



Dental Infection Issues that Contribute to Dental Malpractice

Sunie Keller RN, RDH, BS, CLNC

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Dental malpractice affects thousands of people each year. According to the National Practitioner Data Bank (2004-2014), 15% of medical malpractice claims involve dentists. This article describes some dental infections and how a legal nurse consultant can use this information.

COMMON FORMS OF DENTAL MALPRACTICE

There are four common forms of dental malpractice:

- 1) Infections caused by improperly sterilized instruments and dental unit water lines
- 2) Failure to diagnose and treat periodontal and implant infections
- 3) Root canal infections
- 4) Infections from medication-related osteonecrosis of the jaw

Oral infections can cause significant morbidity. Studies indicate that some may have systemic effects on, among others, cardiac disease, pregnancy, kidney disease, and diabetes. Between 2008 and 2011, 101 people died in Emergency Departments due to preventable dental disease (*Journal American Dental Association, 2014*).

INFECTIONS CAUSED BY IMPROPERLY STERILIZED INSTRUMENTS AND DENTAL UNIT WATERLINES

Infection prevention in dentistry has gained more attention in recent years and guidelines for prevention are common practices in most countries. Agents such as hepatitis B and *Legionella pneumophila* are real threats for cross infection.

The oral cavity naturally harbors a large number of microorganism and can be a reservoir for pathogens that pose a risk for cross contamination and even cause systemic infections.

Pathways of contamination can be bidirectional; infectious microorganisms may be transferred from the patient to a member of the dental team and via the hands of the dental team to the patient. Inadequate sterilization of dental instruments can also cause infectious pathogens to move from patient to patient.



Image: Implant Infection

L.pneumophila causes legionellosis, a respiratory disease, and can cause a severe form of pneumonia called Legionnaires' disease. Outbreaks are often associated with contaminated aerosol-producing water systems, dental unit water lines (DUWL), commonly found in dental offices. This poses a risk to both dental staff and patients. *L.pneumophila* multiplies readily in water at temperatures between 25 and 45 degrees Celsius. In fact, according to the American Dental Association (2012), many studies have documented the presence of *L.pneumophila* contamination in DUWL.

An Italian woman was infected with *L.pneumophila* (serogroup one) originating from a dental office. She died from pulmonary complications. By using molecular typing methods, the source of the legionella infection was shown to be a DUWL. This case was the first documented Legionnaires' disease transmission from a dental office. A report can be found at <http://www.ncbi.nlm.nih.gov/pubmed/22340301>. Read at <http://www.ada.org/en/science-research/science-in-the-news/transmission-of-legionnaires-disease-traced-to-contaminated-dental-unit-waterline>.

LNC Tips: The LNC working in a related case should:

- Obtain the sterilization records of the dental office. Compliant offices send a test indicator out each week to see if the sterilizer is functioning properly and log the results (Centers for Disease Control, 2015).
- Discover whether warm water is being used in a DUWL. While this is more comfortable than cold water for the patient, it can be a breeding ground for infection.
- Obtain logs as to whether the water lines are flushed every day.

FAILURE TO DETECT PERIODONTAL AND IMPLANT INFECTIONS

Periodontal diseases are infections of the gums and bone around the tooth. Swollen and bleeding gums are early signs that the gums are infected. If a person's hands bleed when washed, that would be concerning. Yet many people think it normal if their gums bleed when they brush or floss.

Fifty percent of American adults 30 years and older have periodontal disease. In adults 65 years and older, prevalence is 70% (American Academy

of Periodontology, 2012). If left untreated, periodontal disease can lead to tooth loss. Research has shown that periodontal infections are associated with other chronic inflammatory diseases such as diabetes, cardiovascular disease, and has been linked with to Alzheimer's disease. Periodontal pathogens, such as Fusibacterium nucleate, increase permeability and damage the arterial endothelium, increasing the risk of myocardial infarction and stroke (Fardini, Wang, & Temoin, 2011). Identifying specific periodontal pathogens and eliminating active periodontal infection is critical to maintain arterial wellness. The oral-systemic connection is strong.

Standard of care (SOC) for detection is a comprehensive annual periodontal evaluation, performed by a general dentist, periodontist, or hygienist. This consists of observing for presence or absence of inflammation (usually exhibited by bleeding on probing), probing depths, extent of loss of periodontal attachment and bone, medical and dental history, plaque distribution, calculus, pain, and mobility.

