Cellulitis?

An evidence based approach to diagnosis and treatment of red legs

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North West Healthcare NHS Trust
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Aims and objectives

To be aware of:

- What cellulitis is and what it is not
- The importance of diagnosis
- Antimicrobial stewardship – why it matters
- How to diagnose cellulitis
- How to treat
- Where to treat
- Unresponsive cellulitis
- Unusual organisms
- Considerations when managing co-morbidities
Lower leg cellulitis: A growing problem

- 77 percent increase in the last seven years
- 87,749 admissions
- 400,000 bed days
- Mean length of stay 7.1 days
- Cost £172-£254 million a year on inpatient treatment
What is cellulitis?

Cellulitis is a spreading bacterial infection of the dermis and subcutaneous tissues.

(Morris, 2003)
What causes cellulitis

The bacteria that most commonly cause cellulitis are:

- Streptococci (esp. Strep. pyogenes)
- Staphylococcus aureus
- Other bacteria including Gram-negative bacilli, Strep. pneumoniae and anaerobes such as pseudomonas can also cause cellulitis
The importance of accurate diagnosis

- 1/3 of those diagnosed with cellulitis are misdiagnosed
- Hazards inappropriate antibiotic therapy
- Treatment delays and failures
Guide to diagnosis & treatment

**History**
- Trauma
- DVT/Risk factors
- Previous surgery hip/knee
- Venous disease
- Lymphoedema
- Cardiac disease

**Examination**
- Unilateral/bilateral
- Erythema, warmth, swelling, pain
- Pronounced demarcation
- Mark leg if demarcation
- Joint involvement
- Abscess, ulcer, tinea pedis

**Investigations**
- Glucose
- FBC, LFTs, U&Es, CRP
- Blood cultures?
- Swab wet lesions
- Doppler US if suspect DVT

**Treatment**
- Antibiotic therapy
- Classify cellulitis to determine route and place of therapy
- Consider co-morbidities
- Consult IDT if in doubt
What else could it be?

- Venous eczema
- Lymphoedema
- Lipodermatosclerosis
- Other
How to diagnose

- Cellulitis is diagnosed on the basis of clinical features
- Take your time and check clinical features
- Consider alternative diagnosis
## Clinical features cellulitis

<table>
<thead>
<tr>
<th>Feature</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unilateral</td>
<td>Bilateral – consider venous eczema</td>
</tr>
<tr>
<td>Sudden onset</td>
<td>May have flu like symptoms</td>
</tr>
<tr>
<td>Red, hot, swollen, tender, demarcation</td>
<td>Mark leg to check when receding</td>
</tr>
<tr>
<td>Scratch, cut, ulcer, fungal infection of feet</td>
<td>Check for portal of entry</td>
</tr>
<tr>
<td>Systemically unwell?</td>
<td>Check fever, malaise, rigours vomiting</td>
</tr>
<tr>
<td>Enlarged lymph glands, lymphangitis</td>
<td>Spreads proximally from area of cellulitis</td>
</tr>
</tbody>
</table>
Cellulitis quick guide

