

CASE REPORT

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Fatal Aspiration of Sardine Fry in a Patient with Lung Cancer

REFERENCE: Inayama Y, Udaka N, Amano T, Watanuki Y, Odagiri S, Kawano N, Nakatani Y. Fatal aspiration of sardine fry in a patient with lung cancer. *J Forensic Sci* 2000;45(2):478-482.

ABSTRACT: We report a fatal case of death due to unusual aspiration of sardine fry in an elderly Japanese man with lung cancer. The cause of death was sudden respiratory arrest while eating. Autopsy revealed peculiar materials with cell nests and pigmented particles, together with striated muscle and skin, in the ectatic bronchioles of the left lower lobe. Serial histologic sections suggested that the structures observed were the eyeballs of small animals that appeared to have been inhaled. The patient had habitually eaten sardine fry and rice gruel, which were also detected in the gastric contents. Therefore, the eyes were considered to be those of the fry, which is a popular food item in Japan. This was confirmed by histologic examination of fry that were obtained commercially.

KEYWORDS: forensic science, forensic pathology, aspiration, aspiration pneumonia, foreign body, food, fish, sardine fry

Aspiration of foreign materials often has a fatal outcome in patients with serious illness, especially those who have various forms of respiratory dysfunction or are immunocompromised (1). Not only liquid materials such as gastric juice, but also solid food particles and various kinds of foreign materials have been reported as inhaled substances (2). Among various foods, beans and vegetables are known to be representative foreign bodies (2). Detection of such vegetable materials is important for making a diagnosis of aspiration pneumonia, because they have a peculiar structure unlike human tissue, and can be identified easily by microscopy. Here we report a case of fatal inhalation of sardine fry, which is considered to be a rather unusual inhaled material.

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Received 22 March 1999; and in revised form 25 June 1999; accepted 25 June 1999.

Case Report

A 71-year-old Japanese man was diagnosed as having squamous cell carcinoma in the upper lobe of the right lung, and admitted to hospital. Radiologic examination suggested that the neoplasm involved the mediastinal tissue including the lymph nodes, with dilatation of the superior vena cava. As the patient was considered to be at the end-stage, with increasing dyspnea, dysphagia and renal dysfunction, he was discharged in order to receive conservative therapy at home. He complained of discharge of turbid sputa in the final several weeks of the life. During a meal, with which his wife was assisting, respiratory and subsequent cardiac arrest developed suddenly. He was transferred to the emergency outpatient clinic of our hospital, but was found to be dead on arrival. Necrotic material together with undigested food was aspirated from the airways during resuscitation.

At autopsy, a small amount of necrotic turbid fluid was discharged from the cut ends of the main bronchi, chiefly from the right. However, the larynx and trachea contained almost no such materials, probably because they had already been removed during resuscitation. The stomach contained undigested rice gruel and sardine fry. In the right lung, the primary lesion of the squamous cell carcinoma, about 12 cm in size, appeared markedly necrotic, resulting in cavity formation. Necrotic debris was retained in the affected bronchi. The tumor had directly invaded the mediastinal nodes, and involved the recurrent nerve. Multiple metastases and bronchopneumonia were evident in both lungs. Several cylindrical casts, 1–2 mm in diameter and 5–6 mm long, were also evident in the lumina of the ectatic bronchioles of the left lower lobe, which had been revealed for careful inspection (Fig. 1).

Histologically, non-tumorous areas of the lungs showed severe bronchopneumonia and bronchobronchiolitis containing abundant neutrophils, fibrin and necrotic material. Interestingly, peculiar organoid structures were also noted in the inflamed and ectatic bronchioles of the left lower lobe (Fig. 2a), together with acute inflammatory cells and exudate. The structures consisted of cell aggregates, black to brownish pigments, skin, skeletal muscle and stratified squamous epithelium (Fig. 2b), and appeared to correspond to the cylindrical casts mentioned above. Vegetable fragments, cornified materials of possible oropharyngeal origin, bacte-

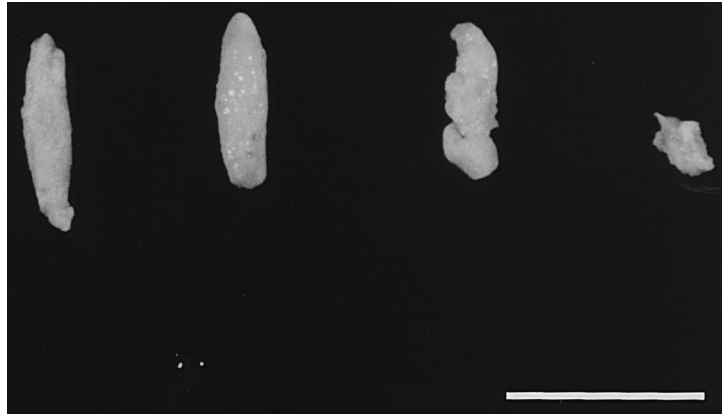


FIG. 1—Photograph of the condensed mucus-like cast seen in the left lower lung. Microscopically, this consisted of fibrin containing fragments of foreign bodies illustrated in Figs. 2 to 3. Bar, 1 cm.

ria and *Candida* were also evident within the ectatic bronchioles. However, foreign body giant cells were scarce, even around the foreign bodies including the peculiar structures.

