

## Full-body Imaging to Obviate Autopsy in a case of Death by Tuberculosis



A case study from the Salt River Mortuary, Cape Town, South Africa; one of the world's busiest mortuaries.

### Introduction

Tuberculosis (TB) is a common infectious disease, usually caused by *Mycobacterium tuberculosis*. The disease usually attacks the lungs, but may also affect other organs or areas of the body. It is spread through the air by sputum particles, particularly when the patient coughs or sneezes. Left untreated, the disease can be fatal<sup>1,2</sup>. Tuberculosis is classified as a granulomatous inflammatory disease. The granuloma prevents dissemination of the mycobacteria and provides a local environment for interaction with cells of the immune system. Necrosis occurs in the centre of tubercles<sup>3</sup>. Global infection rates of tuberculosis are highest in Sub-Saharan Africa<sup>4</sup>. Various factors make people more susceptible to TB infections, among them HIV infection, which increases the risk of contracting the disease by 10%<sup>1</sup>.

### Case Presentation

A 56-year old African male died while awaiting trial at Pollsmoor Prison in the Western Cape of South Africa. He had completed a course of treatment for TB and had been receiving anti-retroviral treatment for HIV at the time of his death. He had been a heavy "stubborn" smoker. He had reportedly been coughing up blood prior to his death.

### Imaging and Diagnosis

There were no signs of blunt or sharp force trauma to the body. A Lodox full-body X-ray was performed at the time of post mortem and showed consolidation of the left lung, which is consistent with possible pulmonary tuberculosis (TB). There was a history that the deceased had suffered from TB and had been coughing up blood the day before his death. This is a common symptom of TB. Since no foul play was suspected, and the X-ray showed infection with TB, an internal post mortem examination was not performed, and the cause of death was given as natural disease, most likely TB.

### Discussion

One third of the world's population is thought to have been infected with *M. tuberculosis*, with new infections occurring in about 1% of the population each year. In 2010, there were an estimated 8.8 million new cases and 1.5 million associated deaths, mostly occurring in developing countries. More people in the developing world contract tuberculosis because of compromised immunity, largely due to high rates of HIV infection and the corresponding development of AIDS<sup>5</sup>. Among those at risk of contracting TB are the health care providers who serve these patients<sup>3,5</sup>. This extends to the forensic pathologists to whom it often falls to investigate the deaths of these patients. Should it not be possible to establish a TB diagnosis via X-ray imaging, an autopsy becomes necessary. During autopsy of the lungs, exposure to the TB bacilli is unavoidable, putting those in the immediate vicinity at risk of infection. In this case, there were no signs of trauma and no foul play was suspected. The Lodox X-ray image confirmed this, and also revealed the presence of TB infection in the lungs. Along with the history of TB and coughing up blood, this information was sufficient to confirm a natural death as a result of TB. Without the high-quality X-ray image, an autopsy would have been necessary to confirm the TB, with the inherent risks of infection.

