Ten top tips for improving the diagnosis of cellulitis in the lower limb

Despite cellulitis being a common medical condition, it is frequently misdiagnosed. This article outlines ten top tips designed to aid the clinician in diagnosing cellulitis, as well as outlining an effective approach to treatment.

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Cellulitis is a common medical condition encompassing an acute, subacute or chronic inflammation of the skin and subcutaneous tissue, usually as a result of a bacterial infection (Kilburn et al, 2010). Microorganisms found on the skin, such as *Streptococcus pyogenes* and *Staphylococcus aureus*, gain access through the skin barrier causing an infection of the subcutaneous tissue (Bjorndottor et al, 2005).

Hospital admissions as a result of cellulitis in the UK have grown in recent years, however, diagnosis of this common condition is often missed. A third of patients thought to have cellulitis are misdiagnosed (Levell et al, 2011), and misdiagnosis leads to treatment delays and failures. These top tips cover the knowledge and skills required to assist in diagnosing cellulitis, and outline how diagnosis and treatment should be approached.

1 RECOGNISE THE EXTENT OF THE PROBLEM

The number of patients being admitted to hospital for cellulitis treatment is growing. Between 2003 to 2004, there were 45,522 inpatient admissions for cellulitis in the UK, costing the NHS £87 million (Carter et al, 2007). According to the Health and Social Care Information Centre (2011) between 2010 and 2011, there were 62,588 primary admissions for cellulitis in England. Cellulitis accounted for 1.6% of emergency hospital admissions during 2008–2009 (Blunt et al, 2010) and was the fourth-leading cause of emergency admissions for an acute condition over 2011/2012 (Health and Social Care Information Centre, 2013).

2 IDENTIFY WHO IS AT RISK

Most cases of cellulitis are attributed to a compromised skin barrier (Clinical Resources Efficiency Support Team, 2005; Kilburn et al, 2010). Key risk factors therefore include fungal infection, leg ulceration, skin maceration, intravenous drug misuse and recent surgery (Cox, 2006; Wingfield, 2012). However, patients who are immunodeficient or/and with some underlying conditions or predisposing factors such as oedema, lymphoedema, venous insufficiency, obesity, pregnancy, alcohol abuse and diabetes are also at risk of cellulitis (Cox, 2006; Linnit, 2007).

3 CHALLENGE YOUR KNOWLEDGE AND THAT OF OTHERS

Although Levell et al (Levell et al, 2011) identified that cellulitis is best diagnosed by dermatologists, district nurses and general practitioners are usually the first to assess patients in the community. The author reviewed current practices for identification of cellulitis of the lower limb among registered nurses on a district nursing team. A knowledge check from a random sample of 12 nurses, with nursing experience ranging from 9 months to 30 years showed that regardless of nursing experience, nurses were not developing the skills 'on the job' to identify whether a patient has cellulitis, venous eczema or lipodermatosclerosis, among other skin conditions. Although all of the nurses could state typical signs of infection associated with cellulitis, such as heat, redness, pain, swelling, however, none of the nurses mentioned signs of demarcated areas and/or raised tight shiny skin, which are key presenting symptoms (Eagle, 2007).

Although this was a small localised survey, it highlights a problem that has been raised in the literature (Nazarko, 2013), and suggests that training in diagnosing cellulitis and other dermatological conditions should be an essential part of healthcare professionals' practice. The Clinical Resource Efficiency Support Team (Clinical Resource Efficiency Support Team, 2005) provides guidelines on cellulitis management in adults, and aims to ensure the highest possible standard of clinical practice. Other position statements and guidelines include the British Lymphology Society Consensus Document on the Management of Cellulitis in Lymphoedema (British Lymphology Society, 2013), the Cochrane Review (Kilburn et al, 2010) and the National Health Service (NHS) Clinical Knowledge Summaries (NICE, 2008) of management of acute cellulitis. Healthcare professionals should read these documents and equip themselves with the knowledge to recognise cellulitis effectively.

4 UNDERSTAND THE CLASSES OF CELLULITIS

There are four classes of cellulitis and each class requires a different care plan (Eron, 2000) (*Table 1*). Clinical findings alone are usually adequate for diagnosing cellulitis, particularly in non-toxic immunocompetent patients. Class I and Class II cellulitis can be successfully managed in the community (Clinical Resource Efficiency Support Team, 2005). It is imperative to be able to identify cellulitis in the first instance to ensure the appropriate care pathway is chosen.

