

MULTIPLE SCLEROSIS and Other Brain Diseases

Robert Gammal BDS
November 2012

Why would I, a dentist be writing about MS. Multiple Sclerosis, we are told, is a disease which has 'no known cause' and 'no known treatment' and is in the medical rather than dental domain. The answer is that I have been fortunate enough to see a number of spontaneous remissions of this disease following dental intervention. (Note - I am not offering a magic bullet. I have also seen many MS cases that did not resolve.)

Each time, the disappearance of the MS symptoms and the lesions (which were visible on MRI), was associated with the removal of a dead root treated tooth. That such a simple thing could be all that is needed to change someone's life for the better sounds too magical. After all, the dental profession as a whole, claim that it is not possible for a root treated tooth to cause any systemic diseases. If the removal of a root treated tooth can allow the body to heal from multiple sclerosis, why is this not the first line of treatment offered by the medical profession? Why is it that the dental profession is not held responsible for causing the disease in the first place? I repeat that I am Not offering a magic bullet. There are many people with MS who do not have any root treated teeth. There are other causes which I will mention below, but dead teeth are certainly a part of the picture.

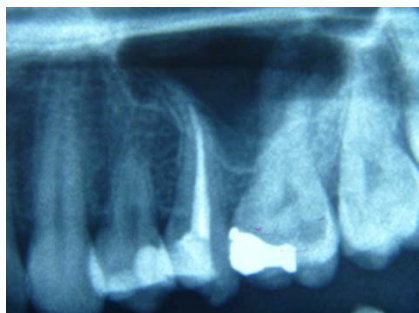
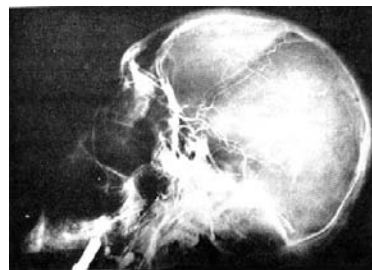
The published scientific literature supports a causal connection between MS and dental disease. My clinical observations (which some may claim to be anecdotal evidence) are in fact aligned with the published science.

Root Canal 'therapy' or 'treatment' is regarded by modern dentistry as the 'state-of-the-art' procedure for saving a tooth. Dentistry generally denies the possible connection between root treated teeth and systemic disease. The claim of modern dentistry is that the idea of 'focal infection' was shown to be incorrect many years ago. This claim is NOT supported by the published science. Modern medicine on the other hand works daily with the concept. Medical practitioners know that an infection can spread from one part of the body to another and may rapidly become life threatening. In fact the current research fully supports that from 100 years ago which traces the spread of infection from dead teeth to the rest of the body with devastating consequences. In Fact the support for the older literature from the turn of the 20th century is supported by literature ever since then including up to the time of writing in 2012. ([See Focal Infections paper](#))

It is remarkable that dentistry denies the spread of disease from a root treated tooth, knowing that this very same tooth is loaded with anaerobic bacteria and other toxic material used in the root canal procedure. It is impossible to sterilize a tooth! It is impossible to remove all the dead tissue from the inside of the tooth. All materials used in RCT are at best cytotoxic and at worst carcinogenic. It is impossible to seal the tooth. All toxins will escape continually from a tooth (whether root treated or not) and circulate throughout the body and the brain. There is little to NO scientific validity nor is there any evidence based validity for the root canal procedure!

Professor Patrick Stortebecker, a professor of neural surgery in Sweden, demonstrated how

infections can spread easily from any of the teeth to the brain. He also demonstrated in 1961 that the primary lesion in Multiple Sclerosis is an infected plaque around the venous side of the blood supply to the brain. Cerebral MS plaques show the same organisms as found in dead teeth.^{1,2,3,4} Stortebecker was able to trace the cause of many brain diseases to infected teeth. ([See Appendix B](#))



Only about 1mm of bone separates the ends of the roots of the upper molars and premolars, and the floor of the maxillary sinus. Often the ends of the roots of these teeth are within the maxillary sinus. Infection or abscess at the end on these roots will cause infection and inflammation in the lining of the sinuses – this is called Sinusitis.^{5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20}

Remarkably, this 1mm of bone, also separates the medical and dental worlds. It separates the domain of the “Dentist” and the domains of the “Ear, Nose and Throat” specialists and also the “Neurologists”. Since when were our bodies divided into states and countries to be ruled over by separate dominion.

**THERE IS A LINEAR RELATIONSHIP WORLD-WIDE BETWEEN
THE INCIDENCE OF MULTIPLE SCLEROSIS AND
THAT OF DENTAL DECAY.²¹**

“Causal comparison of the WHO map of dental caries incidences throughout the world reveals a striking parallel in general trend. Comparison of decayed, missing and filled teeth with the MS death rates results in a correlation coefficient of 0.97, and the probability of a chance occurrence is less than 0.002. This represents a nearly perfect linear relationship between dental disease rates and MS death rates.”

“The geographical distribution and other epidemiological characteristics of multiple sclerosis (MS) are compared with those of dental caries. The rates of death due to MS in Australian states are linearly related to the numbers of decayed, missing, and filled (DMF) teeth found in individuals from those states. In the United States of America, a strong positive correlation also exists between MS death rates and dental caries indices. The prevalence of MS in 45 countries or areas correlates well with the frequencies of DMF teeth among children of school age in those locations. ...The prevalence of MS also correlates well with the percentage of edentulous individuals in certain countries. ...It is suggested that dental caries may be a more accurate epidemiological model for MS than poliomyelitis.”

- THERE IS A STRONG AND WELL-PUBLISHED ASSOCIATION BETWEEN SINUSITIS AND DENTAL INFECTIONS. ([SEE APPENDIX A](#))

- THERE IS A STRONG AND WELL-PUBLISHED ASSOCIATION BETWEEN SINUSITIS AND MULTIPLE SCLEROSIS. ^{22,23,24,25,26,27}
- THERE IS A STRONG AND WELL-PUBLISHED ASSOCIATION BETWEEN OPTIC NEURITIS AND DENTAL INFECTIONS. ^{28,29}
- THERE IS A STRONG AND WELL-PUBLISHED ASSOCIATION BETWEEN OPTIC NEURITIS AND MULTIPLE SCLEROSIS.

AUTO IMMUNE

Multiple Sclerosis is more than just dead teeth. There also appears to be a relationship via auto-immune reactions to heavy metals as well. From the work of Prof Vera Stejskal³⁰ in Europe, it is clear that all metals must be avoided in Multiple Sclerosis patients. This includes the metals in composite resins that are used to colour the filling materials. Porcelains should be the filling material of choice and cemented into place with old fashioned but safer zinc phosphate cement. For all those with an autoimmune disease I strongly recommend you read the information at www.melisa.org.

MERCURY

There is another and important confounding aspect of Multiple Sclerosis which must be mentioned at this point. The symptoms of mercury poisoning and those of Multiple Sclerosis are often identical. There is an increasing body of evidence relating this disease to the presence of heavy metals and especially mercury. The main source of mercury to the general population is of course dental amalgam. A study from 1994 clearly demonstrates this:

“This paper investigates the hypothesis that mercury from silver dental fillings (amalgam) may be related to multiple sclerosis (MS). It compares blood findings between MS subjects who had their amalgams removed to MS subjects with amalgams. MS subjects with amalgams were found to have significantly lower levels of red blood cells, hemoglobin and hematocrit compared to MS subjects with amalgam removal. Thyroxine levels were also significantly lower in the MS amalgam group and they had significantly lower levels of total T Lymphocytes and T-8 (CD8) suppressor cells. The MS amalgam group had significantly higher blood urea nitrogen and lower serum IgG. Hair mercury was significantly higher in the MS subjects compared to the non-MS control group. A health questionnaire found that MS subjects with amalgams had significantly more (33.7%) exacerbations during the past 12 months compared to the MS volunteers with amalgam removal. The paper also examines epidemiological correlations between dental caries and MS; as well as how mercury could be causing the pathological and physiological changes found in multiple sclerosis.” ³¹

SOCIAL COST

The potential dangers are of nightmare proportions. Again, to quote Störtebecker:

Can our society really afford to take care of all these ‘dental diseases’, generated from infectious foci of the teeth and jaws, involving a spread of highly pathogenic agents out into

the human body, even to the cranial cavity and the brain, with all the gruesome consequences being reflected in various symptoms from the nervous system, only to mention disorders like epileptic fits, hallucinations in schizophrenia, and moreover multiple sclerosis and malignant brain tumors.”

Melvin Yahr was highly concerned in his report of the Joint Commission on Neurology from **1975**:³²

"Disorders of the nervous system are a leading cause of chronic disease and disability in the United States today. It is conservatively estimated that well over 12 million people suffer from one or another of these neurologic conditions."

..... "The social and economic consequences to the individual and the community are enormous. The annual direct cost for the care of only three of the disorders of the nervous system -- EPILEPSY, MULTIPLE SCLEROSIS, and STROKE -- has been estimated by the Department of Health, Education, and Welfare at more than 3 billion dollars, while their indirect cost, from loss to the gross national product and loss to federal taxes, is about ten times higher and totals an additional 30 billion dollars. Added to this national burden is the personal tragedy these disorders bring, which is hardly measurable in monetary terms."

"Unfortunately, major disorders of nervous function, particularly schizophrenia and multiple sclerosis, have hitherto been regarded with a deplorable resignation as "unsolved" problems."

IN THE WORDS OF ONE OF MY PATIENTS;

"In September 2003, I went along to my dentist and had a root canal treatment performed. Months later in January 2004, I started to experience problems with my balance, tingling sensations and numbness in my hands and feet. Subsequently I was referred to a neurologist and after many tests – ct scans, lumbar puncture etc, etc – I was told that the probable cause of my problems was Multiple Sclerosis.

The amazing thing for me was I had this root canal filled tooth pulled out in September 2004 and a week later, literally a week later, my balance started to improve, and the sensations that I had been experiencing for 9 months, started to abate. The numbness & tingling – and basically things have just improved from there. It is now December 2005!"

The last contact with this patient was in May of 2007 – he was still in excellent health.

Quoting Professor Dauderer³³

"If we take Multiple Sclerosis patients who removed amalgam but refused both extraction of root canals and treatment of infected maxillary bone, we observe a cure rate from MS of 16%.

But when we consider multiple sclerosis patients that beside amalgam removal accepted our full treatment (root canal extraction and cleaning of alveolar bone), the percentage of cures increases to 86%."

Dauderer in the 1998 TV show by Sabrina Giannini:

"The dental work we get from dentists is not something biological or medical. I'd say it is a technical thing, and the technique give the dentists a number of very strong poisons to be

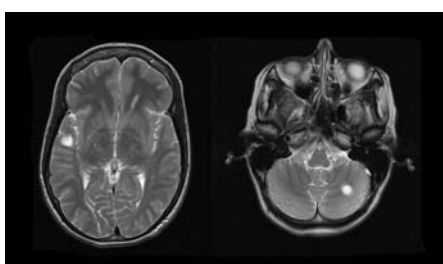
implanted in the mouth. If you kill the tooth and then fill its root canal with mercury, formaldehyde, cortisone, streptomycin, arsenic,... you are not doing any healthy thing. All this dentistry is just a sin against the biology of the body and a sin against the 'real' medicine."

THE CASE OF HEATHER



Heather was a 30 year old female who had a root canal procedure done on tooth #24 in 2006. (fig 1)

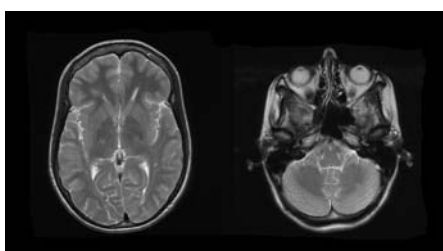
Eight months later the **right side of her face became numb**. Fearing that she was having a stroke she went directly to Emergency in the local hospital. It was a mystery to the doctors and they sent her home.



Over the next **5 years** she had **itchiness, numb arms, no taste, fatigue, double vision**.

The double vision made **her request a MRI** which showed lesions on the brain. The diagnosis of Multiple **Sclerosis** was made. (fig 2)

The root canalled tooth was extracted 1st march 2012. By May 2012 all symptoms of MS were gone.



New MRI scans were done early July 2012. All lesions are gone. (fig 3)

DISCLAIMER

There is NO magic bullet. We may remove the cause of the problem, but if there is too much damage, it may be difficult to repair this damage just by removing the cause. Many times the removal of the dead tooth does result in complete resolution of the disease state. There are unfortunately also times that it does not.

It is important to understand that there may be many contributing causes of a disease. Dentistry is NOT the only cause of disease – just the most forgotten

Root Canal Procedures Create
Dead, Anaerobically Infected, Gangrenous Teeth
deep in the bone
within inches of your brain.

