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Case Report

Cerebral abscess of odontogenic origin[1]

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SUMMARY. 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 abcess.** 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.** © **2006 European Association for Cranio-Maxillofacial Surgery**

Keywords: **cerebral abscess; odontogenic origin**

INTRODUCTION

Cerebral abscess is a rare but serious and life-threatening infection, and constitutes a localized area of suppuration within the brain. It usually occurs after cranial trauma or surgery, or secondary to a 'septic' focus elsewhere, spread either by direct extension or haematologically (*Corson* et al., 2001). Initially, it was resistant to antimicrobial chemotherapy, having been one of the rare bacterial infections where morbidity and mortality rates remained almost unaffected by the improvements in antimicrobial therapy until the late 1960s (*Hollin* et al., 1967). Recently, the advances in neuro-scanning techniques such as CT and MRI, as well as the introduction of more effective antibiotics, have reduced the mortality rate to 0–24% (*Matheison* and *Johnson*, 1997).

Dental infections have occasionally been reported as the source of bacteria which can give rise to such a cerebral abscess (*Schuman* and *Turner*, 1994). The most common causal organisms identified in both oral and cranial sites, have been the microaerophilic streptococci (viridans streptococci) and anaerobic bacteria (*Bacteroides* sp., *Actinobacillus actinomycetem comitans*; *Gortvai* et al., 1987; *Marks* et al., 1988; *Renton* et al., 1996). Also considering that cerebral abscesses are frequently polymicrobial, some other additional microorganisms such as *Staphylococcus aureus* and facultative anaerobic Gram-negative bacteria (i.e. the Enterobacteriaceae) have been reported as the causal microflora depending on the underlying source of infection (*Corson* et al., 2001). Reviewing the relevant literature, only seven references related cerebral abscesses and dental foci (Table 1). The purpose of this paper is to present an interesting case report with a cerebral abscess possibly of odontogenic origin.

REPORT OF A CASE

A 54-year-old man was admitted to this hospital with a right hemiparesis and epileptic fits. After the clinical, laboratory and imaging examination a diagnosis of cerebral abscess of the left parietal lobe was made (Figs. 1 and 2). In the search for the source of this infection, after examining the whole body for possible 'septic' foci with the corresponding clinical, imaging and laboratory investigations, the head and neck area was found more suspicious, thus opinions were requested. ENT colleagues could find no cause for the infection. Intraoral clinical and radiological examination, including a panoramic radiograph and a Dentascan, confirmed the presence of generalized

[1]Based on a paper presented at the 5th European Congress of Oto-Rhino-Laryngology Head and Neck Surgery, 11–16 September 2004, Rodos-Kos, Hellas.

Table 1 – Previously reported cerebral abscesses of odontogenic origin

Authors	Title of publication	Journal
Hollin SA and *Gross SW* (1964)	Subdural empyema of odontogenic origin	J Mt Sinai Hosp NY 1964 November – December; 31: 540–544
Hollin SA et al. (1967)	Intracranial abscesses of odontogenic origin	Oral Surg Oral Med Oral Pathol 1967 March 23 (3): 277–293
Baddour HM et al. (1979)	Frontal lobe abscess of dental origin. Report of a case	Oral Surg Oral Med Oral Pathol 1979 April; 47(4): 303–306
Schotland C et al. (1979)	[Brain abscess after odontogenic infection] German	SSO Schweiz Monatsschr Zahnheilkd 1979 April; 89(4): 325–329
Aldous JA et al. (1987)	Brain abscess of odontogenic origin: report of case	J Am Dent Assoc 1987 December; 115 (6): 861–863
Carver DD and *Peterson SS* (1988)	Brain abscess of odontogenic origin: report of a case	J Houston Dist Dent Soc 1988 May:24
Corson MA et al. (2001)	Are dental infections a cause of brain abscess? Case report and review of the literature	Oral Dis 2001 January; 7(1): 61–65

Fig. 1 – 54 y.o. male, CT scan (axial view): cerebral abscess of the left parietal lobe.

