*Tropical Biomedicine* 35(3): 604–609 (2018)

# *Group B streptococcus* infection in a sudden unexpected death of infancy – the importance of microbiological investigation at post-mortem

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Received 6 December 2017; received in revised form 21 February 2018; accepted 21 February 2018

**Abstract.** *Group B streptococcus* (GBS) is a common cause of infection in newborns and in early infants. However, GBS infection in an infant older than three months is infrequently reported in the literature. We reported a case of an apparently well six-month-old infant who died of sudden death due to GBS pneumonia, diagnosed at autopsy. The six-month-old, apparently well male infant was brought in dead to the Emergency Department. He underwent medicolegal autopsy four hours after death, as part of an overall sudden unexpected death in infancy investigation (SUDI). Apart from whitish froth oozing out of both nostrils, he appeared to be well-nourished infant without any deformity, syndromic features or obvious suspicious marks of injury externally. Internal examination showed generalized hyperinflated with patchy consolidation of upper and middle lobes of bilateral lung. Multiple matted mesenteric lymphadenopathy were also detected. Blood and lung tissue specimens collected under aseptic technique yielded growth of GBS. Post-mortem histology from consolidated lungs confirmed pneumonic features while mesenteric lymph nodes showed reactive changes in-keeping with underlying infective process. Death was attributed to GBS pneumonia. This case highlights the importance of a detailed autopsy in sudden unexpected death in infancy (SUDI) and the crucial role of post-mortem microbiological study in such cases. Relevant autopsy protocols that need to be employed during microbiological sampling are briefly discussed.

## INTRODUCTION

Serious infections with GBS may occur at any age but has been seen most commonly in neonates. An early onset of a GBS infection with respiratory distress and septicaemia or meningitis may develop within the first week of life as a result of acquisition of the organism from the mother at birth; this occurs particularly in babies of low birth weight and when there is prolonged or complicated labour or premature rupture of the membranes (Barnham *et al.*, 1987). Later onset of the GBS infection in neonates often features meningitis and is thought to be due mainly to cross infection from staff or other babies in the community child care. Beyond the neonatal period serious GBS infection becomes much less common. The systemic infection in neonates outnumbered that in older infants is reported as ten to one (Briand *et al.*, 1999). The sources and predisposing factors of infection in this later age group are largely unknown.

## CASE REPORT

A six-month-old Malay male infant, who was born full term spontaneous vaginal delivery with normal developmental milestones, was brought in dead to the Emergency

Department. He had history of preceding upper respiratory tract infection (URTI) one week prior. He was apparently well on the day of presentation and was put to bed after his usual breastfeed but was found dead two hours later.

Autopsy was done on the same day. He was otherwise a well-nourished infant. He was noted to have whitish froth coming out from left nostril. No deformity, syndromic features or obvious suspicious marks of injury detected. Internal examination showed both right and left lungs were hyperinflated with consolidation at bilateral upper and middle lobes. There were multiple mesenteric lymphadenopathy and some of them were matted with the largest size showed reactive changes towards viral with bacterial infection.

Post-mortem blood and lung tissue specimens collected under aseptic technique yielded growth of GBS with contaminant of *Staphylococcus aureus* (in the blood culture) and alpha haemolytic streptococcus (in the lung tissue culture). The sensitivity pattern of the GBS was the same from both tissue and blood samples which were sensitive to ampicillin, penicillin, erythromycin and clindamycin and resistance to tetracycline, gentamycin and cotrimoxazole. The virology studies from the heart and lung tissues were negative for common viral infections. Further history revealed that his mother was not known to be GBS carrier.

## DISCUSSION

GBS also known as *Streptococcus agalactiae* is a gram-positive bacterium that is a common cause of sepsis and meningitis in new-born. In both paediatric and adult populations, invasive GBS infection has been associated with high mortality and morbidity (Eskandarian *et al.*, 2013). Reports have showed an increasing number of pregnancies infected with GBS (Do P *et al.*, 2013). Although antibiotic prophylaxis has been used intrapartum as prevention of GBS infection, its remains the leading cause of neonatal infection and death worldwide.