Dead Teeth ARE Toxin Factories

It would be responsible for the dental profession
to abandon this unscientific procedure known as root canal therapy.

It is NOT therapeutic.

REFERENCES

-
- 1 Stortebecker P "Dental Infectious Foci and diseases of the nervous system - spread of microorganisms and their products from dental infectious foci along direct cranial venous pathways eliciting a toxic - infectious encephalopathy" *Acta. Psych Neural Scand* 36 Suppl. 157 (1961) 62
 - 2 Stortebecker P "The cranial venous system filled from pulp of a tooth - Proceedings" 3rd Int. Congress of Nero Surg. Copenhagen Aug 1965
 - 3 Stortebecker P "Dental significance of pathways for dissemination from infectious foci." *J Can Dent Assoc* 33:6 1967 pp301-311
 - 4 Stortebecker P "Chronic dental infections in the etiology of Glioblastomas. 8th int congress" *Neuropath. Washington D.C. Sept 1978 J Neuroph. Exp. Neurology* 37(s) 1978
 - 5 Selden HS The endo-antral syndrome: an endodontic complication. *J Am Dent Assoc* (1989 Sep) 119(3):397-8, 401-2
 - 6 Ngeow WC Orbital cellulitis as a sole symptom of odontogenic infection. *Singapore Med J* (1999 Feb) 40(2):101-3
 - 7 Maloney PL Doku HC Maxillary sinusitis of odontogenic origin. *J Can Dent Assoc* (1968 Nov) 34(11):591-603
 - 8 Guglani L Maxillary sinusitis due to dental infection. *News Int Coll Dent India Sect* (1970 Sep) 7(3):15
 - 9 Yamazaki Y Shimada K Sakuma M Kawashima Y Kobayashi H [Odontogenic maxillary sinusitis: with special reference to surgical therapy] *Nippon Jibiinkoka Gakkai Kaiho* (1972 Oct) 75(10):1125-6
 - 10 Esposito S [Maxillary sinusitis of dental origin] *Rass Int Clin Ter* (1970 Jan 15) 50(1):39-45
 - 11 Azimov M Ermakova FB [Role of focal odontogenic infection in the pathogenesis of maxillary sinusitis (experimental study)] *Stomatologiya (Mosk)* (1978 Jan-Feb) 57(1):11-4
 - 12 Neupokoev NI Neupokoeva NV [Periapical cyst of the maxillary teeth as a cause of odontogenic maxillary sinusitis] *Stomatologiya (Mosk)* (1991 May-Jun) 70(3):62-3
 - 13 Bertrand B Rombaux P Eloy P Reyckler H Sinusitis of dental origin. *Acta Otorhinolaryngol Belg* (1997) 51(4):315-22
 - 14 Stefaniu A Czausescu V Popescu N Romascanu G Ceausescu A [Orbito- ocular and meningoencephalic complications in odontogenic maxillary sinusitis] *Rev Chir Oncol Radiol O R L Oftalmol Stomatol Otorinolaringol* (1982 Jan-Mar) 27(1):59-64
 - 15 Tarlowska W A case of chronic inflammation of the right maxillary sinus caused by the introduction of cement into its lumen during root canal treatment of the 1st molar through the palatal root canal *Czas Stomatol* (1968 Jan) 21(1):25-8
 - 16 Sato K Pathology of recent odontogenic maxillary sinusitis and the usefulness of endoscopic sinus surgery *Nippon Jibiinkoka Gakkai Kaiho* (2001 Jul) 104(7):715-20
 - 17 Selden HS The interrelationship between the maxillary sinus and endodontics. *Oral Surg Oral Med Oral Pathol* (1974 Oct) 38(4):623-9
 - 18 Selden HS August DS Maxillary sinus involvement--an endodontic complication. Report of a case. *Oral Surg Oral Med Oral Pathol* (1970 Jul) 30(1):117-22
 - 19 Thevoz F Arza A Jaques B Dental foreign body sinusitis *Schweiz Med Wochenschr* (2000) Suppl 125:305-345
 - 20 Bogaerts P Hanssens JF Siquet JP Healing of maxillary sinusitis of odontogenic origin following conservative endodontic retreatment: case reports. *Acta Otorhinolaryngol Belg* (2003) 57(1):91-7
 - 21 Craelius W Comparative epidemiology of multiple sclerosis and dental caries. *J Epidemiol Community Health* (1978 Sep) 32(3):155-65
 - 22 Gay D Dick G Is multiple sclerosis caused by an oral spirochaete? *Lancet* (1986 Jul 12) 2(8498):75-7
 - 23 Callaghan TS Multiple sclerosis and sinusitis *Lancet* (1986 Jul 19) 2(8499):160-1
 - 24 Gay D Dick G Upton G Multiple sclerosis associated with sinusitis: case-controlled study in general practice. *Lancet* (1986 Apr 12) 1(8485):815-9
 - 25 Jones RL Crowe P Chavda SV Pahor AL The incidence of sinusitis in patients with multiple sclerosis. *Rhinology* (1997 Sep) 35(3):118-9
 - 26 Symons AL Bortolanza M Godden S Seymour G A preliminary study into the dental health status of multiple sclerosis patients. *Spec Care Dentist* (1993 May-Jun) 13(3):96-101
 - 27 Khmel'nik VM [Combined intracranial complication in chronic odontogenic maxillary sinusitis] *Kombinirovannoe vnutricherepnoe oslozhenie pri khronicheskom odontogennom gaimorite. Vestn Otorinolaringol* (1981 May-Jun)(3):87-8 ISSN: 0042-4668
 - 28 Papakonstantinou A Papakonstantinou P Dental focal infections and optic neuritis *Stomatol Chron (Athenai)* (1969 Sep-Oct) 13(5):185-91
 - 29 Niho M 2 cases of rhinogenic retrobulbar optic neuritis and a case of odontogenic retrobulbar optic neuritis with abducent palsy *Nippon Jibiinkoka Gakkai Kaiho* (1972 Jul) 75(7):783-99
 - 30 www.melisa.org
 - 31 Sibley RL Kienholz E Evidence that mercury from silver dental fillings may be an etiological factor in multiple sclerosis. *Sci Total Environ* (1994 Mar 15) 142(3):191-205
 - 32 Yahr MD Summary report on the joint commission on Neurology. *Neurology* 25: 497-501 1975
 - 33 (ECOMED VERLAG, LANDSBERG 1998 ISBN 3-609-71750-5)
-

APPENDIX A - SINUSITIS AND TEETH

Some references associating Sinusitis with infections in teeth till 2012.

1. Mattila K Roentgenological investigations into the relation between periapical lesions and conditions of the mucous membrane of maxillary sinuses. *Acta Odontol Scand* (1965) 23:Suppl 42:1-91
2. Ivankievicz D Schumacher GH Ethmoidal complications following maxillary inflammations of dental origin. *Dent Mag Oral Top* (1968 Jun) 85(3):111-4
3. Maloney PL Doku HC Maxillary sinusitis of odontogenic origin. *J Can Dent Assoc* (1968 Nov) 34(11):591-603
4. Maloney PL Doku HC Maxillary sinusitis of odontogenic origin. *J Can Dent Assoc (Tor)* (1968 Nov) 34(11):591-603
5. Lopez A Commissionat Y Lepoivre M Maxillary sinusitis of dental origin Les sinusites maxillaires d'origine dentaire. *Cah Coll Med Hop Paris* (1969 Apr 15) 10(4):259-67
6. Guglani L Maxillary sinusitis due to dental infection. *News Int Coll Dent India Sect* (1970 Sep) 7(3):15
7. Esposito S Maxillary sinusitis of dental origin *Rass Int Clin Ter* (1970 Jan 15) 50(1):39-45
8. Guglani L Maxillary sinusitis due to dental infection. *News Int Coll Dent India Sect* (1970 Sep) 7(3):15 passim
9. Yasuma K Relation between chronic maxillary sinusitis and tooth diseases. The conservative treatment of teeth penetrating the maxillary sinus. *Nihon Koku Geka Gakkai Zasshi* (1971) 17(1):2-12
10. Ivankievicz D Schumacher GH Ethmoid complications of dental inflammations of the maxilla *Fogorv Sz* (1972 Apr) 65(4):109-15
11. Yamazaki Y Shimada K Sakuma M Kawashima Y Kobayashi H Odontogenic maxillary sinusitis: with special reference to surgical therapy *Nippon Jibiinkoka Gakkai Kaiho* (1972 Oct) 75(10):1125-6
12. Ivanov I Maxillary sinusitis and orbit phlegmon from dental origin *Maksilaren sinuit i flegmon na orbitata. Stomatologija (Sofia)* (1973 Oct-Nov) 55(6):467-70
13. Halstead CL Mucosal cysts of the maxillary sinus: report of 75 cases. *J Am Dent Assoc* (1973 Dec) 87(7):1435-41
14. Asiedu WA Calais P Diagnosis and therapy of odontogenous diseases of the maxillary sinus *Fortschr Kiefer Gesichtschir* (1976) 21:80-1
15. Azimov M Ermakova FB Role of focal odontogenic infection in the pathogenesis of maxillary sinusitis (experimental study) *Stomatologija (Mosk)* (1978 Jan-Feb) 57(1):11-4
16. Nortje CJ Farman AG de V Joubert JJ Pathological conditions involving the maxillary sinus: their appearance on panoramic dental radiographs. *Br J Oral Surg* (1979 Jul) 17(1):27-32
17. Nortje CJ Farman AG de V Joubert JJ Pathological conditions involving the maxillary sinus: their appearance on panoramic dental radiographs. *Br J Oral Surg* (1979 Jul) 17(1):27-32
18. Smith D Goycoolea M Meyerhoff WL Fulminant odontogenic sinusitis. *Ear Nose Throat J* (1979 Oct) 58(10):411-2
19. Lindahl L Melen I Ekedahl C Holm SE Chronic maxillary sinusitis. Differential diagnosis and genesis. *Acta Otolaryngol* (1982 Jan-Feb) 93(1-2):147-50
 By a careful ENT and oral examination of 111 patients with suspected chronic maxillary sinusitis, the diagnosis was verified in only 56% (62/111). In 29 of these 62 patients (47%) a relation to dental infections was found, periodontitis being as frequent as apical granulomas. In 61% of the patients, in whom the diagnosis chronic maxillary sinusitis could not be verified, dental infections and/or myofascial pain dysfunction syndrome (MPD) were the most common and likely cause of the symptoms. A careful oral examination including dental radiographs is thus important in patients with chronic maxillary sinusitis.
20. Schmelzle R Schwenzer N Odontogenic diseases of the maxillary sinus *Die odontogenen Erkrankungen der Kieferhohle. Arch Otorhinolaryngol* (1982) 235(2-3):379-86
21. Hovinga J Christiaans BJ Odontogenic infection leading to orbital cellulitis as a complication of fracture of the zygomatic bone. *J Craniomaxillofac Surg* (1987 Oct) 15(5):254-7
 We describe a 51-year-old man in whom chronic maxillary sinusitis developing from a deep periodontal pocket, at 26, gave rise to cellulitis of the left orbit. The immediate cause was a

fracture of the left zygomatic bone with some displacement of the infraorbital margin and the orbital floor. Treatment consisted of drainage and antibiotic medication. The zygomatic bone fracture was not reduced. Eye movements returned to normal and visual acuity was not permanently affected.

22. Selden HS The endo-antral syndrome: an endodontic complication. *J Am Dent Assoc* (1989 Sep) 119(3):397-8, 401-2

Infection of pulpally involved teeth near the maxillary sinus sometimes spreads into the sinus and causes serious complications. This pathological complex, involving both antral and periapical tissues, is referred to as the endo-antral syndrome (EAS). It includes diagnostic difficulties, treatment considerations, and occasionally persistent pathological antral alterations after nonsurgical endodontic therapy. Surgical measures are occasionally required to stimulate healing and preserve the teeth.