- Unilateral – bilateral consider alternative diagnosis
- Sudden onset
- Raised WCC
- Warm, red confined to leg
- Clear demarcation
- Tender
- May be pyrexial
- Portal entry - ulcer, scratch, fungal infection
A = Cellulitis
B = Acute infection chronic venous eczema
C = Acute infection chronic venous eczema
D = Contact dermatitis caused by paste bandages
<table>
<thead>
<tr>
<th></th>
<th><strong>Lipodermatosclerosis</strong></th>
<th><strong>Eczema</strong></th>
<th><strong>Cellulitis</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Symptoms</strong></td>
<td>No fever</td>
<td>No fever</td>
<td>May have fever</td>
</tr>
<tr>
<td>Pain and discomfort</td>
<td></td>
<td>Itching</td>
<td>Painful</td>
</tr>
<tr>
<td>History of varicose veins or deep vein thrombosis</td>
<td>History of varicose veins or deep vein thrombosis</td>
<td>No relevant history</td>
<td></td>
</tr>
<tr>
<td><strong>Signs</strong></td>
<td>Does not feel generally unwell</td>
<td>Normal temperature</td>
<td>May experience chills, sweaty, feel unwell</td>
</tr>
<tr>
<td>Bilateral</td>
<td></td>
<td>Bilateral</td>
<td>Unilateral</td>
</tr>
<tr>
<td>Erythematous, inflamed</td>
<td></td>
<td>Erythematous, inflamed</td>
<td>Erythematous, inflamed</td>
</tr>
<tr>
<td>No tenderness</td>
<td></td>
<td>No tenderness</td>
<td>Tenderness</td>
</tr>
<tr>
<td>Hardening and thickening of the skin</td>
<td></td>
<td>Vesicles</td>
<td>One, or a few, bullae</td>
</tr>
<tr>
<td>Woody feel to skin</td>
<td></td>
<td>Crusting</td>
<td>Skin does not feel woody</td>
</tr>
<tr>
<td>Small white star shaped scarred areas (atrophie blanche)</td>
<td>Lesions on other parts of the body, particularly other leg and arms</td>
<td>Absent</td>
<td></td>
</tr>
<tr>
<td>Changes in pigment may be present (haemosiderin staining)</td>
<td>Changes in pigment may be present (haemosiderin staining)</td>
<td>Absent</td>
<td></td>
</tr>
<tr>
<td>Legs shaped like inverted champagne bottles</td>
<td></td>
<td>Varicose veins may be present</td>
<td>Leg shape normal</td>
</tr>
<tr>
<td>Lesions on other leg</td>
<td></td>
<td>Lesions on other leg</td>
<td>No lesions elsewhere</td>
</tr>
<tr>
<td>Symptom(s)</td>
<td>Lipodermatosclerosis</td>
<td>Eczema</td>
<td>Cellulitis</td>
</tr>
<tr>
<td>----------------</td>
<td>----------------------</td>
<td>--------</td>
<td>-----------------</td>
</tr>
<tr>
<td>No fever</td>
<td>No fever</td>
<td></td>
<td>May have fever</td>
</tr>
<tr>
<td>Portal entry</td>
<td>Not applicable</td>
<td></td>
<td>Usually unknown, but break in skin, ulcers, trauma, athlete’s foot implicated</td>
</tr>
<tr>
<td>Investigations</td>
<td>White cell count normal. CRP normal in chronic lipodermatosclerosis and slightly elevated in acute lipodermatosclerosis</td>
<td>White cell count normal CRP normal Skin swabs—<em>Staphylococcus aureus</em> common</td>
<td>White cell count high CRP High</td>
</tr>
<tr>
<td>Blood culture negative</td>
<td>Blood culture negative</td>
<td></td>
<td>Blood culture usually negative³</td>
</tr>
</tbody>
</table>
Infected venous eczema
Lipodermatosclerosis
Venous eczema
## Eron’s Classification of Cellulitis

<table>
<thead>
<tr>
<th>Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>One</strong></td>
<td>Patients have no signs of systemic toxicity, have no uncontrolled long term conditions and can usually take oral antibiotics at home.</td>
</tr>
<tr>
<td><strong>Two</strong></td>
<td>Patients are either unwell or well but have a condition such as peripheral vascular disease, chronic venous insufficiency or morbid obesity which affect recovery</td>
</tr>
<tr>
<td><strong>Three</strong></td>
<td>Patients may be unwell and have symptoms such as acute confusion, tachycardia, breathlessness, hypotension or may have unstable conditions that may interfere with a response to therapy or have a limb threatening infection due to vascular compromise.</td>
</tr>
<tr>
<td><strong>Four</strong></td>
<td>Patients have septicaemia or severe life threatening infection such as necrotizing fasciitis.</td>
</tr>
</tbody>
</table>
## Treatment by class

<table>
<thead>
<tr>
<th>Class</th>
<th>Description</th>
</tr>
</thead>
</table>
| **One** | Oral flucloxacillin 500mg QDS  
Or Clarithromycin 500mg 12 hourly if penicillin allergy |
| **Two** | IV flucloxacillin 1-2gm 6 hourly  
Or Clindamycin 450mg 8 hourly  
OPAT Ceftriaxone 1gm daily IV |
| **Three** | IV flucloxacillin 2gm 6 hourly  
Or Clindamycin 900mg 8 hourly  
Or Clarithromycin 500mg 12 hourly |
| **Four** | As guided by microbiology |
Classification and place treatment

Cellulitis Diagnosed

Grade one
Home oral antibiotic therapy unless contraindications

Grade two
Consider non Acute IV therapy

Grade three
Admit to acute bed

Grade four
Admit to acute bed and seek specialist advice urgently*
CREST Management of Cellulitis In Adults

