

## Case Report

# An autopsy case of Group A *Streptococcus* meningoencephalitis

Yasuhiro Kakiuchi\*, Nozomi Idota, Mami Nakamura and Hiroshi Ikegaya

Department of Forensic Medicine, Graduate School of Medical Science, Kyoto Prefectural University of Medicine, 465 Kajii-cho, Kamigyo-ku, Kyoto 602-8566, Japan.

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**Group A *Streptococcus* (GAS), which frequently colonizes the oropharynx, causes significant morbidity worldwide due to invasive infections such as pneumonia, necrotizing fasciitis, bacteremia and streptococcal toxic shock syndrome. However, this organism does not usually invade the central nervous system. Here, we report the autopsy of an adult Japanese patient who died from a fulminant infection, and examination of her cerebrospinal fluid and blood cultures showed GAS.**

**Keywords:** Group A streptococcus, Meningitis, Cerebrospinal fluid and blood cultures.

## INTRODUCTION

Group A *Streptococcus* (GAS) frequently colonizes the oropharynx and is a major cause of global morbidity, causing invasive infections such as pneumonia, necrotizing fasciitis and streptococcal toxic shock syndrome (Poradosu and Kasper, 2007; Carapetis et al., 2005). However, GAS does not usually invade the central nervous system and causes infections such as meningoencephalitis (Brouwer et al., 2012; Chaudhuri et al., 2008) and the organism accounts for less than 2% of all systemic streptococcal infections (Lamagni et al., 2008). Similar to other countries (Schlech et al., 1985; Davies et al., 1996), only a few cases of adult GAS meningoencephalitis have been reported in Japan. Therefore, the clinical picture and epidemiological features of this disease are unclear. Here, we report the autopsy of an adult Japanese patient who died from fulminant infection and examination of her cerebrospinal fluid and blood cultures showed the presence of GAS.

for 4 days experienced fever and vomiting during her return flight to Japan. On the day of arrival in Japan, she visited the emergency department of her local community hospital. Her temperature, blood pressure, and SpO<sub>2</sub> were 38.5°C, 105/33 mmHg, and 97% (room air), respectively. She was subsequently discharged with a painkiller and antiemetic drugs. The next morning, she was found lying dead in bed. Her past medical history was unremarkable except for an episode of pyelonephritis 4 months before her death. In addition, she had no previous history of immunodeficiency.

## Computed tomography findings

Postmortem computed tomography (CT) examination was performed on the day of her death. No abnormalities were seen on head CT (Figure 1).

## CASE HISTORY

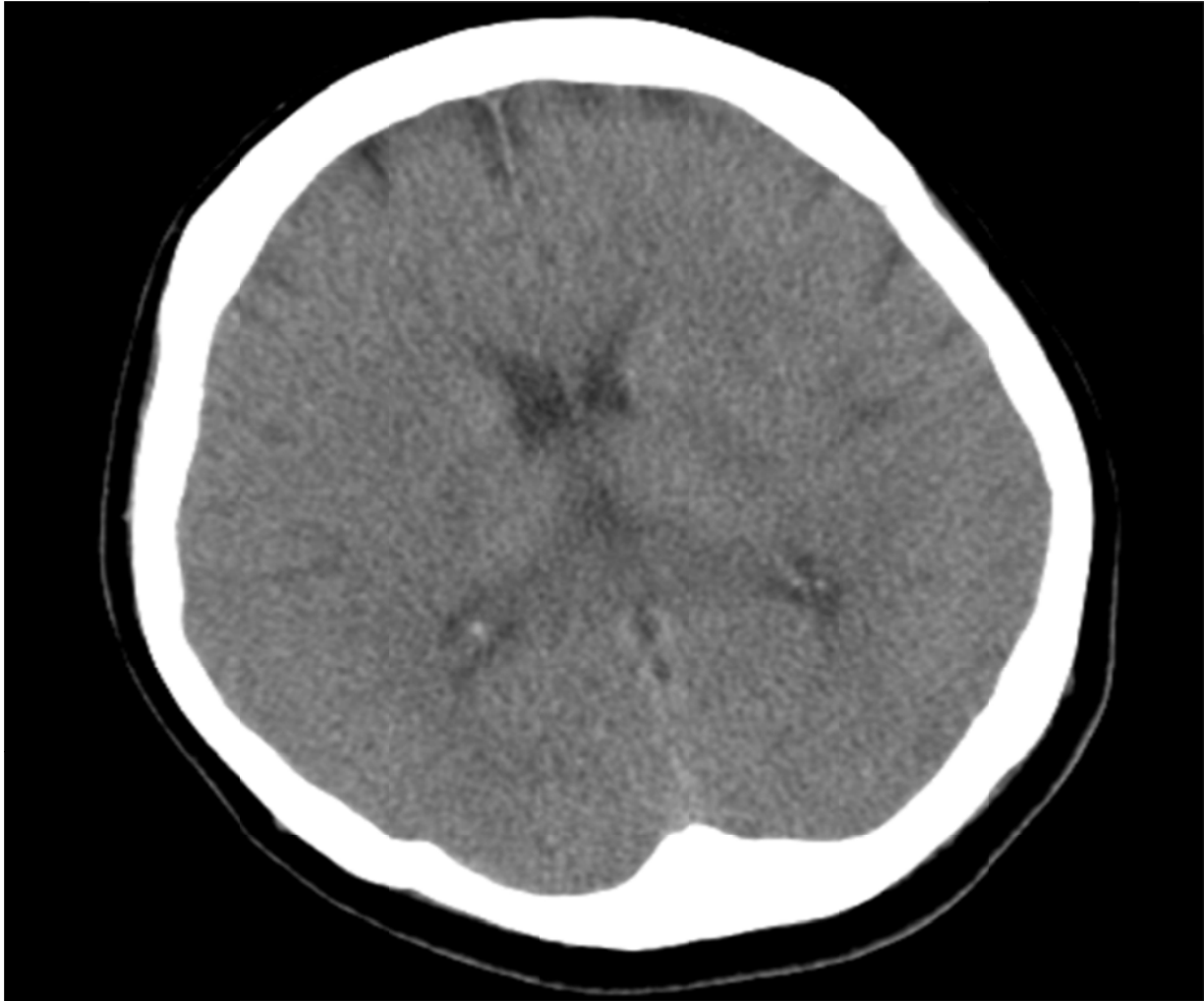
A 48 year old Japanese woman who had visited Guam

