

## Recurrent facial pain due to *Pseudomonas aeruginosa* sinusitis\*

Vasilis Danielides<sup>1</sup>, Christina-Sophia Nousia<sup>1</sup>, Eleni Gesouli<sup>2</sup>, Vasilios Papakostas<sup>3</sup>, Haralampos J. Milionis<sup>4</sup>, Antonios Skevas<sup>1</sup>

<sup>1</sup> Department of Otorhinolaryngology, Medical School, University of Ioannina, Ioannina, Greece

<sup>2</sup> Department of Microbiology, University Hospital of Ioannina, Ioannina, Greece

<sup>3</sup> Department of Radiology, University Hospital of Ioannina, Ioannina, Greece

<sup>4</sup> Department of Internal Medicine, Medical School, University of Ioannina, Ioannina, Greece

### SUMMARY

*Pseudomonas (P) aeruginosa* has been rarely reported as a causative agent of chronic sinusitis in otherwise healthy individuals, mostly as part of polymicrobial infections, while it has been frequently described among immunocompromised patients. We report a case of chronic maxillary sinusitis due to *P. aeruginosa* presenting as recurrent facial pain in a previously healthy middle-aged woman. Bacteriological diagnosis was established by tissue cultures and definitive treatment was achieved by surgical intervention and postoperative antibiotic treatment along with topical care.

*Key words:* chronic sinusitis, bacteriology, sinus cultures, *Pseudomonas aeruginosa*

### INTRODUCTION

Chronic sinusitis can be a serious infection with life-threatening sequelae and a significant variation of bacteriological findings. Previous studies focus on the polymicrobial etiology and the major role of anaerobic bacteria, while *Pseudomonas (P.) aeruginosa* is considered an uncommon causative agent of sinus infection. We present a case of chronic maxillary sinusitis exclusively due to *P. aeruginosa* in a previously healthy woman.

### CASE REPORT

A 54-year-old woman was referred to the Ear-Nose-Throat Department because of an 18-month history of recurrent left-sided facial pain, nasal congestion, postnasal discharge, malodorous breath, and persistent cough. Her past medical history was unremarkable except for seasonal allergic rhinitis, while regional surgery, such as nasal-sinus surgery and dental operations, was not included. Physical examination revealed hyperemic nasal mucosa, moderate nasal septum deviation to the right, severe swelling of the inferior turbinates and tenderness on palpation and mild percussion over the left maxillary sinus. The examination of the oropharynx was negative. Furthermore, dental examination did not reveal an inflammatory process deriving from the teeth.

On plain sinus x-rays, there was complete opacification of the left maxillary sinus. A Computed Tomography (CT) scan revealed a "mass lesion" of soft-tissue density in the left maxillary sinus without any signs of extension beyond the limits of

the antrum, while a central calcification seemed to appear within the total opacification of the maxillary sinus (Figure 1). A complete blood count was as follows: the white cell count was 6,210/ $\mu$ l (61% neutrophils, 33% lymphocytes, 4% monocytes, and 2% eosinophils), the hematocrit was 42.6%, the platelet count was 214 k/ $\mu$ l. The erythrocyte sedimentation rate was 22 mm/h, and the C-reactive protein was 16 mg/l. Immunological markers, including rheumatoid factor (RF), antineutrophil cytoplasmic antibodies (C-ANCA, P-ANCA), antinuclear antibodies (ANA), and anti-double-stranded DNA, were negative. Serum protein electrophoresis was within normal limits. Serological testing for Epstein-Barr Virus,



Figure 1. Coronal section through the maxillary sinuses showing complete occupation of the left antrum by a soft-tissue "mass lesion".

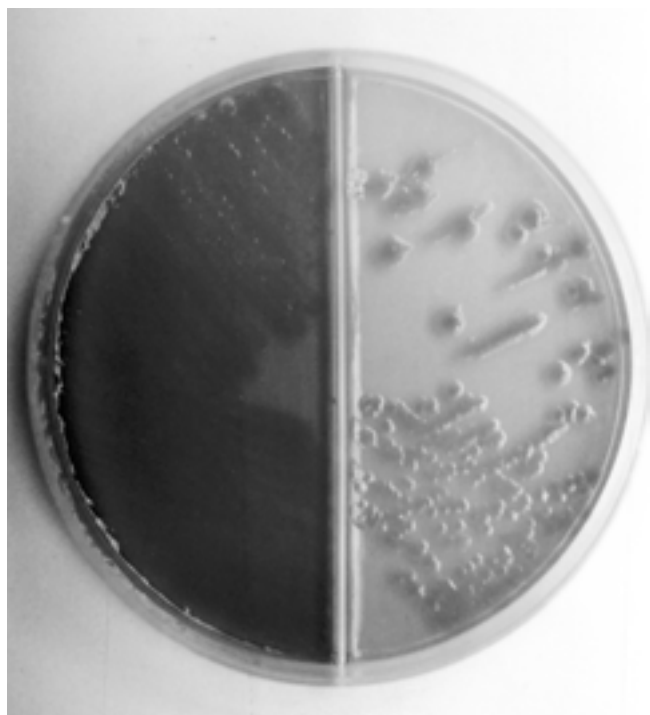


Figure 2. Isolation of *P. aeruginosa* from sinus mucosa cultures.

