ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 12, Issue, 05, pp.11447-11450, May, 2020

DOI: https://doi.org/10.24941/ijcr.38659.05.2020

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

OSTEOMYELITIS IN DENTISTRY: A SHORT REVIEW

[1]Dr. Sarish Latief, [2]Dr. Muneeba Lateaf, [3]Dr. Jaismeen Kaur, [4]Dr. Ranjan Mani Tripathi and [5,*]Dr. Himanshu Singh

[1]PG Student, Department of Oral and Maxillofacial Surgery, Brs Dental College and General Hospital, Sultanpur, Panchkula, Haryana, India-134118
[2]BDS, Dental Surgeon, Srinagar, Jammu and Kashmir, India-190004
[3]MDS, Oral and Maxillofacial Surgery, Medicover Woman and Child Hospital, Hyderabad, India-500081
[4]MDS, Reader, Department of Public Health Dentistry, Index Institute of Dental Sciences, Indore, Madhya Pradesh, India-452016
[5]MDS, Lecturer, Department of Oral Pathology and Oral Microbiology, Index Institute of Dental Sciences, Indore, Madhya Pradesh, India-452016

ARTICLE INFO

Article History:
Received 28th February, 2020
Received in revised form
14th March, 2020
Accepted 28th April, 2020
Published online 30th May, 2020

Key Words:
Osteomyelitis,
Microbiology,
Diagnosis, Treatment.

ABSTRACT

Osteomyelitis of jaw bone is characterized by inflammatory reactions .Osteomyelitis seems to be related with some systemic diseases like malnutrition and autoimmune diseases. Microbiological culture suggests that staphylococcus aureus along with T.palladium, A.israelli are responsible for osteomyelitis .Various diagnostic methods like ultrasound, CT, MRI etc are seen beneficial in accurate diagnosis of osteomyelitis. Antiobiotics, hyperbaric oxygen, incision and drainage are some useful methods that helps in management of osteomyelitis.

Citation: ***Dr. Sarish Latief, Dr. Muneeba Lateaf, Dr. Jaismeen Kaur, Dr. Ranjan Mani Tripathi and Dr. Himanshu Singh.*** **2020.** "Osteomyelitis in dentistry: a short review", *International Journal of Current Research*, 12,(5), 11447-11450.

INTRODUCTION

The term "osteomyelitis" arises from greek words osteon means bone and muelinos means marrow (Baltensperger, 2009). Osteomyelitis is a condition in which inflammatory reaction occurs inside the bone because of the bacterial invasion. Osteomyelitis affects mainly in cortical bone as well as periosteum (Humber, 2011; Nezafati *et al*., 2009). Osteomyelitis is infrequently seen in case of maxilla, whereas in case of mandible, the most common site for occurrence is body of the mandible, following the symphysis, angle of mandible, ascending ramus and mandibular condyle (Baltensperger, 2004; Krakowiak, 2011). The infection is noted in calcified segment of bone when obstruction to the local blood supply occur because of the formation of oedema or pus in medullary cavity. This leads to ischemia, which results in necrosis of bone and subsequent formation of sequestrum, which is considered as important sign of osteomyelitis other factors which contributes to medullary space infection includes radiation, traumatic injuries and various chemical substances (Koorbusch, 1992). The decreased local and systemic host defence can be responsible for appearance of disease. Osteomyelitis seems to be related with systemic diseases like autoimmune diseases, malnutrition, some malignancies, diabetes etc. The outcome of this infection shows diversity which includes difficulty in draining tract and pathologic fracture of the involved site (Baltensperger, 2004).

Corresponding author: Dr. Himanshu Singh,
MDS, Lecturer, Department of Oral Pathology and Oral Microbiology, Index Institute of Dental Sciences, Indore, Madhya Pradesh, India-452016.

