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A Review Study on Cellulitis

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ABSTRACT

Cellulitis is a clinical condition which is characterised by reddishness, soreness, localized pain, erythema, swelling and formation of abscess in the leg, pyrexia and an increase in the heartbeat. It is the infection of the subcutaneous tissue and dermal layer usually found complicating a wound or ulcer. It is considered an infectious disease as it causes morbidity and mortality. It is also called skin diseases, as the skin is involved and lacks sharp demarcation from uninvolved skin. Cellulitis spreads rapidly and is pyogenic in nature and is frequently associated with lymphangitis and fever. *Streptococci (streptococci pyogenes)* and *staphylococcus aureus* are the two species which causes cellulitis. Five types of cellulitis can be classified they are facial cellulitis, periorbital cellulitis, breast cellulitis, perianal cellulitis. Diagnosis of cellulitis is based on morphological features of the lesion and a CT scan is required for determining cellulitis. By the visual inspection, the cellulitis is spotted. The common risk factor for cellulitis is oedema. If the cellulitis patient has Diabetes Mellitus or injury in the skin or any inflammation in the liver, they are considered to be in a dangerous state. Non-Steroidal Anti-Inflammatory Drugs are prescribed to decrease the clinical features. Clindamycin, Dicloxacillin are antibiotics that are administered to cure cellulitis. This review discusses the general information regarding cellulitis, its clinical indications, pathophysiology, microbiology and its treatment.

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INTRODUCTION

Cellulitis is defined as the acute infection of the subcutaneous tissue and dermal layer. It is an infectious

disease which is responsible for unwholesomeness (morbidity) and loss of life (mortality). It is a micro-organism infection where the skin is concerned. It is considered as an epidemic disease which affects both adults and children. Cellulitis can be classified into five types (Linder and Malani, 2017).

Cellulitis occurs due to two species. They are *Streptococci (streptococcus pyogenes)* and *Staphylococcus aureus*. In that, the most identified cause is *Staphylococcus aureus*. Cellulitis requires hospitalization in extreme condition. Computed Tomography (CT) scanning is used in determining cellulitis. However, X-rays are not required in most cases, but in some cases, it is needed (Chiras, 2010).

Moreover, people's caution in cleanliness and their knowledge in vaccine progression had a phenome-

Table 1: The Types of Cellulitis

Types	Description
Facial cellulitis	If there is any inflammation like an ache, swellings, reddishness on the face, lips, tongues, then the person is having more chance to acquire the clinical condition called cellulitis.
Periorbital cellulitis	It is also named preseptal cellulitis. In this case, the person may have the chances to be getting affected in the eye, eyelids or every side of the eye's skin.
Orbital cellulitis	It is a severe condition, where the Medical Practitioner consultation is very must as it has a bigger chance of the brain getting infected.
Breast cellulitis	In this case, the body part of the breast is being affected. In this case, female patients are getting affected.
Perianal cellulitis	In this type, the perianal cellulitis is mostly noticed in males. In this type, every side of the anus's skin will be looked bright red in colour.

Table 2: Steroidal Anti-Inflammatory drugs and Anti-Bacterial drugs to treat Cellulitis

Drugs Name	Uses	Dosage	Strength
Dicloxacillin, Amoxicillin	Used in cellulitis's initial stages	Capsule	250mg,500mg
Clindamycin	Used as a substitute to patient's, those who are having an allergic reaction to drug "Penicillin."	Capsule	150mg,300mg
Levofloxacin or Fluoroquinolones	As alternative medicine	Tablet	250mg,500mg,750mg
Parenteral antibiotic (Cefazolin)	Medical practitioners prefer this as initial dose.	Injection	1g/100ml
Ibuprofen	Prescribed for reducing the body's temperature as well as ache.	Tablet	600mg/1

nal decline in the disease's cellulitis. Non- Steroidal Anti-inflammatory Drugs (NSAID'S) are administered to reduce the inflammation signs, but the bacteria are proliferated as a side effect of Non-Steroidal Anti-inflammatory Drugs (NSAID'S). Anti-bacterial drugs such as Dicloxacillin, Clindamycin, and Levofloxacin are prescribed to cure cellulitis. Superficial cellulitis, which involves lymphatic activity known as Erysipelas, does have an indurated, raised border that demarcates it from normal skin. These distinctive features create a "peau d'orange" appearance (Fleisher and Ludwig, 1980).

Types of Cellulitis

Cellulitis is of different types depending on where the infection occurs. They are five types of cellulitis (Table 1) such as facial cellulitis, periorbital cellulitis, orbital cellulitis breast cellulitis and perianal cellulitis (Maitre, 2006).

Clinical indications

The clinical features are discussed below

First line features

1. Reddishness
2. Ache
3. Soreness
4. Swellings

Clinical indicators

1. Formation of abscess in the leg
2. Pyrexia
3. Chillness
4. Increasing heartbeat
5. Head pain
6. Reduction in the blood pressure level (Christensen et al., 2009).

