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CASE REPORT

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Forensic Evaluation of Sudden Death Due to Tuberculosis

ABSTRACT: The emergence of drug-resistant tuberculosis (TB) poses a major threat to TB control efforts. We report a case of a 50-year-old man with pulmonary TB. The scene investigation had initially suspected for homicide; however, the result of medico-legal autopsy demonstrated natural cause of death. Statistical data suggest that the rates of national mortality by respiratory TB decreased in the last decades in Hungary; however, an increasing TB mortality was detected in the capital Budapest. Facing a new mortality trend in TB, the forensic scene investigation and determination of manner of death represent new challenges for practitioners.

KEYWORDS: forensic science, pulmonary tuberculosis, mortality, sudden death, medico-legal autopsy, social risk factors

Differentiation between natural and non-natural death is a major task for forensic medicine, and the preliminary decision about the manner of death at the scene depends on many factors, including medical experience, knowledge of current epidemics, and circumstances. Fatal complications of infectious diseases represent a challenge for the national public health system, clinicians, and medico-legal investigations. Tuberculosis (TB) is a current concern to modern society. Despite the medical establishment's ability to treat and cure TB, the disease has re-emerged as the leading killer world-wide among infectious or communicable diseases. The resurgence of TB reflects various changes in human ecology like increasing long-distance mobility and trade, the social disruption of conflicts, changes in personal behavior, and human-induced global changes. Eastern European countries have witnessed substantial socio-economic changes. These events have been reflected in the epidemiology of communicable diseases, including TB (1,2).

Sudden death from TB complications may cause diagnostic difficulties at the scene or during medico-legal investigation. Society faces a high death rate of homeless and unemployed persons with little information about previous health conditions. Based on data from the Hungarian National Statistical Office, the mortality of respiratory TB from age 20 to 59 years is presented in Table 1. The total number of TB mortality cases suggests a decrease in last decades; however, the mortality rate increased in the capital Budapest after the 1990s. Other cities and villages of Hungary have showed permanent decrease.

Here, we report a case with fatal complication of TB that was initially investigated as a homicide case; however, the medico-legal autopsy results and the multidisciplinary approach eventually proved this case to be a sudden natural death.

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Case Report

During the autumn, a 50-year-old man was found on the street (Fig. 1) in Budapest. Near the body, the pavement was covered by blood. He had no history of medical treatment. The face and the surface of the body were covered by dry blood (Fig. 2). Rigor was present, hypostasis was clear. External examination showed several fresh bruises, injuries on the face and knee. On the left eye, there was subconjunctival petechial hemorrhage.

Autopsy found bilateral pleural adhesions and many TB nodules diffusely bilateral cavernous in lungs (Fig. 3); bronchioles were hardened and dilated, and the pleura and peritoneum showed multiple small yellowish white tubercles. Liver and kidney were congested; cardiomegaly (weight 520 g) was observed with dilated right ventricle. There was no evidence for any violent cause of death, and the connection between external damage and fatal outcome was excluded. Microscopic findings demonstrated many foci of caseous necrosis with Langerhans' giant cells in the lungs. Tubercle bacilli were demonstrated in the lungs by Ziehl-Neelsen staining. No immunological evidence for HIV infection was found. Toxicology tests for drugs were negative. Influence of alcohol was detected as slight degree (blood alcohol concentration: 51 mg/100 mL), urine alcohol was 66 mg/100 mL. Diagnosis was sudden death caused by TB complications by hemoptysis and hemorrhagic shock.

Discussion

There are numerous cases in forensic practice in which evidence of violent death can be proven after careful medico-legal investigation. In our case, suspicion of violence was excluded by post-mortem investigation. The established vaccination program, the available treatment covered by the health insurance, and the experience of a decreasing trend in infectious diseases result in low expectation of fatal TB complications occurring on the streets (3). However, well-trained professionals at the scene provide the effective investigations of crime cases.