MICROBIOLOGY

In cases of chronic osteomyelitis, the most frequent pathogen involved is Staphylococcus aureus. Also, methicillin-resistant S.aureus is been found progressively in cases of chronic osteomyelitis. Other causative pathogens which is involved in chronic osteomyelitis includes Staphylococcus epidermis, Serratia marcescens, Pseudomonas aeruginosa and Escherichia coli (Conterno, 2013; Atzenbuehler, 2011).

S.aureus is the classical pathogen answerable for acute as well as chronic ostteomyelitis. They form a biofilm, which have capability of forming antimicrobial resistance. In such cases, surgical involvement is required for infection control.[9] Also, Treponema palladium, M.tuberculosis and A.israelli make particular form of osteomyelitis (Baltenspergerl, 2004; Koorbusch, 1992).

PASSAGE OF DISEASES SPREAD

3 important passage are there for advancement of Osteomyelitis (Lew, 1997), which are described below:

Haematogenous spread: In the medullary cavity, blood borne bacteria gets deposited and develops infectious nidus. In long bones, metaphysis region is most common location for infection development as it contains extensive contribution of slow flowing blood. This forms absolute domains for accumulation and proliferation of bacteria (Jaramillo, 2011; Stephen, 2012).

Direct inoculation: Direct implantation of bacteria in bone as a consequences of human bite, animal bite, open fractures, puncture wounds and introduction of metallic implants (Calhoun, 2005).

Contiguous spread: Infections arises from joints as well as soft tissue can grow adjacent to the bone. It occurs because of vascular insufficiency (Calhoun, 2005).

DIAGNOSIS

Laboratory Test: Acute infections are mainly found to be associated with increased number of neutrophils as well as leukocytosis,but this change is infrequently seen in chronic osteomyelitis.ESR as well as CRP, an inflammatory markers, are raised in acute hematogenous osteomyelitis seen in children, but these are considered as indifferent test (Unkila-Kallio *et al*., 1994; Roine, 1995). In children or diabetic patients suffering from hematogenous osteomyelitis, serum procalcitonin levels have not shown any advantageous results (Mutluoğlu *et al*., 2011; Sabine Faesch, 2009; Butbul-Aviel *et al*., 2005) as a diagnostic tool, serum level of interleukin-6 is most commonly considered for bone infections affiliated with joint prosthesis (Berbari, 2010).

Histological test: For the purpose of validate diagnosis of osteomyelitis, the biopsied specimens of soft tissue, bone and bony sequestra must be addressed to histopathological examination. In cases of acute osteomyelitis, polymorphonuclear leukocytes are mainly seen, where as in cases of chronic osteomyelitis, osteoblasts , osteoclasts as well as lymphocytes are principally seen (Ochsner, 2006; Zuluaga, 2006).

IMAGING IN OSTEOMYELITIS

Plain Radiographs: In acute osteomyelitis cases, early plain radiography doesn't demonstrated any significant changes. Increase in soft tissue may be seen after 3-4 days. After 2 weeks, bony changes emerges and also poorly delineated lytic lesion are noted, which mimic aggressive lesion (Termaat *et al*., 2005; Dormans, 1994).

Computed Tomography: Computed tomography presents magnificent multiplanar reconstructions of axial images. In cases of chronic osteomyelitis, computed tomography reveals invasion of medullary cavity, atypically thickened cortical bone and chronic draining sinus. The considerable role of computed tomography in osteomyelitis is the demonstration of sequestra .In chronic osteomyelitis cases, the existence of sequestra propounds the action of infectious process .As computed tomography is considered better than MRI for the diagnosis of cloacas, involucra and sequestra, it assist in joint aspiration as well as needle biopsies (Gold *et al*., 1991; Ciemy *et al*., 2003).

MRI: Magnetic resonance imaging enables the early diagnosis of osteomyelitis. Also, it helps in analysis of proportions of involvement and diseases activity in chronic bone infection cases. To assess doubtful cases of osteomyelitis, MRI is considered as useful technique as MRI possess capability to indicate alteration in bone marrow water content, but in case of metallic implants MRI shows local artifacts which poors the image quality (Meyers, 1991; Towers, 1997). Magnetic resonance imaging is appraised to play an important role in assessment of bone infections. In MRI, edema of bone marrow can be clearly evident. As the diseases continues, abscess develops. In the diagnosis of infection, the particularity of MRI is seen higher when compared to scintigraphy (Kapoor *et al*., 2007; Hatzenbuehler, 2011; Pineda, 2006).