23. Moreschi T Pathology of the maxillary sinus. I: Sinusitis of dental origin *Patologia dei seni mascellari. Dent Cadmos* (1984 May) 52(5):111-4

24. Melen I Lindahl L Andreasson L Short and long-term treatment results in chronic maxillary sinusitis. *Acta Otolaryngol (Stockh)* (1986 Sep-Oct) 102(3-4):282-90

The diagnostic criteria and the length of the observation period are essential factors influencing the results of treatment of maxillary sinusitis. In 198 patients (244 sinuses) with chronic maxillary sinusitis of either rhinogenous or dental etiology all patients were judged as cured or improved at the short-term control 1-3 months after completion of therapy. The long-term observation (mean 3.5 years) revealed different figures of healing. Satisfactory results after conservative therapy were seen in only 34% while the Caldwell-Luc operation gave good results in 80%. In sinusitis of dental origin, dental treatment combined with local sinus surgery was successful in 90%. In 78 sinuses investigated by sinuscopy, discrepancy between the symptoms and the endoscopic findings was seen in 14 cases (18%). Information obtained by questionnaire is therefore unreliable. In 30 sinuses operated upon with the Caldwell-Luc procedure, discrepancy between radiographic and endoscopic findings was seen in 3 cases (10%). Contributory factors, e.g. nasal polyps, dental infections and nasal allergy were found in 48 out of 84 sinuses not completely healed at the long-term control. Patients treated for chronic maxillary sinusitis must be followed up over a long period. A clinical control after 1-2 years, including sinuscopy or sinus radiographs, is recommended even in patients free from symptoms of sinusitis. Sinuscopy seems to be more reliable than sinus radiography and should be performed if the sinus radiographs show any pathology. The patients are also recommended to visit their dentists regularly, due to the close relationship between dental infections and chronic maxillary sinus diseases.

25. Politi M Rossetti G Consolo U Nocini PF Fugazzola C Odontogenic sinusitis. An evaluation and the radiologic checkup protocol after a Caldwell-Luc intervention *Minerva Stomatol* (1990 Feb) 39(2):119-22

26. Neupokoev NI Neupokoeva NV Periapical cyst of the maxillary teeth as a cause of odontogenic maxillary sinusitis *Stomatologija (Mosk)* (1991 May-Jun) 70(3):62-3

27. Chikhani L Dupont B Guilbert F Improvisi L Corre A Bertrand JC Uncommon fungal maxillary sinusitis of dental origin due to *Scedosporium prolificans* Une sinusite maxillaire fongique exceptionnelle d'origine dentaire a *Scedosporium prolificans*. *Rev Stomatol Chir Maxillofac* (1995) 96(2):66-9

This is the first case report of an exceptional maxillary infection due to *Scedosporium prolificans*. This recently discovered fungus was identified in the sinus. In the literature, it has been observed at different locations. Identification requires careful sample taking for mycology and pathology studies emphasizing the importance in maxillary surgery. This pathogenic fungus is very invasive, particularly in immunodepressed or immunocompromised patients. Therapeutic modalities vary with the patient's immune status

28. Bertrand B Rombaux P Eloy P Reyckler H Sinusitis of dental origin. *Acta Otorhinolaryngol Belg* (1997) 51(4):315-22

Acute or chronic sinusitis may be odontogenic. Bacteria involved in odontogenic sinusitis are specific organisms associated with the teeth (*Streptococcus sanguis*, *Streptococcus*

salivarius, Streptococcus mutans, anaerobic germs). They are often secondary to an intrasinus foreign body following periodontitis. The treatment is both naso-sinusal and dental. Cysts of the maxilla can also invade the sinus. In particular, radiculo-dental cysts (periapical) must be surgically excised, in some cases associated with a middle meatotomy. Finally, one should look for oro-antral fistulae. The surgical technique for its closure should take into account the reversibility of the sinus lesions.

29. Abrahams JJ, Glassberg RM. Dental disease: a frequently unrecognized cause of maxillary sinus abnormalities? *AIR. American Journal of Roentgenology* 1996 May; Volume 166, Number 5, pp. 1219-1223.

Periodontal disease may be a frequently unrecognized cause of maxillary sinus disease. The purposes of this study were to determine if maxillary sinus disease is more prevalent in patients with periodontal disease than in an age-and-sex-matched control group and to show radiographically an association of focal maxillary sinus disease with periodontal disease. MATERIALS AND METHODS: Maxillary DentaScans (General Electric Medical Systems, Milwaukee, WI) of 84 patients (168 maxillary sinuses) with periodontal disease were retrospectively evaluated for the simple presence or absence of maxillary sinus disease. This group was compared with an age-and-sex-matched control population of 84 patients who were referred for head or neck CT scans in which the maxillary sinuses (including their inferior aspects) were visualized. For the likelihood of sinus disease in patients compared with controls, an odds ratio and a 95% confidence interval were calculated using the SYSTAT version 5.2 (SYSTAT, Evanston, IL). In the second portion of the study, the subject population alone was graded in the following fashion to establish a causal relationship: grade 0, no sinus disease; grade 1, focal sinus disease not adjacent to periodontal disease (unlikely to be caused by periodontal disease); grade 2, nonfocal sinus disease (complete opacification, air-fluid levels, or diffuse mucoperiosteal thickening; indeterminate cause), and grade 3, focal sinus disease adjacent to periodontal disease (likely to be caused by peri-odontal disease). RESULTS: In the subject population—patients with periodontal disease who were referred for DentaScans 100 of 168 (60%) sinuses had sinus disease; in the control population, only 49 of 168 (29%) sinuses had sinus disease. The odds ratio for maxillary sinus disease in the patient population compared with controls was 3.6 (95% confidence interval, 2.35-6; $p < .0001$). The grading results of the subject population in the second portion of the study were grade 0, 68 sinuses (41%); grade 1, four sinuses (2%); grade 2, 32 sinuses (19%); and grade 3, 64 sinuses (38%). CONCLUSION: We have demonstrated a twofold increase in maxillary sinus disease in patients with periodontal disease and have shown a causal relationship. Recognition of this relationship may have an impact on the clinical management of patients, particularly those planning implant surgery

30. Jones RL Crowe P Chavda SV Pahor AL The incidence of sinusitis in patients with multiple sclerosis. *Rhinology* (1997 Sep) 35(3):118-9 (duplicated in MS section for its importance)

A retrospective study was performed to assess the incidence of sinus disease in patients with MS. The MRI scans of 108 patients referred to a regional Neurosciences Unit with a diagnosis of multiple sclerosis were examined. There were 71 females and 37 males with an age range of 22 to 67 years (mean: 39.7 years). The sagittal and axial images were reviewed and the degree of sinus disease noted. This was graded as absent, minimal, polypoid and pansinus. Fifty-seven patients (53%) had disease, the most common sinus involved was the maxillary followed by the ethmoid, frontal and sphenoid. Thirty-six patients had bilateral disease affecting the ethmoid sinuses most commonly. Three patients had fluid levels and four patients had retention cysts. The incidence of sinus disease is higher than in some other studies of normal populations.

31. Bertrand B Rombaux P Eloy P Reyckler H Sinusitis of dental origin. *Acta Otorhinolaryngol Belg* (1997) 51(4):315-22

Acute or chronic sinusitis may be odontogenic. Bacteria involved in odontogenic sinusitis are specific organisms associated with the teeth (Streptococcus sanguis, Streptococcus

salivarius, *Streptococcus mutans*, anaerobic germs). They are often secondary to an intrasinus foreign body following periodontitis. The treatment is both naso-sinusal and dental. Cysts of the maxilla can also invade the sinus. In particular, radiculo-dental cysts (periapical) must be surgically excised, in some cases associated with a middle meatotomy. Finally, one should look for oro-antral fistulae. The surgical technique for its closure should take into account the reversibility of the sinus lesions.

32. Sandler HJ Clinical update--the teeth and the maxillary sinus: the mutual impact of clinical procedures, disease conditions and their treatment implications. Part 2. Odontogenic sinus disease and elective clinical procedures involving the maxillary antrum: diagnosis and management. *Aust Endod J* (1999 Apr) 25(1):32-6

Although odontogenic sinusitis is a rare entity when compared to sinus disease of rhinogenic origin, it is extremely important to identify a dental aetiology when it occurs. The offending tooth or teeth would thus require endodontic treatment or extraction, and the sinus disease carefully assessed and appropriately managed. Aetiology and presentation of oro-antral fistulae are also discussed and guidelines for the management of this complication are recommended. Certain lesions such as cysts and tumours may involve the jaws and hence the maxillary antrum; some of these, such as a radicular cyst are quite common, but the rarer ones are included for completeness. Surgical techniques are continuously evolving to optimise form and function of the jaws, and when applied to the maxilla there may be some impact on nasal and sinus function. The advent, and now proven success, of osseointegrated jaw implants have brought with them innovations and refinements of bone grafting techniques, and more recently distraction osteogenesis for augmentation. Maxillary osteotomies for surgical orthodontics, and to facilitate prosthodontic treatment are briefly mentioned, as most of these inevitably involve the antrum and/or nose. This paper discusses, in summary form, important aspects of clinical dental practice which may involve the maxillary antrum. It is thus a broad overview of certain pathologic conditions and elective surgical procedures which have relevance to both medical and dental practitioners

33. Lindeboom JA van den Akker HP Sinusitis as the first indication of sarcoidosis an incidental finding in a patient with presumed 'odontogenic' sinusitis: case report. *Br J Oral Maxillofac Surg* (2000 Aug) 38(4):277-9

Involvement of the paranasal sinuses and nose by sarcoidosis is uncommon, and has been reported in only 1-4% of patients with sarcoidosis. Clinical symptoms are nasal obstruction, epistaxis, nasal pain, discharge, anosmia or hyposmia, epiphora, and dyspnoea. We present a case of sarcoidosis in which sinusitis was the first clinical sign of the disease.

34. Bogaerts P Hanssens JF Siquet JP Healing of maxillary sinusitis of odontogenic origin following conservative endodontic retreatment: case reports. *Acta Otorhinolaryngol Belg* (2003) 57(1):91-7

Because of the anatomical proximity, infection of posterior upper teeth can spread into the maxillary sinus. When confronted with a large persistent periapical lesion on a posterior maxillary root-treated tooth, the practitioner should question the quality of the previous endodontic treatment, evaluate the impact of the potential causes of failure and consider, in the majority of cases, the conservative non-surgical retreatment instead of extraction or periapical surgery of the dental element. This paper reports two cases of healing of extensive periapical bone destruction and of the co-existing sinus pathology of odontogenic origin after non-surgical endodontic retreatment of previously root-treated upper molars. Misconceptions concerning the role of epithelium in the periapical lesion are discussed. Also, emphasis is put on the need of precise radiological diagnosis, pre-operatively as well as post-operatively to ascertain healing and to avoid unnecessary delay in the appropriate management of these patients.

35. Brook I Microbiology of acute and chronic maxillary sinusitis associated with an odontogenic origin. *Laryngoscope* (2005 May) 115(5):823-5

OBJECTIVES:: To study the microbiology of sinusitis associated with odontogenic origin. METHODS:: Aspirates of 20 acutely and 28 chronically infected maxillary sinuses that were associated with odontogenic infection were processed for aerobic and anaerobic bacteria. RESULTS:: A total of 66 isolates were recovered from the 20 cases of acute sinusitis (3.3/specimen), 16 aerobic and facultatives, and 50 anaerobic. Aerobes alone were

recovered in 2 (10%) specimens, anaerobes only in 10 (50%), and mixed aerobic and anaerobic bacteria in 8 (40%). The predominant aerobic were alpha-hemolytic streptococci (5), microaerophilic streptococci (4), and *Staphylococcus aureus* (2). The predominant anaerobes were anaerobic Gram-negative bacilli (22), *Peptostreptococcus* (12), and *Fusobacterium* spp. (9). A total of 98 isolates were recovered from the 28 cases of chronic sinusitis (3.5/patient): 21 aerobic and facultatives and 77 anaerobic. Aerobes were recovered in 3 (11%) instances, anaerobes only in 11 (39%), and mixed aerobic and anaerobic bacteria in 14 (50%). The predominant aerobes were alpha-hemolytic streptococci (7), microaerophilic streptococci (4), and *S. aureus* (5). The predominant anaerobes were Gram-negative bacilli (41), *Peptostreptococcus* (16), and *Fusobacterium* spp. (12). Thirteen beta-lactamase-producing bacteria (BLPB) were recovered from 10 (50%) patients with acute sinusitis and 25 BLPB from 21 (75%) patients with chronic sinusitis. No correlation was found between the predisposing odontogenic conditions and the microbiological findings. CONCLUSIONS: These data illustrate the similar microbiology of acute and chronic maxillary sinusitis associated with odontogenic infection where anaerobic bacteria predominate in both types of infections.

