Brain Abscess due to *Streptococcus milleri* in Saudi Arabia

Abdulmohsin Al-Rasheed, Abdur R. Choudhury, Saadia Baksheshwain, Frank Bartlett, Khalaf R. Al-Moutaery, Abimbola O. Osoba


There is increasing recognition of *Streptococcus milleri* as a virulent causative agent of abscesses not only in the brain, but also in the liver, lung and appendix.¹ The natural habitat of *S. milleri* is the oropharynx, upper respiratory tract, vagina and the gastrointestinal tract, from where most of the infections of the organism are thought to originate.²⁻⁵ In rare instances, it has been noted to cause meningitis, arthritis, endocarditis, maxillary sinusitis and infection of implant material.⁶⁻⁷

The name *Streptococcus milleri* has been designated by British taxonomists to include beta-haemolytic streptococci belonging to Group F, minute colony streptococci groups A, C and G, as well as beta-haemolytic strains without group antigens, and non-beta-haemolytic strains without group antigen (called by the American taxonomists *S. constellatus* and *S. intermedius*).²⁻⁷

We present two cases of brain abscesses due to *S. milleri* which were diagnosed and successfully treated in our hospital, with a brief review of the recent literature on this organism.

The purpose of this report is to document the occurrence of this organism as a cause of brain abscess and to record its presence in our area.

**Case 1**

Our patient is a 4-year-old Saudi boy who had a Blalock shunt operation for pseudotruncus, when he was 7 months old. He remained well until a week before admission, when he developed fever associated with severe headache, vomiting and unsteady gait.

On admission, he was pyrexial (temperature: 38.3°C), drowsy and with neck stiffness. His pulse was 80/min and blood pressure 150/80mmHg. The pupils were dilated but reacting sluggishly to light. Papilloedema was noted on fundoscopy. There was no nerve palsy or hemiparesis. The liver and spleen were not palpable, systemic examination revealed systolic and machinery cardiac murmurs.

The white cell count was 20.1 × 10⁹/l, and the differential count was neutrophils 75%, lymphocytes 22%, monocytes 3% and platelets normal. Cranial computed tomography (CT-scan) was done as an emergency, and this showed a large left cerebellar multicocular abscess (Fig. 1).

Initial antibiotherapy was commenced with intravenous (i.v.) penicillin (300mg/kg/day), ceftriaxone (100mg/kg/day) and metronidazole (300mg/kg/day). The abscess (Fig. 1) was excised through a posterior fossa craniectomy when 68ml of thick yellowish offensive pus was obtained. Microscopical examination of the pus revealed numerous white blood corpuscles, with numerous Gram-positive

**Riyadh Armed Forces Hospital, PO Box 7897, Riyadh 11159, Saudi Arabia**

**ABDULMOHSIN AL-RASHEED(10,823),(983,925)

**ABDUR RASHID CHOUDHURY FRCS**, Consultant Neurosurgeon, Department of Neurosurgery

**SAADIA BAKHESHWAIN MS**, Registrar, Division of Microbiology, Department of Pathology

**FRANK BARTLETT FIMS**, Senior MLSO, Division of Microbiology, Department of Pathology

**KHALAF REDEN AL-MOUTAERY FACHAKZT**, Consultant and Head, Department of Neurosurgery

**ABIMBOLA OLU OSOBA MD FRCPath**, Consultant, Division of Microbiology, Department of Pathology

**Date submitted: 30.11.89.**

**Date accepted: 12.03.90.**
coccii. Culture on blood agar incubated at 5% CO₂ atmosphere showed minute beta-haemolytic colonies with characteristic caramel-toffee smell. These were identified by API 20 Strept. system S.A. (La Balme Les Grottes—38390 Montalieu, Vercien, France) as S. milleri, sensitive to penicillin, ampicillin, cotrimoxazole and erythromycin, but resistant to gentamicin and fusidin.

Antibiotic therapy was continued for 2 weeks with i.v. penicillin, during which period the patient made an uneventful recovery. A repeat CT brain scan showed normal intracranial appearances. He was discharged home 2 weeks after admission on oral amoxycillin (250 mg 6 hourly, because of better absorption than oral penicillin) for a further 3 weeks. He was followed up regularly, and when seen 2 years later, he was well and asymptomatic.

Case 2
A 38-year-old Saudi male presented with a history of intermittent headache for 4 weeks prior to admission. The headache was sometimes associated with vomiting, and on one occasion with unconsciousness lasting about 2 hours. He gave a past history of treatment for pulmonary tuberculosis.

On examination, he was fully conscious without any neurological signs. Systemic examination showed evidence of destruction of the left lung due to previous tuberculosis. Haematological studies were normal: ESR was 14 mm/h. Chest X-ray showed opacity of the left lung field, with evidence of upper lobe bronchiectasis. Skull X-ray showed no abnormality. A CT brain scan showed a right frontal and two left parietal abscesses. (Figs 2 and 3). In view of the history and chronicity, the abscesses were thought to be tuberculous in origin, and the patient was started on anti-tuberculous therapy with rifampicin, isoniazid, ethambutol and pyrazinamide. Steroids were given to reduce the increased intracranial pressure. After 4 weeks of anti TB therapy, the patient developed fits with frequent headaches and clinical deterioration. A repeat CT Scan showed no improvement. A right frontal craniotomy was made, and the large frontal lesion which appeared pyogenic was totally excised. The patient was initially prescribed i.v. penicillin, ceftriaxone and metronidazole. Anti TB drugs were stopped immediately after surgery but isoniazid was continued as prophylaxis.

