

## Multi-phase post-mortem CT angiography (MPMCTA)

MPMCTA is a new, non-invasive and standardized method for forensic investigations. By scanning the body after injection of a contrast agent, the complete vascular system of the head, neck, thorax and abdomen can be visualized and reconstructed in detail. MPMCTA can “solve” 80-90% of the cases.



## Only validated method

MPMCTA is currently the only validated method. An international study with nine European institutes (TWGPAM\*) with more than 500 cases was finished at the end of 2015 and will be published in 2016. First, a MPMCTA was performed, followed by an autopsy. The comparison of the results showed that 80-90% of the pathological findings were detected with the angiography only. MPMCTA is even superior to autopsy in vascular and bone findings.

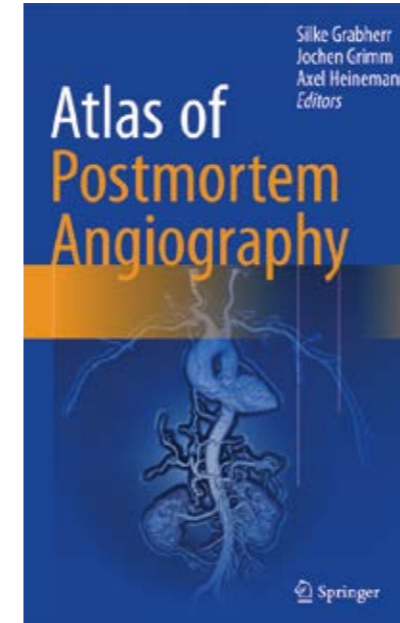
This means that an angiography would be able to replace an autopsy in the majority of the cases. In many other cases, MPMCTA will deliver relevant additional information in comparison to autopsy alone. In countries or cases where an autopsy is declined for religious or ethical reasons, this method can help to find the cause of death without an invasive examination.

\*Technical Working Group Postmortem Angiography Methods

## Literature



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For more information, publications or literature, visit [www.postmortem-angio.ch](http://www.postmortem-angio.ch)

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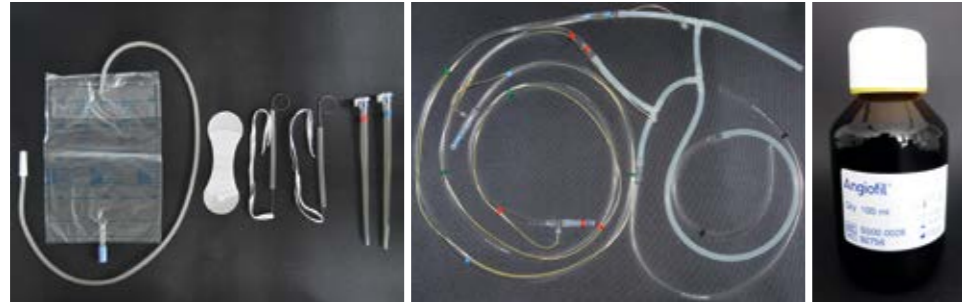
**MPMCTA** MULTI-PHASE  
POST-MORTEM  
CT ANGIOGRAPHY