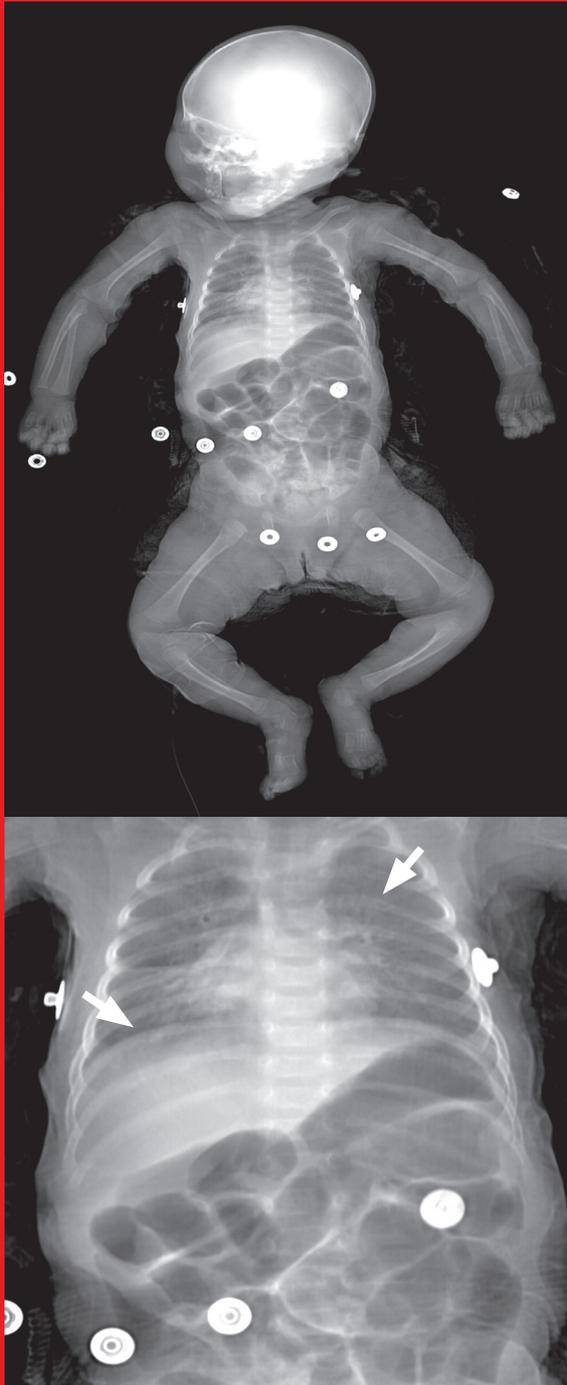
### Conclusions

A full-body radiograph, in conjunction with an external examination, was sufficient to rule out trauma because no fractures or other injuries were visible. Radiographic evidence, in conjunction with the medical history, was able to confirm the suspected TB as the cause of death. By avoiding an internal post-mortem examination, the medical examiner was spared the risk of being exposed to the bacillus unnecessarily.

***"This is an example of how the availability of high-quality X-ray imaging in the mortuary can spare the forensic pathologist unnecessary risk"***

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## Exclusion of Sudden Unexpected Death of an Infant



A case study from the Salt River Mortuary, Cape Town, South Africa; one of the world's busiest mortuaries.

### Introduction

Sudden unexpected death of an infant (SUDI), variously known as sudden infant death syndrome (SIDS), crib death or cot death, is a finding made when the cause of death is not predicted by a medical condition and cannot be determined after a thorough forensic investigation, by exclusion of all other known possibilities. Typically, the infant is found dead after having been put to bed, and exhibits no signs of suffering. In instances where an infant who dies from SUDI has an underlying medical condition, the onus is on the treating clinician to refer the sudden/unexplained death for forensic investigation<sup>1</sup>.

### Case Presentation

A one-month old African female infant was brought to the mortuary with suspected sudden infant death syndrome. The infant had been delivered by caesarean section, and had weighed 3000 g at birth. She had been bottle fed. She was said to have had "chest problems" and had been given Panado (paracetamol) by her mother, a 21-year old woman who had two other children aged two and four. The mother was unemployed and was the primary care-giver. The mother was a non-smoker and a non-drinker. The mother had taken her to the clinic three days prior because of a cough, and because the infant was coughing up blood. The mother said she had been sent home by the sister at the clinic.

### Imaging and Diagnosis

On external examination the forensic pathologist found no evidence of blunt or sharp force trauma to the body. There was a hypo-pigmented rash of the buttocks and perineum in keeping with nappy rash. There was a large amount of green-yellow stool present in the nappy, suggestive of diarrhoea. A Lodox full-body X-ray image showed no fractures to any parts of the body, but revealed pulmonary infiltrates in both lung fields, consistent with pneumonia. An autopsy was not performed on the body, since traumatic abuse had been excluded and a cause of death other than natural causes was not suspected.

### Discussion

In South Africa, radiological investigations are not routinely used to confirm or exclude suspected cases of SUDI<sup>1</sup>. However, in some centres, skeletal surveys are used to exclude the possibility of non-accidental injury (indicated by fractures) or to detect rib fractures associated with resuscitation of suspected SUDI cases<sup>2</sup>. Using conventional X-ray equipment, these surveys usually require multiple images. In this case, full-body imaging facilitated the skeletal survey by allowing all potential sites of fractures to be visualised in a single, rapidly obtained image. In this case, there were no outward signs of trauma, so no foul play was suspected, which was confirmed by the Lodox X-ray image. The image was also sufficient to confirm a natural death as a result of pneumonia, consistent with a medical history of chest problems and coughing up blood. Without the X-ray image, an autopsy would have been necessary to confirm the pneumonia. In a study of 192 suspected cases of SUDI in the Western Cape, Douglas *et al.* found that lung disease was the most common cause of death and that full-body radiological imaging was an efficient way to diagnose these lung conditions, obviating the need to perform a full autopsy<sup>3</sup>. By excluding both non-accidental death and SUDI through rapid, high-quality imaging, the time taken for examination was minimised, with a positive impact on workflow in this mortuary. An accurate cause of death diagnosis was reached without the need for autopsy.

### Conclusions

In this case, a full-body radiograph, in conjunction with an external examination, was sufficient to rule out trauma. Full-body radiographic evidence can be useful for excluding SUDI if other causes of death can be determined from the image.

**"Lodox imaging allows rapid exclusion of suspected SUDI cases without penalty to the Mortuary workflow."**

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