## Autopsy findings

After an external examination had been conducted by the

\*Corresponding author. E-mail: [kakiuchi@koto.kpu-m.ac.jp](mailto:kakiuchi@koto.kpu-m.ac.jp).

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**Figure 1.** Postmortem head CT image revealing no remarkable changes.

police, a judicial autopsy was performed the day after her death. The skin of her face, neck, and anterior chest was reddish, showing putrefactive networks (Figure 2). The surface of the brain was markedly hyperemic but no cloudy abscess was seen. The severely softened brain barely kept the original shape (Figure 3). The other organs showed no remarkable macroscopic or microscopic changes including her kidneys, skins or meninges. Culture of the blood and cerebrospinal fluid (CSF) revealed GAS-positive colonies (Figure 4). The white blood cell count of the CSF was 80 cells/mm<sup>3</sup> with 75% neutrophils. To ascertain the cause of death, we performed microscopic examination of the brain tissue. Gram staining of brain tissue sections revealed gram-positive cocci in chains (Figure 5).

## DISCUSSION

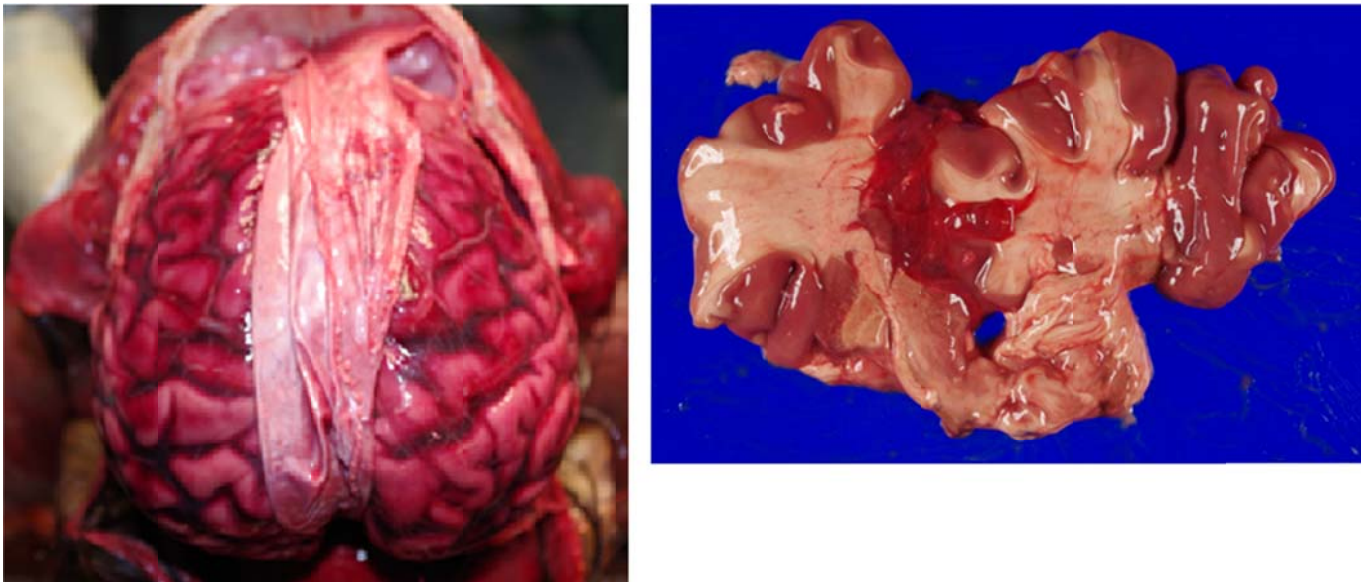
GAS meningoencephalitis is rare. According to van de