36. Brook I Microbiology of intracranial abscesses associated with sinusitis of odontogenic origin. *Ann Otol Rhinol Laryngol* (2006 Dec) 115(12):917-20 (Copy in Brain Section)

OBJECTIVES: The unique microbiology of sinusitis of dental origin that is associated with intracranial abscesses (IAs) and the correlation between the organisms at the two sites has not been reported before. This report describes the author's experience during a 30-year period in studying the microbiology of 8 IAs and their corresponding sinusitis of dental origin. METHODS: Aspirates of pus from 8 infected sinuses associated with odontogenic infections and their corresponding IAs were studied for aerobic and anaerobic bacteria. Polymicrobial flora was found in all 8 sinuses and 7 IAs, and the number of isolates varied from 1 to 5. RESULTS: Anaerobic bacteria were isolated from all sinuses and IAs. A total of 28 isolates (3.5 isolates per site; 25 strict anaerobic, 1 aerobic or facultative, and 2 microaerophilic) were recovered from the sinuses, and 20 isolates (2.5 isolates per site; 16 strict anaerobic, 1 aerobic or facultative, and 3 microaerophilic) were found in the IAs. The bacterial isolates were *Fusobacterium* spp (14), *Prevotella* spp (11), *Peptostreptococcus* spp (13), microaerophilic streptococci (5), *Veillonella parvula* (3), and beta-hemolytic streptococci group F(2). Concordance in the microbiological findings between the sinus and the IA was found in all instances; however, certain organisms were only present at one site. CONCLUSIONS: These data illustrate the concordance in the organisms recovered from sinusitis of dental origin and their associated IAs and confirm the importance of anaerobic bacteria in sinusitis and IAs of dental origin.

37. Arijji Y Obayashi N Goto M Izumi M Naitoh M Kurita K Shimozato K Arijji E Roots of the maxillary first and second molars in horizontal relation to alveolar cortical plates and maxillary sinus: computed tomography assessment for infection spread. *Clin Oral Investig* (2006 Mar) 10(1):35-41

The purposes of this study were to investigate the horizontal relationship of the roots of maxillary molars with the cortical plates and the maxillary sinus and to investigate the influence of these relationships on the spread of odontogenic infection. Computed tomography images of 120 control subjects and 49 patients with infection originating in the maxillary first or second molar were investigated. In the control group, more than 60% of the first molar roots contacted both palatal and buccal cortical plates (type A), while such contact was not seen in more than 60% of second molars. The floor of maxillary sinus was most frequently observed at the level between the bifurcation and apices of roots in both first and second molars. In patients with infection, cortical changes were more frequently seen on the buccal side than on the palatal side, and 80% of patients with buccal cortical change showed the position in which the buccal roots were close to the buccal cortical plate. Mucosal thickening of the maxillary sinus was found in 87.8%. The buccopalatal spread of odontogenic infection originating in the maxillary first and second molars was influenced by the horizontal root position in relation to the cortices.

38. Brook I Sinusitis of odontogenic origin. *Otolaryngol Head Neck Surg* (2006 Sep) 135(3):349-55

Odontogenic sinusitis is a well-recognized condition and accounts for approximately 10% to 12% of cases of maxillary sinusitis. An odontogenic source should be considered in

individuals with symptoms of maxillary sinusitis with a history of odontogenic infection, dentoalveolar surgery, periodontal surgery, or in those resistant to conventional sinusitis therapy. Diagnosis usually requires a thorough dental and clinical evaluation including appropriate radiographs. The most common causes of odontogenic sinusitis include dental abscesses and periodontal disease that had perforated the Schneiderian membrane, irritation and secondary infection caused by intra-antral foreign bodies, and sinus perforations during tooth extraction. An odontogenic infection is a polymicrobial aerobic-anaerobic infection, with anaerobes outnumbering the aerobes. The most common isolates include anaerobic streptococci and gram-negative bacilli, and Enterobacteriaceae. Surgical and dental treatment of the odontogenic pathological conditions combined with medical therapy is indicated. When present, an odontogenic foreign body should be surgically removed. Surgical management of oroantral communication is indicated to reduce the likelihood of causing chronic sinus disease. The management of odontogenic sinusitis includes a 3- to 4-week course of antimicrobials effective against the oral flora pathogens.

Cabala A Chomyszyn-Gajewska M Drozd W [The impact of periodontal infection on systemic inflammatory process and atherosclerosis]

39. Ugincius P Kubilius R Gervickas A Vaitkus S Chronic odontogenic maxillary sinusitis. *Stomatologija* (2006) 8(2):44-8

The aim of the present study was to estimate average age of the patients in both sexes treated for MS, distribution by sex, amount of dexter and sinister MS with and without the fistulas into the maxillary sinus, with and without the foreign-bodies, length of stay in the Department of Maxillofacial Surgery at Kaunas Hospital of University of Medicine during the period from 1999 till 2004. The retrospective data analysis of the patients' treated for chronic MS was made. 346 patients (213 females and 133 males) were treated for chronic MS. 55 cases of chronic dexter MS with a fistula into maxillary sinus, 98 cases of chronic dexter MS without a fistula, 45 cases of chronic sinister MS with a fistula, 112 cases chronic sinister MS without a fistula, 16 cases of foreign-bodies in dexter maxillary sinus, 20 cases of foreign-bodies in sinister maxillary sinus have been detected. The main age of the female was 46.6+/-15.0, the main age of the men was 42.1+/-14.4. Statistically significant difference in the age difference of the women and the men was found ($p=0.0024$). It was determined, that females diagnosed and treated with chronic MS were 1.6 times more than males during the period from 1999 till 2004 in Kaunas Hospital of University of Medicine. Females treated for chronic MS were 4.5 years older than males.

40. Sinusitis of odontogenic origin. *Otolaryngol Head Neck Surg* (2006 Sep) 135(3):349-55

Odontogenic sinusitis is a well-recognized condition and accounts for approximately 10% to 12% of cases of maxillary sinusitis. An odontogenic source should be considered in individuals with symptoms of maxillary sinusitis with a history of odontogenic infection, dentoalveolar surgery, periodontal surgery, or in those resistant to conventional sinusitis therapy. Diagnosis usually requires a thorough dental and clinical evaluation including appropriate radiographs. The most common causes of odontogenic sinusitis include dental abscesses and periodontal disease that had perforated the Schneiderian membrane, irritation and secondary infection caused by intra-antral foreign bodies, and sinus perforations during tooth extraction. An odontogenic infection is a polymicrobial aerobic-anaerobic infection, with anaerobes outnumbering the aerobes. The most common isolates include anaerobic streptococci and gram-negative bacilli, and Enterobacteriaceae. Surgical and dental treatment of the odontogenic pathological conditions combined with medical therapy is indicated. When present, an odontogenic foreign body should be surgically removed. Surgical management of oroantral communication is indicated to reduce the likelihood of causing chronic sinus disease. The management of odontogenic sinusitis includes a 3- to 4-week course of antimicrobials effective against the oral flora pathogens.

41. Mehra P Jeong D Maxillary sinusitis of odontogenic origin. *Curr Allergy Asthma Rep* (2009 May) 9(3):238-43

Odontogenic etiology accounts for 10% to 12% of cases of maxillary sinusitis. Although uncommon, direct spread of dental infections into the maxillary sinus is possible due to the close relationship of the maxillary posterior teeth to the maxillary sinus. If a periapical dental infection or dental/oral surgery procedure violates the schneiderian membrane

integrity, infection will likely spread into the sinus, leading to sinusitis. An odontogenic source should be considered in individuals with symptoms of maxillary sinusitis and a history of dental or jaw pain; dental infection; oral, periodontal, or endodontic surgery; and in those people resistant to conventional sinusitis therapy. An odontogenic infection is a polymicrobial aerobic-anaerobic infection, with anaerobes outnumbering the aerobes. Diagnosis requires a thorough dental and clinical evaluation, including radiographs. Management of sinus disease of odontogenic origin often requires medical treatment with appropriate antibiotics, surgical drainage when indicated, and treatment to remove the offending dental etiology.

42. Patel NA Ferguson BJ Odontogenic sinusitis: an ancient but under-appreciated cause of maxillary sinusitis. *Curr Opin Otolaryngol Head Neck Surg* (2012 Feb) 20(1):24-8

PURPOSE OF REVIEW: For well over 100 years, it has been appreciated that maxillary dental infections can cause sinusitis. This insight has been largely overlooked with the advent of functional endoscopic sinus surgery (ESS) and its emphasis on the osteomeatal complex. We review several recent case series and reviews of odontogenic sinusitis that characterize and discuss emerging diagnostic modalities in odontogenic sinusitis. **RECENT FINDINGS:** In recent publications on odontogenic sinusitis, up to 40% of chronic bacterial maxillary sinus infections are attributed to a dental source, which is far higher than the previously reported incidence of 10%. Plain dental films and dental evaluations frequently fail to detect maxillary dental infection that can be causing odontogenic sinusitis. However, sinus computed tomography (CT) or Cone Beam Volumetric CT (CBVCT) are far more successful in identifying dental disease causing sinusitis. The microbial pathogens of odontogenic sinusitis remain unchanged from earlier reviews; however, the clinical findings in odontogenic sinusitis are better described in recent reviews. Successful treatment of odontogenic sinusitis requires management of the odontogenic source and may require concomitant or subsequent sinus surgery. **SUMMARY:** Odontogenic sinusitis is frequently recalcitrant to medical therapy and usually requires treatment of the dental disease. Sometimes dental treatment alone is adequate to resolve the odontogenic sinusitis and sometimes concomitant or subsequent ESS is required. Evaluation of all patients with persistent chronic rhinosinusitis (CRS) should include inspection of the maxillary teeth on CT scan for evidence of periapical lucencies. Unilateral recalcitrant disease associated with foul smelling drainage is especially characteristic of odontogenic sinusitis. High-resolution CT scans and CBVCT can assist in identifying dental disease.

43. Patel NA Ferguson BJ Odontogenic sinusitis: an ancient but under-appreciated cause of maxillary sinusitis. *Curr Opin Otolaryngol Head Neck Surg* (2012 Feb) 20(1):24-8

PURPOSE OF REVIEW: For well over 100 years, it has been appreciated that maxillary dental infections can cause sinusitis. This insight has been largely overlooked with the advent of functional endoscopic sinus surgery (ESS) and its emphasis on the osteomeatal complex. We review several recent case series and reviews of odontogenic sinusitis that characterize and discuss emerging diagnostic modalities in odontogenic sinusitis. **RECENT FINDINGS:** In recent publications on odontogenic sinusitis, up to 40% of chronic bacterial maxillary sinus infections are attributed to a dental source, which is far higher than the previously reported incidence of 10%. Plain dental films and dental evaluations frequently fail to detect maxillary dental infection that can be causing odontogenic sinusitis. However, sinus computed tomography (CT) or Cone Beam Volumetric CT (CBVCT) are far more successful in identifying dental disease causing sinusitis. The microbial pathogens of odontogenic sinusitis remain unchanged from earlier reviews; however, the clinical findings in odontogenic sinusitis are better described in recent reviews. Successful treatment of odontogenic sinusitis requires management of the odontogenic source and may require concomitant or subsequent sinus surgery. **SUMMARY:** Odontogenic sinusitis is frequently recalcitrant to medical therapy and usually requires treatment of the dental disease. Sometimes dental treatment alone is adequate to resolve the odontogenic sinusitis and sometimes concomitant or subsequent ESS is required. Evaluation of all patients with persistent chronic rhinosinusitis (CRS) should include inspection of the maxillary teeth on CT scan for evidence of periapical lucencies. Unilateral recalcitrant disease associated with foul

smelling drainage is especially characteristic of odontogenic sinusitis. High-resolution CT scans and CBVCT can assist in identifying dental disease.

APPENDIX B

- POMPIANS-MINIAC L APROPOS OF 2 CASES OF ENDOCRANIAL ABSCESES OF DENTAL ORIGIN. PROPAGATION BY VENOUS ROUTE OF APICAL INFECTION REV FR ODONTOSTOMATOL (1966 JUN-JUL) 13(6):1161-76
- HOLLIN SA HAYASHI H GROSS SW INTRACRANIAL ABSCESES OF ODONTOGENIC ORIGIN. ORAL SURG ORAL MED ORAL PATHOL (1967 MAR) 23(3):277-93
- STEVENSON GW GOSSMAN HH DENTAL AND INTRACRANIAL ACTINOMYCOSIS. BR J SURG (1968 Nov) 55(11):830-4
- DECHAUME M LAUDENBACH P CEREBRO-MENINGEAL MANIFESTATIONS OF DENTAL ETIOLOGY REV STOMATOL CHIR MAXILLOFAC (1969 MAR) 70(2):109-14
- MARTINEZ GARCIA W ALEMAN LOPEZ ST SEPTIC THROMBOSIS OF THE CAVERNOUS SINUS OF DENTAL ORIGIN. CASE REPORT DIVULG CULT ODONTOL (1971 SEP-OCT)(171):25-7
- MOJSEOWICZ K CZERWINSKI F LINNIK-KABAT A INTRACRANIAL COMPLICATIONS AS A CONSEQUENCE OF PURULENT ACUTE INFLAMMATORY PROCESSES ON THE FACE AND IN THE ORAL CAVITY CZAS STOMATOL (1971 JUN) 24(6):623-7
- BALOGH G AFRA D INOVAY J ENDOCRANIAL ABSCESS: COMPLICATION OF DENTAL EXTRACTION REV STOMATOL CHIR MAXILLOFAC (1972 APR-MAY) 73(3):205-9
- BALOGH G AFRA D INOVAY J ENDOCRANIAL ABSCESS: COMPLICATION OF DENTAL EXTRACTION REV STOMATOL CHIR MAXILLOFAC (1972 APR-MAY) 73(3):205-9
- URMOSI J WITTMANN K TAMUS I SUCCESSFUL TREATMENT OF THROMBOPHLEBITIS OF THE SINUS CAVERNOSUS ORIGINATING FROM A CUSPID ORV HETIL (1972 MAR 26) 113(13):766-8
- STRAUSS SI STERN NS MENDELOW H SPATZ SS SEPTIC SUPERIOR SAGITTAL SINUS THROMBOSIS AFTER ORAL SURGERY. J ORAL SURG (1973 JUL) 31(7):560-5
- URMOSI J THROMBOPHLEBITIS OF THE SINUS CAVERNOSUS STOMATOL DDR (1975 Nov) 25(11):776-8

A short survey of the relevant literature is followed by the description of the clinical course of a thrombophlebitis of the cavernous sinus. In this case, the initial focus was an infection of a canine which caused thrombophlebitis via the anterior facial vein.

