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# VIRTOPSY

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Virtopsy is a term extracted from two words “virtual” and “autopsy.” It employs imaging methods that are routinely used in clinical medicine, such as computed tomography and magnetic resonance imaging in the field of the autopsy, to find the reason for death.

Virtopsy is a multi-disciplinary technology that combines forensic medicine and pathology, roentgenology (radiology), computer graphics, biomechanics, and physics. The branch of forensics has made exemplary and path-breaking contributions to help solve these problems. This approach has been recently used by forensic odontologists but has yet to make its own mark in the field.

## AUTOPSY V/S VIRTOPSY

Conventional autopsy involves invasive procedures that are the traditional means of post-mortem examination in humans. Contrary to it, virtopsy is a minimally invasive emerging technology in the field of forensic medicine that incorporates imaging technology of radiologists and forensic clinicians to reflect an ethical face in forensic examination.

AIIMS (All India Institute Of Medical Science) and ICMR (Indian Council of Medical Research) are working together on a technique for post-mortem without incising/ dissecting the body. This technique is likely to become functional in a few months. Health Minister Harsh Vardhan highlighted to Rajya Sabha that it is likely to be possible soon to carry out

autopsies without dissecting the body.

## HISTORY

S. No	Name of scientists	Credit	Year
1.	Erasistratus and Herophilus	Dissected on dead bodies to study organs and nerves	1700
2.	Giovanni Morgagni	Published book on "The seats and causes of disease"	1761
3.	William Osler	Taught autopsy as part of medical education	1800
4.	Wilhelm Rontgen	Initiated the first X-rays experiment	1895
5.	Group project (unknown)	Conducted the first body scan for a high-profile case through project names like "digital autopsy" or "scalpel-free autopsy"	1999

## EQUIPMENT FOR AUTOPSY

Virtopsy utilizes powerful scanning and radiographic technology with the power and resolution of modern computers. Virtopsy includes the following tools:

- 3D surface scan using a 3D photogrammetry-based optical surface scanner
- Post-mortem Computed Tomography (PMCT) with adjuvants such as PMCT-guided biopsy
- Post-mortem MRI (Magnetic Resonance Imaging)

## PROCEDURE

1. Prepare the corpse for imaging.
2. Place small disks along the body's exterior so that the surface scan and the interior scans can easily be aligned. These disks mark points that can be used for rendering the images into a single cohesive image.
3. Use virtibot to avoid inaccuracies while placing the markers on the surface of the body.
4. The markers are used to calibrate the exterior scan of the corpse and match it with internal imaging processes.
5. A 3D color model of the corpse is accomplished.
6. 0.02 mm resolution stereoscopic cameras are used to capture the color image.
7. The body is brought to the CT and MRI workplace, usually double-covered inside a blue bag through which X-rays can easily pass, and then the body is laid on the sliding table of the CT, MRI, and MRS (Magnetic Resonance Spectroscopy) equipment.
8. A pathologist has the freedom to peel through the layers of virtual skin and muscle with the click of a computer mouse.
9. Internal and surface scans and a needle biopsy can be done if internal body samples are needed.

## ADVANTAGES OF VIRTOPSY

- 3D illustration
- Easy accessibility
- Allows for a digital re-examination of the body after the liberation of the crime scene and burial or rot of the corpse even decades later
- Less time-consuming, aids in better diagnosis, and renders respect to religious sentiments, and

- Can be used for telemedicine/teleforensic/telepathology



[https://www.researchgate.net/figure/Virtopsy-equipment-From-left-to-right-camera-surface-scanner-biopsy-tool-and-CT-scanner\\_fig1\\_329444591](https://www.researchgate.net/figure/Virtopsy-equipment-From-left-to-right-camera-surface-scanner-biopsy-tool-and-CT-scanner_fig1_329444591)

## FIRST VIRTUAL AUTOPSY IN SAUDI ARABIA

### Case description

The deceased was a female stillbirth. A virtual autopsy was conducted to determine the cause of death. The post-mortem scan was performed by a

- General Electrical (GE) lightspeed 16 multi-detector computerized tomography scan
- The PMCT specifications were 180 mAs, 120 kVp, and a measured FOV (Field of View) of 50 cm.
- This was reconstructed to images of 0.625 mm slice thickness at 1.375:1 pitch.

### Observation

- The CT images revealed significant enlargement of both kidneys with numerous bilateral cystic hypodense lesions, mainly in peripheral areas, causing destruction of the normal renal parenchyma.
- The renal pelvis was under-developed, and mild flank distention was observed.

- Following this, a forensic pathologist, using standard dissection and tissue analysis, conducted a manual autopsy with a biopsy of kidney tissue for laboratory analysis. The diagnosis was multicystic dysplastic kidney disease (MCDK), as there was evidence of renal dysplasia.

## CONCLUSION

The procedure shows a relatively good degree of accuracy, but it may fail to stand on its own without the aid of minimally invasive procedures (biopsies). However, the degree of invasiveness is small and therefore still acceptable under cultural limitations.



Coronal mid-abdomen cross-sectional CT image showing enlargement of both kidneys with diffuse hypodensity.

gross kidney structure with bilateral presentation showing dysplastic ducts.

[https://www.researchgate.net/figure/Images-showing-the-a-gross-kidney-structure-with-bilateral-presentation-and-b-a\\_fig2\\_268690557](https://www.researchgate.net/figure/Images-showing-the-a-gross-kidney-structure-with-bilateral-presentation-and-b-a_fig2_268690557)

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## DID YOU KNOW?

Which forensic unit studies handwriting and typewriting on questioned documents, also analysing paper or ink?

Answer: Questioned Documents Unit