Cellulitis of the lower limbs: incidence, diagnosis and management

KEY WORDS
- Cellulitis
- Lower limb
- Lymphoedema
- Skin infection

Cellulitis is a common clinical condition that is often inaccurately diagnosed. Risk factors for the development of cellulitis include obesity, lymphoedema and lower limb ulceration. It is important to accurately diagnose and effectively treat cellulitis in order to provide cost effective care and reduce patient suffering. This article will deliver an overview on the burden of cellulitis, provide information that will aid accurate diagnosis and summarise current treatment options.

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Cellulitis is an inflammatory skin condition caused by acute infection of the dermal and subcutaneous layers of the skin; it is characterised by a superficial, diffuse, spreading skin infection without underlying collection of pus.

Cellulitis is a common diagnosis among inpatients and outpatients as well as in primary care settings (Bailey and Kroshinsky, 2011). It accounts for 3% of attendance to accident and emergency departments within the UK (Haydock et al, 2007). The prevalence of cellulitis is increasing year on year, with the ageing population and increasing levels of obesity thought to be contributing to this rise (Hirschmann and Raugi, 2012a).

Many practitioners will encounter patients with suspected cellulitis; however, diagnosing cellulitis is not always easy. The identification of cellulitis is based solely on clinical findings and, unfortunately, there are several other common conditions that mimic the clinical signs of cellulitis, creating a potential for misdiagnosis and incorrect management (Hirschmann and Raugi, 2012b). Hence it is essential that all practitioners are skilled in recognising cellulitis, confirming diagnosis, and that they possess the ability and skills to set appropriate treatment plans. This would ensure all patients receive timely, effective care to improve their health outcomes.

CELLULITIS

Cellulitis is an inflammatory skin condition with an infectious origin, classically presenting itself through erythema, swelling, warmth, oedema and tenderness over the affected area. There is often a poorly defined border separating the affected from the non-affected skin (Ch'ng and Johar, 2016). Cellulitis is commonly caused by *Streptococcus pyogenes* or *Staphylococcus aureus*, which resides in the interdigital spaces, and it most often affects the lower limbs (Corwin et al, 2005). Hirschmann and Raugi (2012b) established that 30–80% of patients with cellulitis had an interdigital skin condition, such as eczema, fissures or athletes foot. Any disruptions in the protective barrier of the skin surface allow bacteria to invade the body and place patients at increased risk of developing cellulitis.

INCIDENCE

The incidence and treatment of cellulitis places a significant burden on the NHS, both in terms of costs and resources. Lower limb cellulitis accounted for over 55,000 hospital admissions in England during 2011–2012 (Health and Social Care Information Centre [HSCIC], 2013), with a mean hospital in patient length of stay of 10 days (Department of Health [DH], 2006a; Halpern et al, 2008); this amounts to over 400,000 bed days a year. Annually, the NHS spends £172–254 million on the admission and treatment of patients with cellulitis (DH, 2006b; Curtis, 2011).

RISK FACTORS

Risk factors for developing cellulitis include older

age, obesity, venous insufficiency, saphenous venectomy (vein harvest for bypass surgery), trauma, eczema, dermatitis, athletes foot and oedema (Hirschmann and Raugi, 2012a). Patients with lymphoedema are especially at risk of developing cellulitis, due to the disturbances in lymph drainage and associated localised impaired host response to infection (Soo et al, 2008). It is reported that within a one-year period, 28% of patients with lymphoedema will develop cellulitis, and a quarter of this group will required admission to hospital for treatment with intravenous antibiotics (Soo et al, 2008). Typically, the onset of cellulitis is between the ages of 40 and 60 years (Ellis Simonsen et al, 2006), and cellulitis occurs in equal frequency in men and women. The highest predisposing factor for developing cellulites is a previous episode of cellulitis, with reported annual recurrence rates of 8–20% (Hirschmann and Raugi, 2012b).

