Cellulitis is an acute bacterial infection of the skin and underlying subcutaneous tissue, mostly caused by Group A Streptococci (Mortimer, 2000; Cox, 2009) and Staphylococcus aureus (Hadzovic et al, 2012) (Figure 1). It can occur anywhere on the body, but most commonly affects the lower limb in 75–90% of cases (Tsao and Johnson, 1997).

THE COST OF CELLULITIS

Cellulitis is responsible for over 400,000 bed days per year in England, at a cost of £96 million (Levell et al, 2011). Many patients admitted with a diagnosis of cellulitis do not actually have cellulitis, but common skin conditions such as venous eczema (Consuelo et al, 2011). Furthermore, many patients admitted with cellulitis could have been successfully managed at home (Beasley, 2011). This highlights the need for better recognition and management of cellulitis in the community. For this reason, cellulitis is now categorised as an acute condition that does not usually require admission (Health and Social Care Information Centre, 2013).

It is important that clinicians recognise the risk factors for cellulitis so that its development can be prevented, if possible. To avoid unnecessary admissions, clinicians should be familiar with the systemic and local presentation of cellulitis, be able to carry out patient assessment, diagnose it confidently and initiate prompt and appropriate treatment.

RISK FACTORS FOR CELLULITIS

Any breach in the skin’s integrity that allows the entry of bacteria can result in cellulitis. There are a number of risk factors that are known to be linked to its development, including:

- Lower leg chronic oedema (Dupuy et al, 1999), lymphoedema (Stalbow, 2004) and chronic venous insufficiency (Jorup-Ronstrom and Britton, 1987). These conditions result in fragile skin which is easily broken, with the lymph-rich fluid providing nutrients for bacterial growth
- Insect, animal or human bites
- Injuries or trauma that result in a break in the skin, including blunt trauma (Cox, 1999)
- Athlete’s foot (tinea pedis) (Bjornsdottir et al, 2005)
- Obesity (Dupuy et al, 1999; Scheinfield, 2004)
- Recent surgery (particularly venectomy for coronary artery bypass grafting) (Dupuy et al, 1999)
- Venous eczema (Dupuy et al, 1999)
- Leg ulceration (Dupuy et al, 1999)
- Previous episodes of cellulitis
- Immunocompromised patients
- Intravenous (IV) drug users.

In patients with known risk factors, action should be taken to prevent the development of cellulitis where possible. For example, encouraging healing in patients with venous leg ulcers by using compression and protecting the wound with an appropriate dressing will reduce the risk of bacterial entry.

ASSESSMENT

A thorough patient history must be taken to determine if the patient has any risk factors for the development of cellulitis, as outlined above. If cellulitis is suspected, the patient should be assessed for the following signs and symptoms:

- Pyrexia: elevated temperature is a sign of infection, except in patients who are immunosuppressed or elderly
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Malaise: patients with cellulitis will report feeling generally unwell with flu-like symptoms
Rigor: shivering and/or shaking may accompany high temperature
Sweating (Beasley, 2011; Wingfield, 2012).

Assessment should be the focus on the limb. Examine the limb looking for damage/trauma that could serve as an entry point for bacteria, although this may not be immediately apparent. The common local signs and symptoms of cellulitis are:

- Redness: sudden onset of redness or rash that spreads quickly in the first 24 hours and is well demarcated (Beasley, 2011)
- Tenderness: handling of the limb is usually very painful and this may worsen with progression of infection. The limb may be so tender that the patient is unable to tolerate touch or weight bear.
- Absence of pain means cellulitis is unlikely (Wingfield, 2009)
- Warmth: heat in the affected area will indicate inflammation. If there is an absence of warmth, cellulitis is unlikely (Wingfield, 2012)
- Swelling: this will give a tight, glossy, stretched appearance to the skin (Beasley, 2011). In some patients, especially those with lymphoedema, the limb may exude or leak fluid
- Bullae: one or more of these fluid-filled sacs (which may contain blood) may be present on the limb (Wingfield, 2009). Blistering and ulceration may occur in severe infection, which is often associated with oedema (Cox, 2002).

Patients with chronic oedema and lymphoedema are particularly prone to developing cellulitis, but their symptoms may differ from those usually seen; the sensation of heat and pain may be less pronounced and there may be excessive leakage of exudate or blistering (British Lymphology Society [BLS], 2013; Beasley, 2011). Redness of the limb may also be more blotchy (BLS, 2013).

It is vital that all findings are well documented to form a baseline against which to measure the success of treatment.