Serial sections of the specimens, which were prepared to clarify the nature or origin of the peculiar structures, revealed that they were, in fact, eyeballs, approximately 900 μ m in diameter (Fig. 3). Fish fry seemed to be the most likely origin of the eyes, considering that very few other animals with such tiny eyes—and small enough to be inhaled by chance—would have been present in the food. This possibility appeared to be most likely, because sardine fry had been found in the gastric contents. We therefore embedded some sardine fry, purchased from a local fishmonger, in paraffin and examined them histologically for comparison. Hematoxylin-eosin-stained sections of the heads of the fry showed the same structures as the foreign bodies in the bronchioles (Fig. 4).

The direct cause of death was therefore considered to be aspiration of food item containing sardine fry, possibly together with gastric juice, occurring against a background of preexisting severe respiratory dysfunction due to confluent bronchopneumonia superimposed on end-stage lung cancer.

Discussion

Although aspiration of foreign bodies into the airways is a common problem in children and toddlers, it can also occur in adults (2). In such cases, the foreign bodies reported as inhaled materials have included vegetable matter, or dental and medical appliances in western countries (2,3), or chicken and fish bones in China (4). Representative symptoms are wheezing, coughing, fever and dyspnea (2). Aspiration pneumonia (1) or diffuse aspiration bronchiolitis (5) can also develop as a result, especially in diseased or elderly individuals. Although there have been a number of reports on aspiration of vegetable material, the incidence of meat aspiration appears to be lower (2,6). As far as the authors have been able to review, there has been no report of fish fragments other than fish bones detected as inhaled materials. Sardine fry, known as *shirasu* in Japanese, are a popular food item in Japan because of their high protein and calcium content. They are consumed not only by healthy adults, but also by babies or patients with serious illnesses. In the latter two cases, they are often taken together with rice gruel, since in this form they are easy to swallow and digest. This was the case in the present patient, as

evidenced by the presence of undigested sardine fry and rice in the gastric contents.

Initially, it was difficult to recognize the structures found in the lungs as fry because none of our laboratory personnel were familiar with the morphology of the fry, and other possibilities such as insects (or myiasis (7)) and parasites were considered before serial sections were prepared. In fact, a case of pulmonary myiasis has been documented (8). In addition, very unusual cases of cockroach aspiration (9,10) have also been reported. However, this possibility was readily ruled out, since the eye structures, demonstrated in serial histologic sections, were similar to those of vertebrates and different from those of insects. In addition, the overall structures were quite different from those of parasites. Finally, the clinical history of choking and the autopsy findings strengthened the likelihood that the eye structures were those of fish fry.

Although acute inflammation was clearly observed around the fry in the bronchioles, there was little or no foreign body reaction against the aspirated foreign bodies. Since it is unlikely that such acute inflammation could have developed within a short time after acute choking (within a maximum of one hour before death), it is reasonable to assume that repeated and occult aspiration had occurred in the final few weeks of the patient's life. Before a foreign body reaction had fully developed, the patient appeared to have died due to final aspiration of food particles including sardine fry. This was basically the result of palsy of the recurrent nerve due to invasion by the cancer. Most of the foreign bodies that had been aspirated during the patient's last meal and lodged in the large airways appeared to have been removed during the resuscitation efforts, and therefore they were not detected at autopsy.

Considering the size of the fry, usually <1 to 1.5 cm long and 1 to 2 mm in diameter, they would be easily aspirated and trapped in the bronchioles. Care may be needed when giving such fry to patients with severe dysphagia. In addition, it is considered that forensic pathologists or pathologists should be familiar with the morphology of foreign bodies such as fish fry that may be introduced into the lungs by chance due to inhalation.

Acknowledgments

The authors wish to thank Mr. Tsutomu Yoshida and Mr. Takehisa Suzuki, technicians in the pathology departments of Kanagawa Prefectural Cardiovascular and Respiratory Center and



FIG. 2—Low (a) and high (b) power views of a histologic section of the left lower lobe. Purulent inflammation is evident in the alveoli and the markedly ectatic bronchioles (a). Note foreign body associated with fibrin, neutrophils and necroinflammatory reaction (a and b). Cornified skin (arrow), skeletal muscle (arrowheads) and non-keratinizing squamous epithelium (asterisk) are also evident in b (a, H&E $\times 5$; b, H&E $\times 50$).

