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HIV/AIDS and the teaching and learning of anatomy

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Objectives: To assess the level of risk of contracting HIV from HIV infected cadavers by staff and students who may use them for teaching and learning anatomy. Similarly, the risk of transmission of HIV between surgeons and surgical patients was assessed.

Design: Literature review.

Setting: Department of Anatomy and the Medical Library at the Medical School of the University of Zimbabwe, Harare, Zimbabwe.

Subjects: Journal articles, letters to editors of journals and books published between 1905 and 1996.

Main Outcome Measures: Distribution of HIV in the human body; survival period of the HIV in the human body after the death of host tissue; routes of HIV transmission; transmission of HIV from HIV infected surgeons to their patients or contraction of HIV from HIV infected surgical patients by the surgeons and the effect of embalming chemicals on HIV.

Results: HIV is distributed in body fluids, tissue transplants such as kidneys and bones. The HIV survives for up to 16.5 days *post mortem*. The routes of HIV transmission include sexual contact, tissue transplantation, body fluids but exclude surface-to-surface contact. The risk of transmission of HIV between surgeons and surgical patients is low. Commonly used embalming chemicals are effective against the HIV.

Conclusion: The risk of transmission of HIV from HIV-infected cadavers to users of such cadavers appears to be limited to the pre-embalming stages and within the first three weeks *post mortem*. The risk of transmission of HIV between surgeons and surgical patients is minimal. Therefore, if we are to achieve the fulfilment of the affirmation that dissection of cadavers remains the best method for teaching and learning of anatomy, it would appear to us that there is an urgent need to formulate precautionary measures that will greatly reduce the risk of acquiring the HIV from donated, HIV infected cadavers.

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Introduction

Anatomy, a word derived from the Greek words "ana" (across) and "tomin" (section), is the study of the composition of the body by cutting and separating its structures one from the other in order to examine their shapes, relations and connections to one another.¹ Therefore, most lecturers involved in medical education will agree that dissection of human cadavers is the best method of teaching and learning anatomy. This method allows one to personally dissect the cadaver. During this process, one sees, touches and handles anatomical structures. This experience leads to a better understanding and long term remembrance of the subject. In addition to this, the observations made on several cadavers enable the student and the teacher to appreciate the presence of variations of the human structure; an experience which assists medical practitioners in physical diagnosis.²

The method of teaching and learning of anatomy by dissecting human cadavers is closely followed only by the provision of prosected specimens for careful examination.² However, attempts have been made at some centres to replace the use of cadavers with electronic and computer aided instructions for reasons of escalating cost of cadaver procurement or non-availability of suitable ones. These methods use simulated cadavers ("virtual cadavers") which are at best anonymous and more importantly, not human; and lack the traditional dissection experience that is required by students for the appreciation of natural variations of human structure.²

Furthermore, in addition to the current trend of trying to move away from the use of cadavers in the teaching and learning of anatomy for the stated reasons, there are other factors that militate against their use. These include religious beliefs, emotional effects of dissecting human cadavers and the possible transmission of communicable diseases. An important dimension to the latter is the Human Immunodeficiency Virus (HIV) that causes the Acquired Immune Deficiency Syndrome (AIDS).

Not only has effective treatment of this clinical syndrome evaded scientific efforts, but there are still doubts as to how completely we know the mode of transmission of the virus from infected persons to their uninfected neighbours. As a result of this, anatomy students, technicians and lecturers alike, are weary of handling cadavers of people whose past medical history and specific cause of death are not known. The seriousness of the situation can only be fully appreciated when it is realized that the percentage of deaths occurring due to HIV/AIDS related medical conditions is on the increase³ and that time may soon come when the only cadavers that are available to departments of Anatomy may be those of people who had died from the effects of AIDS.

If the use of cadavers in the teaching and learning of anatomy is to be sustained, the problem associated with HIV/AIDS and the use of cadavers of known HIV/AIDS victims must be examined scientifically with the hope that a recommendation may be made that may ensure an acceptable level of safety for handlers of all categories of cadavers.

Viability of HIV in Cadavers of AIDS Victims.

Assessment of the viability of HIV in cadavers requires that some basic questions be answered. These include:

1. What is the distribution of HIV in the human body?
2. How is the virus transmitted?
3. For how long does the virus survive after the death of the host tissue?
4. Does the virus survive the chemicals that are used for embalming cadavers?

