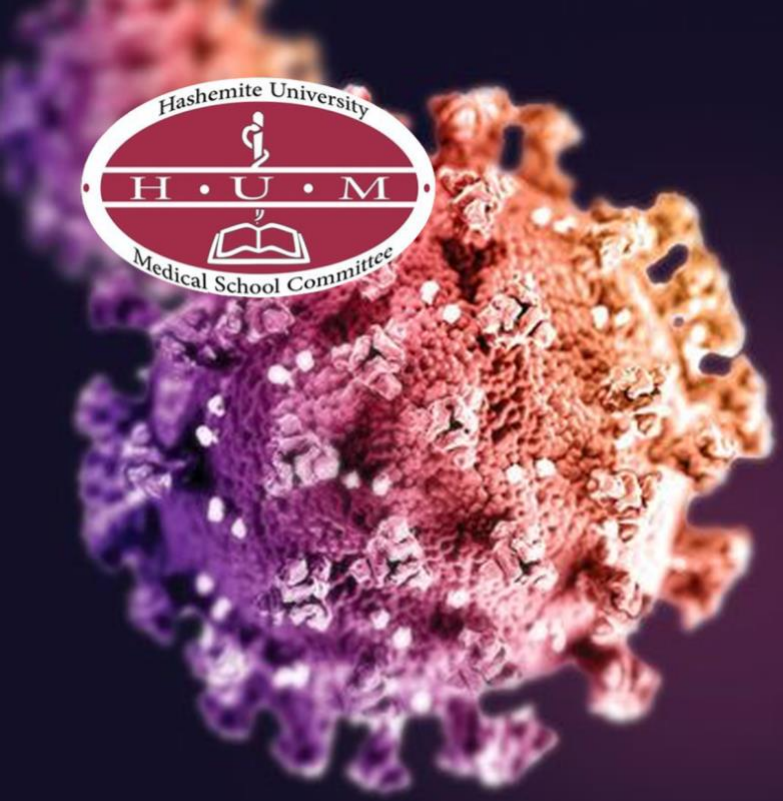


MICROBIOLOGY

DONE BY : Ahmad Alzyood

Necrotizing Fasciitis

بسم الله الرحمن الرحيم

رح نوخذ بهذا اللكتشر skin infection المعروف ب necrotizing fasciitis بهدد الحياه واذا ما وصلت الأمور للموت ممكن يؤدي الى فقدان عضو او طرف بالجسم .

So what is necrotizing fasciitis ? is a rapidly progressive, often insidious, life threatening **bacterial** or **fungal** infection that cause cell death.

" Rapidly progressive " means that in few hours , the complications are occurred and may lead to death.

So it is 1- life threatening 2- rapidly progressive →

لهيك لازم نشخص هاي الحاله بسرعه ونعالجها

الميكروب اللي بسببها بروح بصيب subcutaneous layer وعن طريقها بنتشر لل soft tissues اللي حولها طيب ليه هاي المنطقه؟ لانه الدم فيها قليل لهيك المنطقه بتكون ضعيفه لكن بالأشخاص اللي عندهم نقص مناعه مثلا ممكن عادي يبلش بأي منطقة بال skin هنحكي عن الفاكتورز اللي بتزيد خطورة هالعدوى .

- Bacteria in the vast majority of cases,
- group A beta-hemolytic streptococci (Streptococcus pyogenes),
- Fungi can also rarely lead to this condition as well.
- **Most cases of necrotizing fasciitis are poly microbial** and involve both aerobic and anaerobic bacteria.
- Additional bacterial organisms that may be isolated in cases of necrotizing fasciitis include Escherichia coli, Klebsiella, Pseudomonas, Proteus, Vibrio, Bacteroides, Pepto streptococcus, Clostridium, and Aeromonas hydrophilia, among others.

Primarily affects the subcutaneous connective tissue planes (fascia), where it may quickly spread to involve adjacent soft tissue, leading to widespread necrosis (tissue death). **But** Can involve muscle, fascia, adipose tissue, and skin.

1. Infection spread from the subcutaneous tissues to involve deeper fascial planes.
2. Progressive rapid spread of the infection
3. It can sometimes involve adjacent soft tissues as well, including muscle, fat, and skin.
4. Various bacterial enzymes and toxins lead to vascular occlusion, resulting in tissue hypoxia (decreased oxygen) and ultimately tissue necrosis (death).
5. In many cases, these tissue conditions(نقص الاكسجين ونقص التروية للمنطقه يعني انه جهاز المناعه ما بقدر يوصللها لهيك بسمح للميكروبات بالتكاثر بسهوله) allow anaerobic bacteria to

proliferate as well, allowing for **the progressive spread of infection and continued destruction** of tissue.

Early identification and **prompt treatment** of necrotizing fasciitis are critical to managing the potentially devastating consequences of this medical emergency.