Diagnosis

Flu-like symptoms, malaise
onset of unilateral swelling, pain, redness

Decide Classification

<table>
<thead>
<tr>
<th>Class I</th>
<th>Class II</th>
<th>Class III</th>
<th>Class IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients have no signs of systemic toxicity, have no uncontrolled co-morbidities and can usually be managed with oral antimicrobials on an outpatient basis</td>
<td>Patients are either systemically ill or systemically well but with a co-morbidity such as peripheral vascular disease, chronic venous insufficiency or morbid obesity which may complicate or delay resolution of their infection</td>
<td>Patients may have a significant systemic upset such as acute confusion, tachycardia, tachypnoea, hypotension, or may have unstable co-morbidities that may interfere with a response to therapy or have a limb threatening infection due to vascular compromise</td>
<td>Patients have sepsis syndrome or severe life threatening infections such as necrotizing fasciitis</td>
</tr>
</tbody>
</table>

Lab Investigations

<table>
<thead>
<tr>
<th>Class II - IV</th>
<th>Selected Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>FBC, ESR or CRP, U+E</td>
<td>Blood cultures only Class III or Class IV</td>
</tr>
<tr>
<td>Culture any ulceration or blister fluid</td>
<td>Streptococcal serology only in refractory cases where diagnosis is in doubt</td>
</tr>
<tr>
<td></td>
<td>Skin biopsy where differential diagnosis includes other inflammatory lesions</td>
</tr>
</tbody>
</table>

Treatment

<table>
<thead>
<tr>
<th>First line</th>
<th>Second line</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class I</td>
<td>Flucloxacillin 500mg qds po</td>
</tr>
<tr>
<td>Penicillin allergy - Clarithromycin 500mg bd po</td>
<td></td>
</tr>
<tr>
<td>Class II</td>
<td>Flucloxacillin 2g qds IV or *Ceftriaxone 1g od IV (OPAT)</td>
</tr>
<tr>
<td>Penicillin allergy - Clarithromycin 500mg bd IV or Clindamycin 600mg tds IV</td>
<td></td>
</tr>
<tr>
<td>Class III</td>
<td>Flucloxacillin 2g qds IV</td>
</tr>
<tr>
<td>Penicillin allergy - Clarithromycin 500mg bd IV or Clindamycin 900mg tds IV</td>
<td></td>
</tr>
<tr>
<td>Class IV</td>
<td>Benzylpenicillin 2.4 g 2-4 hourly IV +Ciprofloxacin 400mg bd IV +Clindamycin 900mg tds IV (If allergic to penicillin use Ciprofloxacin and Clindamycin only). NB Discuss with local Medical Microbiology Service</td>
</tr>
</tbody>
</table>

*S*Must not be used in penicillin anaphylaxis

Suggested Criteria For Oral Switch and/or Discharge

- Pyrexia settling
- Co-morbidities stable
- Less intense erythema
- Falling inflammatory markers

Suitable Agents for Oral Switch Therapy Discharge

- Fluclouxacin 500mg qds If penicillin allergy -
  - Clarithromycin 500mg bd
  - Clindamycin 300mg qds

Prophylaxis for Recurrent Cellulitis

- 2 or more episodes at the same site
- Penicillin V 250mg bd or Erythromycin 250mg bd for up to 2 years
Is the patient dyspnoeic & known to have cardiac failure?

