Virtopsy - an alternative to the conventional autopsy

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Abstract: At present, the autopsy reports are based on a subjective, descriptive method. The technical progress of the imagistic domain led to the development of objective, non-invasive and non-destructive methods, whose utility manifested itself within forensic medicine, too. It developed the concept of virtopsy, an alternative to the conventional autopsy, using the imagistic modern techniques, whose results were quantified in comparison to this. Results show that in case of using this uniform and objective method that preserves the forensic evidence, some data important for the expertise, for instance regarding the morpho-pathological aspects, the vital signs and responses, the cause of death, the reconstruction of events- are superior to those provided by the conventional autopsy, existing though domains which offer fewer information. At the same time, virtopsy represents an alternative for the religious communities that do not accept the autopsy or impose strict conditions. Ethically, virtopsy ranges among the methods which support the respect for the human being, the right to intimacy even after death.

Key words: autopsy, virtopsy

The autopsy (from the Greek autopsiā, which means “to see with one’s own eyes”) is a method dating from ancient times. The first in this domain were the Chinese, who used it to examine the animals’ internal organs. The ancient Egyptians applied it on human beings too.

Although at present, remarkable progress has been made in this domain, yet nowadays the autopsy reports are based on a subjective, manual, descriptive method. In parallel, the technical progress developed objective and, at the same time, non-invasive/minimally invasive and non-destructive investigation methods belonging to imagistic domain. The ulterior rapid development of CT and NMR imaging techniques led to the idea of their using for post-mortem investigation.

The use of imagistic in the domain of forensic medicine presents numerous benefits:

- professional, contributing decisively to a uniform research of facts, supporting at the same time a better understanding of events;
- scientific, through the development of new protocols and imagistic sequences;
- social, representing an alternative for certain religious communities and certain cultures that do not accept the autopsy, regarding the human body as intangible even after death and, at the same time, it eliminates the emotional stress of the deceased ones’ families, the existent false beliefs and myths. Also, these methods facilitate the examination of the infectiously or toxically contaminated corpses.

The imagistic uses in forensics are extremely numerous. The micro-imagery (micro-CT, micro-NMR) offers an opportunity of non-destructive histological examination of naturally preserved specimens through sections in any plan and tridimensional images. The digital capture of the smallest details on the skin surface can be achieved through the 3D digital modeling of the surfaces; at the same time, the method contributes to the identification of the suspected incriminatory agent, according to
form, size and action angle. As for the biomechanical body models, they make the connection between the ballistic research and forensic one.

As an alternative to the conventional autopsy, a complex research team from the Institute of Forensic Medicine within the University of Berne, Switzerland suggested the “virtopsy” a project that aims to implement the modern radiological techniques for the benefit of the forensic sciences. Notably, the authors wished to eliminate the prefix “auto”, an element that suggested subjectivity. The project’s components and objectives are represented by:

1. Radiological Imagery (MSCT and NMR);
2. Surfaces’ Photogrammetry and 3D Scanning;
3. Medical Images Processing;
4. NMR Spectroscopy;
5. Body Models Development.

Within this project, a number of 40 forensic cases until the year 2006 (data obtained on the internet sites) were examined through MCST/NMR and conventional autopsy. The comparative evaluation of the radiological and conventional autopsies was made taking into account the following 5 aspects:

1. Medical Cause of Death;
2. Relevant Morpho-Pathological Modifications;
3. Vital Responses;
4. Lesion Reconstruction;
5. Death Cause Re-examination and Visualization.

Regarding the first aspect, 26 of 47 (55%) causes of death discovered in autopsy were independently identified through imagistic methods. The radiological diagnosis was equivalent or superior to the autopsy one in the trauma cases. The only imagistic solution in the cases of death from hemorrhage was the aortic collapse. As opposed to this, the signs of heart insufficiency (n=6) and of fat embolism (n = 2) could not be identified through imagistic methods.

The comparative morpho-pathological observations revealed the fact that the virtopsy, by using the NMR techniques was highly superior to the conventional autopsy for the traumatic lesions: cranio-cerebral, bones, of soft tissues and organs, but inferior to those caused by organic diseases. At the same time, the MCST was superior to the autopsy in the case of the bones traumatic lesions, equivalent with it in those determined by cranio-cerebral traumas, but inferior to it in the traumas of the soft tissues and organs, and in organs’ diseases.

From the point of view of the vital response study, the comparative analyses showed the same results in the case of the MSCT and NMR techniques use, both being superior to the conventional autopsy for pneumothorax, subcutaneous emphysema and aeroembolism, but inferior to it in hemorrhage and fat embolism. It does not identify the vascular or metabolic modifications, because the contrast substance cannot be injected.
The virtopsy techniques have contributed significantly to the events’ reconstruction, proving their utility. In cases of lesions due to traffic accidents, the axis and the impact force were identified for all victims through these techniques. In cases of lesions due to firearms, the bullet channel, the bullet’s entering and escape places were identified; at the same time, it could establish the order in which certain fractures were produced and the probable type of ammunition. The lesion’s depth and orientation are data provided by these techniques in the punctured and/or cut wounds. In the case of burnt corpses, it could determine the direction of flames as well as the tissues’ carbonization degree.