5 CLASSIC PRESENTATION OF CELLULITIS AND FURTHER INVESTIGATIONS

Cellulitis is characterised by pyrexia, general malaise, redness, warmth swelling and pain (Gunderson, 2011; Wingfield, 2012), with demarcated areas and raised, tight, shiny skin (Eagle, 2007). Other symptoms include:

- Chills, sweating, and/or feeling unwell.
- Localised tenderness
- One or more bullae on the skin, which do not feel hard/fibrotic to touch.

Cellulitis usually affects one limb only, although it can be bilateral, and there will be no lesions elsewhere. Erythrocyte sedimentation rate (ESR), C-reactive protein (CRP) and white cell count (WCC) are usually high, so should be checked, and the CREST guidelines (Clinical Resource Efficiency Support Team, 2005) suggest that full blood count, ESR/CRP, urea and electrolytes and blood cultures should also be performed in Class II–IV cellulitis. In a study conducted by Chira and Miller (Chira and Miller, 2010), 68 out of 128 patients with cellulitis were infected with either *Streptococcus pyogenes* or *Staphylococcus aureus*.

The portal of entry is commonly unknown, but breaks in skin, ulcers, trauma, and athlete's foot are implicated (Nazarko, 2013). Unusual causes must also not be ignored; and assessment must explore any foreign travel with exposure to animal contact, animal or human bites and injectable drug use (Dryden, 2010).

6 EXCLUDE VARICOSE ECZEMA

There are several skin conditions that are often mistaken for cellulitis (Linnit, 2007; Wingfield, 2012) (*Box 1*). This article focuses on varicose eczema and lipodermatosclerosis. Varicose eczema has been identified as one of the skin conditions commonly misdiagnosed as cellulitis and lipodermatosclerosis is one of the least identified, but may initially present with similar signs and symptoms (Wingfield, 2012; Nazarko, 2013).

Eczema or atopic dermatitis is an inflammatory, chronically relapsing, non-contagious and extremely pruritic skin disease. Proposed multifactorial links include genetic and environmental factors, with demonstrable immunoglobulin E (IgE) association (Ring and Darsow, 2008). Venous eczema is a common inflammatory skin disease occurring in the lower extremities of patients with chronic venous insufficiency and venous hypertension, which may indicate other problematic conditions, such as venous leg ulceration and lipodermatosclerosis (Jindal et al, 2009).

Venous eczema is also referred to in the literature as varicose eczema (Beldon, 2006), gravitational eczema (Patel et al, 2001), stasis eczema (Romanelli and Romanelli, 2007; Duffill, 2008), and stasis dermatitis (Jindal et al, 2009). The characteristics of varicose eczema include (Nazarko, 2013):

- Itching
- A history of varicose veins or deep vein thrombosis
- Bilateral presentation in the legs
- Erythema
- No tenderness
- Crusting
- Vesicles lesions on other parts of the body, particularly other leg and arms

Box 1. Skin conditions that are often mistaken for cellulitis (Linnit, 2007; Wingfield, 2012).

Venous eczema
Deep vein thrombosis
Lipodermatosclerosis
Lymphoedema
Chronic oedema
Necrotising Fasciitis
Gangrene
Acute gout
Adverse drug reactions
Metastatic cancer
Contact dermatitis
Erythema nodosum
Panniculitis
Vasculitis

- Changes in pigment (haemosiderin staining)
- Normal WCC, CRP and temperature
- Negative blood cultures.

7 EXCLUDE LIPODERMATOSCLEROSIS

Lipodermatosclerosis is a progressive fibrotic process of the dermis and subcutaneous fat associated with chronic venous insufficiency, resulting in hyperpigmentation and induration of the lower leg (Morton and Phillips, 2013), associated with pronounced skin induration and inflammation (Barron et al, 2007). Patients are systemically well, with a normal temperature and a normal CRP and WCC (although this can be slightly elevated in acute lipodermatosclerosis). Blood cultures will also be negative. Physical characteristics of lipodermatosclerosis include (Nazarko, 2013):

- Pain and discomfort
- History of varicose veins or deep vein thrombosis
- Bilateral presentation
- Erythema
- No tenderness
- Fibrotic feel
- Hardening/thickening of the skin
- Small, white star-shaped scarred area (atrophie blanche)
- Changes in pigment (haemosiderin staining)
- Legs shaped like inverted Champagne bottles.