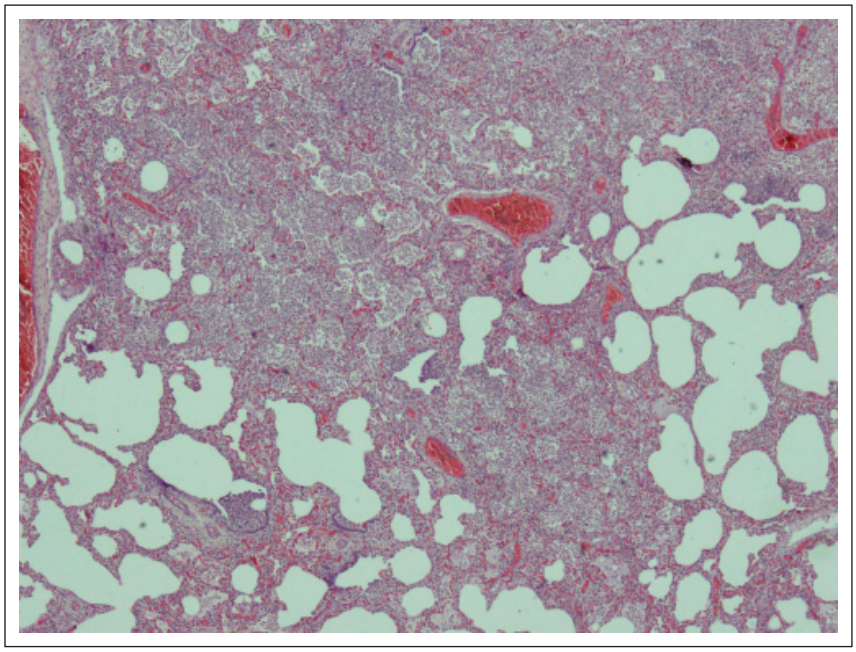

Figure 1a. Section of lung tissue showed alternating areas of collapsed and inflated alveoli. These changes can be seen in most lobes of lungs (Haematoxylin and Eosin stain, x 20 HPF).

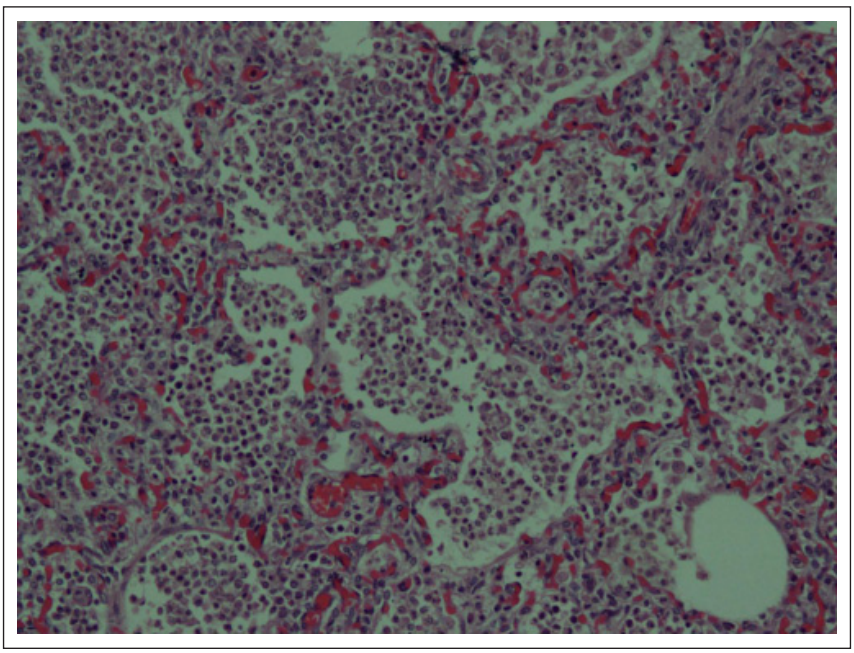

Figure 1b. Section of lung tissue from collapsed areas displayed cellular-filled alveoli consisted of predominantly mixed acute and chronic inflammatory response. Capillaries within alveolar walls were deeply congested (Haematoxylin and Eosin stain, x 100 HPF).