DIAGNOSIS

Cellulitis is one of the most commonly misdiagnosed conditions, with as many as one third of patients being diagnosed incorrectly (Hirschmann and Raugi, 2012b). In the region of 132,000 bed days and £84.5 million per year are wasted as a result of inaccurate diagnosis (Levell et al, 2011). The Levell et al (2011) study also showed that a third of patients (33%) referred with lower limb cellulitis had an alternative diagnosis and, of the confirmed cases of cellulitis, 28% had another skin condition that if treated simultaneously would speed recovery and reduce the risk of recurrence. This misdiagnosis clearly has other impacts in terms of patient expectations, treatment delays and wider public health risks due to the potential inappropriate use of antibiotics. Other conditions that can mimic the clinical features of cellulitis include: varicose eczema, venous hypertension, lipodermatosclerosis, vasculitis, necrotising fasciitis, deep vein thrombosis, septic arthritis, acute gout and thrombophlebitis (National Institute for Health and Care Excellence [NICE], 2015).

Clinical signs of cellulitis include pyrexia, general malaise, pain, and patients often feel generally unwell, reporting chills or sweating (Gunderson, 2011; Wingfield, 2012). These systemic symptoms may accompany or precede the acute onset of skin changes. The affected area will be subject to redness, warmth, swelling and localised tenderness, with the edges of cellulitis ill defined and the affected skin raised, tight and shiny (Eagle, 2007; Opoku, 2015). Typically, presentation is unilateral, with bilateral leg cellulitis being very rare (NICE, 2015).

Laboratory investigations can aid diagnosis. The Clinical Resource Efficiency Support Team (CREST, 2005) state that although non-specific, nearly all patients with cellulitis will have a raised white cell count (WCC) and elevated erythrocyte

CELLULITIS ASSESSMENT CHECKLIST

- Patient name: ..... NHS NUMBER .....
- GP details: .....

Checklist	YES	NO
Is there a sudden and progressive onset of red, hot, inflamed, painful and tender area of skin?		
Are the edges of the redness well demarcated and spreading rapidly?		
Are the edges more diffuse and spreading rapidly?		
Is it unilateral (usually affects only one leg)?		
Are there blisters (usually more than 5mm in diameter)?		
Does the patient have a fever/temperature?		
Raised inflammatory markers, e.g C-reactive protein (CRP) and white cell count (WCC)?		
Total number of Yes's and No's		

If there are 4 or more Yes's	**Consider cellulitis and follow cellulitis treatment guidelines**
Differential diagnoses	
If there are 4 or more No's consider other differential diagnoses below:	
Bilateral with crusting, scaling, itchiness of the lower leg, with history of varicose veins or deep vein thrombosis	**Consider varicose eczema**
Pain, tenderness and swelling without significant redness	**Consider deep vein thrombosis**
Pain, redness, thickening or fibrosis of the skin with history of varicose veins or deep vein thrombosis and hyperpigmentation?	**Consider lipodermatosclerosis**

- TREATMENT PLAN .....
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Figure 1. Example of checklist (with kind permission from Wounds International [Opoku, 2015])

sedimentation rate (ESR) or C-reactive protein (CRP) level and that normal levels of blood inflammatory markers make the diagnosis of cellulitis less likely. However, a normal WCC does not exclude cellulitis. Lazzarini et al (2005) reported that only 50% of patients admitted with cellulitis had a raised WCC, and that ESR and CRP were much more sensitive markers with increases observed in 85% and 97% of patients respectively. The use of a diagnostic checklist can help prevent misdiagnosis, with the checklist produced by Opoku (2015) offering an excellent practical tool to aid accurate diagnosis (*Figure 1*).