Other terms حسب المنطقه والضرر الها اسماء اخرى that have been used to describe this same condition include :

- Hospital gangrene
- Necrotizing fasciitis
- Fournier's gangrene → necrotizing fasciitis in the **genital area**
- Gas gangrene: Clostridial myonecrosis
- Suppurative fasciitis,
- Flesh-eating bacteria syndrome
- Necrotizing cellulitis,
- Necrotizing soft tissue infection,
- Streptococcal gangrene, dermal gangrene, Meleney's ulcer, and Meleney's gangrene.

❖ الفاكتورز اللي بتزيد خطر الاصابه او حدوث هذا النوع من skin infection :_

1. DM especially if poor control DM
2. Advance age, alcoholism/cirrhosis, IV drug abuser
3. renal failure, liver disease, cancer
4. peripheral vascular disease(decrease blood flow lead to decrease immune system function - fight), and HIV infection
5. in general → individuals with **underlying medical problems and a weakened immune system** are at increased risk of developing necrotizing fasciitis such as individuals undergoing chemotherapy, patients who have undergone organ transplant, corticosteroids.
6. intravenous-drug abusers.

مع هيك بتصير بكثير ناس صحيا جيدين وما معهم اشي

❖ طيب شو هي طرق التعرض للبكتيريا او الفطريات اللي بتعمللنا هذا infection ؟؟

1. a history of prior trauma, such as a cut, scrape, insect bite, burn, or needle puncture wound.
2. Recent surgery: surgical incision sites and various surgical procedures may also serve as a source of infection.
3. Penetrating wound/trauma
4. IV drug injection
5. Open fracture
6. Childbirth/retained placenta
7. Boil/abscess
8. Ulcer
9. however, there ***is no obvious source*** of infection or portal of entry to explain the cause (idiopathic).

السؤال الان : كيف بدنا نشخصها بسرعه عشان نمنع كل هاي الاشياء تصير ؟ بالبدايه الامور كثير صعبه لانه المريض غالبا بيجي ومعه cellulitis اللي ظاهريا بتحس الامور سهله لكن فيه بعض الشغلات ممكن تخليك تشك انه مش cellulitis وبس وانما هاي حاله اخطر ، لهيك التشخيص بعتمد بشكل كبيير على شغلتين 1- history 2- physical examination وهمه اهم من اللاب واي اشي ثاني ، لهيك مجرد ما تشك لازم تعطيه ادويه وتتواصل مع جرّاح عشان تقدر تسيطر عالأمور .

The appearance of the skin often underestimate the degree of underlying disease. The diagnosis of necrotizing fasciitis is often presumptively made initially based on the patient's history and physical examination findings. A high index of suspicion in any patient with symptoms or signs suggestive of necrotizing fasciitis should prompt immediate consultation with a surgeon in order to expedite management.

Differential diagnosis

- Cellulitis → disseminated along the limb or site that is affected
- Abscess → usually more localized than cellulitis
- DVT → swelling and erythema in the leg
- Septic arthritis → may the joints near the site are affected

Signs and symptoms :

هسا المريض غالبا بيجي وهو معه cellulitis وبتشوف انه تمام او احيانا معه حرارة وألم ، طبعا كل هيك بكون non specific لهيك صعب تعرف لكن فيه بعض الامور بتخليك تشك زي :

1- اذا شفت انه المنظر بسيط لكن المريض كتيير ببالغ بالألم

2- اذا حكالك المريض انه خلال ساعات صارت زرقا او سودا وبسمع فرقعات وهو مش فاهم اللي عم بصير معه " History"

- Vary with the extent and progression of the disease. حسب المرحله اللي بكون فيها المريض
- Necrotizing fasciitis often affects the extremities or the genital area (Fournier's gangrene), though any area of the body may be involved.
- Early in the course of the disease, patients with necrotizing fasciitis may initially appear deceptively well, and they may not demonstrate any superficial visible signs of an underlying infection. Some individuals may initially complain of pain or soreness, similar to that of a "pulled muscle." However as the infection rapidly spreads, the symptoms and signs of severe illness become apparent.
- localized redness, warmth, swelling, and pain, often resembling a superficial skin infection (cellulitis).
- Many times, the pain and tenderness experienced by patients is out of proportion to the visible findings on the skin.
- Fever and chills
- Over the course of hours to days, the redness of the skin rapidly spreads and the skin may become dusky, purplish, or dark in color.
- Overlying blisters, necrotic eschars (black scabs), hardening of the skin (induration), skin breakdown, and wound drainage may develop..
- Sometimes a fine crackling sensation may be felt under the skin (crepitus), signifying gas within the tissues.
    - Crepitus is grating, crackling or popping sounds and sensations experienced under the skin and joints or a crackling sensation due to the presence of air in the subcutaneous tissue
- The severe pain and tenderness experienced may later diminish because of subsequent nerve damage, leading to **localized anesthesia** of the affected area. يعني الألم الشديد بخف بطرييقه مش طبيعيه

- If left untreated, continued spread of the infection and widespread bodily involvement invariably occurs, frequently leading to **sepsis** (spread of the infection to the bloodstream) and often **death**
- Systemic symptoms: malaise, nausea, vomiting, weakness, dizziness, and confusion.

