancer, vaginal lesion

A normal study is consistent with either lymphedema or complex regional pain syndrome.

BE Careful

Compress Common iliac vein or ex or External iliac vein

- **A neoplasm should be suspected when CUS is suggestive of pelvic outflow obstruction, particularly in patients with a history of cancer or concerning symptoms such as unexplained weight loss.**
- **If a neoplasm is suspected, imaging of the pelvis should be obtained.**
- **Specifically, if ovarian or endometrial cancer is suspected, a transvaginal ultrasound should be performed.**
- **Otherwise, a contrast-enhanced computed tomography (CT) scan of the pelvis is preferred.**
- **The most common etiologies include ovarian cancer, endometrial cancer, bladder cancer, lymphoma, and prostate cancer.**
- **Rarely, benign lesions such as uterine fibroids or ovarian cysts can cause unilateral leg swelling.**

Patients With Bilateral Leg Edema

- **Acute bilateral leg edema**
- **Chronic bilateral leg edema**

Acute bilateral leg edema

1. **Side effect of medications, especially dihydropyridine calcium channel blockers**
2. **Acute heart failure** → pulmonary edema with acute Bi LL edema
3. **Acute nephrotic syndrome** → proteinuria, acute Bi LL edema
4. **Bilateral DVT, which is often associated with malignancy** in pelvis, pancreas, lung - - -

Medications Associated With Edema

Common	Less common
Dihydropyridine calcium channel blockers	**Nondihydropyridine calcium channel blockers**
•Amlodipine •Felodipine •Isradipine •Nicardipine •Nifedipine •Nimodipine •Nitrendipine	•Verapamil •Diltiazem
Other vasodilators	**Anticonvulsant**
•Hydralazine •Minoxidil •Alpha-blockers	•Gabapentin •Pregabalin
Endocrine	**Antineoplastic**

•Thiazolidinediones
  • Rosiglitazone
  • Pioglitazone
•Glucocorticoids
•Fludrocortisone
•Estrogen
•Progesterone
•Tamoxifen
•Aromatase inhibitors
•Testosterone
•Androgens
	•Docetaxel
	•Cisplatin
	•Interleukin 2 therapy

	Antiparkinson
	•Pramipexole •Ropinirole
	Antidepressants
	•Monoamine oxidase inhibitors •Trazodone
	Other
	•Diazoxide •NSAIDs •Proton pump inhibitors

Clinical approach

- **Clinical approach to patients presenting with acute bilateral leg edema is as follows:**
- **Although much less likely than with acute unilateral leg edema, the possibility of DVT must be considered.**
- **If the clinical probability of DVT is high proceed with CUS to evaluate for DVT.**

- **If the clinical probability of DVT is low or moderate, evaluate multiple possible diagnoses simultaneously:**
- **Review the patient's medication history and, if a drug known to cause edema has been initiated or dose-escalated and discontinue it if possible.**
- **Patients presenting with dyspnea, orthopnea, paroxysmal nocturnal dyspnea, tachypnea, tachycardia, rales, or distended neck veins should be evaluated for acute heart failure.**

anasarca, Bi edema, xanthelasma → acute nephrotic syndrome analysis

- **A semi-quantitative urine dipstick should be performed; if positive for protein, then a quantitative urine protein-to-creatinine ratio and serum albumin should be measured.**
- **A serum D-dimer should be measured. If elevated, a CUS is usually indicated to exclude DVT.**

Chronic Bilateral Leg Edema

- **Chronic venous disease is the most common cause of chronic bilateral leg edema.**
- **Heart failure and pulmonary hypertension (usually underestimated)** chronic HF
- **Renal disease,** chronic renal failure
- **Liver disease,** malnutrition
- **A pelvic neoplasm,**
- **Constrictive pericarditis,**
- **Idiopathic edema,**
- **Premenstrual edema, and**

Lymphedema And Myxedema

- Lymphedema and myxedema are not true edematous states. Lymphedema can be primary (usually presenting in childhood) or secondary.
- At the onset of lymphedema, it may be pitting, but it becomes nonpitting over time as cutaneous fibrosis and adipose tissue deposition occurs.
- Myxedema is caused by the accumulation of glycosaminoglycans in the dermis.
- Pretibial myxedema is nonpitting and can be a feature of autoimmune thyroid disease (most often Graves' disease), or may be present in severe hypothyroidism.

Clinical Approach To Chronic Bilateral Edema

- **The initial history and examination may be suggestive of a particular cause of chronic bilateral leg edema. As examples:**
- **Patients with heart failure may present with chronic bilateral leg edema. In most cases, patients have a known history of heart failure and will have associated symptoms and signs such as dyspnea, orthopnea, and paroxysmal nocturnal dyspnea.**
- **Patients may also note fatigue, anorexia, and abdominal distention.**

- **The examination findings in heart failure are varied, but the most specific are extra heart sounds, hepatomegaly, cardiomegaly, lung rales, and elevated jugular venous pressure.**

- **Chronic bilateral leg edema may be a manifestation of pulmonary hypertension caused by conditions such as sleep apnea.**
- **Sleep apnea should be suspected if the patient has excessive daytime sleepiness or is aware of loud snoring or interruptions of breathing while sleeping.**

- **Chronic bilateral leg edema can be a sign of advanced kidney or liver disease.**
- **Such patients typically have other clinical features of the underlying disorder as well as suggestive laboratory abnormalities.**

Investigations :