Cellulitis rarely affects both limbs. If both are affected, and/or if there is a lack of systemic symptoms, a differential diagnosis should be considered (Clinical Resource Efficiency Support Team [CREST], 2005).

**DIFFERENTIAL DIAGNOSIS**

Several common skin conditions are often mistaken for cellulitis, including venous eczema, lipodermatosclerosis and deep vein thrombosis (DVT). However, there are differences between the presenting signs and symptoms of these and cellulitis.

**Venous eczema**

Limbs with venous eczema may have haemosiderin staining, pitting oedema, dry itchy skin, skin inflammation and induration (Wingfield, 2009) (Figure 2), which may look like cellulitis. The florid, red appearance of the limb with venous eczema, however, will not have had a rapid onset, and will not have spread rapidly. Symptoms such as itching and scaliness may appear on both legs, and there will be an absence of pyrexia, acute pain and tenderness in the limb (Quartey-Papafio, 1999; CREST, 2005; Beasley, 2011).

It is important to remember that venous eczema is a known risk factor for the development of cellulitis and they can present together. If pain and reduced mobility are present, particularly in one limb, a diagnosis of cellulitis should be considered (Quartey-Papafio, 1999).

**Lipodermatosclerosis**

Patients with lipodermatosclerosis (Figure 3) may have symptoms associated with cellulitis such as induration, redness and pain, but there will be an absence of symptoms of infection, e.g. pyrexia, heat and tenderness. The signs and symptoms of lipodermatosclerosis develop slowly over time and are more likely to be bilateral, with limbs having an inverted champagne bottle shape.

**Deep vein thrombosis**

Symptoms of DVT include pain, swelling and tenderness, a heavy ache and/or warm skin in the affected area, plus redness or discoloration at the back of the leg below the knee.

The redness does not spread rapidly and is localised to the area of clot (CREST, 2005). No pyrexia or other signs of infection are usually present.

Other less common skin conditions that are misdiagnosed as cellulitis include necroting fasciitis, gangrene, acute gout and vasculitis (Wingfield, 2012). An ability to differentiate between cellulitis and other conditions of the skin could reduce morbidity and decrease the costs of acute admission, as well as helping to prevent unnecessary antibiotic therapy (Quartey-Papafio, 1999).

**STAGING CELLULITIS**

Following assessment and a positive diagnosis, cellulitis should be classified into one of four classes (Table 1) (CREST, 2005). This will provide guidance on where and how the patient should be managed. Patients falling into classes 1 and 2 are suitable for management in a community...
setting, while patients in classes 3 or 4 need urgent admission.

**MANAGEMENT**

Cellulitis can be managed well in the community, but the decision to do so must be based on the severity of infection, as determined during assessment (Table 1). Close monitoring is essential so that improvement or deterioration can be quickly identified. The aims of management are to:
- Eradicate bacterial infection
- Alleviate symptoms
- Prevent recurrence where possible due to management of risk factors, such as leg ulceration and oedema.

**Eradicate bacterial infection**

The causative bacterial infection must be eradicated using antibiotics as soon as possible, and before any swab results are received. Local policies and antibiotic guidelines should be followed (Beasley, 2011).

**Alleviate symptoms**

Systemic signs of infection should be monitored, including the patient’s blood pressure, pulse and temperature. It is important to remember that in some patient groups, such as the elderly, there may be a lack of pyrexia, even when severe infection is present (Wingfield, 2012). Local symptoms, including redness and swelling, should be monitored to measure effectiveness of therapy. Measuring the circumference of the leg will enable clinicians to establish if swelling is reducing, while elevating the limb will help to reduce volume (Stalbow, 2004). The area of redness on the skin should be marked with an indelible pen, so that spreading or resolution of the rash can be easily observed. The limb may be very tender and painful so analgesia should be given regularly.

If the patient is wearing compression, this should be removed in the acute stages of infection. However, it should be recommenced once the acute signs of infection have been managed and compression can be tolerated (BLS 2013).

The HAMMMER acronym helps to remember the key principles of management (Beasley, 2011) (Table 2).

**WHEN TO REFER**

Patients should be reviewed after 5–7 days of taking first-line antibiotics (Wingfield, 2012). However, they should be informed to seek help if:
- They have a temperature, especially with rigors
- A red streak forms from the cellulitis, or if redness spreads rapidly
- Pain increases and is not helped by analgesia
- The limb cannot be moved due to pain
- Nausea and vomiting occur (Wingfield, 2012).

