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Pathologist and HIV - Are Safe Autopsies Possible?

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Pathologists are at particularly high risk for blood contamination and skin injuries, so they are vulnerable to blood borne pathogens, like HIV. This article describes the first and the only one documented case of occupational HIV transmission in the world concerning American pathologist. The factors increasing the risk of contracting infection during the autopsy on the patient who has died of AIDS are considered. World-known recommendations to follow in such autopsy are described. The importance of compliance with universal precautions and the necessity of knowledge of the post-exposure prophylaxis are pointed as a way to avoid HIV infection.

Whether pathologists like it or not, there are amongst professionals those who are occupationally exposed to HIV (human immunodeficiency virus) infection. Firstly, they are ethically obliged to diagnose patients living with the virus. The role of such biopsies in medicine is to limit the mortality and morbidity rates of AIDS (acquired immune deficiency syndrome), which remains undisputed [12, 18, 21]. With 40 million cases of HIV infection all over the world, pathologists, like other medical personnel, expose themselves to retroviral infected blood and tissues on an everyday basis [28]. Secondly, despite two decades of research into AIDS, there is so much to be learned from the associated mortalities. Those who have had the opportunity to study this disease during an autopsy recognise a lot of unexpected factors. Many infections and neoplastic complicating disorders may not have been recognised during the deceased life-span. An autopsy allows us to see the full range of lesions caused by impaired host's responses. It allows for the development of sufficient familiarity with the morphologic presentations, which, despite AIDS, are very uncommon [8]. Furthermore, it is important to establish arguments for the necessity of an AIDS autopsy. In that, the value of the information likely to be derived by the autopsy should be weighed against a small but real danger involved (a risks-benefits analysis).

Of the three hundreds, or so, cases of occupationally acquired HIV infection among health care workers (HCWs) most were nurses and laboratory workers. It is already

known that infectious HIV has been discovered in 5% of blood samples obtained from AIDS patients at 24 hours post mortem. Infectious retrovirus has been also recovered from tissue, bone and blood following a post mortem interval of six days, from spleen following an interval of two weeks [17]. Postmortem viral level is influenced by numerous factors, including viral burden of death, viral strain, pre-mortem antiviral therapy and morgue temperature [12].

There have been only two cases of HIV infections among pathologists in the world, both of which were identified as likely to having been infected in the work setting, including one well-documented case of an autopsy acquired infection in a board certified staff pathologist from the USA [11, 12, 16].

The doctor acquired the HIV infection in 1992 while he was performing an autopsy on a 47-year-old man. The patient died of progressive neurological deterioration and the autopsy was requested to characterise the patient's brain lesions. The autopsy was begun five hours postmortem* twelve hours into the pathologist's work day. The doctor wore a disposable "spacesuit" with hood, a waterproof apron, a surgical mask with a face shield, shoe covers, sleeve protectors and two pairs of latex gloves. The wound occurred while retracting the scalp from the skull, which was stabilised by a standard head block. The pathologist's left hand which was retracting the scalp with a round scalpel slipped resulting in a wound approximately 1cm in depth in the left first digit. The wound was immediately rinsed with undiluted Clorox and washed with water and povidone iodine. An infectious disease physician was consulted an hour later and it was decided not to institute the post exposure prophylaxis (PEP). The doctor had no history of blood transfusion, parenteral drug use or risky sexual contacts. His last sexual partner remains negative by ELISA. The pathologist's HIV-antibody test was negative just after the accident, but became positive six weeks later [12].

*In Poland autopsy is performed 12 hours post mortem

The factors responsible for HIV infection in this case study should be considered. Such analysis may be useful in drawing conclusions on how to prevent such situations in future. As there is a lack of both: the effective vaccine and a cure to eliminate the virus from all body reservoirs, prevention is the only way to stop the spread of HIV in medical setting.

An "exposure" that may place a HCW at risk for HIV infection is defined as a:

- percutaneous injury (e.g., a needle-stick or cut with a sharp object),
- contact of mucosa or non-intact skin,
- contact with intact skin when the duration of contact is prolonged (i.e., several minutes or more) or involves an extensive area, with blood, tissue, or other body fluids.

Prospective studies of HCWs have estimated the average risk of HIV transmission after a percutaneous exposure at 0.3%. On average 99.7% of HCWs, who are exposed to HIV, will not be infected. For mucosa exposure the risk is 0.09% and for non-intact skin even less. It increases when the exposed skin is chapped, abraded, or afflicted with dermatitis. In the context of an autopsy it is worth mentioning that, except blood, some other body fluids are potentially infectious:

- semen,
- vaginal secretions,
- cerebrospinal, synovial, pleural, peritoneal, pericardial, amniotic fluid [2, 3, 5, 16, 20].