Table 3: Drug Interactions and Toxicity

Chemical Name	Molecular Weight	Metabolism	Excretion	Generic Name and Brand Name	t _{1/2}	Drug Interactions	Toxicity
Dicloxacillin	470.327 g/mol	In liver	Excreted in Renal and Biliary	Dicloxacillin (Dynapen)	0.7 hours	It has possible interactions with the below given drugs 1. Methotrexate 2. Warfarin 3. Tetracycline	Irritation, rash, laboured breathing, hives, itching and wheezing, nausea and chills, as well as fever are the symptoms of overexposure.
Amoxicillin	365.40 g/mol	In liver	Excreted in Kidney	Amoxicillin (Amoxil)	1hour 1min 3 sec	Amoxicillin may interact with the following drugs, Methotrexate, Warfarin, Dabigatran, Uricosuric drug. Oral contraceptives may become less effective. Typhoid vaccine	Nausea, vomiting, diarrhoea and abdominal pain. Acute oliguric renal failure and haematuria may occur following large doses.
Clindamycin	424.981 g/mol	In liver	Excreted in Biliary and Renal	Clindamycin (Cleocin)	2-3hours	It may have prolong effects of neuromuscular-blocking drugs with succinylcholine and vecuronium	Adverse effects of the drugs are nausea may be dose-limiting diarrhoea, allergic reaction, pseudomembranous colitis, transient neutropenia and hepatotoxicity, agranulocytosis as well as eosinophilia.

Continued on next page

Table 3 continued

Clarithromycin	747.964 g/mol	In liver	Excreted in Urine	Clarithromycin (Biaxin)	3-4 hours	Clarithromycin inhibits a liver enzyme, CYP3A4	Diarrhoea, dyspepsia and abnormal taste, abdominal discomfort, as well as nausea. Transient hearing loss with high doses has been observed.
Azithromycin	748.996 g/mol	In liver	Excreted in Biliary and Renal	Azithromycin (Zithromax)	11-14 hours (single dose) 68 hours (multiple dosing)	This drug may interact with (R)-warfarin (S)-Warfarin 6-O-benzyl guanine 4-hydroxy coumarin 7-ethyl-10-hydroxyca mptothecin 5-androst enedione 7-Deaza guanine 3,5-diiodothy ropionic acid 6-O-benzy lguanine	The major adverse effects of the Azithromycin are hearing loss and cardiovascular arrhythmias.
Cephalexin	347.389 g/mol	80% gets excrete and unchanged in urine within 6 hours of administration	Excreted in renal	Cephalexin (Keflex)	0.6-1.2 hours	Renal excretion of cefalexin is delayed by probenecid also interacts with metformin hydrochloride.	Symptoms of high dose include Haematuria, diarrhoea, nausea and upper abdominal pain, as well as vomiting.
Levofloxacin	361.373 g/mol	Dimethyl and N-oxides gets metabolite	Excreted in renal	Levofloxacin (Levaquin)	6.9 hours	This drug interacts with (R)-warfarin (S)-Warfarin 4-hydroxy coumarin 5-androste nedione 6-O-benzylg uanine 7-ethyl-10-hydroxyca mptothecin	The adverse of the drug Levofloxacin are drowsiness, Dysarthria, dizziness, hot and cold flashes, swelling and numbness in the face, nausea, and also disorientation.

Pathophysiology

1. Cellulitis is an infection of the subcutaneous tissue and dermal layer. It happens in the skin by the entry of pathogens into the dermis skin's layer.
2. The phalanges webspace bacteria, fungal, foot infections pressure ulcers and venous leg ulcers these things cause the cutaneous barrier disruption.
3. The lowest level surface pH, low point temperature and commensal micro-organisms availability decrease the skin external pathogenic organism's expansion ([Cranendonk et al., 2017](#)).

In cellulitis,

1. Swelling in the inner layer of skin
2. Lymphatic dilation
3. Dispersed huge impartial filtration on every side of the bloodvessel ([Gundersong, 2012](#)).

The above-mentioned characteristics are the cytological characteristics of cellulitis. In the next step, the lymphocytes, as well as histocytes, also incorporates as its biological characters. Commonly the unfavourable conclusion is because of the cultures performed with needle aspiration or biopsy. When the bacteria's concentration is in a short amount, it gives favourable outcomes. This study indicates that a very low number of bacteria are accountable for the inauguration of sturdy provocative reaction ([Bruun et al., 2016](#)).