SAZONOV AM MUROMSKII IUA PLOTNIKOV NA ZUBKOVA LF TROIANSKII IV ODONTOGENIC
MEDIASITIS GRUDN KHIR (1977 JUL-AUG)(4):82-6

INGHAM HR KALBAG RM THARAGONNET D HIGH AS SENGUPTA RP SELKON JB ABSCESSES OF THE
FRONTAL LOBE OF THE BRAIN SECONDARY TO COVERT DENTAL SEPSIS. LANCET (1978 SEP 2)
2(8088):497-9

The bacterial species found in pus aspirated from brain abscesses in two patients were typical of those found in dental sepsis. Subsequently apical-root abscesses were demonstrated in the upper jaws of both patients. This evidence strongly suggests that these cerebral abscesses were secondary to dental sepsis which could have spread from the teeth to the frontal lobes by several possible anatomical pathways.

TAICHER S GARFUNKEL A FEINSOD M REVERSIBLE CAVERNOUS SINUS INVOLVEMENT DUE TO MINOR
DENTAL INFECTION. REPORT OF A CASE. ORAL SURG ORAL MED ORAL PATHOL (1978 JUL) 46(1):7-9

HENIG EF DERSCHOWITZ T SHALIT M TOLEDO E TIKVA P AVIV T BRAIN ABSCESS FOLLOWING DENTAL
INFECTION. ORAL SURG ORAL MED ORAL PATHOL (1978 JUN) 45(6):955-8

A 48-year-old woman underwent root canal treatment of the upper left lateral incisor and lower right second premolar. Close to the conclusion of the endodontic treatment she complained about headaches. Later on, because of aggravation of her condition, with headaches, fever, malaise, Weakness, and numbness of the right limbs, she was admitted to the hospital. The disease progressed to an epileptic state, with appearance of a right hemiparesis. A brain scan and carotid arteriogram revealed the presence of a mass occupying the left parietal space. Craniotomy disclosed an abscess containing yellow pus from which *Streptococcus viridans* was cultured. After thorough surgical cleansing of the area, removal of the bone for decompression, and treatment with ampicillin the patient improved gradually and slowly regained the mobility of her right side.

HENIG EF, DERSCHOWITZ T, SHALIT M, TOLEDO E, TIKVA P, AVIV T. BRAIN ABSCESS FOLLOWING DENTAL INFECTION.
ORAL SURGERY, ORAL MEDICINE, AND ORAL PATHOLOGY 1978 JUNE; VOLUME 45, NUMBER 6, PP. 955-958.

A 48-year-old woman underwent root canal treatment of the upper left lateral incisor and lower right second premolar. Close to the conclusion of the endodontic treatment she complained about headaches. Later on, because of aggravation of her condition, with headaches, fever, malaise, weakness, and numbness of the right limbs, she was admitted to the hospital. The disease progressed to an epileptic state, with appearance of a right hemiparesis. A brain scan and carotid arteriogram revealed the presence of a mass occupying the left parietal space. Craniotomy disclosed an abscess containing yellow pus from which *Streptococcus viridans* was cultured. After thorough surgical cleansing of the area, removal of the bone for decompression, and treatment with ampicillin the patient improved gradually and slowly regained the mobility of her right side.

VALACHOVIC R HARGREAVES JA DENTAL IMPLICATIONS OF BRAIN ABSCESS IN CHILDREN WITH
CONGENITAL HEART DISEASE. CASE REPORT AND REVIEW OF THE LITERATURE. ORAL SURG ORAL MED
ORAL PATHOL (1979 DEC) 48(6):495-500

There is a high morbidity and mortality associated with brain abscesses in children with congenital cyanotic heart disease. A case is reported here which implicated an *endodontically treated primary molar in the etiology of a brain abscess* in a boy with congenital cyanotic heart disease.

SCHOTLAND C STULA D LEVY A SPIESSL B BRAIN ABSCESS AFTER ODONTOGENIC INFECTION SSO
SCHWEIZ MONATSSCHR ZAHNHEILKD (1979 APR) 89(4):325-9

LUTSIK LA STREPTOCOCCAL CHRONIOSEPSIS COMPLICATED BY MENINGOENCEPHALITIS WITH A FATAL
OUTCOME STOMATOLOGIJA (MOSK) (1979 NOV-DEC) 58(6):55-6

SCHOTLAND C STULA D LEVY A SPIESSL B BRAIN ABSCESS AFTER ODONTOGENIC INFECTION SSO
SCHWEIZ MONATSSCHR ZAHNHEILKD (1979 APR) 89(4):325-9

VALACHOVIC R HARGREAVES JA DENTAL IMPLICATIONS OF BRAIN ABSCESS IN CHILDREN WITH
CONGENITAL HEART DISEASE. CASE REPORT AND REVIEW OF THE LITERATURE. ORAL SURG ORAL MED
ORAL PATHOL (1979 DEC) 48(6):495-500

CHURTON MC GREER ND INTRACRANIAL ABSCESS SECONDARY TO DENTAL INFECTION. N Z DENT J
(1980 APR) 76(344):58-60

HEDSTROM SA NORD CE URSING B CHRONIC MENINGITIS IN PATIENTS WITH DENTAL INFECTIONS.
SCAND J INFECT DIS (1980) 12(2):117-21

PERNA E LIGUORI R PETRONE G MANNARINO E ACTINOMYCOTIC GRANULOMA OF THE GASSERIAN
GANGLION WITH PRIMARY SITE IN A DENTAL ROOT. CASE REPORT. J NEUROSURG (1981 APR)
54(4):553-5

ESSIOUX H BURLATON J LEGROS J DALY JP MOLINIE C LAVERDANT C RECURRENT SUPPURATIVE
MENINGITIS OF DENTAL ORIGIN IN BEHCET'S DISEASE ACTUAL ODONTOSTOMATOL (PARIS) (1982)
36(139):355-60

VITZTHUM HE ERLE A LAMBRECHT R INTRACRANIAL COMPLICATIONS INDUCED BY ODONTOGENIC
PYOGENIC INFECTIONS STOMATOL DDR (1985 NOV) 35(11):637-42

ZACHARIADES N VAIRAKTARIS E MEZITIS M TRIANTAFYLLOU D PAPAVALASSIOU D CEREBRAL ABSCESS
AND MENINGITIS COMPLICATED BY RESIDUAL MANDIBULAR ANKYLOSIS. A STUDY OF THE ROUTES THAT
SPREAD THE INFECTION. J ORAL MED (1986 JAN-MAR) 41(1):14-20

BENECH A BARRALE S DALMASSO DI GARZEGNA A LEFT TEMPORAL ABSCESS IN BEARERS OF MAXILLARY
AND MANDIBULAR ENDOSSEOUS IMPLANTS. A CLINICAL CASE MINERVA STOMATOL (1986 OCT)
35(10):999-1003

ALDOUS JA POWELL GL STENSAAS SS BRAIN ABSCESS OF ODONTOGENIC ORIGIN: REPORT OF CASE. J AM DENT ASSOC (1987 DEC) 115(6):861-3

GUERIN JM LAURENT C MANET P SEGRESTAA JM FACIAL CELLULITIS AND SEPTIC THROMBOPHLEBITIS OF THE CAVERNOUS SINUS OF DENTAL ORIGIN REV MED INTERNE (1987 SEP-OCT) 8(4):416-8

MARKS PV PATEL KS MEE EW MULTIPLE BRAIN ABSCESES SECONDARY TO DENTAL CARIES AND SEVERE PERIODONTAL DISEASE. BR J ORAL MAXILLOFAC SURG (1988 JUN) 26(3):244-7

SAAL CJ MASON JC CHEUK SL HILL MK BRAIN ABSCESS FROM CHRONIC ODONTOGENIC CAUSE: REPORT OF CASE. J AM DENT ASSOC (1988 SEP) 117(3):453-5

OGUNDIYA DA KEITH DA MIROWSKI J CAVERNOUS SINUS THROMBOSIS AND BLINDNESS AS COMPLICATIONS OF AN ODONTOGENIC INFECTION: REPORT OF A CASE AND REVIEW OF LITERATURE. J ORAL MAXILLOFAC SURG (1989 DEC) 47(12):1317-21

SYRJANEN J, PELTOLA J, VALTONEN V, LIVANAINEN M, KASTE M, HUTTUNEN JK. DENTAL INFECTIONS IN ASSOCIATION WITH CEREBRAL INFARCTION IN YOUNG AND MIDDLE-AGED MEN. JOURNAL OF INTERNAL MEDICINE 1989 MARCH; VOLUME 225, NUMBER 3, PP. 179-184.

The association between dental infections and cerebral infarction was investigated in a case-control study involving 40 patients with ischaemic cerebral infarction under the age of 50, and 40 randomly selected community controls matched for sex and age. Poor oral health, as assessed by two indices measuring the severity of infections of teeth and periodontium, or by the presence of subgingival calculus or the presence of suppuration in the gingival pockets, was more common in male patients than in male controls, but no difference was observed in females. If severe dental infections were combined with other probable bacterial infections there were altogether 16 patients (40%) but only two controls (5%) who had suffered from a probable bacterial infection within 1 month or at the time of the stroke or when examined as a control (P less than 0.01). Our results suggest an association between bacterial infection and ischaemic cerebrovascular disease in patients under 50 years of age. Severe chronic dental infection seems to be an important type of infection associated with cerebral infarction in males.

ANDREWS M FARNHAM S BRAIN ABSCESS SECONDARY TO DENTAL INFECTION. GEN DENT (1990 MAY-JUN) 38(3):224-5

FELDGES A HEESSEN J NAU HE SCHEITTLER D ODONTOGENIC BRAIN ABSCESS. 2 CASE REPORTS DER ODONTOGENE HIRNABSZESS. 2 FALLBERICHTE. DTSCH Z MUND KIEFER GESICHTSCHIR (1990 JUL-AUG) 14(4):297-300

Frequently the bacteria found by aspiration of the brain abscess are the only indication of a dental focus.

ANDERSEN WC HORTON HL PARIETAL LOBE ABSCESS AFTER ROUTINE PERIODONTAL RECALL THERAPY. REPORT OF A CASE. J PERIODONTOL (1990 APR) 61(4):243-7

YUN MW HWANG CF LUI CC CAVERNOUS SINUS THROMBOSIS FOLLOWING ODONTOGENIC AND CERVICOFACIAL INFECTION. EUR ARCH OTORHINOLARYNGOL (1991) 248(7):422-4

GOSCINSKI I STACHURA K UHL H [THROMBOSIS OF THE CAVERNOUS SINUS] ZAKRZEP ZATOKI JAMISTEJ. NEUROL NEUROCHIR POL (1991 MAY-JUN) 25(3):386-9

EL FAKIR Y JIDDANE M ABID A THROMBOPHLEBITIS OF THE CAVERNOUS SINUS OF DENTAL ORIGIN. APROPOS OF A CASE WITH A REVIEW OF THE LITERATURE REV STOMATOL CHIR MAXILLOFAC (1993) 94(1):55-9

MONTEJO M AGUIRREBENGOE K STREPTOCOCCUS ORALIS MENINGITIS AFTER DENTAL MANIPULATION [LETTER] ORAL SURG ORAL MED ORAL PATHOL ORAL RADIOL ENDOD (1998 FEB) 85(2):126-7

RENTON TF DANKS J ROSENFELD JV CEREBRAL ABSCESS COMPLICATING DENTAL TREATMENT. CASE REPORT AND REVIEW OF THE LITERATURE. AUST DENT J (1996 FEB) 41(1):12-5

LORBER M DENTAL AND OTHER ASPECTS OF A POSSIBLE ASSOCIATION BETWEEN CEREBROVASCULAR ISCHEMIA AND CHRONIC INFECTION. STROKE (1998 JAN) 29(1):257-8

MONTEJO M AGUIRREBENGOE K STREPTOCOCCUS ORALIS MENINGITIS AFTER DENTAL MANIPULATION. ORAL SURG ORAL MED ORAL PATHOL ORAL RADIOL ENDOD (1998 FEB) 85(2):126-7

LI X TRONSTAD L OLSEN I BRAIN ABSCESES CAUSED BY ORAL INFECTION. ENDOD DENT TRAUMATOL (1999 JUN) 15(3):95-101

Brain abscesses are rare but can be life-threatening infections. Recent progress in microbiological classification and identification has indicated that they are sometimes caused by oral infection and dental treatment. It has been postulated that oral microorganisms may enter the cranium by several pathways: 1) by direct extension, 2) by hematogenous spread, 3) by local lymphatics, and 4) indirectly, by extraoral odontogenic infection. In the direct extension, oral infections spread along the fascial planes. Hematogenous spreading occurs along the facial, angular, ophthalmic, or other veins which lack valves, through the cavernous sinus and into the cranium. Another hematogenous pathway is through the general circulation. Oral bacteria may cause systemic infections, e.g., endocarditis, and then indirectly initiate brain abscess. Microbiota, complications, and the prevention and management of odontogenic brain abscesses are also discussed in this review.