In May 2015, Dentists Advantage (2015) reported a net verdict of \$295,378 for a case that demonstrated failure to recognize and treat periodontal disease. The plaintiff was a patient of the defendant's dentist starting in 1999. The plaintiff alleged she began having periodontal problems in 2005, which progressed over the next four years. Of the 14 office visits during those four years, 11 were with the defendant dentist.

When the plaintiff saw the defendant dentist in August 2009, the plaintiff reported "pimples" on her gums. The defendant referred her to a periodontist. She required extraction of 14 teeth, underwent implants, and needed more at the time of trial. The plaintiff alleged negligence in failure to diagnose her gum disease timely. A jury found negligence by the defendant dentist and



Image: Perio Disease

hygienist in that group, assessing 65% fault to the dentist, 25% to the hygienist and 10% to plaintiff.

Professional liability claims pertaining to periodontal infections most commonly allege failure to diagnose, failure to inform, failure to refer, or failure to treat. Often the diagnosis of periodontal infection is made by another general dentist; that leads the patient to conclude that the diagnosis should have been made by the former dentist.

LNC Tips: The LNC working in a related case should:

- Determine whether the dental staff completed an annual full mouth periodontal probee was. Any pockets over 55mm should be noted in the chart.
- Discover whether staff noted in the chart that they explained periodontal disease and suggested treatment, and that the patient acted on the suggested treatment. The comprehensiveness and accuracy of clinical records will have important details.

IMPLANTITIS

Peri-implantitis and peri-implant disease are nonspecific terms for infection or

inflammation around a dental implant, which can affect surrounding soft and hard tissue. Clinical signs are similar to periodontitis. A baseline radiograph and periodontal probe are used for identifying bone loss. True peri-implantitis occurs when inflammation spreads to underlying bone, causing bone loss; because the periodontal ligament is missing after implant, so inflammation can progress there directly.

Conditions that contribute to systemic inflammation can exacerbate local inflammation around implants. In diabetes, poor glycemic control appears to aggravate peri-implant disease because elevated blood glucose levels impairs host defenses and neutrophilic functions. Rheumatoid arthritis, which exacerbates the local inflammation triggered by biofilm insult, is also a risk factor.

More than three million implants are placed by general dentists in the United States annually. Failure of implants is largely due to insertion. The bone can be too thin to support the implant or it can be inserted into the sinus or a nerve if not done properly. See also Osteonecrosis, below.

LNC Tips: The LNC working in a related case should:

- Determine whether the implants were placed by a general dentist who took a weekend course at a destination resort conference to learn how, or a board-certified surgeon with two years of post-doctoral training.
- Discover whether the dentist used cone-beam computed tomography, also known as CBCT, to assess for adequate bone near the nerves and the sinus cavity.

ROOT CANAL INFECTIONS

A root abscess involves pus in bone tissue at the tip of the infected tooth, usually caused by bacterial infection in the tooth's pulp. In some cases, it may perforate bone and drain into surrounding tissue, creating local swelling. Sometimes cervical lymph glands will be tender. Treatment is root canal therapy and antibiotics, if swelling is significant.

If not treated properly, a tooth abscess can result in swelling, fever, intense pain, tooth loss, sinus infection, endocarditis, brain abscess, osteomyelitis, cellulitis, or Ludwig's angina (cellulitis in the floor of the mouth).

Endodontists specialize in treatment of the pulp or nerve. They have two or more years of specialized training beyond dental school. The average endodontist does 25 root canals per week; general dentists average two per week. Most endodontists use electron microscopes for their detailed work, which most general dental offices do not have available.

Baxter (2007) reviewed 41 malpractice cases, all by general dentist, involving complications due to endodontic procedures. These include instruments left in canals, nerve and sinus perforations, air embolism, and life-threatening infections. There were eight life-threatening infections, seven due to brain abscesses and one to osteomyelitis. Of these eight,

four were fatal and four resulted in irreversible brain damage.

LNC Tips: The LNC working in a related case should:

- Discover who performed the root canal, a general dentist or an endodontist. Remember, the general dentist will be held to the same SOC as the specialist.
- See if the records show that the dentist used a rubber dam. A rubber dam prevents instruments, solutions, tooth parts, and debris from going down the patient's throat. The SOC requires the use of a rubber dam during endodontic therapy.
- Determine qualifications of the dentist. Dentists often get into trouble when they attempt work that they should have referred to specialist.