Although the pathologist described above used two pairs of gloves, he sustained a cut with a scalpel. Regrettably, such situation is quite frequent during autopsy. It has been proven that every fifth glove is permeate or becomes permeate during the necropsy. Weston and Locker showed an 8% prevalence of glove punctures across HCWs in the mortuary, and 3 - 4 fold increased risk of puncture if a technician rather than pathologist eviscerated the body. However, 31.8% of glove punctures go unnoticed, and this is where the danger of prolonged skin contact with potentially infected material lies [29]. Although not every glove perforation results in hand injury, autopsy skin cuts remain common (occurring in approximately one in eleven autopsies performed by residents, and one in fifty-five of those performed by experienced pathologists). Mortuary personnel should also note that approximately 67% of scalpel wounds are inflicted in the area consisting of the distal thumb, index and middle fingers of the nondominant hand [12]. The case mentioned above documents this observation.

Thus protection of the retracting hand remains critical. Use of Kevlar gloves with two layers of latex gloves or chain mail gloves is recommended. However, the last type of glove is criticised by pathologists because of the clumsiness, par-

ticularly when holding instruments, and of the uncertainty concerning their efficacy in preventing penetration by sharp instruments. According to Geller, such gloves do have a role in the removal of pelvic contents [8]. That is, the frequent changing of gloves, whether or not there are obvious tears or leakage is recommended to reduce the risk of a pathologist being infected [8, 21, 29].

In one retrospective case-control study from France, Great Britain and the USA a group who had had percutaneous exposure to HIV and acquired the infection was compared with those who had remained healthy. The study suggested that several factors may affect the risk for HIV transmission after occupational exposure:

- a procedure that involved a needle placed directly in a vein or artery,
- a device visibly contaminated with the patient's blood,
- a deep injury,
- source-patient with terminal illness [3, 5, 13, 20, 23].

Three of these risk factors were present in our case study.

The type of the instrument used during autopsy plays an important role, as it influences the number of HIV contaminants in the incision. The scalpel blade, which caused the wound during the aforementioned incident, was visibly contaminated with blood infected by HIV. Consequently, and according to the literature, the risk of infection is five times higher. Additionally, the injury was 1cm in depth, so the risk of HIV infection increased approximately six-fold [13, 23].

Thus far, our knowledge of HIV infection shows the highest level of viral load occurs in two stages, with a ten year interval between them. The first peak is observed during seroconversion period, the second one when the patient gets AIDS. It has been proven that exposure to blood obtained from a patient with terminal illness is associated with six times increased risk of contracting HIV infection. The number of viral particles in 1ml of blood, in this very moment, is 10 to 100 times larger than in the asymptomatic stage of infection [7, 11, 12, 23]. In our case study the autopsy took place five hours postmortem, therefore the viral load in the patient's blood should be considered very high.

Although antiretroviral treatment usually decreases the viral load, in our case it became less effective after one-year therapy. The number of CD4 cells was hugely reduced (30 in 1mm^3) just before death, and this was an obvious marker of the progression of AIDS.

Actual information about primary HIV infection indicates that systemic infection does not occur immediately. Data from studies in animal models and *in vitro* tissue studies suggest that dendritic cells in the mucosa and skin are the initial targets of HIV infection. In a primate model of simian immunodeficiency virus (SIV) infection, which is similar to HIV, infection of dendritic-like cells occurs at the site of

inoculation during the first 24 hours following skin exposure. During the subsequent 24 - 48 hours the migration of these cells to regional lymph nodes occurs and the virus is detectable in peripheral blood cells within 5 days [25]. Such situation is a chance for antiretroviral PEP and this may prevent, or inhibit, systemic infection by limiting the proliferation of the virus towards the initial target cells or lymph nodes. It has been proven that PEP reduces the risk of HIV infection by approximately 79% [3, 9, 13, 16, 19].