Beek et al. (2002), the incidence of GAS meningoencephalitis in adults was 0.03 cases per 100,000 persons, which remained constant during the period studied. Unlike meningoencephalitis caused by *Haemophilus influenzae* and *Streptococcus pneumoniae*, considered secondary to bacteremia, the clinical picture and epidemiological features of GAS meningoencephalitis have not been well studied. In addition, the specific contributing risk factors for GAS meningoencephalitis are unclear. GAS meningoencephalitis is associated with various underlying diseases (85.3%) including upper respiratory tract infections such as otitis media or sinusitis, and upper respiratory tract infections are considered to be the major cause (44.1%) (van de Beek et al., 2002).

In the present case, the patient experienced pyelonephritis 4 months before her death, which might have caused GAS meningoencephalitis. The clinical symptoms of GAS meningoencephalitis in adults include fever (89%), headache (68%), neck stiffness (76%), focal



**Figure 2.** Redness with putrefactive networks on the neck and anterior chest.

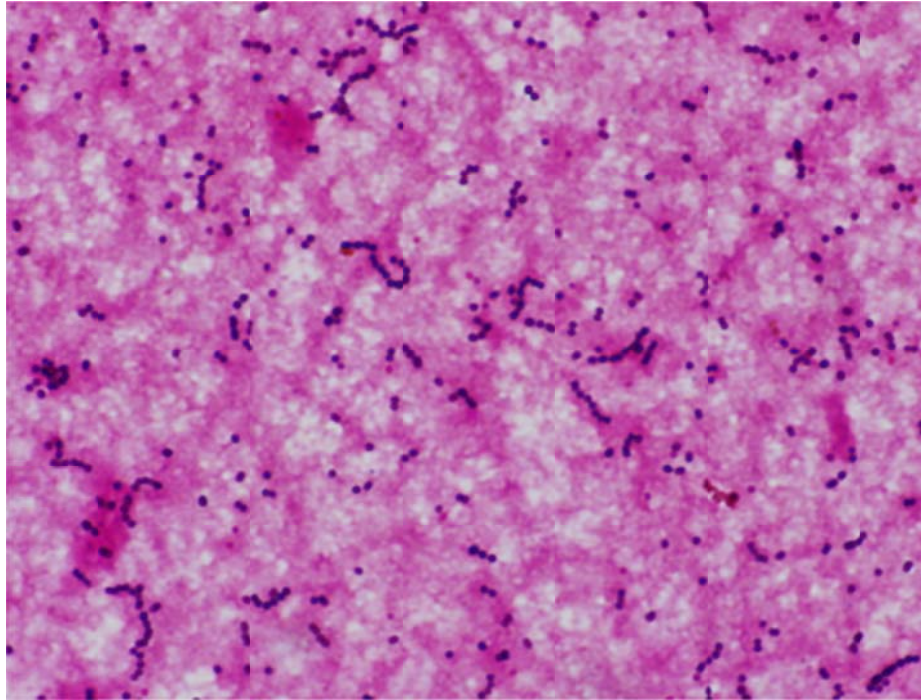


**Figure 3.** Appearance of the surface and frontal section of the severely softened brain.

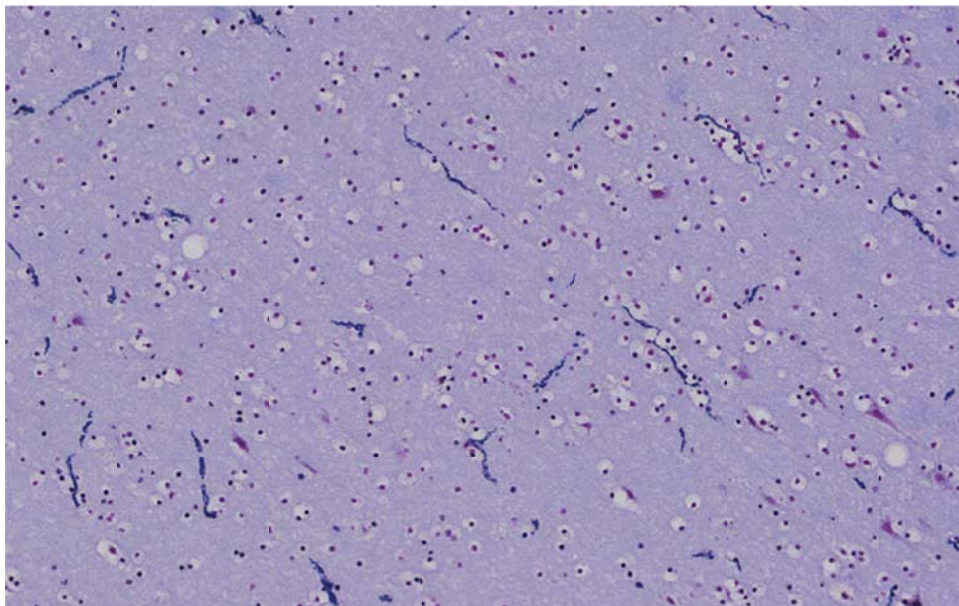
neurological deficits (36%), seizures (32%), and coma (11%) (van de Beek et al., 2002), which are similar to those of adult meningoencephalitis caused by other

organisms. In the present case, the patient only had fever and vomiting, so it would be difficult to diagnose meningoencephalitis instead of infectious enteritis in the





**Figure 4.** Culture of the cerebrospinal fluid revealing GAS-positive colonies.



**Figure 5.** Histological examination with Gram staining of the hippocampus revealing gram-positive cocci in chains.

absence of other symptoms.

### **Conclusion**

Clinicians should be aware that sporadic GAS infections with a fulminant course might occur. In addition, forensic and anatomical pathologists need to study more cases of