INFECTIONS FROM MEDICATION RELATED OSTEONECROSIS OF THE JAW

In the mid-1990s, reports began to appear in the professional literature of dental implant failures and osseous destruction, osteonecrosis of the jaw (ONJ), affecting both the mandible and maxilla in individuals who took an oral form of bisphosphonate. At first, all case reports involved Fosamax (alendronate), a drug used to ameliorate the effects of osteoporosis. Later, reports revealed that intravenous bisphosphonate drugs, principally with chemotherapy, were associated with similar destruction.

New medications unrelated to bisphosphonates came on the market in the 2000s, among them Prolia (denosumab). Osteonecrosis of the jaw (ONJ) began to be reported in individuals who took denosumab. Recently, the FDA has issued advisory warnings regarding potential ONJ development for antiangiogenic chemotherapy agents, Sutent (sunitinib) and Avastin (bevacizumab). (Berenson and Stopeck, 2016)

Infection can be a contributing factor, since periodontal or apical disease in the presence of antiresorptive drugs appears to increase risk for ONJ. A 2014 study identified an Actinomyces species, an uncommon microorganism associated with oral infection, in specimens of necrotic bone. Fungi and viruses require "sophisticated therapies to combat the multiorganisms associated biofilms." (Atherton Pickett, 2015)

The risk for ONJ in cancer patients prescribed antiresorptive or antiangiogenic medications range from zero to 1.9 cases per 10,000 patients. With bisphosphonates, the risk is higher (100 cases per 10,000), 1% of all cases. More than 400 lawsuits have been filed against the manufacturer of Fosamax. Among cancer patients with ONJ who had pre-existing infection, oral disease increased the risk for medication related ONJ (Ruggiero, 2014).

Cancer patients cannot stop their medications. The goal for patients receiving IV antiresorptive or antiangiogenic treatment is to reduce the potential for oral surgery by eliminating oral infection early in the chemotherapy regimen. One study's conclusion recommended drug cessation for more than four months before oral surgical procedures. (Kim, Lee, & Song, 2014).

LNC Tips: The LNC working in a related case should:

- Determine whether a MD expecting to prescribe any medication associated with ONJ consulted the patient's dentist. Oral procedures to bring the mouth to optimum health can be recommended before chemotherapy begins. Dentists should do a thorough clinical exam and eliminate any infection or potential infection.
- Determine whether there was a drug holiday for procedures that involved osseous surgery.
- Look for documentation on patient teaching about risk of ONJ, which

increases the longer the drugs are taken. Patients should be educated not to take bisphosphonates for longer than four years.

SUMMARY

Most dental infection cases are filed against general dentists. If these dentists had referred the patients to specialists sooner, many dental malpractice cases could have been avoided. Anaerobic infections from endodontic procedures can be deadly. Because implants are another potential source of infection, patient evaluation should include the history of smoking and systemic disease or medications that can affect healing, bone density, and decrease resistance to infection.

REFERENCES

Atherton Pickett, F (2015) Update on medication related osteonecrosis of the jaw. RDHmag. Oct 2015. pg 69-73.

Baxter, C. (2007) Malpractice Survey: A Survey Of 242 Dental Negligence Cases With Breakdown As To The Sex Of The Defendant Dentist. <http://www.experts.com/Articles/Malpractice-Survey-A-Survey-Of-242-Dental-Negligence-Cases-With-Breakdown-As-To-The-Sex-Of-The-Defendant-Dentist-By-Dr-J-Crystal-Baxter> Retrieved 2/15/2016

Berenson JR and Stopeck AT (2016) Medication-related osteonecrosis of the jaw in patients with cancer. <http://www.uptodate.com/contents/medication-related-osteonecrosis-of-the-jaw-in-patients-with-cancer> Retrieved 8/18/2016

Clementini, M., Rossetti, P.H., Penarrocha, D. (2014, March). Systemic Risk Factors for Peri-implant Bone Loss: A systematic review and meta-analysis. *Int J Oral Maxillofac Surg*, 43(3): 323-34. Epub 2013 <http://www.ncbi.nlm.nih.gov/pubmed/24373525> Accessed 2/15/2016

Dentistry IQ (n.d.) A review of dental negligence. <http://www.dentistryiq.com/articles/wdj/print/volume-2/issue-8/you-and-your-practice/a-review-of-dental-negligence.html>