ULTRASOUND

Ultrasound also plays important role in diagnosing osteomyelitis mainly in younger patients. Ultrasound reports the soft tissue edema around the bone, subperiosteal and periosteal thickening.In color doppler, hyperemia zone can be observed (Dinh *et al*., 2008; Strobel, 2007). Ultrasound shows numerous advantages. ultrasound are convenient, can conduct quickly with patients comfort. It is practical in those patients in which MRI is contraindicated. For diagnosing musculoskeletal infections, ultrasound is considered as effective utensil, especially in distinguishing acute/chronic infection from tumor/non infective conditions. In childrens, ultrasound are capable to recognize joint effusion corresponding to osteomyelitis or septic arthritis. To locate hyperemia around periosteum or soft tissue abscess, power doppler sonography is widely used (Cardinal, 2001; Kaiser, 1994).

NUCLEAR MEDICINE

Nuclear medicine utilizes radiotracers for tracing the picture of Physiological procedure of organism. In expected cases of Osteomyelitis having questionable radiographic and clinical signs, Nuclear medicine methods are commonly used (Abdullah, 2010; Chen *et al*., 2012). Bone scintigraphy is performed to distinguished osteomyelitis and soft tissue infections. For this purposes, they uses ^{99m}tc-labeled diphosphonates,mainly ^{99m}tc-mdp and hydroxy methylene diphosphonate (Sandler, 2003). Gallium scintigraphy utilizes gallium -67 citrate, which accumulate in inflammed tissues because of increased blood flow and high concentration of transferrin. Gallium scintigraphy should be used in synchronization with bone scintigraphy for diagnosing the osteomyelitis. Gallium citrate shows increased reactivity to acute and chronic infections (Sandler *et al*., 2003). Indium-111 distinct leukocyte scintigraphy is known as best technique of nuclear medicine for diagnosing osteomyelitis as it is

autonomous of bone remodelling. It gives good sensitivity as well as specificity. Because of the high cost techniques, it is seen in less diagnostic centres (Sandler *et al*., 2003)

Positron Emission Tomography Fluorine-18 Fluorodeoxyglucose: With the help of glucose transporters, fdg is shifted into cells. Those inflammatory cells which are activated may indicate rise in glucose transporter expression. With using of this technique, outcomes can be achieved in 30-60 minutes after administration of tracer. Also, metallic implant artifacts does not affect imaging. It has been proved that fdg-pet shows favourable diagnostic reliability in cases of osteomyelitits (Santiago-Restrepo *et al*., 2003).

Treatment modalities of osteomyelitis: Conservative management and surgical management are considered as valuable treatment option in cases of osteomyelitis. Conservative management includes antibiotics and hyperbaric oxygen, whereas different surgical treatment aspects includes decortications, irrigation and drainage, saucerisation, sequesterectomy, resection and bone graft.

Antibiotics: Kim *et al.* (2001) suggested that I.V antibiotics (2 weeks) which is followed by oral administration (6 weeks) after surgery shows 94.9 % effective result. Theologie-lygidakis *et al*. (2011) adviced to use combination of amoxicillin or clavulanic acid with metronidazole for a period of2-3 weeks or combination of ciprofloxacin with clindamycin in cases where patients is allergic to penicillin Patel *et al*. (2010) advised that combined IV and PO antibiotics course is more effective as compared to oral antibiotics.

Hyperbaric Oxygen: Various studies have been conducted regarding the effect of using hyperbaric oxygen in the treatment of osteomyelitis. Kim *et al.* (2001) advocate the use of hyperbaric oxygen alongwith antibiotics and surgery in those cases where previous treatment with antibiotics are not successful. Handschel *et al* suggested that use of hyperbaric oxygen is considered as an effective and successful treatment in chronic osteomyelitis case (Handschel, 2007).