WU T, TREVISAN M, GENCO RJ, DORN JP, FALKNER KL, SEMPOS CT PERIODONTAL DISEASE AND RISK OF CEREBROVASCULAR DISEASE: THE FIRST NATIONAL HEALTH AND NUTRITION EXAMINATION SURVEY AND ITS FOLLOW-UP STUDY.. : ARCHIVES OF INTERNAL MEDICINE 2000 OCTOBER; VOLUME 160, NUMBER 18, PP. 2749-2755.

Periodontal disease has been found to be a potential risk factor for coronary heart disease. However, its association with cerebrovascular accidents (CVAs) is much less studied.

METHODS: This study examines the association between periodontal disease and CVA. The study cohort comprises 9962 adults aged 25 to 74 years who participated in the First National Health and Nutrition Examination Survey and its follow-up study. Baseline periodontal status was categorized into (1) no periodontal disease, (2) gingivitis, (3) periodontitis, and (4) edentulousness. All CVAs (International Classification of Diseases, Ninth Revision [ICD-9], codes 430-438) were ascertained by hospital records for nonfatal events and death certificates for fatal events. The first CVA, nonfatal or fatal, was used to define incidence. Relative risks were estimated by hazard ratios from the Cox proportional hazard model with adjustment for several demographic variables and well-established cardiovascular risk factors. Weights were used to generate risk estimates. **RESULTS:** Periodontitis is a significant risk factor for total CVA and, in particular, nonhemorrhagic stroke (ICD-9, 433-434 and 436-438). Compared with no periodontal disease, the relative risks (95% confidence intervals) for incident nonhemorrhagic stroke were 1.24 (0.74-2.08) for gingivitis, 2.11 (1.30-3.42) for periodontitis, and 1.41 (0.96-2.06) for edentulousness. For total CVA., the results were 1.02 (0.70-1.48) for gingivitis, 1.66 (1.15-2.39) for periodontitis, and 1.23 (0.91-1.66) for edentulousness. Increased relative risks for total CVA and nonhemorrhagic stroke associated with periodontitis were also seen in white men, white women, and African Americans. Similar results were found for fatal CVA. **CONCLUSION:** Periodontal disease is an important risk factor for total CVA and, in particular, nonhemorrhagic stroke.

SHOTELERSUK V GOYAL M RAUCHENSTEIN JN KONEZ O SUBDURAL EMPYEMA SECONDARY TO ODONTOGENIC MASTICATOR SPACE ABSCESS: DETECTION BY INDIUM-111-LABELED WHITE CELL SCAN. CLIN IMAGING (2001 JAN-FEB) 25(1):18-22

Subdural empyema (SDE) is an extremely rare but serious complication of dental infection. A case is presented in which dental infection was complicated by a masticator space abscess and eventually led to a SDE. This report illustrates a rare sequence of events leading to SDE and its serendipitous detection by indium-111-labeled leucocyte scan.

CORSON MA POSTLETHWAITE KP SEYMOUR RA ARE DENTAL INFECTIONS A CAUSE OF BRAIN ABSCESS? CASE REPORT AND REVIEW OF THE LITERATURE. ORAL DIS (2001 JAN) 7(1):61-5

Dental pathology and/or treatment have been linked to a small number of brain abscesses as possible sources of infection. A further case is presented, in which a dental site is implicated. A review of the evidence was undertaken. A wide range of dental procedures had been implicated. In some cases the brain isolate was not of dental origin. In many, the diagnosis was one of exclusion. In order to confirm the role of odontogenic infection in the pathogenesis of brain abscess, modern sampling techniques should be used to precisely identify the isolates. The causal organism should be identified in both oral and cranial sites.

ZWAVELING-SOONAWALA N SPANJAARD L VAN DE WETERING M WINTERBERG DH INTRACRANIAL ACTINOMYCOSIS IN A CHILD WITH DENTAL NED TIJDSCHR GENEESKD (2003 NOV 29) 147(48):2386-9

A diagnosis of intracranial actinomycosis was made in a 9-year-old boy with headache, cranial nerve dysfunction and ataxia. Poor dental hygiene leading to caries and an inflammation in his right upper jaw probably was the cause of cervicofacial actinomycosis with intracranial extension. A full recovery was achieved by treatment with benzylpenicillin. Actinomyces is a gram-positive bacterium belonging to the endogenous flora of the mucous membranes of the oropharynx, gastrointestinal tract, and female genital tract. Disruption of the mucous membrane is the portal of entry for an extremely destructive infective process that is effectively treated with penicillin. Good orodental hygiene is important for the prevention of actinomycosis.

LIMERES-POSSE J TOMAS-CARMONA I FERNANDEZ-FEIJOO J MARTINEZ-VAZQUEZ C CASTRO-IGLESIAS A DIZ-DIOS P CEREBRAL ABSCESSES OF ORAL ORIGIN REV NEUROL (2003 AUG 1-15) 37(3):201-6

INTRODUCTION: It has been suggested that between 3% and 13% of the cerebral abscesses (CA) are presumably associated to oral infections or dental procedures. AIM: Determine the prevalence of CA of oral origin, discussing their clinical and microbiological characteristics. PATIENTS AND METHODS: Retrospectively, 54 cases of CA diagnosed in 3 hospitals of Galicia between 2001 and 2002 were reviewed. RESULTS: A presumed oral portal of entry was recorded in 6 patients (11.1%); 4 cases were associated to oral infections and the remaining 2 had received dental treatment in the months prior to the onset of symptoms. Half of the patients showed irrelevant medical record, 2 had had previous extracranial abscesses and 1 presented a type A immunoglobulin deficiency. In 4 cases, the microbiological analysis was positive and typical oral bacteria (*Streptococcus viridans* and *Peptostreptococcus* spp.) were identified. CONCLUSIONS: The results of this study suggest that a significant number of CA are probably of oral origin. In consequence, to maintain a good oral health status is important and specific prophylactic measures before any dental procedure should be applied, especially in patients with risk recognized factors.

IIDA Y HONDA K SUZUKI T MATSUKAWA S KAWAI T SHIMAHARA T CHIBA H BRAIN ABSCESS IN WHICH PORPHYROMONAS GINGIVALIS WAS DETECTED IN CEREBROSPINAL FLUID. BR J ORAL MAXILLOFAC SURG (2004 APR) 42(2):180

In this paper, we report one case of severe brain abscess in which *Porphyromonas gingivalis* was detected in the spinal fluid.

MARQUES DA SILVA R CAUGANT DA JOSEFSEN R TRONSTAD L OLSEN I CHARACTERIZATION OF STREPTOCOCCUS CONSTELLATUS STRAINS RECOVERED FROM A BRAIN ABSCESS AND PERIODONTAL POCKETS IN AN IMMUNOCOMPROMISED PATIENT. J PERIODONTOL (2004 DEC) 75(12):1720-3

BACKGROUND: There have been a number of reports of brain abscesses suggesting an odontogenic etiology. However, no efforts have been made to compare brain abscess isolates with isolates from the oral cavity using highly discriminative methods. We report a brain abscess caused by *Streptococcus constellatus* in an immunocompromised patient where oral infection (periodontitis) was suspected to be implicated. METHODS: The brain abscess and oral isolates were compared by means of one phenotypic and three genetic (restriction fragment length polymorphism [RFLP], ribotyping, and random amplified polymorphic DNA [RAPD]) fingerprinting techniques. RESULTS: The phenotypic method and RFLP showed identical profiles between brain and periodontal isolates, while ribotyping and RAPD showed very close similarity, with only one band difference in one of the three ribotypes and in one of the three polymorphic RAPD. CONCLUSIONS: Gene transfer by genetic recombinational events in the periodontal pocket might have been responsible for the emergence of a strain variant of *S. constellatus* that had the potential to cause an abscess at a distant site (brain). The importance of odontogenic sources as potential foci of infection for brain abscesses is discussed.

VEGA-BASULTO S DOMINGUEZ-NAPOLES M BETHANTES-SOTOMAYOR Y DE LA CONCEPCION-ALMEIDA F
SARDUY-RAMOS CM GABRIEL MC GUTIERREZ-MUNOZ F RIVERO-GARCIA C RIVERO-TRUIT F VEGA-
TRENADO SA ACTINOMYOTIC BRAIN ABSCESS REV NEUROL (2004 NOV 16-30) 39(10):991-3

BROOK I MICROBIOLOGY OF INTRACRANIAL ABSCESES ASSOCIATED WITH SINUSITIS OF ODONTOGENIC
ORIGIN. ANN OTOL RHINOL LARYNGOL (2006 DEC) 115(12):917-20 (COPY IN SECTION ON SINUSES)

OBJECTIVES: The unique microbiology of sinusitis of dental origin that is associated with intracranial abscesses (IAs) and the correlation between the organisms at the two sites has not been reported before. This report describes the author's experience during a 30-year period in studying the microbiology of 8 IAs and their corresponding sinusitis of dental origin. METHODS: Aspirates of pus from 8 infected sinuses associated with odontogenic infections and their corresponding IAs were studied for aerobic and anaerobic bacteria. Polymicrobial flora was found in all 8 sinuses and 7 IAs, and the number of isolates varied from 1 to 5. RESULTS: Anaerobic bacteria were isolated from all sinuses and IAs. A total of 28 isolates (3.5 isolates per site; 25 strict anaerobic, 1 aerobic or facultative, and 2 microaerophilic) were recovered from the sinuses, and 20 isolates (2.5 isolates per site; 16 strict anaerobic, 1 aerobic or facultative, and 3 microaerophilic) were found in the IAs. The bacterial isolates were *Fusobacterium* spp (14), *Prevotella* spp (11), *Peptostreptococcus* spp (13), microaerophilic streptococci (5), *Veillonella parvula* (3), and beta-hemolytic streptococci group F(2). Concordance in the microbiological findings between the sinus and the IA was found in all instances; however, certain organisms were only present at one site. CONCLUSIONS: These data illustrate the concordance in the organisms recovered from sinusitis of dental origin and their associated IAs and confirm the importance of anaerobic bacteria in sinusitis and IAs of dental origin.

WAGNER KW SCHON R SCHUMACHER M SCHMELZEISEN R SCHULZE D CASE REPORT: BRAIN AND LIVER
ABSCESES CAUSED BY ORAL INFECTION WITH *STREPTOCOCCUS INTERMEDIUS*. ORAL SURG ORAL MED
ORAL PATHOL ORAL RADIOL ENDOD (2006 OCT) 102(4):E21-3 (COPY IN NLIVER SECTION)

Organ abscesses are a rare and life-threatening complication mostly of hematogenously disseminated infections. We report a case of brain and liver abscesses. Identification of the lesions was made by contrast-enhanced computed tomography (CT) and magnetic resonance imaging (MRI), respectively. An oral examination comprised an oral focus of infection. *Streptococcus intermedius* was isolated from oral smear, liver and ventricular drainage, and blood sample. After the commencement of antibiotic therapy, drainage of abscesses and oral rehabilitation, complete recovery was noted.