Dentists Advantage Case Study (2015, May). Retrieved from <http://www.dentists-advantage.com/sites/DA/rskmgt/casestudy/Pages/FailuretoRecognizeandProperlyTreat.aspx> Retrieved 2/15/2016 16

Fardini, Y., Wang, X., & Temoin, S. (2011, December). Fusobacterium Nucleatum Adhesion FadA Binds Vascular Endothelial Cadherin and Alters Endothelial Integrity. *Molecular Microbiology*, 82(6):1468-80. <http://www.ncbi.nlm.nih.gov/pubmed/22040113> Retrieved 2/15/2016

Kim, Y.H., Lee, H.K., Song, S.I. (2014, Oct.). Drug Holiday as a Prognostic Factor of Medication-related Osteonecrosis of the Jaw. *J Korean Assoc Oral Maxillofac Surg*, 40(5): 206-10. Epub 2014 Oct 24. <http://www.ncbi.nlm.nih.gov/pubmed/?term=Drug+holiday+as+a+prognostic+factor+of+medication> Retrieved 2/15/2016

Laheij, A.M., Kistler, J.O., Belibasakis, G.N. (2012). Healthcare-associated Viral and Bacterial Infections in Dentistry. *J Oral Microbiol*. 4.10:3402/jom.v4i0.Epub 2012 June 12. <http://www.ncbi.nlm.nih.gov/pubmed/22701774> <http://www.ncbi.nlm.nih.gov/pubmed/22701774?term=Healthcar> Retrieved 2/15/2016

Lee, M.K., Allareddy, V., Nalliah, R.P. (2015, Dec.). Hospital-based Emergency Department Visits Involving Dental Conditions: Profile and Predictor of Poor Outcomes and Resource Utilization. *Journal Amer Dent Ass*. <http://www.ncbi.nlm.nih.gov/pubmed/24686965> Accessed 2/15/2016

National Practitioner Data Bank (2004-2014). Malpractice Reports for all Practitioners. Retrieved from <http://www.npdb.hrsa.gov/resources/npdbstats/npdbStatistics.jsp> National Practitioner Data Bank (2004-2014). Malpractice reports for all practitioners. <http://www.npdb.hrsa.gov/resources/npdbstats/npdbStatistics.jsp#contentTop> Retrieved 2/15/2016

Papapoulos, S., Chapurlat, R., Libanati, C. (2012, March). Five years of Denosumab Exposure in Women with Post-menopausal Osteoporosis. Results from the First Two Years of the FREEDOM Extension. *J Bone Miner Res*, 27(3): 694-701. <http://www.ncbi.nlm.nih.gov/pubmed/22113951> Retrieved 2/15/2016

Fardini Y., Wang, X., & Temoin, S. (2011, December). Fusobacterium nucleatum adhesion FadA binds vascular endothelial cadherin and alters endothelial integrity. *Molecular Microbiology*, 82(6):1468-80. <http://www.ndbi.nlm.nih.gov/pubmed/22040113> Retrieved 2/15/2016

Ricci, M.L., Fontana, S., & Pinci, F. (2012, February). Pneumonia Associated with a Dental Unit Water Line. *The Lancet*, *Lancet*. 376 (9816) 684. [http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(12\)60074-9/abstract](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(12)60074-9/abstract) Retrieved 2/15/2016

Papapoulos S, Chapurlat R, Libanati C. @012, March). Five years of denosumab exposure in women with post-menopausal osteoporosis. Results from the first two years of the FREEDOM extension. *J Bone Miner Res*, 27(3): 694-701. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/22113951>

Ruggiero, S.L. (2015, November). Medication-related osteonecrosis of the jaw. (MRONJ) that is linked to the treatment of malignant. *Introduction. Oral Maxillofac Surg Clin North Am*, 27(4). <http://www.ncbi.nlm.nih.gov/pubmed/26608159> Accessed 2/15/2016362366



Sunie Keller RN, RDH, BS, CLNC is a practicing dental hygienist and legal nurse consultant. Since becoming an RN 40 years ago, she has worked in a variety

of settings ranging from CCU/ICU, oncology, med-surg, urgent care to corrections. 37 years ago, while she was doing nursing, she obtained her dental hygiene degree. She still continues to work one-two days per week to keep clinically active in dentistry. With Ms. Keller's varied background of nursing and dentistry, she is adept at all areas of personal injury and medical/dental malpractice. She can be contacted at suniekeller@gmail.com