Decortication: Decortication was first proposed in 1917 in treatment of mandibular osteomyelitis. This procedure is used as universal procedure (Schwegler *et al*., 2008; Aliabadi, 1994). In advanced cases of acute osteomyelitis and chronic osteomyelitis of jaws, utilization of decortication encouraged resolution which is based on assumption that affected cortical bone is avascular as well as possess microorganisms. The obliterated medullary cavity is filled by pus and granulation tissue (Topazian, 2002; Baltensperger, 2009). The principal justification for decortication procedure is to eliminate infected jawbone cortex and obtain entrance into affected medullary cavity so as adequate decompression of intra-medullary force will occur (Masahiko Gunge, 1987).

Irrigation and Drainage: Irrigation and drainage after surgical debridement is important .Irrigation decreases number of micro-organism, residual necrotic tissue as well as accumulation of toxin. Drainage is advantageous for 24-48 hours to block formation of hematoma (Masahiko Gunge, 1987).

Saucerization: Saucerization is known as an important step in which surgical debridement of infected jawbone will done. The main advantage of the saucerization procedure is prevention of facial scarring as well as direct access of jaw bone. It is seen that the saucerisation procedure is mainly advantageous in cases of early acute osteomyelitis. Saucerization treatment procedure is mainly used in cases of mandibular osteomyelitis[1].

Sequesterectomy: Sequestration is defined as a procedure in which necrotic bone is detached from living bone. This detached necrotic and dead bone is known as sequestrum. The sequestrum occurs because of resorption of living bone which is present around the dead bone (Theologie-Lygidakis, 2011).

RESECTION

If the patient complains of consistent recurrences and also feels discomfort like disability and pain, then the diseases is treated by resection procedure. In resection, there is excision of some part of mandible occur. After resection, the continuity of mandible gets disturbed, which is restored by bone grafting method or some other reconstruction techniques (Topazian, 2002).

Conclusion

Osteomyelitis is known as an inflammatory diseases of bone, which usually starts as infection of medullary cavity and involves the haversian system very rapidly. Various surgical treatment aspect of osteomyelitis includes saucerisation, irrigation and drainage, sequestrectomy, decortications.

REFERENCES

Abdullah ZS, Khan MU, Kodali SK, Javaid A. 2010. Pyomiositismimicking osteomyelitis detected by SPECT/CT. *Hell J NuclMed*. Sep-Dec;13(3):277–9

Aliabadi P, Nikpoor N. 1994. Imaging Osteomyelitis. Arthritis and Rheumstism May;37(5), 617 -22.

Baltensperger M, Grätz K, Bruder E, Lebeda R, Makek M, Eyrich G. 2004. Is primary chronic osteomyelitis a uniform disease? Proposal of a classification based on a retrospective analysis of patients treated in the past 30 years. *J Craniomaxillofac Surg.,* Feb;32(1): 43-50.

Baltensperger MM. 2009. Eyrich GK (eds). Osteomyelitis of jaws. Springer

Berbari E,Mabry T,Tsaras G,Spangehl M,Erwin PJ, Murad MH, *et al.* Inflammatory blood laboratory levels as markers of prosthetic joint infection: asystematic review and meta-analysis. J Bone Joint Surg Am.2010 Sept;92(11):2102–9.

Butbul-Aviel Y, Koren A, Halevy R, Sakran W. Procalcitonin as a diagnostic aid in osteomyelitis and septic arthritis. PediatrEmerg Care. 2005 Dec;21(12):828–32.

Calhoun JH, Manring MM. 2005. Adult osteomyelitis. *Infect Dis Clin North Am.,* 19(4):765-86.

Cardinal E, Bureau N, Aubin B. Role of the ultrasound in musculoskeletal infections. Radiol Clin North Am 2001 Mar;39(2): 191–201.