1. Distribution of HIV in the human body: The virus is present in body fluids such as blood, pleural fluid, pericardial fluid⁴, vitreous fluid and bile⁵ and tissue transplants such as those of kidneys⁶ and bones.⁷ However, cartilage transplants from known HIV/AIDS victims were found to be free of the virus.⁸

2. Routes of transmission of HIV infection: It has been established that HIV is transmitted by sexual contact, through tissue transplants and body fluids.⁹ In surgical practice, however, where surgical intervention, whether for diagnostic or therapeutic purposes continues to play a major role in the management of HIV/AIDS patients¹⁰ the issue of HIV transmission between the surgeon and his/her patient remains controversial. Retrospective studies conducted on surgical patients who had been operated upon by HIV infected surgeons suggested that no HIV transmission occurred from the surgeons to the patients.^{11,12} On the contrary, in one report which involved an HIV infected dental surgeon, five out of 1100 of the patients operated upon by him were found to be HIV positive.¹³ Unfortunately, it would be difficult to accurately identify the source of the HIV infection in these cases since their HIV status was not previously known. Therefore, these studies suggest that the risk of HIV transmission during an operative procedure from a surgeon to his/her patient is very low. This observation justifies the result of surveys of the attitudes of surgeons to HIV/AIDS patients, which showed that most surgeons are willing to continue to operate on these patients.¹⁴ Some surgeons have, in fact, supported the idea that an HIV infected surgeon should continue to operate on his/her patients despite his/her HIV status.¹⁵ This is because they believe that taking precautions and using safe surgical procedures when operating on HIV/AIDS patients markedly decreases the risk of HIV transmission between them and their patients.¹⁶⁻¹⁸ However, there has been no study to demonstrate the existence of HIV transmission from surgical patients to surgeons.

Other modes of transmission such as liquids other than blood (water), aerosols (airborne transmission) and surface contact, have previously been investigated. Although some of the investigations were by indirect methods, it has been shown that HIV can survive for up to 11 days in unchlorinated water especially in the presence of organic matter.¹⁹ There is yet, however, no evidence for the transmission of HIV through treated drinking water.⁹ The survival of HIV in aerosols and on inanimate surfaces was observed to depend on the nature of the liquid medium, the ambient temperature, relative humidity and exposure to light and chemicals.^{20,21} Although some unexplained cases of HIV infection among health workers have been ascribed to one or the other of these non-parenteral suspected methods of transmission^{22,23}, it is also impossible to completely exclude the more conventional routes of transmission in these cases.

3. Survival period of HIV in the body after death: The HIV has been isolated from a pericardial effusion obtained 155

days post mortem and also from blood obtained 16.5 days post mortem.²⁴

4. HIV survival in chemicals used for embalming cadavers: Suspension tests have shown that 25% ethanol and 0.5% formalin are effective against HIV.²⁵ However, extrapolation of these results to embalmed cadavers is difficult because other factors such as concentration gradient of the embalming chemicals and the tissue barrier which these chemicals have to penetrate in order to reach the intracellular location of the virus would come into play when considering their effect on HIV in cadavers.

Summary of Present State of Affairs.

The HIV is known to be transmitted parenterally from blood and other tissue fluids, tissue transplants and by sexual contact. However, the risk of transmission from an HIV infected surgeon to his/her patient during a surgical procedure is uncertain. In addition to this, it has not been shown conclusively that the virus can be transmitted in aerosol form, in water or by surface-to-surface contact. The HIV survives in unembalmed human cadavers for up to 16.5 days after death and could be destroyed by low concentrations of common embalming chemicals such as ethanol, formaldehyde, glutaraldehyde, phenol and chlorine-producing disinfectants.

The Way Forward.

As a result of the fear expressed earlier about the safety or lack of it, when handling and/or using cadavers of known HIV/AIDS victims in the teaching of anatomy, two options are open to Departments of Anatomy. Either :-

1. They abandon the use of real human cadavers and turn to the use of "virtual cadavers" if non HIV infected cadavers cannot be obtained in required numbers
2. They formulate precautionary measures that will greatly reduce the risk of acquiring the infection.

If we are to achieve the fulfilment of the earlier affirmation that dissection of cadavers remains the best method for teaching and learning of anatomy, the way forward will have to be the second option.

Conclusion.

It appears that there is a potential risk of HIV transmission associated with the handling of HIV infected cadavers within the first three weeks post mortem and before they are embalmed. If appropriate precautionary measures are put in place especially during embalming of cadavers, the risk of infection could be greatly reduced if not eliminated. Therefore, efforts should be made to study the viability of the HIV in unembalmed cadavers after using various chemical agents at varying concentrations.

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