Case report

Pott’s puffy tumor caused by *Actinomyces naeslundii*

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**A B S T R A C T**

Pott’s puffy tumor is characterized by forehead swelling from subperiosteal abscess and frontal bone osteomyelitis. It is encountered mainly in children; rarely in adults. When it does occur in the latter population, the most common risk factors include head trauma, sinusitis, or cocaine abuse. Generally, the organisms thought to be involved include streptococci, staphylococci and oral anaerobic flora. We present a case of a 53 year old female who presented with forehead swelling of 3 month duration after a dental procedure, found to be secondary to *Actinomyces naeslundii*. Actinomyces is a very rare etiology of this disease and has been reported only twice earlier in the literature. We present an uncommon infectious disease along with summary of clinical characteristics of this entity in the adult population.

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Introduction

Pott’s Puffy Tumor (PPT) is a clinical diagnosis of a subperiosteal abscess and osteomyelitis of the frontal bone [1]. It is encountered mainly in children, and rarely seen in adults [1]. When it does occur in the latter population, the most common risk factors include head trauma, sinusitis, or cocaine abuse [1]. Complications from PPT include meningitis, epidural empyema, frontal lobe abscess, and cavernous sinus thrombosis; hence the need for prompt diagnosis and aggressive treatment [1].

Case report

A 53 year-old Caucasian female with history of sleep apnea and acid reflux presented with gradual swelling of her forehead for 3 months. She denied having any history of chronic sinusitis or illicit drug use. She did smoke tobacco, 1 pack per day for 30 years. About 6 months prior to presentation, the patient had undergone a tooth extraction; shortly thereafter that she developed symptoms of sinus pressure and congestion. She was initially treated with multiple courses of antimicrobials and steroids for presumed sinusitis without improvement. About three weeks prior to presenting, the patient underwent sinus surgery and was placed on oral levofloxacin for five days. No cultures were obtained at that time.

About a week after surgery, the patient started to develop fevers, chills and worsening headache. She reported that while she did have forehead swelling prior to surgery on her sinuses, it became much more pronounced post-operatively. Three weeks after surgery the patient had a CT head that revealed a peripherally enhancing fluid collection measuring 3.1 cm × 5.9 cm along the right frontal scalp in close proximity to the frontal sinuses and enhancement of the frontal subdural space. MRI head confirmed the findings (Fig. 1). The patient underwent surgical debridement of the abscess with frontal sinus trephination. Cultures were obtained, which grew *Actinomyces naeslundii*. Due to history of being allergic to penicillin the patient was treated with intravenous (IV) ceftriaxone for 9 weeks and then transitioned to oral doxycycline for a total of 6 months of therapy. At 6 month follow up, her symptoms and radiological abnormalities had resolved.

Discussion

Subperiosteal abscess and frontal bone osteomyelitis, also known as Pott’s Puffy Tumor (PPT) was first described by Sir Percival Pott in 1768 in association with head trauma and sinusitis [2]. It occurs as the result of infection traversing through the venous drainage of the frontal sinus or due to direct inoculation to the frontal bone [3]. In order to better understand the clinical characteristics of this disease in the adult population, we reviewed case reports (a total of 47 cases, Table 1) of PPT in adults to determine common risk factors, microbial involvement, management, and outcome of this relatively rare condition. The details are tabulated, and some salient features are described here. With regards to precipitating or underlying risk factors, chronic sinusitis, penetrating defects (either through trauma or