Chen WC,Tsai KD,Chen CH, Lin MS, Chen CM, Shih CM, *et al*. Role of gallium 67scintigraphy in the evaluation of occult sepsis in the medical ICU. Intern Emerg Med. 2012 Feb;7(1):53–8.

Cierny G III, Mader JT, Pennick JJ. A clinical staging system for adult osteomyelitis. Clin Orthop Relat Res 2003 Sept;414:7–24

Conterno LO, Turchi MD. 2013. Antibiotics for treating chronic osteomyelitis in adults. *Cochrane Database Syst Rev.*, Sept;9:CD004439.

Dinh MT, Abad CL, Safdar N. Diagnostic accuracy of thephysical examination and imaging tests for osteomyelitisunderlying diabetic foot ulcers: meta-analysis. Clin Infect Dis.2008 Aug;47(4):519–27

Dormans JP, Drummond DS. Pediatric hematogenous osteomyelitis: new trends in presentation, diagnosis and treatment. J Am Acad Orthop Surg. 1994 Nov;2(6):333–41.

Gold RH, Hawkins RA, Katz RD. Bacterial osteomyelitis: findings on plain radiography CT, MR and scintigraphy. AJR Am J Roentgenol 1991 Aug;157(2):365–70

Handschel J, Brüssermann S, Depprich R, Ommerborn M, Naujoks C, Kübler NR, *et al*. Evaluation of hyperbaric oxygen therapy in treatment of patients with osteomyelitis ofthe mandible. Mund Kiefer Gesichtschir. 2007 Nov; 11(5): 285- 90.

Hatzenbuehler J, Pulling TJ. Diagnosis and management ofosteomyelitis. Am Fam Physician. 2011 Nov;84(9):1027–33

Hatzenbuehler J., Pulling TJ. 2011. Diagnosis and management of osteomyelitis. *Am Fam Physician* Nov;84(9):1027-33.

Humber CC, Albilia JB, Rittenberg B. 2011. Chronic osteomyelitis following an uncomplicated dental extraction *J Can Dent Assoc.,* 77: b98.

Jaramillo D. 2011. Infection: musculoskeletal. Pediatr Radiol May;41 Suppl 1:S127-34.

Kaiser S, Rosenborg M. Early detection of subperiosteal abscesses by ultrasonography: a means for further successful treatment in pediatric osteomyelitis. Pediatr Radiol 1994;24(5): 336–9

Kapoor A, Page S, Lavalley M, Gale DR, Felson DT. Magneticresonance imaging for diagnosing foot osteomyelitis: a meta-analysis. Arch Intern Med. 2007 Jan;167(2):125–32.

Kim SG, HS Jang. Treatment of chronic osteomyelitis in Korea. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2001 Oct; 92(4): 394-98.

Kluytmans J., van Belkum A., Verbrugh H. 1997. Nasal carriage of Staphylococcus aureus: epidemiology, underlying mechanisms, and associated risks. *Clin Microbiol Rev.,* Jul; 10(3):505-20.

Koorbusch GF, Fotos P, Goll KT. 1992. Retrospective assessment of osteomyelitis. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.,* Aug;74 (2):149-54

Krakowiak PA. 2011. Alveolar osteitis and osteomyelitis ofthe jaws. *Oral Maxillofac Surg Clin North Am.* Aug; 23(2): 401-13.

Lew DP, Waldvogel FA. 1997. Osteomyelitis. N Engl J Med Apr;336(14):999-1007.

Masahiko Gunge, Hirotsugu Yamamoto, Takao Katoh and Hirotsugu Izumi. 1987. Suppurative Osteomyelitis ofthe mandible in a child. *Int J. Oral Maxillofac. Surg.*, Feb:16(1): 99-103.

Meyers SP, Wiener SN. Diagnosis of hematogenous pyogenic vertebral osteomyelitis by magnetic resonance imaging. Arch Intern Med 1991 Apr;151(4):683–87

Mutluoğlu M, Uzun G, İpcioğlu OM, Sildiroglu O, Özcan Ö, Turhan V,*et al*. Can procalcitonin predict bone infection in people with diabetes with infected foot ulcers? A pilot study. Diabetes Res Clin Pract.2011 Oct;94(1):53–6

Nezafati S, Ghavimi MA, Yavari AS. 2009. Localized osteomyelitis of the mandible secondary to dental treatment: report of a case. *J Dent Res Dent Clin Dent Prospects.*, 3(2): 67-9.