periodontal disease, multiple dental caries and periapical pathology (Fig. 3). In particular, periapical lesions were found in the molar, bicuspid, canine and maxillary incisor regions bilaterally, along with severe periodontal disease in the anterior maxillary teeth. In the mandible, periapical pathology along with periodontal destruction involved the molar region bilaterally; the anterior teeth of the mandible were severely affected by rapidly progressive periodontitis, showing increased mobility. The patient declined periodontal and endodontic treatment where needed, and considering the general reluctance of both the patient and his family to follow a dental treatment plan and a regular programme of oral hygiene, the staff of the Department of Oral and Maxillofacial Surgery advocated the removal of almost all the patient's teeth. This effort to eradicate all possible 'septic' foci, together with construction of immediate upper and lower complete dentures, presumed the cerebral abscess originated as an odontogenic infection.

Treatment included (i) Immediate administration of high dose intravenous antibiotics, (ii) craniotomy and resection of the abscess cavity (Fig. 4), and (iii) removal of the periodontally diseased and decayed teeth, alveoloplasty, and construction of immediate upper and lower complete dentures.

The intravenous antibiotic regimen administered for 23 consecutive days, included: (a) Ceftriaxone [pd.sol.inf* ROCEPHIN®/Roche 2000 mg/vial (iv.inf)] × 2 per day, (b) Metronidazole [inj.sol.inf* FLAGYL®/Aventis 500 mg/100 ml-vial] × 4 per day, and (c) Vancomycin [ly.pd.iv.inf* VONCON®/Lilly 500 mg/vial × 2] × 3 per day. The patient recovered uneventfully. The intravenous antibiotic regimen, was continued by administering Ofloxacin [inj.sol.inf* TABRIN®/Hoechst Marion Roussel 200 mg/100 ml-vial × 2] × 3, and Teicoplanin [ly.pd.inj* TARGOCID®/Vianex 400 mg/vial] × 2, for a further 5 weeks (34 days) after the neurosurgical procedure. It should be noticed that Ceftriaxone [ROCEPHIN®] and Teicoplanin [TARGOCID®] presented the following side effects/adverse reactions: fever, diffuse pruritic maculopapular rash, and cholestatic jaundice, leading to their discontinuation.

Muscular power on the right side slowly improved over the following weeks, and on the day of discharge the patient presented with a slight improvement of mobility and no more epileptic fits. Twenty-nine months postoperatively, the patient had almost recovered from the hemiparesis, although he complains of slightly sub-optimal speech.

*pd.sol.inf. – powder for solution for infusion. inj.sol.inf. – injection of solution in infusion. ly.pd.iv.inf. – lyophilized powder for intravenous infusion.

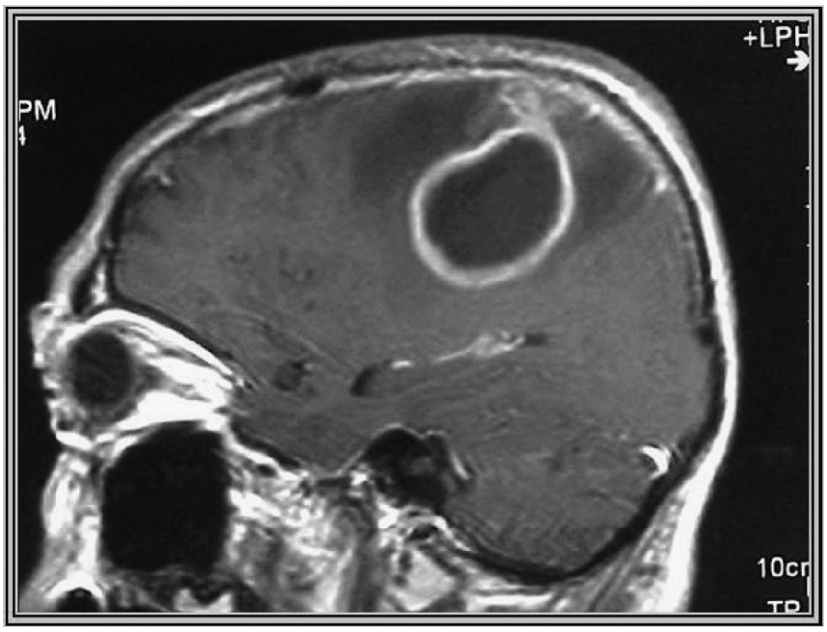

Fig. 2 – Same, MRI scan (sagittal view): cerebral abscess of the left parietal lobe.