From the point of view of identifying the death cause, the benefits of the techniques used by virtopsy are indisputable. The imagery’s 2D, 3D reconstruction possibilities are highly superior to the oral description. The 2D and 3D reconstruction methods improve significantly the clarity and understanding of the evidence presented by the experts. At the same time, the stored digital images can be re-examined or sent to another centers, when a second opinion is needed. In comparison to the clinical imaging methods, these techniques have a higher resolution due to the absence of the artifacts due to movement and of the limit radiation dosage.

Virtopsy can be assessed not only from the point of view of scientific benefits but also from its socio-ethical aspects. The fact that the human body integrity is preserved through the applied techniques represents another proof of the respect for the human being, even after his death. There still are religions that forbid the autopsy or accept it only on certain conditions. In Judaism and Moslem religion, the human body represents the mirror of the soul; therefore it is intangible, acquiring thus a sacred aura. Thus, Judaism accepts the autopsy only on the condition that it could bring direct benefits to other persons, like finding the cause of an epidemic etc. In other religions’ case, there is the impossibility of separating the soul from the body, the idea of unitary transformation of the deceased and transcendence to other dimensions is conditioned by the natural integrity as the man was born, lived and died. The social stigma in such cases, if the autopsy forbidden were still performed, would have serious consequences like the impossibility of practicing the funeral rituals, the rejection by the community of the deceased family members with no possibility of later re-integration etc.

From ethical point of view, we are of the opinion that before doing a good thing, we have a duty not to do wrong. Applied in the autopsy domain, this would mean that, although its benefits are undisputable, yet from the point of view of “sacrificing” the body integrity, the prejudice brought to the former being is a major one; the respect for the human being should exist after his death and, although at present we cannot consider the autopsy as lack of respect, we have to admit that besides benefits, the autopsy has significant shortcomings.

We should not leave out the fact that the human being is intimately and inseparably identified with his body and it is impossible to regard death in this context only from a scientific point of view, without religious implications. One more argument would be that Western languages say “man has a body”, while in the Eastern parts, the man “is a body”. If we consider things from Christian anthropology perspective, the body is not only the exponent of the physical dimension but it represents the symbol of the human being as a whole. In the first Epistle to Corinthians (6, 19) the moral-religious significance of the body is clearly defined: “What? Know ye not that your body is the temple of the Holy Ghost which is in you, […]?” As long as Christianity offers us the perspective of Resurrection, of “Life after Death”, the respect for the human body acquires the dimension of the respect for this promise.

From this point of view, virtopsy represents an alternative method that solves a great number of the shortcomings like body dissociation, as a technique which regards the person with more empathy and humanity after his death, too.

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<th>VITAL REACTION</th>
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<th>CIRCULATORY SYSTEM</th>
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<th>RESPIRATORY SYSTEM</th>
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The Relative Value of the Method In Comparison to the Autopsy:
- inferior to autopsy; =equivalent to autopsy; + superior to autopsy
At the same time, in most of the cases the autopsy is a practice refused by the family members exactly on the grounds of respect for the deceased, respect shown by protecting his body integrity. There is the belief that the soul can leave the body only on the condition of unity and harmony obtained by performing certain rituals, especially religious, but also socio-cultural. Thus, the impact of the conventional autopsy on the family members is extremely strong. The deceased body reveals his last image, sometimes different significances being associated to it: according to the countenance, the family members see if their dear one suffered or not, if the end was an easy or a tormented one, the impact of this image being very powerful. The body significance is often identified by the family members with the dead person himself, whose memory is very important. From this point of view, we can discuss about the moral-ethic imperative to respect the family mourning, virtopsy bringing its substantial support to this.

The corporal integrity can be also regarded from the point of view of the right to intimacy, as an option to the personal information which a patient alive would and could reveal only on certain conditions. The autopsy’ social stigma is extremely important and at the same time visible in the case of the conventional autopsy; thus we can affirm that the intimacy is violated on one hand by the forensic staff and on the other hand, by the community members who find the “stigma”.

If virtopsy proved its supremacy over the conventional autopsy in certain types of lesions, then maybe it should become a routine in such cases where it is highly superior to the classic techniques. The inconveniency is the financial aspect, the utilitarian criterion of cost-benefit analysis; in a transition society like the Romanian one, it would be extremely difficult, if not impossible to determine the routine practice of virtopsy techniques in certain cases, although the high costs could be partially compensated by the possibility of examining a high number of corpses in a shorter time and with fewer employees. But, surely the principle of justice and fairness would not be respected since the inhabitants from the poor areas could not benefit from such expensive technologies, and introducing a supplementary tax which the family would pay, if they wished a “different” autopsy would lead towards injustice in services; thus, keeping the body intact would be a privilege for the rich people.

Virtopsy represents not only the first step towards a better acquiring of information regarding death causes, lesions’ types etc. through modern technologies, but also an alternative that ensures the right to body integrity, to intimacy, attributing an intrinsic value to the human body. At the same time, virtopsy avoids social stigma, whose huge prejudices would manifest on the family members and on the deceased person, influencing the image of his life. Thus, the religious value and moral significance of the body are respected. So, could it be just a matter of time until virtopsy “dethrones” the conventional autopsy?

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