In the presented case, the police requested medico-legal autopsy which revealed differences in the manner of death. Problems associated with distinguishing presumed natural death from accident, suicide, or homicide arise during the scene investigation. A study

TABLE 1—*Rate of fatal respiratory tuberculosis from age 20 to 59 years (per 100,000 citizens), Hungary, 1974–2003.*

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1974–1988	
Budapest	8.4	7.7	6.8	6.4	4.9	7.3	6.0	7.5	6.5	6.3	5.4	4.9	5.9	4.4	4.7	6.2	
Cities	6.4	4.7	5.9	4.4	4.0	5.1	5.7	5.2	4.9	4.9	3.5	3.9	2.4	2.6	3.5	4.4	
Villages	3.5	2.9	2.5	2.9	3.4	3.6	3.7	2.8	3.4	3.2	2.5	2.1	2.8	2.9	1.9	3.0	
All	5.4	4.5	4.5	4.1	3.9	4.8	4.8	4.6	4.5	4.4	3.4	3.4	3.3	3.1	3.1	4.1	
	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	1989–2003	1974–2003
Budapest	6.5	6.1	7.1	8.2	9.4	7.0	8.9	7.0	5.0	6.8	6.3	5.1	5.1	3.9	3.4	6.4	6.3
Cities	3.4	3.4	3.7	3.2	4.4	4.0	4.1	3.6	3.6	2.6	3.2	2.3	2.0	1.8	1.8	3.1	3.7
Villages	2.2	2.0	2.5	3.4	3.8	2.9	3.2	2.4	2.1	2.3	1.9	2.0	1.7	1.8	1.2	2.4	2.7
All	3.6	3.4	3.9	4.3	5.2	4.2	4.7	3.8	3.4	3.3	3.3	2.7	2.4	2.2	1.9	3.5	3.8

FIG. 1—*A 50-year-old man was found on the street in the capital Budapest.*

FIG. 2—*The face was covered by dry blood.*

(4) concluded that there is no support for replacing the forensic autopsy by medico-legal external examination alone. In forensic practice, sudden unexpected death has been reported in connection with myocardial TB (5), miliary TB (6), intracranial mass lesions caused by *Mycobacterium tuberculosis* (7), and fibro-cavernous pulmonary TB (8). A review of medico-legal autopsy material (9) suggests a very low incidence of unrecognized active TB, namely 0.05%, and the incidence appears to be lower than among nonforensic autopsies. Asnaes et al. (4) suggested that the proportion of forensic autopsies should be increased to discover previously undiagnosed pulmonary TB.

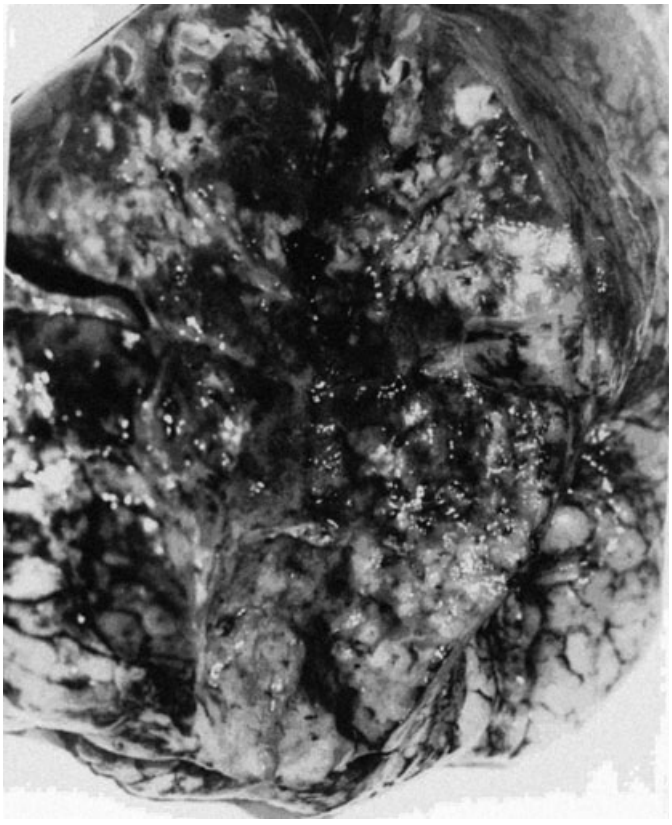

FIG. 3—*Pleural adhesions, many tuberculosis nodules with diffuse cavernous, dilated hardened bronchioles in the lung.*