MYLONAS AI TZERBOS FH MIHALAKI M ROLOGIS D BOUTSIKAKIS I CEREBRAL ABSCESS OF
ODONTOGENIC ORIGIN. J CRANIOMAXILLOFAC SURG (2007 JAN) 35(1):63-7

INTRODUCTION: Cerebral abscess is a rare but serious and life-threatening infection. Dental infections have occasionally been reported as the source of bacteria for such an abscess. PATIENT AND METHODS: A 54-year-old man was admitted with a right hemiparesis and epileptic fits. After clinical, laboratory and imaging examination, the diagnosis of a cerebral abscess of the left parietal lobe was made. The intraoral clinical examination as well as a panoramic radiograph confirmed the presence of generalized periodontal disease, multiple dental caries, and periapical pathology. The treatment included: (i) Immediate administration of high-dose intravenous antibiotics and (ii)

surgical procedures consisting of craniotomy and resection of the abscess cavity first, and secondly removal of the periodontal, decayed and periapically involved teeth of the patient, in an effort to eradicate all the possible septic foci, presuming the cerebral abscess to be of odontogenic infection. RESULTS: The patient made an uneventful recovery, and 29 months postoperatively he had completely recovered from the hemiparesis.

STEFANIKOVA L FREIBERGEROVA M HUSA P KERKOVSKY M MULTIPLE BRAIN ABSCESES OF ODONTOGENIC ORIGIN CAUSED BY FUSOBACTERIUM NUCLEATUM KLIN MIKROBIOL INFEKC LEK (2008 AUG) 14(4):149-53

Infection caused by the anaerobic gram-negative rod *Fusobacterium nucleatum* belongs to endogenous infections. A 41-year-old man developed multiple brain abscesses of odontogenic origin. The main causes were poor oral hygiene and no dental check-ups. Pus aspirated from a site in the brain contained DNA of the bacterium *Fusobacterium nucleatum*. Several teeth with periapical abscesses were extracted. Initially, the patient was treated empirically with a combination of cefotaxime and metronidazole (18 days). Subsequently, co-trimoxazole and rifampicin were administered (8 months). Four and eight months after the onset of the disease, MRI scans revealed only persistent residual changes in the brain parenchyma; the patient was asymptomatic, with no neurological signs and back at work.

SAKAMOTO H KARAKIDA K OTSURU M ARAI M SHIMODA M A CASE OF BRAIN ABSCESS EXTENDED FROM DEEP FASCIAL SPACE INFECTION. ORAL SURG ORAL MED ORAL PATHOL ORAL RADIOL ENDOD (2009 SEP) 108(3):E21-5

A case of brain abscess in the temporal lobe caused by direct intracranial extension of deep neck abscess is described. The abscess also spread to the orbital cavity through infraorbital fissure. The possible etiology of this case might be dental surgery. The diagnostic imaging clearly showed the routes of intracranial and orbital extension of parapharyngeal and masticator space abscesses. From the abscess specimens, oral streptococci, anaerobic streptococci, and anaerobic gram-negative bacilli were isolated. Antimicrobial susceptibility testing of isolates showed that some *Prevotella* and *Fusobacterium* strains had decreased susceptibility to penicillin, and these bacteria produced beta-lactamase. The bacteria from the deep neck abscess were consistent with those detected from the brain abscess. Proper diagnosis, aggressive surgical intervention, and antibiotics chemotherapy saved the patient from this life-threatening condition.

MUELLER AA SALDAMLI B STUBINGER S WALTER C FLUCKIGER U MERLO A SCHWENZER-ZIMMERER K ZEILHOFER HF ZIMMERER S ORAL BACTERIAL CULTURES IN NONTRAUMATIC BRAIN ABSCESES: RESULTS OF A FIRST-LINE STUDY. ORAL SURG ORAL MED ORAL PATHOL ORAL RADIOL ENDOD (2009 APR) 107(4):469-76

OBJECTIVE: Bacterial cultures from nontraumatic brain abscesses (BAs) frequently contain oral bacteria. We assessed bacterial cultures from BAs and oral infective sources for a bacterial match. STUDY DESIGN: Bacterial samples from brain abscesses and oral abscesses, and at sites with probing depths ≥ 3.5 mm were taken from 11 nontraumatic BA patients and analyzed. RESULTS: Brain abscess bacterial cultures were obtained in 9 of the 11 cases, which revealed 5 cases of

Streptococcus milleri group bacteria and 4 cases of subgingival flora. The bacteriologic results were interpreted taking all medical and bacteriologic findings into account, which made an oral origin of the BAs most likely in 6 of the 11 cases: from an oral abscess and from the subgingival flora in 3 cases each. CONCLUSIONS: Early collaboration between neurosurgeons, infectious disease specialists, and oral-maxillofacial surgeons will aid the identification and treatment of suspected oral sources of nontraumatic BAs.

KIDDEE W PREECHAWAI P HIRUNPAT S BILATERAL SEPTIC CAVERNOUS SINUS THROMBOSIS FOLLOWING THE MASTICATOR AND PARAPHARYNGEAL SPACE INFECTION FROM THE ODONTOGENIC ORIGIN: A CASE REPORT. J MED ASSOC THAI (2010 SEP) 93(9):1107-11

Neglect of odontogenic infections can have serious consequences. If they spread through fascial planes and intracranially they can cause an abscess, orbital cellulitis, and eventually cavernous sinus thrombosis. The authors report a case of rapid progressive bilateral orbital cellulitis and cavernous sinus thrombosis that originated from dental caries. Septic cavernous sinus thrombosis is a medical emergency. Early recognition and prompt treatments direct to the underlying sources of infection are crucial. Broad-spectrum intravenous antibiotics are the mainstay of treatment to reduce morbidity and mortality from this lethal condition. Management should be based on early diagnosis and prompt management with intravenous broad-spectrum antibiotics and surgical intervention.

COLBERT S CAMERON M WILLIAMS J SEPTIC THROMBOSIS OF THE CAVERNOUS SINUS AND DENTAL INFECTION. BR J ORAL MAXILLOFAC SURG (2011 SEP) 49(6):E25-6

We report a case of septic thrombosis of the cavernous sinus and dental infection, and highlight the clinical features to enable prompt diagnosis and management.

RAHAMAT-LANGENDOEN JC VAN VONDEREN MG ENGSTRÖM LJ MANSON WL VAN WINKELHOFF AJ MOOI-KOKENBERG EA BRAIN ABSCESS ASSOCIATED WITH AGGREGATIBACTER ACTINOMYCETEMCOMITANS: CASE REPORT AND REVIEW OF LITERATURE. J CLIN PERIODONTOL (2011 AUG) 38(8):702-6

INTRODUCTION: Aggregatibacter actinomycetemcomitans is considered a major pathogen in localized and generalized aggressive periodontitis. A. actinomycetemcomitans has been found in various extra oral infections and most frequently in endocarditis. We report a patient with multiple brain abscesses due to infection with A. actinomycetemcomitans and review the English language literature related to this subject. CASE REPORT: A 42-year-old patient with no underlying medical conditions presented with multiple brain lesions initially thought to be metastatic lesions of a tumour of unknown origin. Findings during drainage and subsequent histopathological conclusions made infection more likely. Culture of drained material remained negative; however, 16S rDNA polymerase chain reaction and sequence analysis on direct material revealed A. actinomycetemcomitans as the causative agent of the infection. The most likely source of infection was the poor dentition of the patient. After repeated drainage of the lesions and antibiotic treatment the patient gradually improved, although cognitive impairment remained. CONCLUSIONS: Our report illustrates that a poor dental condition, notably destructive periodontal disease, can be a risk for life-threatening extra oral disease, and thus contributes to the total inflammatory burden of the body.

ANTUNES AA DE SANTANA SANTOS T DE CARVALHO RW AVELAR RL PEREIRA CU PEREIRA JC BRAIN ABSCESS OF ODONTOGENIC ORIGIN. *J CRANIOFAC SURG* (2011 Nov) 22(6):2363-5

Brain abscess is a rare and threatening infection, which is in a suppuration area, caused either by trauma, neurosurgical complication, or by a secondary infection of dental origin complication. The infectious process spread from the start focus can occur in 2 ways: hematogenous or by contiguity. The treatment should ideally be based on the etiological factor excision, combined with drainage and antibiotics as adjuvant; this philosophy is not observed in the reports described in the 1960s, 1970s, and 1980s. This study's goal was to report a case of brain abscess consequent of an odontogenic outbreak, where an adequate treatment was set up, but it was already in advanced stages and had as a result the lethal outcome. Complications from the odontogenic infections have a low incidence, but should never be disregarded, because they can lead to death, as described in this manuscript.

KANU OO UKPONMWAN E BANKOLE O OLATOSI JO ARIGBABU SO INTRACRANIAL EPIDURAL ABSCESS OF ODONTOGENIC ORIGIN. *J NEUROSURG PEDIATR* (2011 MAR) 7(3):311-5

Dental infection as a cause of epidural abscess is rare compared with other forms of intracranial suppurations. A 10-year-old boy was seen because of headaches and fever. There was no history of otitis media or sinusitis, but he had sought care for dental complaints. The patient was from an upper-middle-class family, was not immunocompromised, and had no other risk factor for a major infection. A CT brain scan confirmed a frontal epidural abscess. The patient underwent emergency surgery for evacuation of the epidural abscess, followed by antimicrobial therapy. His condition improved remarkably following surgery, with complete resolution of symptoms. He subsequently underwent extraction of 2 teeth following dental review. Dental infection as a cause of intracranial epidural abscess is rare, but should be considered when evaluating patients for intracranial infections. A review of the literature sheds light on the causal relationship and possible pathogenesis of this condition.

HOBSON DT IMUDIA AN SOTO E AWONUGA AO PREGNANCY COMPLICATED BY RECURRENT BRAIN ABSCESS AFTER EXTRACTION OF AN INFECTED TOOTH. *OBSTET GYNECOL* (2011 AUG) 118(2 PT 2):467-70 (COPY IN REPRODUCTION SECTION)

BACKGROUND: Odontogenic infections are quite common and, in unusual cases, can extend beyond the oral cavity with potentially life-threatening complications. CASE: A 35-year-old woman, G3P0020, underwent extraction of an infected left maxillary third molar tooth at 19 3/7 weeks of gestation and later presented with mental status changes. Computed tomography revealed left pterygoid muscle abscess, which progressed to brain abscess. She underwent multiple partial lobectomies to drain her recurrent brain abscess. The pregnancy continued until term, and she underwent a cesarean delivery. CONCLUSION: Brain abscess is a rare but life-threatening complication of pregnancy. This case illustrates the potential complications after extraction of an infected tooth in pregnancy.

HAGGERTY CJ TENDER GC ACTINOMYCOTIC BRAIN ABSCESS AND SUBDURAL EMPYEMA OF ODONTOGENIC ORIGIN: CASE REPORT AND REVIEW OF THE LITERATURE. *J ORAL MAXILLOFAC SURG* (2012 MAR) 70(3):E210-3

CLIFTON TC KALAMCHI S A CASE OF ODONTOGENIC BRAIN ABSCESS ARISING FROM COVERT DENTAL SEPSIS. ANN R COLL SURG ENGL (2012 JAN) 94(1):E41-3

Odontogenic infections can spread to any organ of the body and in some cases cause life threatening infections. We report a case of multiple odontogenic brain abscesses resulting from undetected tooth decay. Whereas most odontogenic brain abscesses occur following dental treatment, this report documents brain abscesses prior to dental treatment, signifying the dangers of covert dental infections. This case report updates the literature on the topic of odontogenic brain abscesses.

HIBBERD CE NGUYEN TD BRAIN ABSCESS SECONDARY TO A DENTAL INFECTION IN AN 11-YEAR-OLD CHILD: CASE REPORT. J CAN DENT ASSOC (2012) 78:c49

A primary molar dental abscess was implicated as the cause of a brain abscess in an 11-year-old boy. This case report describes the neurological signs and symptoms, and acute management of a brain abscess in a child. A brain abscess is provisionally diagnosed from the patient's medical history, as well as the presence of signs and symptoms such as fever, headache, nausea, vomiting, focal neurological deficit, altered mentation, speech alterations, papillary edema, and neck stiffness or seizures. A definitive diagnosis of brain abscess is confirmed through imaging. The dental source of infection is identified by the exclusion of more probable foci such as the ears, heart, lungs, eyes or sinuses.

