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## Review Article

# A literature review on various diagnostic modalities and treatment options for the treatment of the osteomyelitis of the jaw

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### ABSTRACT

Osteomyelitis of the jaw is found to be the most common disease affecting the maxillofacial region. Osteomyelitis is found to be true bacterial infection affecting the jaw bone. Different types of osteomyelitis which are distinguishable are acute osteomyelitis, primary chronic osteomyelitis and secondary chronic osteomyelitis of the jaw. The main characteristic features of the osteomyelitis of the jaw are, formation of the fistula, suppuration, and sequestration of the jaw bone. Different treatment modalities of the osteomyelitis of the jaw include surgery, debridement of the lesion superficially and curettage and in non surgical approach it includes usage of proper antibiotics, usage of topical agents, usage of hyperbaric oxygen, local anesthetic solution.

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## 1. Introduction

Osteomyelitis is an inflammatory process of the bone. Osteomyelitis means infection of the medullary portion of the bone. Nelaton in the year 1844, introduced the term Osteomyelitis. Osteomyelitis can be defined as an inflammatory reaction occurring within the bone and is caused by bacterial invasion. According to medical literature it can be defined as an inflammatory process of the entire bone including the cortex and the periosteum, and recognizing that the pathological process is rarely confined to the endosteum. Osteomyelitis usually encompasses the cortical bone along with the periosteum. Infection which has been occurred by the osteomyelitis becomes established, when there will be obstruction of the blood supply and if it has been followed by the process of ischemia the part of the bone which has been infected becomes necrotic and which finally leads to formation of the sequestrum, which has been classified as the classical sign of the osteomyelitis.<sup>1-7</sup>

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The chronic form of the Osteomyelitis has a marked tendency towards the recurrence. Literature has revealed two different variants of osteomyelitis, one is suppurative type of osteomyelitis and the other type is non suppurative type of osteomyelitis. Suppurative type of osteomyelitis is one in which there is presence of pus, which leads formation of fistulas and which finally leads to sequestration and the other type is characterized by inflammatory process of unknown reason. In the suppurative type of osteomyelitis, pathogen which is responsible for the infection can be identified and the causative pathogen is appearing at the different stages in the pus, fistulas and in sequestration. This suppurative type of osteomyelitis can be seen with the infected foci. The other type of osteomyelitis is non suppurative chronic osteomyelitis, with an unexplainable onset, that too without culturable organism. This non suppurative osteomyelitis can be defined as a chronic inflammatory disorder affecting the cortical as well as cancellous bone that too of unknown etiology. This type of osteomyelitis can be characterized by lack of any acute

features, there can be periods without symptoms which can be followed by exacerbations.<sup>5-8</sup>

## 2. Etiology

Osteomyelitis is found to be secondary to dental infection, or also found secondary to surgical procedure in young patient. Other causes like dento alveolar infection, trauma, surgical procedure, use of bisphosphonates systemically, usage of tobacco, genetic conditions, chronic consumption of the alcohol. Bacterial focus are responsible as a causative factor in the development of the acute and secondary chronic osteomyelitis of the jaws.<sup>3-6</sup>

Osteomyelitis can be classified as, according to shafer, acute suppurative osteomyelitis, chronic suppurative osteomyelitis, chronic focal sclerosing osteomyelitis, chronic diffuse sclerosing osteomyelitis, and chronic type of osteomyelitis along with proliferative periostitis. Another classification, according to Kelly classification, hematogenous osteomyelitis, osteomyelitis in a fracture which is united, osteomyelitis in a fracture which is non union, and post operative type of osteomyelitis without fracture.<sup>9-15</sup>

## 3. Different Diagnostic Techniques

### 3.1. Conventional radiographs

They can be used as an initial diagnostic tool along with other diagnostic modalities. The accuracy of the conventional or the plain radiography is found to be limited that too especially after surgery in which there is destruction of the bony structures. The process of the disease can be diagnosed on the conventional radiography in the early stages.<sup>7-13,16,17</sup>

### 3.2. CT scans

In cases with overt bony destruction, c t scan is found to be a useful imaging technique in initial surgical treatment planning and is found to be very helpful in following the lesion. With the help of usage of CT scan, one can identify the changes in the soft tissue in the initial timing of the disease and in following the lesion.<sup>10-15,18</sup>

### 3.3. Laser doppler flowmetry

This technique is found to be helpful in diagnosing the inflammation, which can lead to decrease in the blood flow.