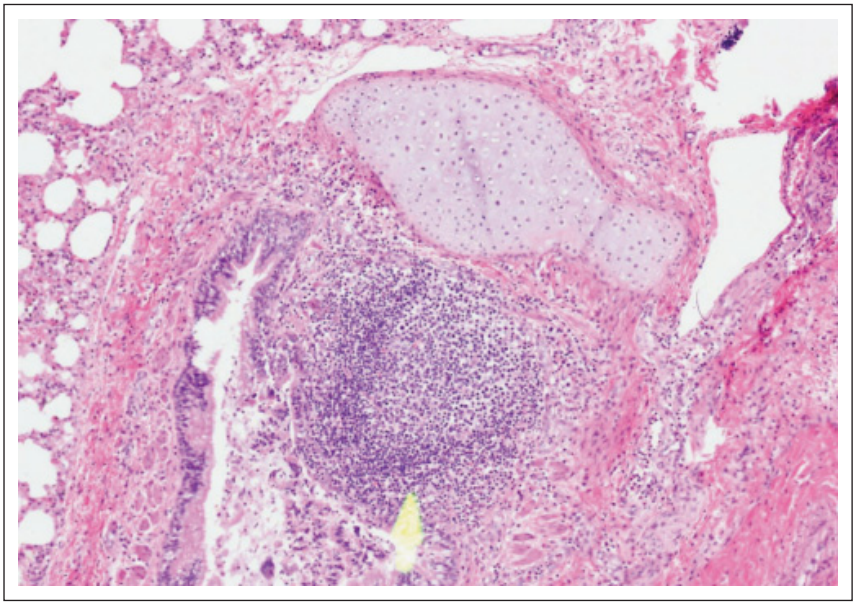

Figure 1c. Section of lung tissue displayed reactive bronchial associated lymphoid aggregates (Haematoxylin and Eosin stain, x 40 HPF).

GBS neonatal infection is divided into early-onset and late-onset disease. Early-onset disease occurs within the first week of life, while late-onset disease occurs between 1 week and 3 months of age (Briand *et al.*, 1999). However, there is little information available on the course of GBS infection in infant older than three months old. The source of GBS infection in the latter group is unknown but, there are some theories regarding the predisposing factors. Primary viral infection is one of the suggested risk factors for GBS infection beyond the early infancy group (Barnham *et al.*, 1987; Raymond *et al.*, 2007). There were two reported cases of fatal GBS infection, one of which yielded cytomegalovirus (CMV) from the lung tissue (Barnham *et al.*, 1987). Viral infections were also proven in four cases and suspected in one case of infants presenting with GBS sepsis and meningitis (Raymond *et al.*, 2007). Therefore, there is a possibility that an underlying viral disease contributed to GBS infection in this case. However viral screening performed in this case was negative.

On the other hand, it has been reported that more than half of the Sudden Infant Death Syndrome (SIDS) infant had had a recent mild viral illness near the time of death. In addition to that, concurrent bacterial and viral infection have been reported in the SIDS infant. In one of a retrospective analysis, over half of the explained deaths were due to an infective cause which were determined primarily by histological examination and complemented by microbiological study in 20% of the cases ( Blood-Siegfried J, 2009).

Thus, in order to prove infection related death, especially in the case of sudden unexpected infant death, bacteriological study plays an important role as a part of the detailed autopsy examination.

However, there are concerns that the organisms obtained during post-mortem are merely contaminants and not related to the cause of death. In a quarter of infant deaths with a known non-infective cause, pathological pathogens have been isolated, supporting that detection of pathogens do not necessarily indicate the cause of death (Weber MA *et al.*, 2008). Moreover, a positive blood culture could be due to post-mortem artefact (through agonal spread and post-mortem translocation) or contamination when obtaining the sample (Morris JA *et al.*, 2007; Weber MA *et al.*, 2010).

As interpreting the significance of bacteriological results can be difficult, we need to consider the relevant factors when utilizing post-mortem bacteriological cultures. In addition, correlation with other tools of investigations is also essential (Weber MA *et al.*, 2010).

To minimize contamination, microbiological samples should be obtained within 24 hours of death or the body should be kept at 4ºC before autopsy (Prtak L *et al.*, 2010). Although in one study concluded that, an increased post-mortem interval is not associated with an increased frequency of mixed-growth episodes, as was hypothesized to occur with post-mortem translocation when the bodies are stored in appropriate temperature (Weber MA *et al.*, 2010). The samples also should be taken before manipulation of bowel or evisceration of organs to avoid passive re-circulation of blood from contaminated area (Tsokos *et al.*, 2001) To minimize the percentage of contamination, an aseptic technique is important as it can reduce the rate of obtaining mixed growth cultures to around 10% (Weber MA *et al.*, 2010).

The specimens should be taken from at least 2 different sampling sites (Prtak L *et al.*, 2010; Tsokos *et al.*, 2001) and due to their valuable correlation with the post-mortem bacteriological result, spleen and heart blood are considered to be favourable sites.