**Virtangio®**

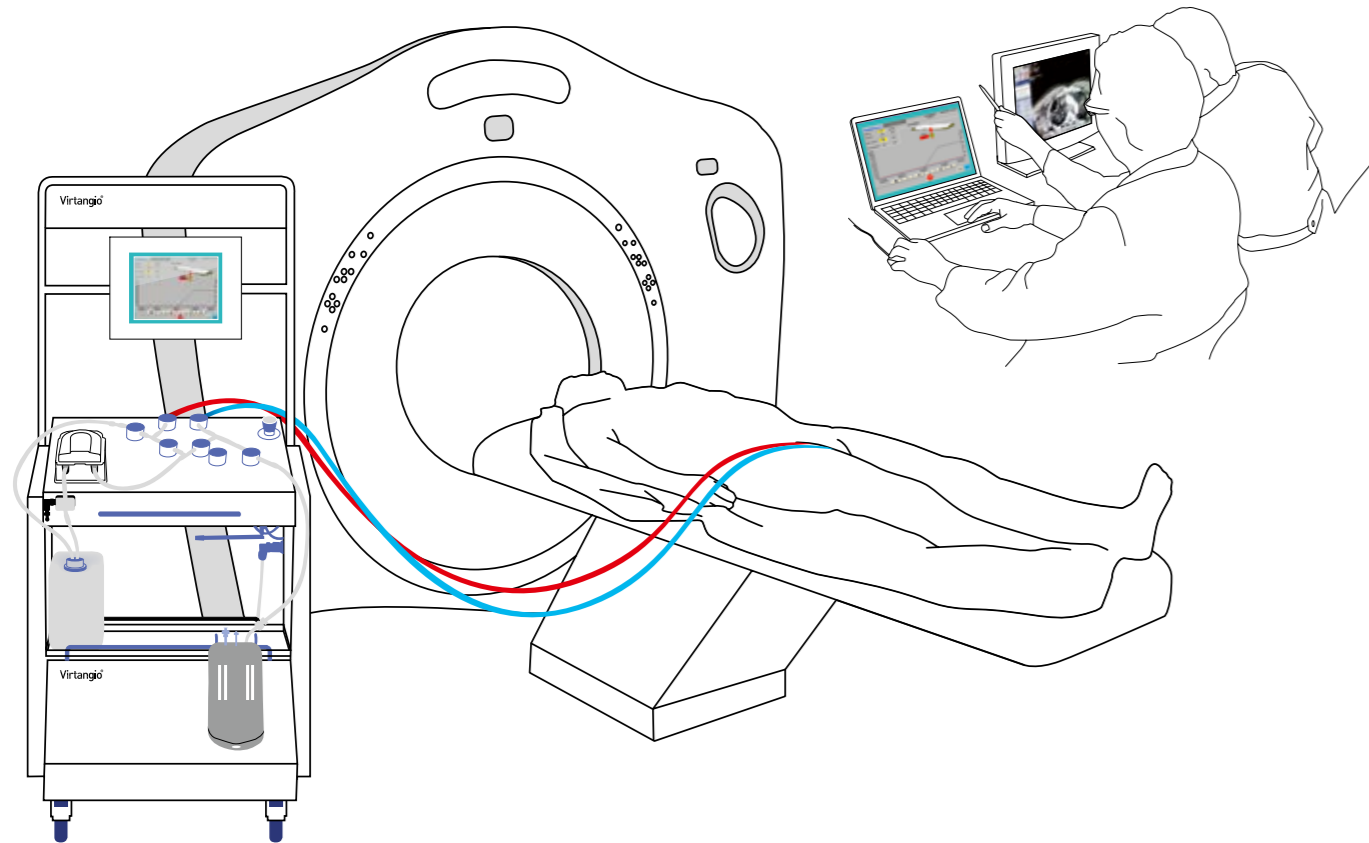
## Virtangio® The equipment



- the Virtangio® machine (injection machine)
- the single use Virtangio-set
- the contrast agent Angiofil®



The equipment was developed by the company Fumedica AG in Muri/Switzerland in collaboration with the Legal Medicine Department of the University Lausanne/Switzerland (Prof. Dr Silke Grabherr). To perform MPMCTA, a CT scanner is needed.



## Virtangio® The use

The Virtangio® machine is placed beside the CT scanner. It works independently from the scanner and can be operated by remote control in the CT command room.

**Before starting the angiography, an unenhanced CT scan of the body is performed. The body preparation for angiography takes about 15 minutes:**

- small incision in the inguinal region on one side
- insertion of two cannulas into the femoral artery and vein
- connect the Virtangio® machine with the two cannulas fixed in the body with the tubing set
- entry of case information into the system

The angiography can start and the system guides the user systematically through the process.

**To avoid vascular filling defects, the angiography consists of three different phases:**

- arterial phase
- venous phase
- dynamic phase

During each phase, the machine automatically fills the respective blood vessels with the contrast agent mixture (Angiofil® with paraffin oil). While the CT scan in the arterial and venous phase is performed after the respective injection is complete, the scan for the dynamic phase is performed during the ongoing injection to simulate live perfusion. Depending on the CT scanner, performing the three phases takes between 10 – 30 minutes.

**The Virtangio® machine provides the following advantages:**

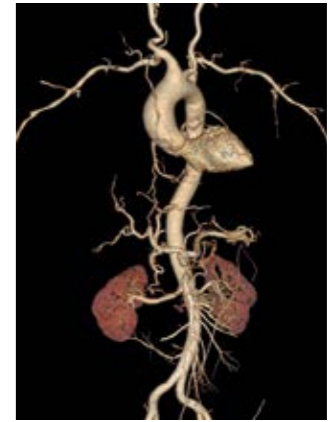
- injection can be performed volume- or pressure-controlled
- standard or individual protocols available
- machine stops in case of abnormal pressure loss or increase
- injection data are stored automatically

MPMCTA can even be performed on putrefied bodies, as long as the vascular system is intact.



The radiological interpretation of the images is done by a forensic radiologist together with the forensic pathologist. The image quality is comparable to or even better than corresponding images of living patients. By comparing the images of the three different phases and the native CT scan, artefacts and filling defects can be recognized and pathological findings verified. Trainings and guidelines for radiological interpretation are available.

If necessary, a conventional autopsy can be performed after the angiography. With the exception of pulmonary fat embolism, there is no negative impact of the technique and the contrast agent on histology or toxicology; nevertheless it is recommended to take sensitive biopsy samples before the angiography if possible.



Indications	Advantages
<ul style="list-style-type: none"> <li>• trauma cases like traffic accidents, sharp trauma, gunshot, blunt trauma</li> <li>• suspicion of cardio-vascular disease</li> <li>• suspicion of medical malpractice</li> <li>• any kind of unexpected and sudden death</li> </ul>	<ul style="list-style-type: none"> <li>• standardized, validated and minimally invasive procedure</li> <li>• controlled vascular filling in three phases (arterial, venous, dynamic)</li> <li>• closed system, no contamination</li> <li>• oily contrast agent with high radio opacity</li> <li>• no mixture with remaining blood</li> <li>• no oedemisation, no extravasation</li> <li>• training and guidelines for radiological interpretation</li> </ul>

Performing MPMCTA with the Virtangio® equipment is a fast, standardized and minimally invasive procedure that can be easily implemented into the daily routine. The oily contrast agent does not mix with remaining blood and avoids an oedemisation of tissues (as frequently observed with most other contrast agents) due to a micro-embolization of the capillary vessels. The contrast agent can remain in the body after the examination. The single use tubing/cannula set avoids any contamination due to its closed system design.