From the pus obtained, Streptococcus milleri was isolated and identified as described above. The patient was then treated only with i.v. penicillin, 2.4 g 4-hourly.

He had a stormy postoperative period with a massive pulmonary embolism on the first postoperative day, needing pulmonary embolectomy. Subsequently, he developed cardiac tamponade due to haemothorax as a result of an overdose of warfarin which was treated appropriately. He then made a steady recovery. He was discharged home after 6 weeks on amoxycillin for a further 4 weeks. Serial follow-up CT scans of the brain showed total removal of the right frontal abscess, and the left parietal abscesses had resolved with antibiotic treatment. He was followed up regularly and when seen 9 months later, he was well and asymptomatic.

Discussion
There are a number of reports worldwide of S. milleri as a virulent pyogenic organism causing abscesses of the brain, spleen, liver and lungs, as well as intraabdominal abscess and maxillary
Streptococcus milleri is a common inhabitant of the mouth, nasopharynx, gastrointestinal tract and vagina, with isolation rate of 15-30%. The first report of the isolation of an organism resembling S. milleri from a brain abscess was by Wheeler & Foley in 1943, who isolated a Lancefield group F streptococcus from the abscess of a child. All isolates of S. milleri reported by de Louvois belong to Lancefield group F and had the Ottens and Winkler O III antigen, the possession of which confers a predilection of S. milleri for the central nervous system. Brain abscess due to S. milleri has been documented in a number of countries, viz. Israel, USA, Belgium, UK, South Africa, West Germany.

The first report of the isolation of S. milleri in Saudi Arabia was by Kambal in 1987. Eighty strains of S. milleri were isolated from 80 patients with clinical evidence of infection. Over a third of the isolates were from lesions related to the gastrointestinal tract and a quarter from abscesses of other various sites. Two strains were isolated from cerebrospinal fluid. In the first case, the patient had meningitis following chronic discharge from the ear. The other was from a hydrocephalic child with an infected implanted shunt. There was no isolate recovered from a brain abscess in this series.

The identification and differentiation of streptococcus viridans remains undecided. Two major schemes have emerged in the last decade. One from Great Britain by Colman & Williams and one from USA by Facklam.

The British taxonomists considered S. milleri as a species consisting of the following: (1) beta-haemolytic streptococci of group F; (2) beta-haemolytic minute colony streptococci of groups A, C and G; (3) beta-haemolytic streptococci without group antigen; as well as, non-beta-haemolytic streptococci without group antigen. These are called by the American taxonomists, Streptococcus constellatus (formerly anginosus-constellatus) and Streptococcus intermedius (formerly MG-intermedius).

However, according to the American classification, the name Streptococcus milleri is not used, and all the former beta-haemolytic streptococci are called collectively Streptococcus anginosus. While all other non-beta-haemolytic streptococci with no specific group antigen, including both S. constellatus and S. intermedius, are considered as non-haemolytic strains of the viridans classification.

Most strains of S. milleri produce minute colonies less than 0.5 mm in diameter after 18 h incubation in an increased CO2 atmosphere and are regarded as capnophilic, since they fail to grow in a normal atmosphere. These strains have been identified in up to 40% of samples from brain abscesses and pose problems of isolation and identification, since they have a biochemical profile similar to that of Peptostreptococcus intermedius which is resistant to metronidazole.

Consequently, laboratories not utilizing the miniaturized, automated or semiautomated systems may experience difficulty in the identification of these organisms, especially when biochemical and conventional techniques are used. In our study, we have used the API system, which is reported to identify about 85% of strains accurately.

Streptococcus milleri has been reported to be one of the commonest organisms isolated from brain abscesses, which is frequently associated with intra-abdominal infections. Although S. milleri has been associated with disease of the gastrointestinal tract, we found no evidence of this in any of our patients. In the first case described, the underlying factor was the congenital heart lesion. Cyanotic congenital heart disease is associated with 5-10% of brain abscess cases. The associated polycythemia in our patient (Hb. 19.7g/dl) might have increased the viscosity with a reduction in brain capillary blood flow leading to microinfarction and reduced tissue oxygenation, complicated later by bacterial colonization. We therefore feel that in this patient contiguous spread from the ear or sinuses was unlikely, and haematogenous spread from the oropharynx or gastrointestinal tract was more likely.

In the second case, we speculate that the bronchiectatic cavity in the lungs acted as a predisposing factor for haematogenous spread of the organism from the chest to the brain. The origin of the organism was probably in the oropharynx, from where the bronchiectatic cavity was colonized.

Bacteriological diagnosis of brain abscess is not definitely made until the abscess has been aspirated or excised. Some authors have advocated initial therapy with penicillin, or ampicillin, chloramphenicol and metronidazole pending laboratory diagnosis. However, we feel that in the management of these cases, a better combination would be high doses of penicillin, a third generation cephalosporin, e.g. ceftriaxone, and metronidazole, since some abscesses may contain aerobic Gram-negative bacilli which may be resistant to ampicillin or chloramphenicol. Both of our cases treated initially with this combination gave an excellent response, pending bacteriological identification of the aetiological agent.

In the case of S. milleri brain abscess, therapy should be carried out with high doses of penicillin, since the organism is always sensitive to this antibiotic. Therapy should be continued for 6-8 weeks, with surgical aspiration and/or excision at the earliest opportunity.

As far as we are aware, this is the first report of this organism causing brain abscesses in Saudi Arabia.
References