The bacteriological result should be interpreted with regards to the anatomical location and its normal flora, the pathogenic potential of the microorganism and the child's age. As the general rule, polymicrobial growth can be considered as contamination and a heavy or pure growth from different sampling sites is a strong indicator of an aetiologic agent as only bacteraemia prior to death can yield the same result in all sampled specimens (Tsokos *et al.*, 2001). In addition to which a histological examination,

showing the presence of cellular response in the affected tissues will add confidence to the diagnosis of infection related death. Hence, histological study is considered as the most useful investigation in suspected infection related deaths (Arnestad M *et al.*, 2002).

An impressive aspect of GBS infection was the rapid course to death, giving no time to establish a diagnosis or begin treatment. The presentation and initial autopsy findings suggested a diagnosis of the sudden infant death syndrome. It had been defined as "the sudden unexpected death of an infant in which a thorough post-mortem examination fails to reveal an adequate cause of death" without microbiological culture the diagnosis of acute streptococcal septicaemia would have been missed.

## CONCLUSIONS

GBS is a significant problem and is associated with serious underlying disease that can cause high mortality rate especially in infants. Presence of bacteriological culture from post-mortem finding should be considered because it is one of the important diagnostic tools to determine the cause of sudden unexpected infant death (SUDI). Correct aseptic technique in taking microbiological samples and correlation with other tools will increase the likelihood of identifying the infection-related cause of death and improve our investigation in the sudden unexpected infant death. With respect to prevention of GBS infections in neonates and infants, universal screening may identify pregnant women who are colonized by GBS, who may benefit from prophylaxis when indicated.

**Funding source**
This case report did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

## REFERENCES

Arnestad, M., Vege, A. & Rognum, T.O. (2002). Evaluation of diagnostic tools applied in the examination of sudden unexpected deaths in infancy and early childhood. *Forensic Science International*, Feb 18; **125**(2-3): 262-8.

Barnham, M. & Henderson, D.C. (1987). Group B streptococcal infection presenting as sudden death in infancy. *Archives of Disease in Childhood* **62**(4): 419-420.

Blood-Siegfried, J. (2009). The role of infection and inflammation in sudden infant death syndrome. *Immunopharmacology Immunotoxicology* **31**(4): 516-523.

Briand, E., Dehan, M., Grangeot-keros, L. & Hermine, A.C. (1999). Microbiology in sudden infant death syndrome (SIDS) and other childhood deaths, *FEMS Immunology and Medical Microbiology* **25**: 59-66.

Do, P., Do, E., Investigaci, P., Estreptococo, D.E.L., Grupo, D.E.L. & Gestantes, E.N. (2013). A Study Of Group B Streptococcus In Pregnant Women Of Eastern São Paulo. *Revista da Escola de Enfermagem da USP* **47**(1): 22-29.

Eskandarian, N., Neela, V., Ismail, Z., Puzi, S.M., Hamat, R.A. & Desa, M.N.M. (2013). International Journal of Infectious Diseases Group B streptococcal bacteremia in a major teaching hospital in Malaysia: a case series of eighteen patients. *International Journal of Infectious Disease* **17**(9): e777-e780.

Morris, J.A., Harrison, L.M. & Patridge, S.M. (2007). Practical and theoretical aspects of postmortem bacteriology. *Current Diagnostic Pathology* **13**(1): 65-74.

Prtak, L., Al-Adnani, M., Fenton, P., Kudesia, G. & Cohen, M.C. (2010). Contribution of bacteriology and virology in sudden unexpected death in infancy. *Archives of Disease in Childhood* **95**(5): 371.

Raymond, J., Armengaud, J.B., Lambe, C., Tchetchoua, A., Moulin, F., Lebon, P., Poyart, C. & Gendrel, D. (2007). Late-onset neonatal infections caused by group B Streptococcus associated with viral infection. *The Pediatric Infectious Disease Journal Issue* **26**(10): 963-965.

Tsokos, M. & Püschel, K. (2001). Postmortem bacteriology in forensic pathology: diagnostic value and interpretation. *Legal Medicine* **3**(1): 15-22.

Weber, M.A., Klein, N.J., Hartley, J.C., Lock, P.E., Malone, M. & Sebire, N.J. (2008). Infectionandsuddenunexpected death in infancy: a systematic retrospective case review. *Lancet* **371**: 1848-1853.

Weber, M.A., Hartley, J.C., Brooke, I., Lock, P.E., Klein, N.J., Malone, M. & Sebire, N.J. (2010). Postmortem interval and bacteriological culture yield in sudden unexpected death in infancy (SUDI). *Forensic Science International* **198**(1): 121-125.