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| Ref No. | Sex | Age | Past medical history | Precipitating cause | Duration of onset | Organism | Antibiotic | Outcome |
|--------|-----|-----|----------------------|--------------------|------------------|----------|------------|---------|
| [6]    | M   | 49  | No prior history     | Insect bite        | 1 wk             | Staph aureus | Flucloxacillin, fusidic acid, metronidazole for 6 weeks | Resolved at 6 weeks |
| [7]    | F   | 55  | No prior history     | Prior surgical history along the frontal bone 8 yr ago | 2 mo            | Staph aureus | Antibiotic NR, treated for 8 weeks | NR |
| [8]    | M   | 55  | Alcoholism, cirrhosis, epilepsy, tobacco abuse, HTN | Prior history of sinus surgery | 1 mo           | Viridans group strep | Vancomycin and clindamycin, unknown duration | Patient lost to follow up |
| [9]    | F   | 54  | Cocaine/heroin, tobacco abuse, hepatitis C | Trauma to forehead | 1 mo            | Coagulase negative Staphylococci and beta-hemolytic Streptococci | 2.4 million units of benzathine penicillin; 2 IM injections | Resolution by day 5 |
| [10]   | M   | 25  | Allergic rhinitis and asthma | No known cause | 3 wk            | Staph aureus | Ceftriaxone 2 g IV daily and then switched to PO antibiotics for 8 weeks (did not specify antibiotic) | Resolved at 6 month follow up |
| [11]   | M   | 33  | No prior medical history | No known cause | 5 mo            | Staph aureus, Peptostreptococcus, S. pneumoniae, H. influenzae | Ceftriaxone 2 g Q 12 h and then oral metronidazole and amoxicillin-clavulanate for 4 weeks | No recurrence for 7 yrs |
| [12]   | M   | NR  | Hx of headaches and recurrent abscesses along the frontal soft tissue | No known cause | Not known | Strep anginosus | Moxifloxacin and metronidazole for 3 months | NR |
| [13]   | M   | 41  | Chronic sinusitis, tobacco use, cocaine use | No known cause | 26 days | Strep intermedius | Ceftriaxone and metronidazole, unknown duration | NR |
| [14]   | M   | 37  | Chronic exophthalma | No known cause | 2 yr           | Mycoplasma | Doxycycline, unknown duration | Symptoms resolved at 2 months |
| [15]   | M   | 46  | No prior medical history | No known cause | 6 mo           | No organism identified by culture | NR | Recurred twice and required second I&D | resolved |
| [16]   | M   | 26  | No prior medical history | No known cause | 2 mo           | H. influenzae | IV ampicillin/sulbactam 2 wks then oral amoxicillin/clavulanate for 4 wks | NR |
| [17]   | M   | 34  | No prior medical history | Cocaine use | 6 wk           | B. melaninogenicus, Fusobacterium, Propionibacterium, group A Strep | IV benzyl penicillin for 3 weeks followed by amoxicillin for 3 weeks | NR |
| [18]   | F   | 54  | No prior medical history | No known cause | Not known | No organism isolated | PO amox/clav and cloxacillin for 1 mo, PO penicillin for 1 mo | resolved |
| [19]   | M   | 83  | Unknown | Head trauma | 4 yr           | H. influenzae | Ceftriaxone for 2 weeks followed by cefprozil for 4 week | No recurrence for 1 yr f/u resolved |
| [20]   | M   | 74  | Unknown | Scalp injections for hair loss | 2 mo           | Staph aureus | IV nafcillin 1 mo, Po dicloxacillin 4 weeks | resolved |
| [21]   | M   | 21  | No prior medical history | Dental sepsis | 3 wk           | Streptococcus intermedius, Bacteroides melaninogenicus | 4 weeks of IV ampicillin | resolved |
| [22]   | M   | 53  | None | Head trauma | 3 wk           | Streptococcus milleri | Unknown | Died 5 days after admission | resolved |
| [23]   | M   | 39  | None | No known cause | 3 mo           | Streptococcus milleri | IV benzyl penicillin for 3 weeks followed by amoxicillin for 3 weeks | Unknown |
| [24]   | F   | 67  | None | No known cause | Not known | Pseudomonas aeruginosa | Unknown | NR |
| [25]   | M   | 58  | Diabetes mellitus | Head trauma | 2 mo           | No organism isolated | Cefuroxime, unknown duration | No recurrence |
| [26]   | M   | 35  | Diabetes mellitus | Head trauma 13 yrs prior | 3 wk           | Staph aureus | NR | Unknown |
| [27]   | M   | 54  | No prior medical problems | No known cause | 4 mo           | Aspergillus flavus | NR | No recurrence at 3 mo f/u |
| [28]   | M   | 54  | Diabetes, CKD, HTN | No known cause | 1 wk           | mucormycosis | Amphotericin B for 3 weeks | No recurrence |
| [29]   | M   | 37  | Hx of frontal bone reconstruction 30 yrs prior | URI- cold virus | 15 days | No organism isolated | Amoxicillin/sulfactam for 10 days followed by amoxicillin/clavulanate for 15 days | Did well at 24 month follow up |
| [30]   | M   | 37  | No prior medical history | No known cause | 1 mo           | unknown | NR | No recurrence |
| No. | Gender | Age | Prior Medical History | Cause | Duration | Treatment | Outcome |
|-----|--------|-----|-----------------------|-------|----------|-----------|---------|
| 1   | M      | 36  | No prior medical history | No known cause | 1 mo | Streptococcus anginosus, Micromonas micros | Unknown |
| 2   | M      | 76  | Aplastic anemia, Diabetes | No known cause | 2 wk | IV ceftriaxone for 3 weeks, oral amoxicillin/clavulanate for 4 weeks | Unknown |
| 3   | M      | 38  | History of cranioplasty for pituitary tumor | No known cause | 2 days | Strep milleri | Unknown |
| 4   | M      | 28  | No prior medical history | No known cause | 2 yr | Eikenella corrodens, Prevotella bivia, streptococcus intermedius | Refused surgery, recurred after 2 months |
| 5   | M      | 56  | sinuses | Traumatic injury | 1 month | IV antibiotics for 1 month, type NR | Drain removed and had full recovery at 3 months follow up |
| 6   | F      | 72  | None | No known cause | 4 yr | MSSA and Coagulase negative Staphylococcus | A third generation cephalosporin, duration NR |
| 7   | M      | 60  | sinusitis | No known cause | 6 mo | Clindamycin for 2 weeks, ertapenem * metronidazole for 6 weeks and then clindamycin for another 6 weeks IV vancomycin and metronidazole for 4 weeks, then PO moxifloxacin for unknown duration | Resolved at 12 month follow up |
| 8   | M      | 63  | Chronic rhinosinusitis | No known cause | 2 wk | Strep milleri | Co-amoxyclav, unknown duration |
| 9   | F      | 58  | Recurrent sinusitis | No known cause | 3 wk | Pasteurella multocida | Unknown |
| 10  | M      | 79  | HTN, prostate cancer, CKD | No known cause | unknown | Actinomyces | Required further debridement 5 months later |
| 11  | M      | 52  | none | Trauma | 1 mo | Actinomyces, Fusobacterium, Propionibacterium | Resolved at 6 mo follow up |