CLASSIFICATION

Table 1. The Eron classification adapted from the CREST guidelines (2005)

Classification	Description	Treatment
I	Patients have no signs of systemic toxicity, have no uncontrolled comorbidities and can usually be managed with oral antimicrobials on an outpatient basis	Oral antibiotic therapy Identification and management of underlying risk factors
II	Patients are either systemically ill or systemically well but with a comorbidity such a peripheral vascular disease, chronic venous insufficiency or morbid obesity which may complicate or delay resolution of their infection	Requires IV antibiotics. Admission may not be necessary if there are suitable facilities and expertise in community
III	Patients may have significant systemic symptoms, such as acute confusion, tachycardia, tachypnoea, hypotension; or may have unstable comorbidities that may interfere with a response to therapy; or a limb-threatening infection due to vascular compromise	Admit to hospital for IV antibiotics and careful monitoring
IV	Patients have sepsis syndrome or severe life-threatening infections, such as necrotising fasciitis	Admit to hospital for IV antibiotics and treatment of sepsis.

Classification of severity can be useful for guiding admission and treatment decisions. The Eron classification (*Table 1*) is used within the CREST guidelines (2005) and the NICE guidelines (2015) for cellulitis.

TREATMENT

Staphylococcus aureus is the most common cause of cellulitis, and has been found to be the causative bacteria in 59–76% of cases (Moran et al, 2006; Lee et al, 2015). Individualised bacterial identification from microbiology is often difficult due to the low recovery rate from needle aspirates, skin biopsies and blood cultures (Jeng et al, 2010). The choice of which antimicrobial agent to use will be governed by the suspected bacteria involved and steered by local antibiotic guidelines. Flucloxacillin is commonly used as first-line treatment as it covers both streptococcal and staphylococcal infections. Clarithromycin if allergic to penicillin. In patients with known lymphoedema, amoxicillin is more effective if there is no evidence of folliculitis, pus formation or crusted dermatitis (British Lymphology Society, 2015; NICE, 2015). Antibiotics should be used for a period of 7 days. Before commencing treatment, if possible, mark the area around the extent of the infection with an appropriate skin marker, as this can be useful for monitoring responses to antibiotics (NICE, 2015). All patients should be reviewed after 48 hours of commencing treatment, either face to face or by telephone, depending on clinical judgement, to assess the effectiveness of the management plan.

COMPRESSION IN CELLULITIS

Patients with venous ulceration are at higher risk of developing cellulitis due to the breakdown of the protective barrier of the skin, and these patients are often in compression therapy to treat the underlying venous hypertension. It is commonly thought that it is contraindicated to continue compression therapy when patients have an acute infection, and in many patients compression therapy is routinely stopped if there is evidence of acute cellulites. This is not definitive, and in fact there is an argument for the need of continued compression. In each episode of cellulitis the lymphatic system is challenged, and cellulitis can result in permanent damage to

the lymphatics system leading to the development of chronic oedema or lymphoedema (Cox, 2006). This results in an increased risk of recurrence of cellulitis as oedema, lymphoedema and cellulitis are strongly associated (Soo et al, 2008). The lymphatic changes resulting from cellulitis lead to these patients entering a continuous cycle of increased wrisk of oedema, which in turn predisposes patients to cellulitis. Additionally, cellulitis is a cause of persistent oedema and any episode of cellulitis predisposes to further episodes (Cox, 2006). This all results in patients being at increased risk of recurrence and long-term conditions. As compression therapy can help support the lymphatic channels during acute episodes, it does not need to be routinely stopped. However, many patients are simply not be able to cope with compression therapy due to increased pain from the affected area. The decision to stop compression therapy should be based on individual patient assessment rather than standard practice.

CONCLUSION

Lower limb cellulitis is a common condition that has both significant morbidity and resource implications. Many other conditions mimic the clinical signs of cellulitis but can easily be distinguished from it with careful history taking and holistic patient assessment. Accurate diagnosis is vital to ensuring effective patient management while protecting the limited resources of antibiotics. Wherever possible, practitioners also need to treat underlying or predisposing conditions in parallel to optimise treatment, thus reducing the risk of recurrence and improving overall quality of care. WUK

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