- YES: Has the patient taken their medication?
  - YES: Ensure patient has medication. Elevate limbs & encourage pedal exercises.
  - NO: Perform Leg Ulcer assessment, including Doppler Ultrasound. Apply Compression therapy if appropriate. If patient has complicating factors, i.e. Arterial dis. or Diabetes refer to Specialist Leg Ulcer Clinic.
- NO: Is the patient blood pressure outside normal range?
  - YES: On auscultation is the patient having multiple coupled beats?
    - YES: Inform GP Elevate Limbs & encourage pedal exercises.
    - NO: Are both legs symptomatic?
      - YES: Has the patient been wearing compression?
        - YES: Local inflammation may be due to wound healing. Review regularly
        - NO: Oral Antibiotics – if no response in 24 hrs i.e. demarcation line extends, then admit to hospital Rest & Elevation
      - NO: Is there general inflammation present?
        - YES: Patient requires hospitalisation for: Intravenous Antibiotics Rest Elevation
        - NO: Ensure hosiery: Correct size & strength. Still functioning – may need renewal.
  - NO: Is the patient known to have venous insufficiency?
    - YES: Are both legs symptomatic?
      - YES: Has the patient been wearing compression?
        - YES: Local inflammation may be due to wound healing. Review regularly
        - NO: Oral Antibiotics – if no response in 24 hrs i.e. demarcation line extends, then admit to hospital Rest & Elevation
      - NO: Is there general inflammation present?
        - YES: Patient requires hospitalisation for: Intravenous Antibiotics Rest Elevation
        - NO: Ensure hosiery: Correct size & strength. Still functioning – may need renewal.
  - NO: Is the patient pyrexial?
    - YES: Is the patient feverish & generally symptomatic with either wet or dry inflamed legs? OR has widespread wet inflammation
      - YES: Patient requires hospitalisation for: Intravenous Antibiotics Rest Elevation
      - NO: Perform Leg Ulcer assessment, including Doppler Ultrasound. Apply Compression therapy if appropriate. If patient has complicating factors, i.e. Arterial dis. or Diabetes refer to Specialist Leg Ulcer Clinic.
    - NO: Is the patient known to have venous insufficiency?
One antibiotic or two?

- Penicillin + Flucloxacillin common practice
- Rationale treats staphylococcal and streptococcal but flucloxacillin effective against streptococcal infections
- Lehman and Mukherjee’s 2005 study found no difference clinical outcomes those treated solely with flucloxacillin
IV to oral switch

- No benefit IV after 4 days
- Indicators for oral switch – less intense erythema, erythema receding, skin cooler. Pain and swelling settling. Inflammatory markers settling. Pyrexia settling.
Unresponsive cellulitis

- Wrong diagnosis
- Wrong antibiotic
- Immunocompromised host
Treatment of venous eczema

- Compression therapy to correct venous stasis.
- Vein surgery, endovenous laser ablation or sclerotherapy
- Weight reduction
- Emollient therapy
Treatment of acute lipodermatosclerosis

- This is an inflammatory condition not an infective condition
- Treatments include, stanozolol (2 mg bid for 8 weeks), topical steroids, topical capsaicin, weight loss, compression, improved mobility
Treatment of chronic lipodermatosclerosis

- Compression therapy to correct venous stasis.
- Vein surgery, endovenous laser ablation or sclerotherapy
- Weight reduction
- Ultrasound therapy
- Fibrinolytic agents such as stanozolol
- Pentoxyfylline to increase blood flow
- Clobetasol propionate or other high potency steroid
- Intraloesional triamcinolone injections reduce inflammation
- Capsaicin to reduce pain
- Horse chestnut extract
Sweet’s syndrome

- Fever;
- Leucocytosis;
- Acute, tender, red plaques;
- Papillary dermal infiltrate of neutrophils.
- Classical, malignancy related and idiopathic
- Treated with steroids
- Potassium iodide and colchicine are alternative first-line therapies and indomethacin (indometacin), clofazimine, cyclosporine (ciclosporin), and dapsone are second-line treatments
Other bacterial causes cellulitis

- B streptococci (e.g., Streptococcus agalactiae) more common in older people.
- Pseudomonas aeruginosa more common in those with diabetes and older people.
- Animal bites can lead to Pasteurella multocida (cat bite) Capnocytophaga sp (dog bite).
- Fresh water bathing, paddling Aeromonas hydrophila;
- Warm salt water, by Vibrio vulnificus
Lets try an antibiotic
What harm can it do?

- Primary aim healthcare “Primum non nocere”
- Patients deserve an accurate diagnosis and appropriate treatment
- We need to use resources wisely
Antibiotic stewardship

“Every antibiotic expected by a patient, every unnecessary prescription written by a doctor, every uncompleted course of antibiotics, and every inappropriate or unnecessary use in animals or agriculture is potentially signing a death warrant for a future patient.”

(Donaldson, 2008)
Effective management of co-morbidities

- Venous disease affected 20 percent of over 70s.
- Management of leg ulceration
- Use of compression to compensate
- Encourage weight loss and activity
Take home messages

- 400,000 bed days - £254 million spent on cellulitis – one third inappropriately
- One third of “cellulitis” is misdiagnosed
- This exposes patients to the hazards of inappropriate antibiotic therapy and treatment delay/failure
  - We must ensure that we use antibiotics prudently and are aware of the evidence base.
Thank you for listening
Any questions?