Cytomegalovirus, Hepatitis A, B and C, Human Immunodeficiency Virus, and Herpes Simplex Virus I and II was negative and so was a tuberculin skin test. Blood cultures were negative and the chest x-ray was normal.

A puncture and irrigation of the left maxillary sinus was performed under local anesthesia and adequate asepsis. *P. aeruginosa* was isolated from the cultures of the sinus aspirate as well as from cultures obtained from nasal cavity and middle meatus secretions. Cultures obtained from the oropharynx revealed natural flora. A diagnosis of unilateral chronic maxillary sinusitis due to *P. aeruginosa* was suggested and the patient was treated with ciprofloxacin 500mg orally twice daily (based on an antibiotic sensitivity test), self-administered nasal irrigations with normal saline, and gentamycin sulfate drops intranasally along with a topical decongestant three times daily.

After 10 days of treatment, the symptoms persisted and the radiological findings showed no signs of improvement. A functional endoscopic sinus surgery was, therefore, performed under general anesthesia consisting of an ample left middle meatal antrostomy, thorough removal of the diseased sinus epithelium, reduction of the left middle turbinate, and bilateral submucous cauterization of the inferior turbinates. Specimens obtained intraoperatively from the antral mucosa were adequately transported and cultured for the identification of any aerobic, anaerobic bacteria and fungi (Erkan et al., 1994; Brook et al., 1994; Brook et al., 1996b). *P. aeruginosa* was again the only isolate (Figure 2). Despite a central calcification within

the total opacification of the antrum, which seemed to appear in the CT imaging giving the impression of fungal infection, fungi were not detected. A histopathologic examination revealed severe chronic inflammatory changes of the left maxillary sinus.

Postoperatively, the patient was initiated on ceftazidime 1g every 8h intravenously together with daily antral lavages with normal saline and ceftazidime. As an outpatient (a week later), she was instructed to self-lavage her nose with normal saline together with gentamycin drops instillations three times daily. In addition, antral irrigations with normal saline and ceftazidime were performed twice a week at the hospital.

Five weeks later the patient was symptom-free; an endoscopic examination showed resolution of the sinus infection, while sinus cultures were negative. On reevaluation three months following surgery, the patient was totally asymptomatic; culture specimens were sterile.

#### DISCUSSION

Diseases of paranasal sinuses account for a significant portion of morbidity and healthcare expenditure annually. Chronic sinusitis is more than just a prolonged infection of the sinuses; by definition, it involves changes within the mucous membrane lining of the sinus (with scarring, fibrosis, polypoid proliferation, and loss of ciliary activity) altering the production and the drainage of sinus secretions (Koltai et al., 1985).

Bacteriological studies investigating the causative agents of chronic maxillary sinusitis have yielded a diversity of results, with type and methods of specimen collection, transportation, and cultivation significantly influencing the bacteriological findings (Su et al., 1983; Koltai et al., 1985; Erkan et al., 1994). Contamination of the specimen by nasal organisms (e.g. sinus puncture) and failure to transport and culture specimens adequately for anaerobic bacteria comprise some of the technical problems, which produce unreliable findings (Su et al., 1983; Koltai et al., 1985; Erkan et al., 1994; Talmor et al., 1997). Furthermore, the type of the cultured specimens, such as nasal secretions, sinus secretions or antral mucosa, may also present a problem. Therefore, intraoperative cultures of the antral mucosa are considered the most reliable means of getting the "correct picture" of the bacteriology of chronic maxillary sinusitis, since sinus mucosa represents the "real site" of infection (Su et al., 1983).

Previous studies documented a polymicrobial etiology for chronic sinusitis, including anaerobic bacteria and Beta-Lactamase-Producing Bacteria (BLPB). Polymicrobial sinus infection is implicated in even up to 100% of the cases, with a ratio of 2.7 to 3.6 bacterial isolates per specimen (Su et al., 1983; Brook et al., 1994; Erkan et al., 1994; Brook et al., 1996b). Anaerobic bacteria represent the most important causative agents of chronic maxillary sinusitis, being reported in 82-100% of the cases (Su et al., 1983; Erkan et al., 1994;

Brook et al., 1994; Brook, 1996a; Brook et al., 1996b). On the other hand, BLPB, which are detected in 77% of the cases, are mainly responsible for therapeutic failures due to resistance to various antimicrobial agents (Brook, 1988; Brook et al., 1994; Brook, 1996a; Brook et al., 1996b).

