

Knowledge, Awareness and Perspective about Virtopsy among Dental Students in Tamilnadu - A Survey

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Abstract: *The gold standard in forensic medicine for establishing the cause and manner of death is still an autopsy. "To observe with own eyes" is the meaning of the word "autopsy". A corpse is thoroughly examined during an autopsy, recording all anatomical details, surface wounds, histological findings, and cultural studies. The phrases "virtual" and "autopsy" were combined to create the term "virtopsy". Virtopsy is the virtual dissection of the human body through radiographic imaging to analyze the internal aspects of the body to find the reason of death. Virtopsy may provide an efficient and more accurate view of the individual case through images. It is quickly acquiring significance in the forensics community. Forensic odontologists have recently employed this strategy, although it hasn't yet gained notoriety in the field.*

Keywords: Autopsy, Virtopsy, Radiology, Forensic odontology, Dental autopsy.

1. Introduction

Autopsy is the scientific examination of bodies after death, where the whole surface of the body as well as all the body cavities is explored to record the findings [2]. While doing so, we have to collect all the possible findings, which will help in establishing the circumstances leading to the death and also may help the law enforcing agencies [2]. At the same time, it is also equally important to consider the sentiment of the relatives of the deceased, who are always upset at the conventional autopsies [1]. So, if there exists a means by which all the findings in the body can be collected other than conventional, it should be accepted by all [6].

The procedures for doing autopsies were invented a long time ago, and they continue to be performed using the same antiquated methods even now, despite the fact that forensic medicine as a whole has experienced remarkable growth and technological advancement in other areas [2]. A preliminary step in this direction is Virtopsy [2].

The term virtopsy came from virtual autopsy, which is a scalpel free procedure of autopsy carried out using modern medical, imaging and measuring technology [3]. Here, there is no need of any dissection of the body for opening the body cavities or dissection of the different organs of the body [2]. Using the different imaging techniques, which provide a complete three - dimensional view of the inside as well as outside of the body, all the vital information like the position and dimensions of the wounds, or other pathological conditions in the body can be known and documented without the use of any scalpel [2]. The procedure might provide a less invasive option than the common one, which disturbs many families and is forbidden by various religions [2].

The Virtopsy, or "virtual autopsy" was developed by Richard Dirnhofer, former Director of Forensic Medicine, Berne, which was then continued by his successor, Michel Thali and his colleagues at the University of Berne's Institute

of Forensic Medicine, Switzerland. According to Thali, a forensic pathologist and project manager for Virtopsy, "If you are doing an autopsy, you are always damaging the 3 - D geometry of the body." "The same findings can be non - invasively documented using this cross - section imaging approach [2].

2. Methodology

A questionnaire survey was conducted among the UG and PG dental students and dental practitioners across the state of Tamilnadu to assess their awareness and knowledge about the virtual autopsy. Ethical clearance from the institutional review board was obtained. The survey was conducted by generating online google forms and circulated through social media platforms. The questionnaire comprised of 20 questions which has the combination of both selected responses to certain questions and some close ended questions (yes/no/not aware of). After agreeing to an informed consent form, the questionnaire was given to each volunteer. Each respondent was given a brief explanation of the study's objectives before responding to the questionnaire, and information confidentiality was assured.

A total of 201 dental students and dental practitioners across Tamilnadu participated in this survey. All the participants were briefed about the purpose of the study and an informed consent was obtained before the survey through Google forms and assured that their participation was purely voluntary.

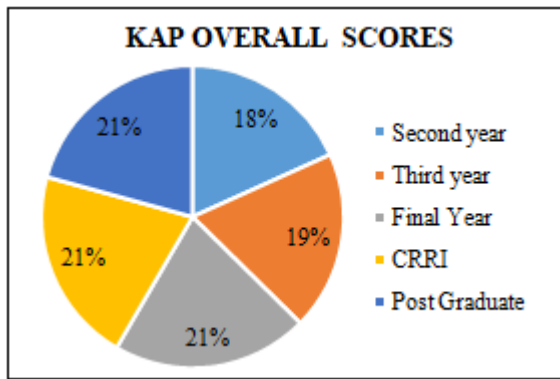
Statistical Evaluation

Non - probability, convenient stratified sampling technique was employed in this observational study having a cross - sectional design. Responses were noted among the selected population group under the study and evaluated for statistical analysis by SPSS software Version 24.0.