NR: not reported.
surgical interventions), dental issues, and cocaine abuse appeared to be present in majority of the patients. It is felt that the presence of cocaine or tobacco use results in disruption of the mucosal barrier of the nasal passage ways, predisposing to infection [1]. In our patient, we suspect that the preceding dental procedure was the inciting event leading to the development of PPT.

Symptom onset ranged from weeks to years, depending on the risk factors and type of organism implicated. Microbes like *Actinomyces* and anaerobes are more indolent compared to others like *Staphylococcus aureus* or agents of mucormycosis which tend to be more aggressive and onset of clinical symptoms tends to be relatively faster. Of these 47 cases reviewed, *Actinomyces* was reported in two previous cases [4,5].

Treatment most often involves surgical debridement followed by antimicrobial therapy for 4–8 weeks targeted towards the isolated pathogens [1]. In the cases with unknown bacterial involvement, antimicrobials were targeted towards *α*-hemolytic streptococci and anaerobes. The majority of cases had good outcomes, with near complete resolution of symptoms. Our patient was treated for 9 weeks with IV ceftriaxone, followed by 6 months of PO doxycycline due to the presence of *Actinomyces naeslundii* which generally requires a longer course of treatment.

Pott’s puffy tumor should be considered as a potential diagnosis in people who present with a forehead swelling, particularly in the presence of known risk factors such as sinusitis, head trauma, dental procedures, and cocaine abuse. While staphylococci and streptococci have been commonly implicated, rarely *Actinomyces* may be encountered, especially in indolent cases.

**Credit author statement**

All the authors have contributed to the writing of the manuscript of the case report.

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**Consent**

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**Declaration of Competing Interest**

The authors report no declarations of interest.

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