حكينا انه physical exam مهم جدا – الاشياء الغالبا بتصير للناس المصابين هي كالتالي

Physical Examination

- Swelling 75%
- Pain out of proportion to physical findin72%
- Erytheme66%
- Induration 45%
- Crepitus 36%
- Blistering 23%
- Maladourous (رائحه كريهه)

في حال اذا كنت مش متأكد بعد ما اخذت هستوري وفيزيكال بنلجأ لل imagining

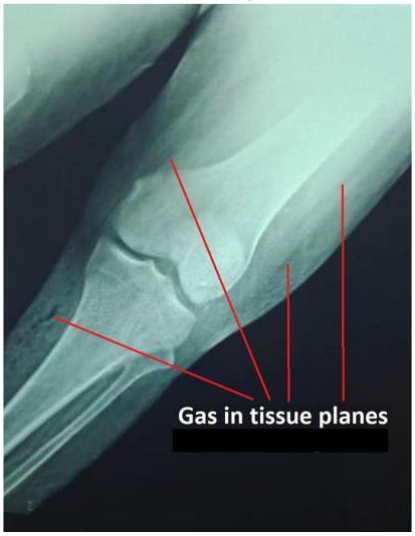
Imaging

- ♦ Plain film
- ♦ CT scan
- ♦ MRI

And looking for

1. Edema
2. Air (black color)
3. Fluid collection
    - Imaging studies such a CT scanning, MRI, and ultrasound have all been used successfully to identify cases of necrotizing fasciitis.

- identify areas of fluid collections, inflammation and gas within the soft tissue, in addition to helping delineate the extent of the infection.



- Although occasionally plain radiographs (X-rays) may demonstrate gas in the soft tissue, they are considered less useful and of little value.
- Obtaining imaging studies **<u>should not delay</u>** definitive treatment in those cases highly suggestive of necrotizing fasciitis.

➢ Tissue culture, tissue biopsy, and Gram stain results can help definitively identify the organism(s) responsible for the infection, and this can help guide appropriate antibiotic therapy.

Classification

1. type 1 NF is caused by multiple bacterial species (polymicrobial) **most common**,
2. type 2 NF is caused by a single bacterial species (monomicrobial), which is typically Streptococcus pyogenes and clostridium; **most lethal + very rare**
3. type 3 NF is caused by Marine organism مُحب الماء المالح (Vibrio spp. (frequently Vibrio vulnificus) is a variant form often occurring in individuals with liver disease, typically after ingesting seafood or exposing skin wounds to seawater contaminated by this organism.
4. type 4 NF is caused by fungal infections, mainly Candida spp. and Zygomycetes. → متواجده في المزارع + بتنتشر خلال الكوارث الطبيعيه

Clostridial myonecrosis (Gas gangrene)

There are two types : 1- traumatic 2- spontaneous

اللي طلبه الدكتور هو الاول

- ❖ Pentratingwound
- ❖ Postoperative
- ❖ Iv drug injection
- ❖ Open fracture
- ❖ Rare, highly lethal
- ❖ Bronze discoloration of skin with bister
- ❖ Require urgent surgical debridement and often amputation.
  - Clostridium →
    - Gram positive rods , spore-forming
    - Found in soil, intestine of human and Animals
    - Release toxins : Most aggressive is alpha-toxin
      - ♦ Causes capillary occlusion that give arise to anaerobe bacteria to drive the progressive rapid damage .
      - ♦ It considered ionotropic that decrease cardiac output .
    - Release enzymes : phospholipase C that destroy cell membrane and lead to cell lysis.

Fournier's Gangrene

- Necrotizing fasciitis of perineum
- Usually **perirectal or perianal** abscess
- Polymicrobial
- Predisposing condition
  - ➢ DM
  - ➢ Obesity
- Any infection in the perineum of a diabetic can turn into a surgical emergency

مريض معاه سكري ومعاه انفكشن بمكان الشرج او قريب منها ما لازم تخليه يروح وانما بتقعده عندك بالمستشفى .

- Is Necrotizing Fasciitis Contagious? ؟ هل هو مُعدي
  - Necrotizing fasciitis is not considered to be a contagious disease.
  - However, it is theoretically possible for an individual to become infected with the same organism causing necrotizing fasciitis in someone with whom they have had direct close contact (for example, a MRSA infection).