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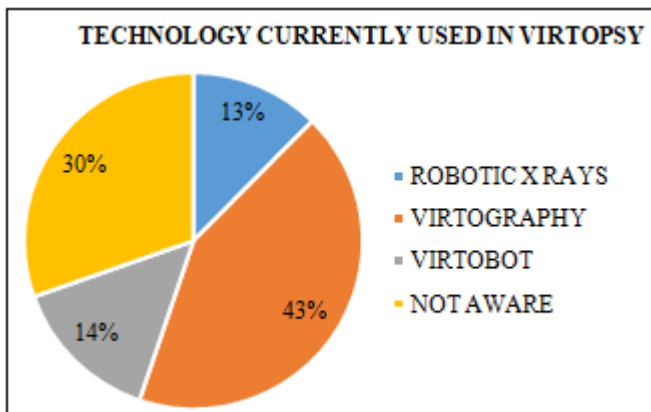
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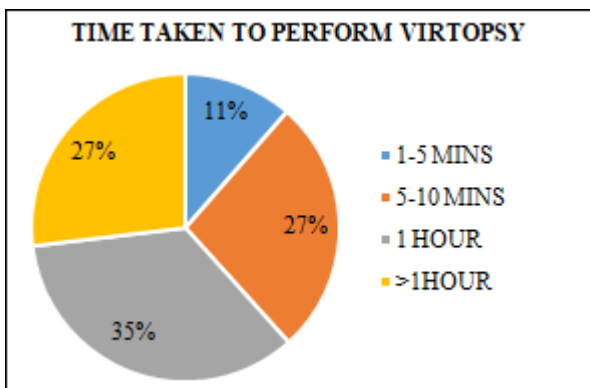
3. Results

On analysis of the data, it was observed majority of the study participants (28.85%) were internship students followed by (27.36%) third years, (26.36%) Second years and least being (8.45%) final year students respectively.

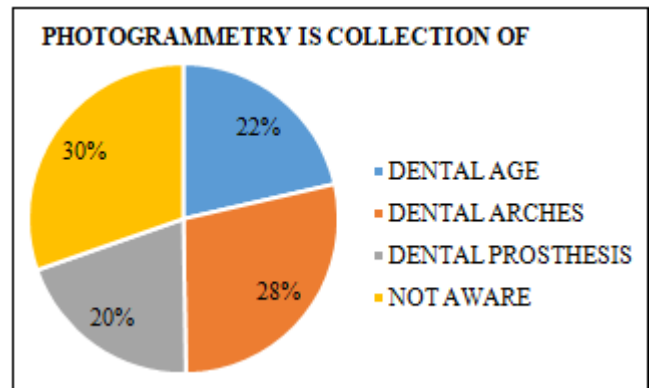
In the present study on analyzing the knowledge about virtopsy 75.5% of the participants were aware of it. Around 59.7% of students are aware that radiographic images are used in virtual autopsy. 86.6% of participants are unaware of the VIRTOTOP technology.



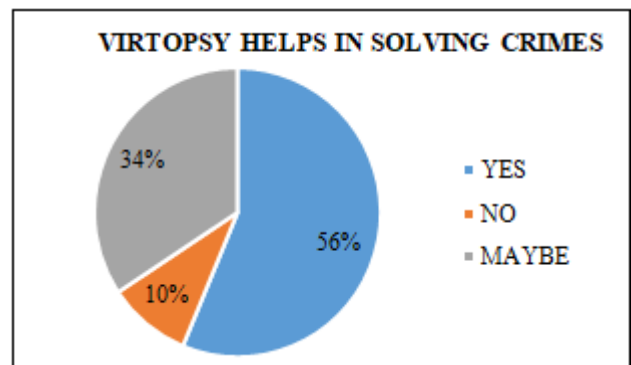
About 88.6% of participants are unaware of the time management of virtopsy. Around 54.2% of students are aware that virtopsy can be performed by forensic dentists, forensic odontologists, and pathologists. The term VIRDENTOPSY was unknown to 71.6 percent of students. Among the participants 49.3% choose 3D photogrammetry for bitemarks evaluation.



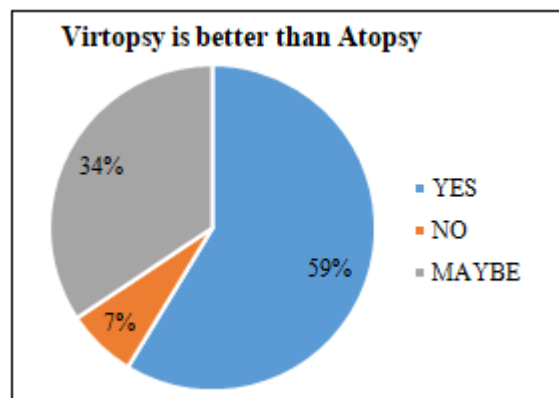
Around 41.3% of the participants were unaware that PM angiography is utilized in virtopsy to visualize CVS. On analyzing the perspective, around 72.1% of participants agree that virtopsy is used for facial reconstruction. About 79.6% of students agree that internal bleeding, bullet paths and hidden fractures can be easily detected in virtopsy.



Approximately 77.6% agree that virtopsy allows for the complete nondestructive gathering of findings from head to toe. Around 56.2% of participants believe that virtopsy aids in the investigation of crimes and provides valuable information.



Around 30.3% of participants are aware of the disadvantages of virtopsy. About 58.7% of the study participants agree that virtopsy is better than traditional autopsy in this pandemic situation. Only 9.5% of the participants had previously attended virtopsy lectures or courses.



