
INFECTION IN ORTHOPAEDIC PRACTICE

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Introduction

Infection continues to be a real problem in orthopaedic practice. Infection is probably the first cause of failure of orthopaedic and trauma operation, it is behind prolonged suffering for our dear patients because of the morbidity and mortality. Although there have been significant reduction in infection due to better surgical techniques, improved operating room environment, more effective antibiotics and the wide spread use of prophylactic antibiotics, we all will face this bad omen in one of our patients at some time in our practice.

Sadly, infection continues to happen despite our strenuous efforts to prevent it. Prolonged hospital stay to treat infection may expose the patients to resistant nosocomial pathogens.

The incidence of infection varies considerably worldwide; I think the incidence in our locality is very high. The current use of ultra clean air, antibiotics, and exhaust ventilated suits during implantation of prostheses considerably reduced infection. Nevertheless, lack of agreement and controversies still exist regarding the benefit of these very strict infection prevention techniques.

Infections are considered nosocomial if there is no evidence that the infection was present or incubating at the time of hospital admission.

Infection is considered related to surgery if that occurs at the incision site within 30 days after surgery, if no implant is left in place or within one year if the implant is in place.

Infection may occur at all anatomical levels, from the treatment point of view it is vital to precisely allocate the anatomical site of infection.

Infection is usually diagnosed depending on clinical features which are to be confirmed by laboratory tests. The presence of pus does not always mean infection, because necrosis of malignant lesion may simulate purulent material. Frequently, patients who have prostheses may be readmitted to the hospital for medical care or other surgical procedures during that time, the bladder catheter, intravascular line, that involve contaminated areas of the body may increase the risk of nosocomial infection.

A high risk of infection is present in collagen disease, malnutrition, steroid dependent and other immune suppression drugs, sicklers, hidden nidus of infection anywhere in the body and any operation that lasted longer than the anticipated surgical time.

The presence of diabetes mellitus is a concern in patient for surgery. Diabetes impairs the immune response to infection; therefore, wound healing may be difficult in those patients. In acute infection the influence of diabetes is much than in chronic infection. Some patients may have more than one risk factor.

Current status of infection

Staphylococcus aureus is the leading nosocomial (hospital acquired) infection throughout the world. Over 30% of the population is colonized with *staph. aureus*. One quarter of the hospital acquired infection are surgical site infections and one third are orthopaedic, 22% of all health care associated infections are surgical site infections. About 500,000 surgical site infections occur annually in the United State leading to 1-10 billion dollars medical cost each year. The death rate from methicillin resistant *staph. aureus* is 2.5 times greater than non resistant *staph. aureus* (Richard Evans Feb. 2011).

Who is to be blamed if post operative infection occurs?**The surgeon:**

Play a major role in the avoidance of infection by sticking to the standard rules.

The following points may reduce the incidence of infection:

1. Shaving to be done by electric razor immediately prior to surgery, better not to be done 24 hours prior to surgery.
2. Proper patient selection and the timing of surgery is vital, a thorough search for any hidden nidus of infection which should be eradicated.
3. Gentle tissue handling and dead tissue should be taken out of the field.
4. In infected cases, radical treatment is necessary. All infected, dead, necrotic material should be excised to end up with a healthy bleeding tissue. The policy of half way surgery is disastrous. All hidden foci and pockets of pus should be cleaned at the same time.
5. Surgeon is obliged to stick to the standard rule in regard to scrubbing, toweling and working in an ultraclean environment.

The patient may play a rule in infection by:

1. Not obeying or applying the instruction taking irregular treatment or no treatment.
2. Avoiding cleanliness and dirty patient.
3. Illiterate and those with low I.Q. need special follow up.
4. Lazy and depressed patients are very un-cooperative and may actively participate in the occurrence of infection.

Theater and word facilities

Utmost cleanliness, laminar flow, body exhaust suits and bacteria free environment, all will help in reducing the incidence of infection. Using the disposable towels, gowns and gloves is a necessity.

Sterile mask is superior to non sterile mask. It is preferable to use disposable instruments as much as possible. All the machines in the theater are subjected to routine and regular check out regarding cleanliness and preferably to stay bacteria free. The type of infection should be precisely specified, avoidance of the blind and haphazard treatment, or shooting in the dark is very vital.