- What Specialists Treat Necrotizing Fasciitis? مين المسؤول عن علاج هاي الحاله؟
  - A multidisciplinary team of providers is needed in the care of patients with necrotizing fasciitis. طاقم كامل مكمّل
    - emergency-department physician, surgeon, a urologist in cases of Fournier's gangrene), An infectious disease specialist is frequently involved to help direct antibiotic treatment.

Treatment

- When the diagnosis of necrotizing fasciitis is highly suspected or confirmed, immediate measures must be taken to initiate treatment and quickly intervene in order to reduce morbidity and mortality.
- The medical treatment of necrotizing fasciitis primarily involves the administration of **antibiotics**, with **hyperbaric oxygen therapy**
- Definitive treatment for necrotizing fasciitis, however, ultimately requires surgical intervention.

  - Initial management includes patient **stabilization**, including supplemental oxygen, cardiac monitoring, and intravenous fluid administration.
  - Some patients with sepsis may require the administration of intravenous medications to increase blood pressure and/or the insertion of a breathing tube (intubation) in cases of severe illness or respiratory compromise.
  - Close monitoring and supportive care in an intensive-care unit ICU is required.

Antibiotics for Necrotizing Fasciitis مش مطلوب نحفظهم

- Broad-spectrum antibiotics should be started immediately. As the responsible organism(s) may not be known initially, antibiotics should include coverage for a wide array of organisms, including aerobic gram-positive and gram-negative bacteria, as well as anaerobes.
- Consideration for infection caused by MRSA must also be taken into account.
- There are various antibiotic regimens available, which may involve monotherapy or multidrug regimens. Commonly recommended antibiotics include penicillin, ampicillin-sulbactam(Unasyn), clindamycin (CleocinHCl, CleocinPediatric), aminoglycosides, metronidazole (Flagyl, Flagyl375, FlagylER), cephalosporins, carbapenems, vancomycin (Lyphocin, VancocinHCl, VancocinHClpulvules), and linezolid (Zyvox).
- Most clinicians treat with more than one IV antibiotic because bacteria causing necrotizing fasciitis are often resistant to more than one antibiotic and some infections are caused by more than one type of bacteria.
- Antibiotic coverage can be adjusted once culture results identify the causative organism(s) and antibiotic sensitivity results are available.

Hyperbaric Oxygen Therapy (HBO) for Necrotizing Fasciitis

- This therapy delivers highly concentrated oxygen to patients in a specialized chamber, thereby increasing tissue oxygenation. This inhibits anaerobic bacteria and promotes tissue healing.
- Some investigators feel that HBO reduces mortality in certain patients when used in conjunction with an aggressive treatment regimen that includes surgery and antibiotics.

Surgery for Necrotizing Fasciitis

- Rapid surgical debridement of infected tissue is the cornerstone of treatment in cases of necrotizing fasciitis.
- Extensive surgical debridement of all necrotic tissue is required.

- Wide and deep incisions may be necessary to excise all infected tissue (fascia, muscle, skin, etc) until healthy, viable tissue is visualized.
- Repeated surgical debridement is often necessary within the ensuing hours to days after the initial surgical intervention, as progression of the disease may be sudden, severe, and unrelenting.
- Sepsis may lead to other infection sites and those areas may need surgical intervention, resulting in some patients requiring multiple amputations.
- In some cases, despite repeated surgical debridement, a life-saving amputation may be necessary if the necrosis is too widespread and the imminent risk of overwhelming sepsis and death is felt to be present.

When Is Follow-up Necessary After Treatment of Necrotizing Fasciitis?

- Patients who survive necrotizing fasciitis often require follow-up with various specialists, depending on the complications encountered during their hospital course and the subsequent outcome.

What Is the Prognosis of Necrotizing Fasciitis?

- The prognosis for patients with necrotizing fasciitis depends on many factors, **including patient age, underlying medical problems, the causative organism(s), extent and location of infection, as well as the time course of diagnosis and initiation of treatment**. Early diagnosis and aggressive surgical and medical treatment are the most important factors in determining the outcome.

- Necrotizing fasciitis is a life-and limb-threatening condition that carries a poor prognosis if left untreated or undertreated.

- Complications and potential results may include limb loss, scarring, disfigurement, and disability, with many patients going on to develop sepsis, multisystem organ failure, and death.
- Combined morbidity and mortality rates have been reported to be between 70%-80%.
- Mortality rates in the scientific literature range anywhere between 8.7%-76%.
- The mortality rate for untreated necrotizing fasciitis approaches nearly 100%.

بالنهاية أهم 4 اجراءات عشان ننقذ المريض

1- Good History
2- Physical Examination
3- Broad Antibiotics
4- Surgical Intervention

Good Luck