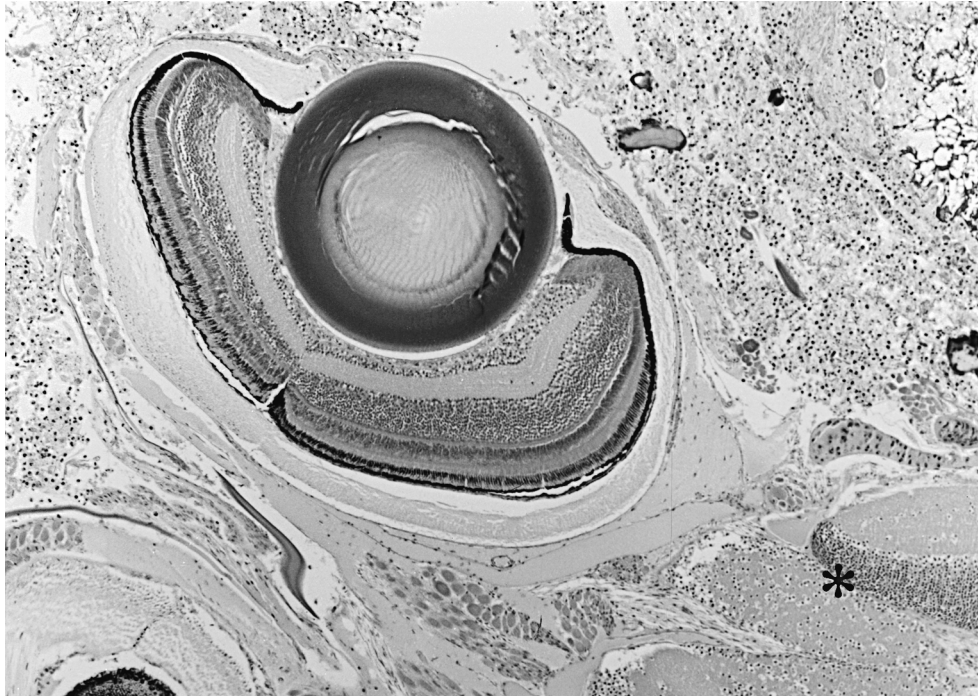


FIG. 3—Photomicrograph of one of the serial sections of the foreign body. The peculiar structures seen in Fig. 2b are proven to be an eyeball. Brain tissue (asterisk) is also noted close to the eye (H&E $\times 20$).

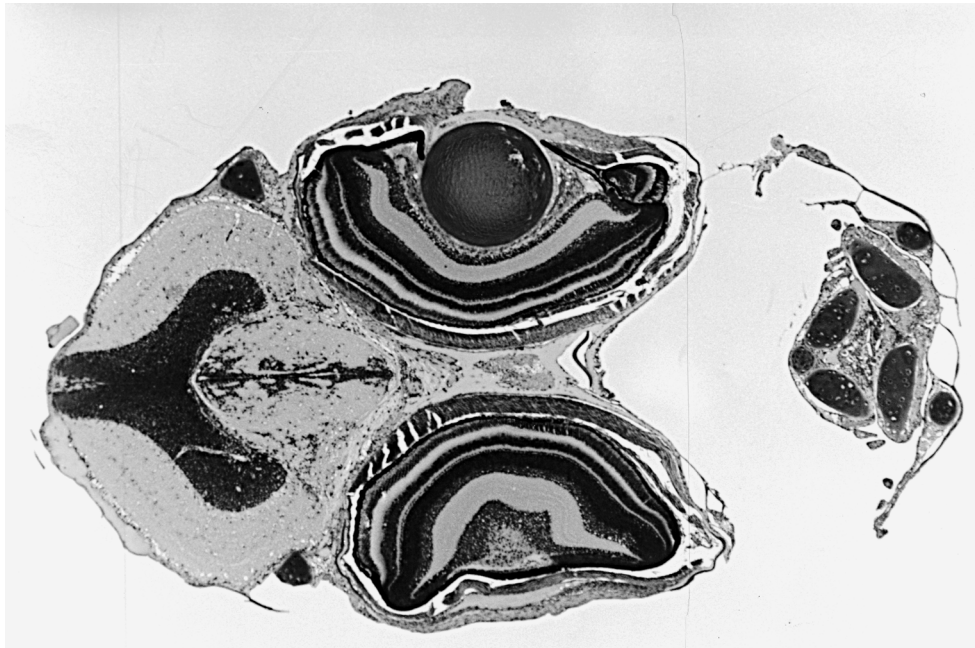


FIG. 4—Photomicrograph of a paraffin-embedded section of boiled sardine fry, showing the same structure as the foreign materials in Fig. 3. (H&E $\times 16$).

Yokohama City University, respectively, for preparing the histologic sections.

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