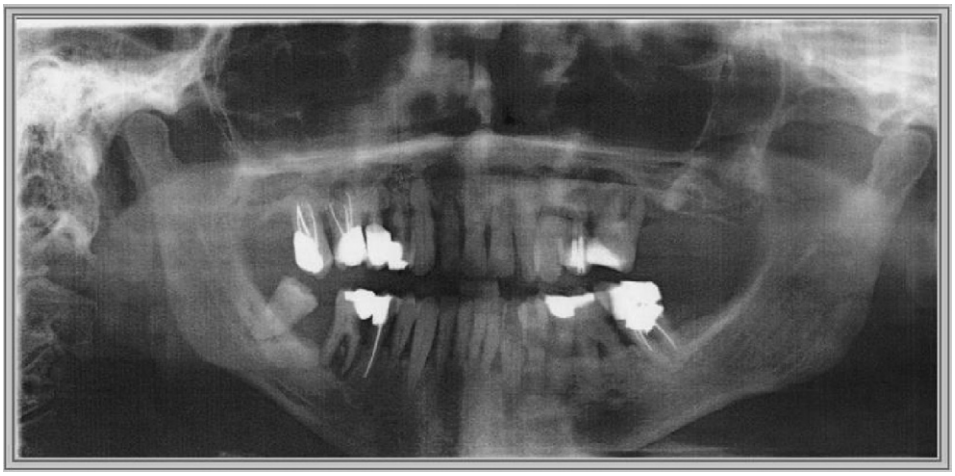

Fig. 3 – Same, panoramic radiograph: generalized periodontal and apical disease, and multiple dental caries.

DISCUSSION

Cerebral abscesses, although rarely, can result from dental or maxillofacial infections constituting direct threats to the patient's life (*Corson* et al., 2001). The most common sites of cerebral abscesses are the temporal lobes (42%) and the cerebellum (30%; *Yang*, 1981). They may occur following cranial trauma, or cranio-maxillofacial surgery, or secondary to a 'septic' focus elsewhere and spread either by direct extension or haematological route (*Corson* et al., 2001). The oral cavity is considered as being home to a rich and abundant microflora. To be more specific, dental plaque contains one of the most concentrated accumulations of microorganisms in the human body. In particular, approximately 350 different bacterial strains can be isolated in marginal periodontitis, and 150 in endodontic infections (*Corson* et al., 2001). The oral/dental procedures purported to have caused a cerebral abscess include dentoalveolar surgery, operative dentistry, periodontal therapy, dental local anaesthetic injection and dental prophylaxis (*Schuman* and *Turner*, 1994).

Cerebral abscesses are frequently polymicrobial. The most common aetiological organisms reported in clinical series are microaerophilic streptococci (*Streptococci viridans*), anaerobic bacteria (*Bacteroides* sp., *Actinobacillus actinomycetem comitans*), *Staphylococcus aureus*, and facultative anaerobic Gram neg. bacteria (Enterobacteriaceae; *Gortvai* et al., 1987; *Marks* et al., 1988; *Renton* et al., 1996; *Corson* et al., 2001). Oral pathogens from an odontogenic infection could enter the brain via either an haematological route (facial, angular, ophthalmic artery, spread