Aerobic and Anaerobic cultures are to be performed as a routine, to identify the causative agent and to specify the resistance and sensitivity.

The possibility of mixed infection, like aerobic and anaerobic, or pyogenic and tuberculous infection should not be forgotten.

Risk factors for infections

There are so many risk factors which make the patient more vulnerable to infection than a normal subject; a search for the risk factors is the responsibility of the surgeon and to be done prior to surgery.

The risk factors are

Diabetes mellitus, collagen disease, malnutrition, urinary tract infection, smoking, obesity, poor oral health, pregnancy, anaemia, local or remote nidus of infection, immune compromised patients, colonization with staph.aureus, lady in the period (menstrual cycle) and patients with sickle cell disease.

Infection can be diagnosed easily if the cardinal clinical feature is clear, this can be confirmed by laboratory test which documents infection. The isolation of the bacteria does not always mean infection if the clinical feature is not supportive.

Some factors may mask the cardinal clinical features like irregular use of antibiotics, steroidal and non steroidal anti inflammatory drugs, immune deficiency, the presence of cast or heavy dressing and the patient inability to describe his clinical status.

Investigations or pre-operative screening are very helpful in specifying the diagnosis which is either local or systemic.

Local-swab for culture and sensitivity identify the Micro-organism, keeping in mind this is not the best way to prescribe an antibiotic, still more parameters are to be considered, like tissue concentration of the drug, age of the patient, allergy and other points. Tissue culture and histopathological examination are also very useful.

So many blood tests are also required to confirm the diagnosis, a single one test is not reliable so a combination of more than one test result is preferable.

The followings are examples of the test required:

1. HB%, E.S.R., blood sugar, blood urea, serum creatinine, C. reactive protein (titer, rather than a single reading), blood film for morphology, W.B.C. and differential count.
2. Leukorge. Which is aggregation of leucocyte in the peripheral smear.
3. PCR (polymerase chain reaction) is a very useful test to specify the micro-organism.
4. Pro-calcitonin.
5. Complement fixation test and special test.
6. Both serum albumin and lymphocyte count to estimate the nutritional status.

Anaerobic infection:

It is frequently missed and underestimated; it is usually the cause of chronic discharging sinus or sinuses, which is chronic with no response to commonly used antibiotics.

It flourishes in the presence of dead, necrotic tissue and in ischemic areas of the body. It is usually mixed with aerobic infection.

Special anaerobic culture is required to isolate the microorganism. It is frequently seen in diabetic patients and patient with poor immune response, in the presence of ischemic tissue and foreign bodies.

Treatment: Exposure to oxygen and local application of hydrogen peroxide are very useful, but the best treatment is wide local excision to end up with a healthy bleeding tissue. Some antimicrobials like metronidazole and a specific antibiotic are also effective.

Infection in war wounded patient:

Is always related to insufficient or delayed wound excision, so wound excision is the corner stone in the treatment and should be done as soon as possible with antibiotics as a supplement.

Infection in war wounded patients is a real disaster, spoiling the outcome of treatment. Retained foreign body and dead tissue are one of the causes of infection. Sadly, our local incidence is very high. Surgeon should not forget subclinical infection.

The secret remains in the proper selection & dissection and the surgeon is never blameless.

Infection after external fixation:

External skeletal fixation is the preferable treatment for missile induced limb injuries. In compound fracture with soft tissue loss, pus may come through pin track after deep seated bone and soft tissue infection. Loose pins may be followed by pin track infection. Pin track infection is very common which is probably related to improper drilling, improper pin placement and insufficient wound excision which may lead to ring sequestrum & osteomyelitis.

Treatment consist of radical wound excision, changing the site of the Schanz screw and heavy cover of antibiotics.

Infection after joint replacement and internal fixation

Infection after implants and internal fixation is a real disaster and may lead to prolonged morbidity or ever mortality, it is a real emergency infection after intra medullary fixation worse than extra medullary fixation and it is worse in joint replacement than intra medullary fixation.

The best treatment is prophylaxis, which means choosing the right patients for this procedure or performing this operation in a suitable time and in the ideal theater facilities.