For those with chronic oedema and lymphoedema, longer courses of antibiotics are generally required to effectively manage cellulitis. The BLS (2013) indicate that antibiotic therapy should continue for at least 14 days following a positive clinical response.

Worsening symptoms may indicate that the antibiotics need to be changed, the course extended, the dose increased, or the patient admitted to hospital (Beasley, 2011).

**PREVENTION OF RECURRENCE**

Once a patient has had an episode of cellulitis, they are at an increased risk of it occurring again (Cox, 2006). Prophylactic antibiotics may be prescribed in the long term for patients at high risk of recurrence.

**CONCLUSIONS**

Cellulitis is a costly condition if it

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**Table 1: Classification of cellulitis in adults (CREST, 2005; Beasley, 2011)**

<table>
<thead>
<tr>
<th>Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No signs of systemic toxicity No uncontrolled comorbidities Can be managed with oral antibiotics on an outpatient basis</td>
</tr>
<tr>
<td>2</td>
<td>Systemic illness Systemically well but comorbidities present which may complicate or delay management of infection, e.g. peripheral vascular disease Can be managed with oral antibiotics or intravenous (IV) antibiotics in the community</td>
</tr>
<tr>
<td>3</td>
<td>Significant systemic upset, e.g. confusion, tachycardia, tachypnoea, hypotension Unstable comorbidities which may complicate or delay management of infection Limb-threatening infection due to vascular compromise Requires hospital admission for intravenous antibiotics</td>
</tr>
<tr>
<td>4</td>
<td>Sepsis syndrome Life-threatening infection, such as necrotising fasciitis Urgent hospital admission for intensive therapy</td>
</tr>
</tbody>
</table>

**Table 2: HAMMMER (from Beasley, 2011)**

<table>
<thead>
<tr>
<th>Action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrate:</td>
<td>Drink 2 litres of fluid per day, if possible</td>
</tr>
<tr>
<td>Analgesia:</td>
<td>Take pain relief on a regular basis</td>
</tr>
<tr>
<td>Monitor pyrexia:</td>
<td>Is temperature still rising?</td>
</tr>
<tr>
<td>Mark off the area:</td>
<td>Is redness spreading?</td>
</tr>
<tr>
<td>Measure limb circumference:</td>
<td>Is it increasing in size?</td>
</tr>
<tr>
<td>Elevate the limb:</td>
<td>Reduce swelling if possible</td>
</tr>
<tr>
<td>Record the site:</td>
<td>Document progress accurately</td>
</tr>
</tbody>
</table>

This is common, possibly because risk factors are not identified and managed, particularly those relating to underlying lymphovenous disease (Jorup-Ronstrom and Britton, 1987).

The correct management of underlying lymphovenous disease using compression can help to alleviate chronic oedema, lymphoedema, venous eczema and leg ulceration as risk factors for the recurrence of cellulitis. It is important to remember, however, that the patient may not be able to tolerate application of compression in the early stages of infection.

Skin care is also important to prevent recurrence, as hydration helps to maintain skin integrity and prevent the entry of bacteria. Patients should use emollients to wash and moisturise the skin to maintain hydration and elasticity.
results in admission for treatment, and it is well recognised that many admissions are misdiagnosed skin conditions or could have been managed in the community. Awareness of the risk factors for cellulitis are crucial for preventing both first episodes and recurrence. It is important that clinicians have an understanding of cellulitis and how to distinguish it from other common skin conditions so that they can adequately assess, diagnose and manage patients at home.

**REFERENCES**


King’s Fund (2013) *Transforming our Health Care system*. The King’s Fund, London


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**What’s your next step?**

To use the knowledge that you have gained from this article to inform your continuing professional development (CPD), you should take the following steps before logging onto the website (www.jcn.co.uk/learning-zone/) to take the learning zone test:

**Reflect**

Are you familiar with the risk factors for the onset of cellulitis?
Are you able to identify the local signs and symptoms of cellulitis?
Can you list the common skin conditions that are frequently mistaken for cellulitis?

**Evaluate**

Do you understand why it is important to recognise cellulitis in the community setting and the principles of management?

**Act**

Read the article when you have a spare few minutes in the day.

Make some notes on what you have learned, then visit the online test (www.jcn.co.uk/learning-zone/) to complete this subject.

The whole test, which involves reading this article and answering the online questions, should take you 90 minutes to complete.

Finally, download your certificate to show that you have completed the JCN e-learning unit on cellulitis as part of your CPD portfolio.