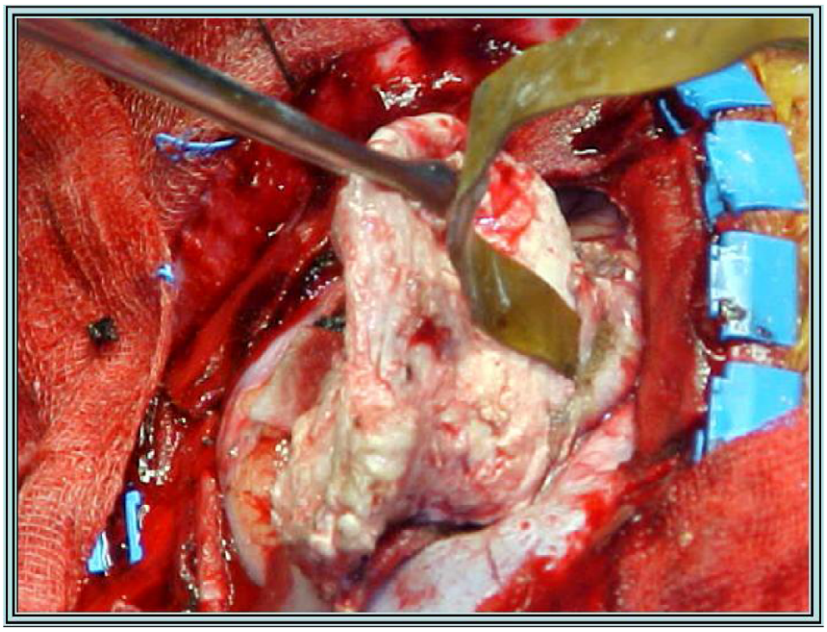

Fig. 4 – Same, resection of the abscess following craniotomy.

through the cavernous sinus), or a lymphatic route, or by direct extension through the fascial planes. In view of their relative rarity, the diagnosis of such a life-threatening condition as a cerebral abscess is a significant challenge for every clinician, since it often occurs 'spontaneously', and the source of infection should then be identified. Although a previous stroke (*Chen* et al., 1995) or an underlying neoplasm (*Shimomura* et al., 1994) may serve as a nidus for abscess formation, in most cases there is no apparent predisposing cerebral pathology. On the other hand odontogenic sources of infections (especially periodontal) are commonly found in adults (*Corson* et al., 2001).

The search for the aetiological organism in any infection must always be based on sound microbiological methodology. The causal organism should therefore be identified in both the oral and cranial sites. In particular, modern sampling techniques such as molecular finger-printing based upon nucleotide sequencing, should be used to identify the isolates precisely, in order to positively confirm the role of an odontogenic infection in the pathogenesis of a cerebral abscess (*Corson* et al., 2001).

Regarding treatment for patients with cerebral abscesses of odontogenic origin, it should be stressed that the decision to treat dental disease radically or more conservatively depends on the overall medical status of the patient, the severity of dental disease, and the patient's understanding of dental treatment, and good oral hygiene methods. In particular, when the patient's medical status makes it practical and beneficial, dental treatment should be more conservative to preserve the dentition. Then the full range of therapeutic procedures should be offered i.e. periodontal surgery, root canal therapy and endodontic surgery and restorative dentistry. The patient's willingness to follow a regular oral hygiene programme along with follow-up, as well as the original severity of his dental disease, are factors in deciding the type of dental management for cases with a cerebral abscess of odontogenic origin. In the authors' opinion, it seems unwise if not very risky to avoid multiple extractions in cases when the patient presents with a cerebral abscess and severe dental disease, and is unlikely to cooperate with meticulous dental treatment and oral hygiene, thus risking recurrence. Despite seeming radical, such intervention is considered to be the treatment of choice in cases such as this.

CONCLUSION

A cerebral abscess linked to a dental source is a rare occurrence since in most individuals the blood-brain barrier along with the immune response will exclude bacteria. In the literature so far, the role of odontogenic infections in the pathogenesis of a cerebral abscess has been implicated whenever periodontal disease preexisted and in combination with the absence of any predisposing intracranial pathology, as in the present case. However, the management of these life-threatening infections depends on the location and the dimensions of the lesion, as well as on the level of medical alertness.

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