Microbiology

In adults, cellulitis occurs due to two species. They are as follows,

1. Streptococci (streptococcus pyogenes)
2. Staphylococcus aureus

In a review by [Raff and Kroshinsky \(2016\)](#) in the year 2016, 1000 adults and children patients in the United States of America (USA) had undergone needle aspiration or punch biopsy. 16% of them had civilizations that established a bacterial diagnosis. And in a favourable conclusion, it is identified that 5% were *Staphylococcus aureus* and 27% were *streptococcus pyogenes*. Bacteria like *Haemophilus influenza* may cause cellulitis and it causes facial cellulitis in young children ([Ginsberg, 1981](#)).

Risk Factor's For Cellulitis

Edema is considered as the not uncommon risk factor for cellulitis. The lymphedema is the specific risk factor since bacterial growth is aided by the lymphatic fluid. Fluid is supposed to facilitate bacterial growth ([Raff and Kroshinsky, 2016](#)).

The patient is at risk or dangerous state if they have the following,

1. Diabetes mellitus
2. Injury in the skin
3. Inflammation in the liver (Hepatitis)
4. Circulatory complications like not enough blood flow to the arms and legs, poor drainage of veins
1. Dermatological issues like eczema, psoriasis, which may lead to chickenpox ([Yarbrough et al., 2015](#)).
5. Dermatological issues like eczema, psoriasis, which may lead to chickenpox ([Yarbrough et al., 2015](#)).

Identification of Cellulitis

There are no diamond calibre approaches to identify cellulitis ([Levell et al., 2011](#)).

1. It is detected based on the corporal (physical) check-up and the patient's previous medical records.
2. Computed Tomography (CT) scans as well as ultrasound is used to discover deeper infections like abscesses.
3. Additionally, a blood test is required if the medical officer suspects that it may spread to your blood.
4. X-rays are needed if a foreign particle present in the skin or behind the bone.
5. Moreover, it is spotted by visual inspection too.
6. In cellulitis, *Pastecurella multicoidea* is combined with animal bites, maximum in cat bites ([Griegord and Orengoif, 1995](#)).

Treatment

Antibiotics are prescribed to cure cellulitis. It is administered orally for most of the patients. Hospitalization is required for extreme stages of cellulitis. During hospitalization, the antibiotics are administered in the intravenous IV route ([Abrahamian and Goldstein, 2011](#)).

In some cases, the antibiotics are prescribed for many weeks and even months, this is followed only if

the patients often suffer from severe cellulitis, if not, antibiotics are prescribed only for a limited duration. Also, Non-Steroidal Anti-Inflammatory Drugs are prescribed to treat cellulitis (Daum, 2007).

Drugs Used in Cellulitis

The Non - Steroidal Anti-Inflammatory Drugs and Anti-bacterial drugs are administered to treat cellulitis and this is discussed briefly in the Table 2. Beta-lactam antibiotics having activity against penicillinase-producing *S. aureus* are the drugs of choice. Cefazolin (first generation cephalosporin), nafcillin (synthetic penicillin) and ceftriaxone (third-generation cephalosporin) are initial treatment options for cellulitis (Chosidow, 1991).

If the patient is suspected to have methicillin-resistant *S. aureus* (MRSA) or is highly allergic to penicillin, then linezolid and vancomycin can be treated for cellulitis. IV should be given as an initial treatment in the hospital if the inflammation is spreading very rapidly or if the patient has a significant systemic response such as chills and fever or occurrence of any complicating conditions like neutropenia, cardiac failure, immuno suppression, or renal insufficiency (Madaras-Kelly et al., 2008). Structures, Molecular weight, Metabolism, Excretion, Generic name and Brand Name half- life period ($t_{1/2}$), Drug interactions and toxicity of the drugs are discussed in Table 3.

Preventive Measures

1. As there is a famous proverb, "cleanliness is next to godliness" here, in this cellulitis condition, cleanliness will prevent the cellulitis infection.
2. Maintaining good hygiene like washing hands properly will be the best preventive measure.
3. If the person has dry skin, he/she is advised to intake plenty of water.
4. Also, applying lotion or ointment to the braked skin will be an effective preventive measure.
5. It is advised to have the avoidance antibiotic, which is prescribed by your Medical officer (Thomas et al., 2013).

DISCUSSION

Majority of the patients who are affected with cellulitis gets a quick response to the antibiotics. In unusual cases, the cellulitis may reach the systemic circulation and it becomes complicated. In some rare cases, surgery is needed to clear the abscess, also to detach the deceased tissue (Karpelinm and Vuopio-Varkilaj, 2010).

CONCLUSIONS

Cellulitis is an infectious clinical condition where micro-organism is concerned. It is an antibacterial skin disease where it has to be treated effectively at the early stage. Cellulitis is considered a general global issue and it could be reduced by curing its risk factor. Various information about Cellulitis has been discussed in this article and it can be treated with prior knowledge, even with low-cost antibiotics.

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Conflict of Interest

The authors declare that they have no conflict of interest.

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