NEUROLOGICAL

STRUZAK-WYSOKINSKA M PERIPHERAL PARALYSIS OF THE FACIAL NERVE CAUSED BY PERIDONTAL FOCI CZAS STOMATOL (1967 MAR) 20(3):283-8

GLONTI TI MALASHKIIA IUA CHKHIKVISHVILI TS SH ON THE ROLE OF CHRONIC ODONTOGENIC INFECTION IN THE GENESIS OF NEUROLOGIC DISORDERS KLIN MED (MOSK) (1968 JAN) 46(1):112-5

BERGOUIGNAN H BENOIT P BOUSSAGOL P BRUN G NEURALGIC SYNDROME OF DENTAL ORIGIN SIMULATING AN ESSENTIAL FACIAL NEURALGIA REV ODONTOSTOMATOL MIDI FR (1969) 27(2):124-5

DECHAUME M LAUDENBACH P CEREBRO-MENINGEAL MANIFESTATIONS OF DENTAL ETIOLOGY REV STOMATOL CHIR MAXILLOFAC (1969 MAR) 70(2):109-14

TASSAROTTI B [A CASE OF SPHENO-PALATINE GANGLIONIC SYNDROME OF DENTAL ORIGIN] RASS INT STOMATOL PRAT (1969 SEP-OCT) 20(5):307-13

LEWANDOWSKI L SERAFINOWSKA A PERIPHERAL FACIAL NERVE PALSY CAUSED BY FOCAL DENTAL INFECTION CZAS STOMATOL (1970 DEC) 23(12):1357-60

CADENAT H MARCOPOULOS A GELY P FABIE M COMBELLES R 2 NEW CASES OF MELKERSSON-ROSENTHAL'S SYNDROME REV STOMATOL CHIR MAXILLOFAC (1971 SEP) 72(6):635-42

KING R. INTERACTION OF NOXIOUS AND NONNOXIOUS STIMULI IN PRIMARY SENSORY NUCLEI ADV NEUROL 1974; 4:659-63

HAMLYN JF ACUTE HEMIPLEGIA IN CHILDHOOD FOLLOWING A DENTAL ABSCESS. BR J ORAL SURG (1978 Nov) 16(2):151-5

The syndrome of acute hemiplegia in childhood is described and a case following dental infection reported. The possible mechanisms responsible for the development of this condition are considered.

GRAY RL PERIPHERAL FACIAL NERVE PARALYSIS OF DENTAL ORIGIN. BR J ORAL SURG (1978 Nov) 16(2):143-50

The aetiology, diagnosis and treatment of peripheral facial nerve palsy are discussed. Four cases of facial nerve palsy following dental procedures are reported. Following a revision of the world literature during the last 23 years, the 25 cases of facial nerve palsy documented are analysed and divided into four groups on the basis of aetiology, speed of onset and recovery and modes of treatment suggested.

MUKHARINSKAIA VS ANTADZE ZI DEVIDZE NV EMCHENKO VT NODIJA EI NEUROLOGICAL COMPLICATIONS IN CHRONIC SUPPURATIVE ODONTOGENIC INFECTION STOMATOLOGIJA (MOSK) (1981) 60(4):22-3

MUCKE L CLINICAL MANAGEMENT OF NEUROPATHIC PAIN NEUROL CLIN 1987;5:649-63

METZGER MC WAGNER KW HOHLWEG-MAJERT B VOSS PJ SCHOEN R SCHMELZEISEN R DIPLOPIA AND ACUTE RECTUS MUSCLE PALSY AS SYMPTOMS OF AN INFECTED FOLLICULAR CYST OF A MAXILLARY RIGHT THIRD MOLAR: A CASE REPORT. QUINTESSENCE INT (2007 JUL-AUG) 38(7):571-4

Severely impacted third molars have a high risk of developing a dentigerous cyst. Dental cysts in the maxilla can cause acute infection of the maxillary sinus that can involve the orbital cavity. Possible complications of infections of the orbital cavity are eyesight reduction, including blindness, and disseminated infections, including brain abscesses. This article reports on a 53-year-old male patient with diplopia caused by acute rectus inferior muscle palsy as symptoms of an empyema of the maxillary right sinus. An infected follicular cyst due to the impacted and displaced maxillary right third molar caused the empyema. An emergency trepanation with drainage of the right maxillary sinus was performed. Additionally, intravenous antibiotic therapy with penicillin G and metronidazole resulted in improvement. In a secondary surgical process 2 weeks later, the cyst and the third molar were removed. Complete recovery was noted. It is important to be familiar with clinical diagnostics in cases of undefined pain of the teeth and jaws. Radiographic imaging is indicated in such cases. Disseminated odontogenic infections must be considered as the primary origin of pain and diplopia.

AL-MUHARRAQI MA O'SULLIVAN EC UNILATERAL FACIAL NERVE PARALYSIS FOLLOWING AN INFECTED LOWER THIRD MOLAR. INT J ORAL MAXILLOFAC SURG (2010 FEB) 39(2):192-5

The authors report the case of a 35-year-old Arab man who presented with unilateral facial nerve palsy in the presence of an infected lower third molar. The paralysis occurred within hours of the development of a left-sided facial swelling. Surgical removal of the tooth and drainage of the abscess

produced significant improvement in facial nerve function, and total resolution occurred prior to clinical follow-up 10 days later. The authors discuss the aetiology of this hemifacial paralysis and its significance as a clinical sign of third molar odontogenic infection.

TOLSTUNOV L BELAGA GA BELL'S PALSY AND DENTAL INFECTION: A CASE REPORT AND POSSIBLE ETIOLOGY. *J ORAL MAXILLOFAC SURG* (2010 MAY) 68(5):1173-8

LAZOW SK IZZO SR VAZQUEZ D DO DENTAL INFECTIONS REALLY CAUSE CENTRAL NERVOUS SYSTEM INFECTIONS? *ORAL MAXILLOFAC SURG CLIN NORTH AM* (2011 NOV) 23(4):569-78, VII

In the post-World War I antibiotic era, the prevalence of central nervous system (CNS) infections is estimated to be 1 per 100,000 population. The literature is replete with anecdotal case reports of CNS infections of apparent dental etiology. Conversely, it is widely cited that the incidence of CNS infection of dental etiology is only in the range of 1% to 2%. We seek to answer the question if dental infections really cause CNS infections. In this article, we focus on septic cavernous sinus thrombosis and brain abscess and if it is a diagnosis of exclusion or evidence-based.

YAMAMOTO T KONDO K HIRAI H NAKADE M AIDA J HIRATA Y ASSOCIATION BETWEEN SELF-REPORTED DENTAL HEALTH STATUS AND ONSET OF DEMENTIA: A 4-YEAR PROSPECTIVE COHORT STUDY OF OLDER JAPANESE ADULTS FROM THE AICHI GERONTOLOGICAL EVALUATION STUDY (AGES) PROJECT. *PSYCHOSOM MED* (2012 APR) 74(3):241-8

OBJECTIVES: Studies have shown that people with cognitive impairment have poor dental health. However, the direction of causality remains unknown. This prospective cohort study aimed to determine the association between four self-reported dental health variables and dementia onset in older Japanese people. **METHODS:** Analysis was conducted on 4425 residents 65 years or older. Four self-reported dental health variables included the number of teeth and/or use of dentures, ability to chew, presence/absence of a regular dentist, and taking care of dental health. Data were collected using self-administered questionnaires given in 2003. Records of dementia onset during 2003 to 2007 were obtained from municipalities in charge of the public long-term care insurance system. Age, income, body mass index, present illness, alcohol consumption, exercise, and forgetfulness were used as covariates. **RESULTS:** Dementia onset was recorded in 220 participants. Univariate Cox proportional hazards models showed significant associations between the dental health variables and dementia onset. In models fully adjusted for all covariates, hazard ratios (95% confidence intervals) of dementia onset of respondents were as follows: 1.85 (1.04-3.31) for those with few teeth and without dentures; 1.25 (0.81-1.93) for those who could not chew very well; 1.44 (1.04-2.01) for those who did not have a regular dentist; and 1.76 (0.96-3.20) for those who did not take care of their dental health. **CONCLUSIONS:** Few teeth without dentures and absence of a regular dentist, not poor mastication and poor attitudes toward dental health, were associated with higher risk of dementia onset in the older Japanese cohort even after adjustment for available covariates.

TRIGEMINAL NEURALGIA

UPPGAARD RO TIC DOULOUREUX--MULTICAUSES INCLUDE DENTAL ORIGIN. *NORTHWEST DENT* (1968 SEP-OCT) 47(5):273-7

BLACK R., LABORATORY MODEL FOR TRIGEMINAL NEURALGIA. *ADV. NEURO.*1974; 4:651-8

WESTRUM LE., CANFIELD RC., BLACK R., TRANSGANGLIONIC DEGENERATION IN THE SPINAL TRIGEMINAL NUCLEUS FOLLOWING THE REMOVAL OF TOOTH PULPS IN ADULT CATS. *BRAIN RES* 1976; 6:100:137-40

WESTRUM LE., CANFIELD RC., ELECTRON MICROSCOPY OF DEGENERATING AXONS AND TERMINALS IN THE SPINAL TRIGEMINAL NUCLEUS AFTER TOOTH PULP EXTERPATION. *AM J ANAT.* 1977; 149:591-6

GOBEL S., BINK J., DEGENERATIVE CHANGES IN PRIMARY TRIGEMINAL AXONS AND IN NEURONS IN NUCLEUS CAUDALIS FOLLOWING TOOTH PULP EXTIRPATION IN THE CAT., : *BRAIN RES.* 1977;132:347-54

RATNER EJ, PERSON P, KLEINMAN DJ, SHKLAR G, SOCRANSKY SS. JAWBONE CAVITIES AND TRIGEMINAL AND ATYPICAL FACIAL NEURALGIAS *ORAL SURGERY, ORAL MEDICINE, AND ORAL PATHOLOGY* 1979 JULY; VOLUME 48, NUMBER 1, PP. 3-20.

The possible role of dental and oral disease in the etiology of idiopathic trigeminal and atypical facial neuralgias has been examined. Among thirty-eight patients with idiopathic trigeminal neuralgia and twenty-three patients with atypical facial neuralgia, there was in nearly all instances a close relationship between pain experienced and the existence of cavities in alveolar bone and jawbone of the patients. The cavities were at the sites of previous tooth extractions and, although at times more than 1 cm. in a given diameter, were usually not detectable by x-rays. A new method for their detection and localization was developed empirically, based on the observation that peripheral infiltration of local anesthetic into or very close to the bone cavity rapidly abolished trigger and pain perception by patients during persistence of the anesthetic action. Histopathologic examination of bone removed from cavities by curettage revealed, in both idiopathic trigeminal and atypical facial neuralgias, a similar pattern characterized by a highly vascular abnormal healing response of bone. Some lesions presented a mild chronic inflammatory (lymphocytic) infiltration. Preliminary microbiologic studies of material from the walls of the cavities showed the existence within them of a complex, mixed polymicrobial aerobic and anaerobic flora. Treatment consisted of vigorous curettage of the bone cavities, repeated if necessary, plus administration of antibiotics to induce healing and filling-in of the cavities by new bone. Responses of patients to the above treatment consisted of marked to complete pain remissions, the longest of which has been for 9 years. Complete healing leads to complete and persistent pain remissions. It was concluded that in both idiopathic trigeminal and atypical facial neuralgias, dental and oral pathoses may be major etiologic factors.

BAYER D. ET AL TRIGEMINAL NEURALGIA AN OVERVIEW. *ORAL SURG. ORAL MED. ORAL PATHOL.* 1979:48:393-9

SHABER EP, KROL A.1. TRIGEMINAL NEURALGIA—A NEW TREATMENT CONCEPT. : *ORAL SURGERY, ORAL MEDICINE, AND ORAL PATHOLOGY* 1980

A concept for the treatment of trigeminal neuralgia is presented. On the basis of distinctive pain patterns, localized areas of pathosis within the jawbones are detected and obliterated. To date, we have treated eight patients with idiopathic trigeminal neuralgia. All patients have experienced total or near total abatement of pain.

URBANI G FERRONATO G BERTELE GP TRIGEMINAL NEURALGIA WITH CHRONIC INFECTION DUE TO THE PRESENCE OF A LARGE ROOT FRAGMENT IN THE MANDIBULAR CANAL G STOMATOL ORTOGNATODONZIA (1982 JUL-SEP) 1(2):17-20

SELBY G., DISEASES OF THE FIFTH CRANIAL NERVE. IN DYKE PJ., THOMAS PK., PERIPHERAL NEUROPATHY. PHILADELPHIA. W.B. SAUNDERS 1984;1224-65

RIES P TURK R HISTOPATHOLOGIC CHANGES IN BONE MARROW AND IN DENTAL PULP IN PATIENTS WITH TRIGEMINAL NEURALGIA DTSCH Z MUND KIEFER GESICHTSCHIR (1984 JUL-AUG) 8(4):301-4

FROMM G., ET AL TRIGEMINAL NEURALGIA. CURRENT CONCEPTS REGARDING ETIOLOGY AND PATHOGENESIS ARCH NEUROL 1984;41: 1204-

RATNER EJ LANGER B EVINS ML ALVEOLAR CAVITATIONAL OSTEOPATHOSIS. MANIFESTATIONS OF AN INFECTIOUS PROCESS AND ITS IMPLICATION IN THE CAUSATION OF CHRONIC PAIN PUBLISHED ERRATUM APPEARS IN J PERIODONTOL 1987 FEB;58(2):77] J PERIODONTOL (1986 OCT) 57(10):593-603