- obtain a semi-quantitative urine dipstick for protein, serum creatinine, serum albumin, PT , liver function tests, and TSH
- By contrast, if these tests are unrevealing, obtain an echocardiogram to evaluate the possibility of heart failure or pulmonary hypertension.
- If echocardiography is unrevealing, assess the likelihood of chronic venous disease (pigmentary changes, induration, and ulceration)
- If typical skin findings of chronic venous disease are absent, obtain imaging of the pelvis to exclude a pelvic neoplasm or other lesion-causing venous outflow obstruction. If ovarian cancer is suspected, we start with a transvaginal ultrasound; otherwise, we obtain a contrast-enhanced CT scan of the

Arm Edema

- **Acute isolated upper extremity edema can be caused by:**

1. **Trauma**
2. **DVT of the deep veins of the upper limb**
3. **Infection**
4. **Superficial thrombophlebitis**
5. **Inflammatory arthritis of the upper extremity.**

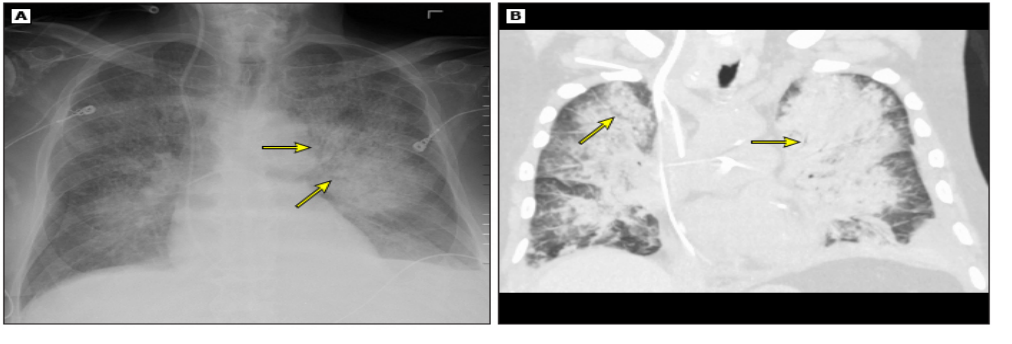
- **In such cases, the underlying etiology is typically apparent from the history and examination.**

- **Upper extremity venous thrombosis should be suspected when none of the etiologies noted above are present, or if there are other significant risk factors such as the presence of a venous catheter.**
- **Spontaneous thrombosis occurs most often in muscular male athletes engaging in strenuous activity with the involved arm and usually involves anatomic abnormalities of the thoracic outlet.**
- **Acute bilateral upper extremity edema is rare but may be seen with bilateral spontaneous venous thrombosis or superior vena cava syndrome.**

- **CUS with Doppler is the study of choice for the initial evaluation of patients with possible upper extremity venous thrombosis.**
- **More gradual swelling of the arm occurs with lymphedema. Lymphedema can be primary (usually presenting in childhood) or secondary (usually following surgery or radiation treatment).**
- **At the onset of lymphedema, it may be pitting, but it becomes nonpitting over time as cutaneous fibrosis and adipose tissue deposition develop.**

Isolated Pulmonary Edema

- **Patients with pulmonary edema complain primarily of shortness of breath and orthopnea. Physical examination usually reveals a tachypneic patient with rales and possibly a diastolic gallop (S3).**
- **The diagnosis of pulmonary edema should be confirmed by radiologic studies because other disorders, such as a pulmonary embolus, may produce similar symptoms but will require different therapy**



- **Although cardiac disease (eg, acute myocardial infarction, heart failure, mitral or aortic valvular pathologies) is the most common cause of pulmonary edema, it can also be produced by volume overload due to primary renal sodium retention (such as acute glomerulonephritis) or by increased capillary permeability in the acute respiratory distress syndrome.**

- **Other causes of noncardiogenic pulmonary edema, including high-altitude pulmonary edema, neurogenic pulmonary edema, and pulmonary edema related to opioid overdose.**
- **In contrast to cardiac and renal disease, uncomplicated cirrhosis is not associated with pulmonary edema. The intrahepatic sinusoidal obstruction in this disorder leads to selective increases in venous and capillary pressures proximal to the hepatic vein.**
- **The systemic vascular resistance decreases in cirrhotic patients, and this generates relatively reduced blood volume in the cardiopulmonary circulation**

- **Pulmonary edema also does not occur due to isolated hypoalbuminemia.**
- **Thus, in the absence of a concurrent rise in left atrial and pulmonary capillary pressures, pulmonary edema is not usually seen with hypoalbuminemia, even at a plasma albumin concentration low enough to induce peripheral edema.**
- **The reasons for this are presented elsewhere.**

Ascites

- **Ascites is associated with abdominal distention and both shifting dullness and a fluid wave on percussion of the abdomen.**
- **Causes of ascites include cirrhosis, hepatic veno-occlusive disease (eg, Budd-Chiari syndrome), malignancy, and infection.**
- **Right-sided heart failure and constrictive pericarditis can cause ascites, but these processes typically also cause peripheral edema. If ascites is suspected, the diagnosis can be confirmed by ultrasonography.**
- **Abdominal paracentesis is used to determine the cause of ascites.**

Other Types Of Edema

- **Periorbital and scrotal edema —**
- **Periorbital and scrotal edema are localized forms of edema that can be seen in systemic edematous states but should not be the sole manifestation of edema in these disorders.**
- **The differential diagnosis of localized periorbital/facial edema and acute idiopathic scrotal edema are different and may be :**

1. **Infectious**
2. **Allergic**
3. **Hypothyroidism**

Thank you