High index of suspicion is very vital, no place for procrastination, immediate action is required. A critical balance between unreasonable haste and unnecessary delay is always required. The diagnosis can be confirmed by proper history, physical examination and laboratory test.

Once diagnosis is established, immediate exploration is very useful to clear necrotic material, tightening the loose screw and copious wound lavage. Better not to rush for removal of the metal, but if there is severe deep seated bone infection, removal of the metal is necessary to be followed by heavy cover of antibiotics for several weeks.

Wound irrigation:

It is the corner stone for the treatment of bone and soft tissue infection. Several types of solutions were used, personal preference play a rule in choosing which is which. I feel the safest and the best is normal saline, hydrogen peroxide (3%) is preferable if the wound is very dirty with necrotic tissue; it is useful in war wounded limbs. Povidone iodine (1%-10%) is very useful diluted solution and is safe for irrigating joints, but it is not safe for spinal infection.

Chlorhexidine 0.05% is also useful and preferred by some surgeons.

Antibiotic solutions using Rifampicin or ceftriaxone are also useful in certain conditions.

We found, vinegar is very useful for irrigating wounds with gram negative infection. Combination of more than one solution has also been used.

The application done through bulge syringe irrigation or high pressure lavage is preferable for wound with severe infection.

Also ultraviolet light has been used to sterilize infected wound but we have no experience in using the ultraviolet light.

Honey has also been used with satisfactory outcome.

Important questions to be answered before treating infection:

Differentiation: is required between bone infraction and bone infarction. Septic joint and bone infection. Soft tissue or bone infection, or bone and soft tissue infection. Aerobic and anaerobic infection. Intrinsic and extrinsic foreign body. Superficial or deep infection.

Who is behind the occurrence of infection: the orthopaedic surgeon, the patient, the facilities, or the underlying cause or causes in the patient's body? Infection is the simulator of infection.

How to solve the problem:

The following points may help:

1. Correct the patient's status locally and systemically.
2. Specify the causative micro-organism and its response to antibiotics.
3. Track the underlying cause or causes.
4. Give antibiotics on pin points basis for several weeks.
5. Remember, healthy & bleeding tissue is superior to the strongest available antibiotics.
6. Improve nutritional status by excess of organic natural milk, boiled eggs and honey.
7. Elevate the patient moral, psychiatric help may be needed.
8. Beware of half way treatment.

Some helpful technical points:

1. Avoid the use of tourniquet and hot knife.
2. Gentle tissue handling and anatomical dissection.
3. Satisfactory haemostasis.
4. Use absorbable rather than non absorbable suture.
5. Meticulous asepsis.
6. Avoid leaving flail bone (cortical bone).
7. Avoid using metals if possible.
8. Proper drainage is required.

The simulator of infection:

Some pathological disorders may simulate infection to the extent that differentiation is not easy. The specific diagnosis is very important because surgical interference may lead to infection. Considering infective disorders as non infective disorders may delay the definitive treatment with real disaster. In this case, advanced and specific laboratory and radiological tests are very useful.

The following pathological processes may simulate infection;

1. Malignant lesion, both primary and secondary.
2. Gouty arthritis.
3. Inflammatory disorders.
4. Collagen disease like rheumatic and rheumatoid arthritis.
5. Eosinophilic granuloma.
6. Diabetic osteolysis.

7. Sarcoidosis.
8. Blood dyscrasia like sickle cell disease and leukemia.
9. Retroperitoneal sarcoma eroding the spine.

Finally:

1. We have to be aware of hidden neuropathy.
2. No foreign body is to be left behind in the operative field.
3. Ischemic changes play definite rule in the chronicity of the infection.
4. We have to look for and discover hidden diabetes.
5. We have to differentiate between superficial and deep infections.
6. Curing the underlying cause or causes will help in curing infection.
7. Giving antibiotics should be on solid scientific base.
8. Normally looking skin is sometimes deceiving.
9. It is vital to evaluate the patient's general status because infected limbs are part of the human body.
10. Never close the wound before being pretty sure that you left a healthy bleeding tissue and a healthy bone ends.
11. In chronic infection, the psychological status of the patient should be evaluated.
12. Avoid personal financial benefits, because the patient's benefit comes on the top of everything.