8 USE A CHECKLIST

The use of simple clinical diagnostic criteria should be encouraged and should avoid over- or misdiagnosis and inappropriate investigations and antibiotics. Although nonspecific, nearly all patients have a raised WCC and elevated ESR or CRP. Normal results make a diagnosis of cellulitis less likely. CREST (Clinical Resource Efficiency Support Team, 2005) recommend a simple tool to help with diagnosing cellulitis, to assist practitioners in ensuring the timely provision of care, such as that produced by the author (*Figure 1*).

9 KNOW THE TREATMENT OPTIONS

The management of cellulitis should aim at resolution of the symptoms presenting and avoidance of or reduction in hospital admission (Al-Niaimi and Cox, 2009). The patient should therefore be advised about the right treatment, which includes antibiotics, bed rest, leg elevation, analgesia, skin and wound care (Al-Niaimi and Cox, 2009). It is, therefore, imperative to liaise with Lead nurse or the patients general practitioner with an aim to achieve the above.

The suggested duration of antibiotic treatment is seven days for mild infections and 10 days for more severe forms, although there is limited evidence available for the estimated duration of tr The patient should be advised about the treatment (Al-Niaimi and Cox, 2009). CREST (Clinical Resource Efficiency Support Team, 2005) make the following recommendations regarding treatment for cellulitis:

- Class I patients can usually be managed with oral antimicrobials on an outpatient basis
- Class II patients are suitable for short term (up to 48 hours) hospitalisation and discharge on outpatient parenteral antimicrobial therapy (OPAT), where this service is available
- Class III and Class IV patients require hospitalisation until the infected area is clinically improving, systemic signs of infection are resolving and any comorbidities are stabilised.

Intravenous antibiotic home therapy treatment prevents admissions and provides a faster pathway of treatment (Wingfield, 2009). It is cost effective and improves patients

Table 1. Clinical classes of cellulitis (Eron, 2000; Clinical Resource Efficiency Support Team, 2005; Nazarko, 2013).

Class I	No signs of systemic toxicity; no uncontrolled comorbidities; usually managed with oral antimicrobials on an outpatient basis
Class II	Systemically ill or systemically well, but with comorbidity such as peripheral vascular disease, chronic venous insufficiency or morbid obesity, which may complicate or delay resolution of infection. Can be effectively managed with IV antibiotics at home followed by transition to oral agents as infection improves
Class III	May have significant systemic upset, such as acute confusion, tachycardia, tachypnoea and hypotension; or unstable comorbidities that may interfere with a response to therapy. May have a limb-threatening infection owing to vascular compromise
Class IV	Sepsis syndrome or severe life-threatening infection, such as necrotising fasciitis.

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)?		

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 .....
  .....
  .....

Figure 1. ***Example of checklist, produced by author, to assist in diagnosing cellulitis (not yet validated).***

satisfaction (Corwin et al, 2005; Lasschuit et al, 2014).

10 MONITOR FOR PROGRESSION

It is important to map and monitor for progression of cellulitis, and clinicians should be marking and dating the edge of the erythema where possible to establish a baseline to monitor progress (British Lymphology Society, 2013). Rapid progression of symptoms may indicate a more acute and deeper infection such as necrotising fasciitis or crepitus, which require urgent hospital admission (Wingfield, 2012; Puvanendran et al, 2009).The development of fungal infections of the foot in a diabetic patient should also not be ignored, as it can contribute to the pathogenesis of ulceration and cellulitis in a diabetic foot. Interdigital fungal infections can create inflammation and fissuring causing a breach in the epidermis (Chadwick, 2013), which may also progress to cellulitis.

Conclusion

Cellulitis is a common medical condition encompassing an acute, subacute or chronic inflammation of the skin and subcutaneous tissue, usually owing to a bacterial infection (Kilburn et al, 2010). While there are pathways available in cellulitis management, the focus here is on diagnosing cellulitis — including the class of cellulitis — and distinguishing it from other skin conditions. Two differential diagnoses — varicose eczema and lipodermatosclerosis — are outlined and other skin conditions that may be mistaken for cellulitis highlighted. The use of a simple diagnostic tool is recommended to aid safe patient management and improve patient outcomes and quality of care provision. WE

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