From this point of view, the decision against PEP made in the case of the American pathologist is open to discussion. In 1992, when the incident occurred, such treatment became widespread. Although only zidovudine was recommended, more than 40% of HCWs reporting HIV exposures in the USA elected such treatment [7, 16]. According to current Centers of Disease Control (CDC) recommendations, in the incident described in our article (large quantity of blood - deep injury, device visibly contaminated with the patient's blood, as well as high viral load in a patient who has just died of AIDS) a combination of two or three drugs should be implemented as PEP. Such regimen is also available in Poland [3, 7, 9, 23, 24]. What is striking, is that in one documented in 1994 case of HIV seroconversion concerning an Italian surgeon, PEP (although recommended by an infectious disease consultant) was not implemented either. It had been established that the female surgeon declined the offer [6, 10].

A rational approach to the safe conduct of AIDS autopsies incorporates several elements: experienced and well-trained personnel, the use of recommended safety devices and appropriate work practices as well as vaccination against hepatitis B [8, 12, 21, 29]. During the autopsy on the HIV subject everyone should remember that the pathologist is the most important factor in assuring the well-being of the pathologist. The greatest danger is not the case itself, but the doctor's lack of regard for the potential risk. In the autopsy room there is no place for fear or ignorance. Although not all injuries are preventable, they should not be the result of carelessness, mistake or negligence. Necropsies are burdened with measurable and well-documented risk of accidental injury, which is greatest among inexperienced personnel. As occupational practice results in a decrease in the injury rate, in AIDS autopsies the personnel should be competent and experienced [12, 21, 27]. What is obvious, is that such recommendations concern surgeons operating on HIV infected patients [17, 26]. Clearly, individuals who have wounds, weeping skin lesions or other dermatitis, who are immunosuppressed or immunodeficient should not participate in the autopsy [8]. The autopsies should be planned to avoid inordinate time pressures and fatigue. All precautions, although time consuming, are absolutely essential.

Personnel should be equipped with protective items such as: double pair of latex gloves, Kevlar or chain mail

gloves, face shields or goggles/safety glasses and masks, hair covers, waterproof aprons, long-sleeved surgical clothing with water-repellent sleeves, either attached or separately provided, protective shoes with water-impermeable shoe-covers [8, 12, 15].

Pathologists should avoid any cuts or needle punctures. Instruments should be used rather than fingers, and more care should be taken in handling them. Additional measures such as using rounded scalpel blades and placing towels over sharp bony projections are recommended. The safest cutting instruments are scissors and there are very few instances where scissors cannot replace knives. Non-pointed scissors should be used wherever possible [4, 8, 15]. In the case mentioned above, the circumstances of the injury suggest that using fingers to hold tissue while making an incision is a risk factor for percutaneous injury and should be replaced by minimal-touch techniques. Blades should not be passed from one prosector to another. They should be put down on a firm, stable surface by one prosector and then picked up by the second [8, 10, 17].

Fortunately, there is no evidence to suggest transmission of HIV by aerosolisation [8, 13, 14, 17, 21]. However, with the emergence of active tuberculosis in AIDS patients all over the world, as well as in our country, extraordinary care must be taken to avoid the creation of aerosols that may transmit tuberculosis. As there is considerable aerosolisation with the oscillating saw, a vacuum attachment has been recommended. The primitive suction devices must be eliminated from morgues and replaced by surgical-type vacuum reservoirs that are connected by appropriate filters to the hospital vacuum lines [8, 21, 22, 28].

It is the responsibility of the employers to provide an adequately equipped and safe morgue facility. The pathology directors should consequently exact the recommendations made by several authorities [8, 12, 20, 21]. Lighting must be adequate, the room must be properly ventilated and the equipment and any contaminated surfaces promptly cleansed, treated with disinfectant and well maintained.

Estimating the post-exposure risk of contracting HIV infection can be complicated, so it is necessary to consult an infectious disease specialist as soon as possible (1 - 2 hours). The exposure should be evaluated for the potential to transmit HIV or not, and whether PEP is necessary or not, based on the type and severity of the exposure, as well as source-patient's serological status [6, 9, 13, 20, 24].

Certainly, there is an unknown number of HIV infected persons who died for many other reasons, without any testing for HIV-antibodies:

- accident victims with acute retroviral infection and high viral load,
- myocardial infarction patients with seropositivity,
- individuals with cerebrovascular accident and a history of transfusion with HIV infected blood.

In this context every patient should be considered potentially infectious [3, 8, 13, 15, 27]. Adherence to universal precautions, modification of procedural techniques and knowing the principles of PEP are the only way to minimise the number of occupationally acquired HIV infections among pathologists. Let the motto: "*hic locus est ubi mors gaudet succurrere vitae*", which adorns the walls of many autopsy rooms throughout the world, be still a live issue.

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