In Hungary, the Bacille Calmette-Guérin (BCG) vaccination has been compulsory for every newborn since 1954. It appears to be more effective in preventing disseminated forms of TB in children than pulmonary TB (10), which suggests that BCG vaccination limits the multiplication and haematogenous spread of tubercle bacilli rather than preventing primary infection or reactivation of disease in the lung. In addition to the rise of TB observed world-wide, the emergence of drug-resistant TB poses a major threat to TB control efforts, predominantly in Eastern Europe (2). TB can be controlled if effective clinical and public health management is ensured, and there are committed and co-coordinated efforts from within and outside the health sector (11). The epidemic of TB can be controlled only through concerted national and international action (12,13).

Family practice, public health management, and forensic medicine also have diagnostic difficulties with the increasing rate of TB mortality. Social changes, international migration, and rapid

urbanization may assist the increasing rate of infectious diseases, such as TB. Vulnerable populations with unhygienic conditions and close contact are susceptible to microbial colonization (3). The circumstances of death with TB complication may mimic homicide or other violent death. TB declines as socio-economic conditions improve (1,11); in contrast, socio-economic changes are followed by an increasing rate of TB (3,12). Microbes frequently capitalize on situations of ecological, biological, and social disturbance, and vulnerable populations—especially if also socially disordered and living in circumstances of privation, unhygienic conditions, and close contact—are susceptible to microbial colonization (3). In Hungary, a geographical distribution was observed in TB mortality with a high rate in the capital Budapest after the socio-economic change in 1989. The social changes lead to a breakdown in traditional family and health structures, and entail greater personal mobility and a changeable social network. International migration and rapid urbanization boost well-established infectious diseases, such as TB. The mortality rate was 6.2–6.4 deaths per 100,000 citizens in Budapest; however, other cities or villages showed a significantly lower rate, between 2.4 and 3.1 deaths.

Tuberculosis is the largest cause of death from a single infectious agent in the world, killing nearly 3 million people every year (14,15). Mortality from multiple drug-resistant TB, particularly with HIV co-infection, remains high (7,16). In industrialized nations, immigrants have become an increasingly important factor in the epidemiology of TB (17); however, LoBue et al. (18) found that only a minority of foreign-born persons (12%) with active TB were discovered. Another study (19) suggested a re-emergence of TB among children. Khan et al. (17) indicated that a strategy of screening immigrants from developing regions of the world for latent TB infection at the time of their entry could result in substantial health and economic benefits.

In the U.K. (1), true declines in overall case fatality reflect increases in the proportion of TB patients in younger age groups and with low mortality extra-pulmonary disease. Estimations suggest that less than 30% of global TB cases are reported to have received effective diagnosis, treatment, and monitoring (11). TB can be controlled if effective clinical and public health management is ensured, and there are committed and co-coordinated efforts from within and outside the health sector (5). The case fatality rate could be achieved among treated patients through prompt diagnosis, effective and directly observed treatment, and by increasing the proportion of patients treated. The epidemic of TB can be controlled only through concerted national and international action.

Both public health management and forensic medicine have difficulties with the increasing rate of TB mortality, because the circumstances of death may mimic violent death. The collaboration and information exchange among family practitioners and forensic medical specialists can provide a correct interpretation of death cases caused by re-emergence of infectious disease.

We concluded that the new mortality trend in TB, the forensic scene investigation, and determination of manner of death represent new challenges for practitioners. Our results emphasized the need for medical expertise in the investigation of death and that forensic autopsy practice can reveal natural disease masquerading as homicide.

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