Ochsner PE, Hailemariam S. Histology of osteosynthesis associated bone infection. Int J Care Injury. 2006 May;37 Suppl.2:S49–58.

Patel V, Harwood A, McGurk M. Osteomyelitis presenting in two patients: a challenging disease to manage. Br Dent J. 2010 Oct; 209(8): 393-96

Pineda C, Vargas A, Rodríguez AV. Imaging of osteomyelitis:current concepts. Infect Dis Clin North Am. 2006 Dec;20(4):789–825

Roine I, Faingezicht I, Arguedas A, Herrera JF, Rodríguez F. Serial serum C-reactive protein to monitor recovery fromacute hematogenous osteomyelitis in children. Pediatr InfectDis J. 1995 Jan;14(1):40–4

Sabine Faesch, Bogdan Cojocaru, Carole Hennequin, Stéphanie Pannier, Christophe Glorion, Bernard Lacour, *et al*. Can procalcitonin measurement help the diagnosis of osteomyelitis and septicarthritis? A prospective trial. Ital J Pediatr. 2009 Nov;35:33

Sandler MP, Coleman RE, Patton JA, Wackers FJT, GottschalkA. Diagnostic nuclear medicine. 4th ed. Philadelphia:Lippincott Williams & Wilkins; 2003

Santiago-Restrepo C, Gime´nez CR, McCarthy K. Imaging of osteomyelitis and musculoskeletal soft tissue infections: current concepts. Rheum Dis Clin North Am 2003 Feb;29(1):89–109

Schwegler B, Stumpe KD, Weishaupt D, Strobel K, Spinas K, Spinas GA, von Schulthess GK,*et al*.Unsuspected osteomyelitis is frequent in persistentdiabetic foot ulcer and better diagnosed by MRI than by ^{18}F_FDG PET or ^{99m}Tc_MOAB. Journal of Internal Medicine 2008 Jan; 263(1); 99-106.

Stephen RF, Benson MK, Nade S. 2012. Misconceptions about childhood acute osteomyelitis. *J Child Orthop.,* Oct;6(5):353-6.

Strobel K, Stumpe D. PET/CT in musculoskeletal infection.Semin Musculoskelet Radiol. 2007 Dec;11(4):353–64.

Termaat MF, Raijmakers PG, Scholten HJ, Bakker FC, Patka P,Haarman HJ. The accuracy of diagnostic imaging for theassessment of chronic osteomyelitis: a systematic review andmeta-analysis. J Bone Joint Surg Am. 2005 Nov;87(11):2464–71.

Theologie-Lygidakis N, Schoinohoriti O, Iatrou I. Surgical management ofprimary chronic osteomyelitis of the jaws in children: a prospective analysis of five cases and review of the literature.Oral Maxillofac Surg 2011 Mar;15(1),41-50.

Topazian RG. 2002. Osteomyelitis of the jaws. In: Topizan RG, Goldberg MH, Hupp JR (eds) Oral and maxillofacial infections, 4th edn. Saunders, Philadelphia.

Towers JD. The use of intravenous contrast in MRI of extremity infection. Semin Ultrasound CT MR 1997 Aug;18(4): 269–75

Unkila-Kallio L, Kallio MJ, Eskola J, Peltola H. Serum C-reactiveprotein, erythrocyte sedimentation rate, and white blood cellcount in acute hematogenous osteomyelitis of children.Pediatrics. 1994 Jan;93(1):59–62

Zuluaga AF, Galvis W, Saldarriaga JG, Agudelo M, Salazar BE,Vesga O. Etiologic diagnosis of chronic osteomyelitis: aprospective study. Arch Intern Med. 2006 Jan;166(1):95–100.

****