4. Discussion

The questionnaire - based survey was conducted amongst the dental students in Tamilnadu to assess their knowledge,

awareness, and perspective about virtopsy. Dental students must have adequate knowledge about virtopsy as they are future clinicians, pathologists or forensic odontology experts.

According to A. J. Patowary autopsy is a scientific examination of bodies after death, where whole surface of the body as well as all the body cavities are explored to record the findings [2]. The term Virtopsy coined by Thali M. et al is created from the terms Virtual and Autopsy [5]. Raj Kumar Badam, TriekanSownetha and Sunanda Chavva stated that virtopsy is a multi - disciplinary technology that combines forensic medicine and pathology, computer graphics, biomechanics, and physics. From the results obtained from the questionnaire, it is evident that the majority of the study participants are familiar with the term human autopsy and virtopsy.

An accurate forensic judgement was required in the late 1990s in Switzerland for a high - profile homicide case. This instance is commonly heralded as the birth of virtopsy [4]. In virtopsy, there is fusion of the technologies of medical 3D imaging techniques as well as a 3D surface scans with the power and resolution of modern computers. It is a key tool that helps in establishing the manner and cause of death [1].

Virtopsy uses an all - in - one machine called "Virtobot" which integrates the four imaging modalities: (a) surface scanning 3D/computer - aided design photogrammetry, (b) multi - slice computed tomography (MSCT), and (c) magnetic resonance imaging (MRI) (d) MRI spectroscopy [4]. Virtomobile is a version of Virtobot mounted on a trailer which can be easily transported to the site of disaster. On assessment on knowledge about technology used for conducting virtopsy, **we observed only 14.4% of the participated dental students knows about Virtobot.**

Virtopsy can be employed as an alternative to standard autopsies for broad and systemic examination of the whole body as it is less time consuming [Estimated time = 1 - 5mins], aids better diagnosis, and renders respect to religious sentiments [3]. **On assessment about time requirement among the participants only 11.4% has answered 1 - 5 minutes.**

Depending on the condition of the remains, a team of forensic experts must be involved in the identification of the deceased. DNA, fingerprints, and dental data are considered primary identifiers [5]. The dental autopsy of unidentified human skeletal remains involves one or more forensic odontologists who carry out inspection of jaws and teeth and collect all postmortem available dental data. A forensic team from the University of Turin, Italy, is trying to make this procedure digital and remote developing a touch - free digital dental autopsy called **VIRIDENTOPSY** [7]. **From the results obtained from the questionnaire, 35.8% of the survey participants are aware of the term Viridentopsy.** Sex, place of origin, dental age, and cheiloscropy are all considered in this evaluation. Provisions on the unidentified human remains consist of the following data collection: 2D or 3D video recording of the dental arches and oral cavity, using intraoral camera, Photographic collection of the dental arches, Photogrammetry of the dental arches using an

intraoral scanner, 3D scanning of jaws and skull, Intraoral radiographic collection using digital sensors, Any radiographic imaging of the skull (Panoramic images, OPG, TC scans, if available), Live streaming using smartphone and smart glasses [6].

Its key benefit is that it uses non - invasive, scalpel - free imaging technology. The ease with which photographs may now be shared online and the ease with which it can be accepted by family members who forbid alterations after a person has passed away are ethical developments of technology. It saves time and is a highly efficient and effective way to investigate without disrupting the body's design that the results may be made public right away [9].

Facial reconstruction comes to the rescue when more traditional identification procedures fail. Facial reconstruction is at best a tool for producing images that are an approximation of what a face may have looked like in life [8]. **72.1% of the subjects were aware that virtopsy can be used for face reconstruction.**

The whole cardiovascular system can be viewed through PM angiography. If there is any injury to a vessel, there will be spillage of dye to the surrounding tissues, making it visible in the CT images [8]. **During the assessment, 41.3% of the participants were unaware that PM angiography is utilized in virtopsy to visualize CVS.**

Although the method is highly reliable, there are some forensically significant details that virtual autopsy cannot pick up on. All clinical conditions, infectious status, AM, or PM wounds cannot be distinguished. It is also difficult to appreciate the PM artifacts, color changes, and sometimes small tissue injury [8].

In this pandemic circumstance, more than 58.7% of individuals believe virtopsy is preferable than autopsy. Only 9.5 percent of the 201 participants had attended virtopsy courses or seminars.

5. Conclusion

The traditional autopsy still leaves its mark on the postmortem table, as does the virtual 3D image of a decomposing body, which uses cutting - edge technology to safeguard the privacy of the deceased and perfectly close their final chapter of life. Through this survey, dental students' perspectives, knowledge, and understanding of virtopsy might be evaluated. Under the limitations of present study, it can be concluded that majority of the dental students are aware of the basics of virtopsy. The participants, however, are unaware of crucial components of virtopsy, such as imaging equipment, time requirements, and procedures. Awareness has to be done through educational interventions. This emphasises the requirement for the maintenance of further virtopsy educational programmes and updated undergraduate curriculum emphasizing the significance of virtopsy among dental students.

Conflict of Interest

Nil.

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