*P. aeruginosa* has been infrequently implicated in the pathogenesis of chronic sinusitis mostly as part of a polymicrobial infection (Su et al., 1983; Koltai et al., 1985; Erkan et al., 1994). It has been documented as a common causative agent in cases of chronic sinusitis in special populations, such as patients in intensive care units (representing 15,9% of isolates), patients with immunosuppression, in instrumentation (nasal tubes or catheters), and in patients with cystic fibrosis (being detected in up to 38.2% of the cases) (Shapiro et al., 1982; Koltai et al., 1985; Brook 1996a; Talmor et al., 1997). By contrast, in individuals with no concurrent illness, *P. aeruginosa* as a causative agent of chronic sinusitis accounts for 0-3% of the isolates, mainly in the context of a polymicrobial sinus infection (Su et al., 1983; Brook, 1988; Brook et al., 1994; Erkan et al., 1994; Brook et al., 1996b). It has been postulated that the emergence of uncommon organisms, such as *P. aeruginosa*, may result from modification of sinus bacteriology due to multiple courses of antimicrobial agents for recurrent or chronic sinusitis (Koltai et al., 1985).

*P. aeruginosa* has been rarely reported as the only pathogen in chronic sinusitis in a few case reports. It has been described in the course of severe immunosuppression (leukemia), multi-antimicrobial therapeutic courses, and following regional surgery (Koltai et al., 1985). However, sinus mucosa culture verification was not feasible in all cases (Koltai et al., 1985; Erkan et al., 1994).

Our patient was a previously healthy middle-aged lady with no history of dental infection, medical treatment or regional surgery (nasal-sinus surgery or dental operation) prior to admission. The diagnosis of chronic sinusitis exclusively due to *P. aeruginosa* was established upon the clinical, radiological and bacteriological findings. Nevertheless, the diagnosis was confirmed by tissue cultures and definitive treatment was achieved only by surgical intervention. Thus, in cases of refractory sinus infections, bacteriological diagnosis remains the

golden standard prior to any therapeutic endeavor. A successful management should be based on the principles of nasal-sinus surgery and on meticulous postoperative care (Koltai et al., 1985; Brook 1996a). In particular, an ample middle meatal antrostomy along with a thorough removal of the diseased sinus epithelium represent the basic surgical steps. Occasionally, combination with an inferior meatal antrostomy may be indicated. Postoperative care should consist of nasoantral lavages as well as appropriate antimicrobial agents provided topically and systematically.

#### REFERENCES

1. Brook I (1988) Beta-lactamase-producing bacteria in head and neck infection. *Laryngoscope* 98: 428-431.
2. Brook I, Thompson DH, Frazier EH (1994) Microbiology and management of chronic maxillary sinusitis. *Arch Otolaryngol Head Neck Surg* 120: 1317-1320.
3. Brook I (1996a) Microbiology and management of sinusitis. *J Otolaryngol* 25: 249-256.
4. Brook I, Yocum P, Frazier EH (1996b) Bacteriology and b-lactamase activity in acute and chronic maxillary sinusitis. *Arch Otolaryngol Head Neck Surg* 122: 418-423.
5. Erkan M, Aslan T, Özcan M, Koç N (1994) Bacteriology of antrum in adults with chronic maxillary sinusitis. *Laryngoscope* 104: 321-324.
6. Koltai PJ, Maisel BO, Goldstein JC (1985) *Pseudomonas aeruginosa* in chronic maxillary sinusitis. *Laryngoscope* 95: 34-37.
7. Shapiro ED, Milmoë GJ, Wald ER, Rodnan BJ, Bowen A (1982) Bacteriology of the maxillary sinuses in patients with cystic fibrosis. *J Infect Dis* 146: 589-593.
8. Su WY, Liu C, Hung SY, Tsai WF (1983) Bacteriological study in chronic maxillary sinusitis. *Laryngoscope* 93: 931-934.
9. Talmor M, Li P, Barie PS (1997) Acute paranasal sinusitis in critically ill patients: guidelines for prevention, diagnosis and treatment. *Clin Infect Dis* 25: 1441-1446.

Dr Vasilis G. Danielides, MD, Assistant Professor  
Department of Otorhinolaryngology  
Medical School, University of Ioannina  
P.O. Box 1186  
GR-451 10 Ioannina  
Greece

Tel: +30 651 097513  
Fax: +30 651 097013  
E-mail: vdanielidis@hotmail.com