GAS meningoencephalitis in order to clarify the clinical picture and epidemiological features of this rare infection.

### **Conflict of interest**

Authors have none to declare.

## REFERENCES

- Brouwer MC, Thwaites GE, Tunkel AR, van de Beek D (2012). Dilemmas in the diagnosis of acute community-acquired bacterial meningitis. *Lancet*. 380(9854):1684-1692.
- Carapetis JR, Steer AC, Mulholland EK, Weber M (2005). The global burden of group A streptococcal diseases. *Lancet Infect. Dis.* 5(11):685-694.
- Chaudhuri A, Martinez MP, Kennedy PG, Andrew SR, Portegies P, Bojar M, Steiner I (2008). EFNS Task Force. EFNS guideline on the management of community-acquired bacterial meningitis: report of an EFNS Task Force on acute bacterial meningitis in older children and adults. *Eur. J. Neurol.* 15(7):649-659.
- Davies HD, McGeer A, Schwartz B, Green K, Cann D, Simor AE, Low DE (1996). Invasive group A streptococcal infections in Ontario, Canada. Ontario Group A Streptococcal Study Group. *N. Engl. J. Med.* 335(8):547-554.
- Lamagni TL, Darenberg J, Luca HB, Siljander T, Efstratiou A, Henriques NB, Vuopio VJ, Bouvet A, Creti R, Ekelund K, Koliou M, Reinert RR, Stathi A, Strakova L, Ungureanu V, Schalén C (2008). Strep-EURO Study Group, Jasir A. Epidemiology of severe *Streptococcus pyogenes* disease in Europe. *J. Clin. Microbiol.* 46(7):2359-2367.
- Poradosu RC, Kasper DL (2007). Group A *Streptococcus* epidemiology and vaccine implications. *Clin. Infect. Dis.* 45(7):863-865.
- Schlech WF, Ward JI, Band JD, Hightower A, Fraser DW, Broome CV (1985). Bacterial meningitis in the United States, 1978 through 1981. The National Bacterial Meningitis Surveillance Study. *JAMA* 253(12):1749-1754.
- van de Beek D, Gans J, Spanjaard L, Sela S, Vermeulen M, Dankert J (2002). Group A streptococcal meningitis in adults: report of 41 cases and a review of the literature. *Clin. Infect. Dis.* 34(9):e32-36.