### 3.4. MRI

Magnetic resonance imaging are used along with the gadolinium agent, which is contrast in nature , and it helps in revealing the early changes in case of osteomyelitis and there by found to be helpful in detecting the early or acute osteomyelitis. Magnetic resonance imaging scans helpful

in detecting the extent of the lesion and in monitoring the disease. Magnetic resonance imaging is found to be safer in terms of radiation than CT scans. Magnetic resonance imaging technique is less helpful in diagnosing the soft tissue changes, and is found to be less sensitive in terms of inflammatory changes as compared to CT scans. This technique i.e. magnetic resonance imaging has its ability limited to differentiate in between edema and infection.<sup>2-6</sup>

### 3.5. Nuclear scans

The most common agent used in this technique is technetium99m, which shows increased in the turnover of the bone. Other agents which can be used in the nuclear scans are indium 111 and gallium 67.<sup>7,8,16</sup>

### 3.6. Immunological count

In cases of acute osteomyelitis, there will be increased in the leukocyte count that too more than 15000, in about one third of the patients. Along with this erythrocyte sedimentation rate and the values of the C – reactive proteins also get raised.<sup>1-9,16,17</sup>

## 4. Treatment

Treatment modality is broadly classified into surgical intervention and non surgical intervention. According to the literature, surgical treatment is widely recommended in the treatment of the osteomyelitis. Surgical treatment includes debridement of the tissue, which is infected from the infected site, decortication done along with bone grafting or without bone grafting, sequestrectomy, and saucerization can be done. It is advised to remove the infected tooth , as retained infected tooth possesses a risk of retained infection or can make a pathway for the bacteria to get entry, and can finally lead to failure of the treatment. In some of the cases, Resection of the bone done partially and reconstruction of the resected part of the bone is performed simultaneously. Resection of the bone which shows loss in the continuity of the bone, should only be used in the severe cases. Decortication is found to be the most common and preferred surgical procedure in cases of both i.e. septic cases as well as aseptic cases. Early intervention of the disease helps in reducing the morbidity and also helps in reducing the extent of the surgery. Poor response to surgical intervention is most commonly shown up by non suppurative form of osteomyelitis.<sup>2-7,9-12,16,17</sup>

### 4.1. Other treatment modality is non surgical approach

Antibiotics are most commonly used in the treatment of the osteomyelitis. Most commonly used antibiotics are NSAIDS, steroids. The recommended variation for the usage of antibiotic varies from 2 weeks to 6 weeks, that too typically started with i.v. antibiotics which is after

than followed by orally administered antibiotics. After the surgery has been done, i.v. antibiotics need to be given for 2 weeks (augmentin, cefazolin and an aminoglycoside), which is followed up by orally administration of the antibiotics (augmentin and roxythromycin.) clindamycin and metronidazole also proven helpful in treating cases of osteomyelitis. In general antibiotics can be treated as important part in the treatment of the osteomyelitis.<sup>10–13</sup>

Linezolid and tigecycline, new artificial antibiotics shows promising results against multi drug resistant bacteria's in the treatment of the osteomyelitis.

Resorbable and non resorbable local delivery system can be used to elevate the levels of the drugs locally. However for the removal of the local delivery system second surgery is required, but these local drug delivery system shows promising results in the treatment of the osteomyelitis. Different biodegradable materials like, polylactic acid, polyglycolic acid, polyesters, hydroxyapatite, bio ceramics, composites, calcium, phosphates, fibrin sealant, and collagen sponges are used in animals and shows promising results.<sup>14,15,18</sup>

Usage of steroids helps in relieving pain, in case of osteomyelitis, and that's how shows relieving effects on symptoms.<sup>1–5</sup>

#### 4.2. Hyperbaric oxygen

Administration of hyperbaric oxygen helps in treatment of osteomyelitis and shows promising results. Hyperbaric oxygen helps in increasing the oxygen tension in the tissue, thereby helps in reducing the local effects of hypoxia in the medullary infection and along with it helps in reestablishing the blood flow in the tissue and helps in reestablishing the normal health of the tissue.<sup>12,13</sup>

### 5. Conclusion

One should have a thorough knowledge of different diagnostic tools, that can help in diagnosing the osteomyelitis. One should have a thorough knowledge of various treatment options, that can be applied to treat the disease. One should understand the cause of the disease and exactly with the help of the diagnostic tools and start the treatment of the disease.

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### 7. Conflict of Interest

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