NASCA TRIDACTYLS:

CAUSE OF DEATH FOR TRIDACTYL 'MONTSERRAT':
Virtual autopsy based on scientific evidence obtained using CT scan with 3D image reconstruction and virtual dissection

by
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Acknowledgement:
The author was grant special permission to access the DICOM data files 'Monserrat Part 1' and 'Monserrat Part 2' and 'Maria DICOM UNICA' on website "www.tridactyls.org". Based on the DICOM files, the author had performed advanced 3D image reconstruction using image segmentation techniques, image remodeling and virtual dissection to gain additional insight into the cause of death of tridactyl 'Montserrat'.

CT EVIDENCES SHOWING TRIDACTYL 'MONTSERRAT' SUFFERED FROM SEVERE TRAUMA LEADING TO DEATH

(A) ***Evidence of large penetrating injury in right anterior chest wall:***

1. The right hemithorax appeared to have been deformed and compressed. A gapping hole was found in right anterior chest wall in upper part of right breast, located between the right 5th and 6th ribs. A concave depression of the chest wall could be seen surrounding the hole. (*Figure 1*)
2 The gapping hole in skin can be followed internally to a large wide bore tract that extended deep into the upper abdomen at an angle in a posterior, medial and inferior direction. (*Figures 2,3,4*) Irregular tissue thickenings were noted around the internal tract suggestive of associated hematoma. The path could have caused major disruption of the liver but sparing the gravid uterus.
3. The tract possibly reached the right retroperitoneum. Thickened tissue in right peri-renal fascia was noted suggestive of retroperitoneal hematoma. (*Figure 2*)
4. Gapping defects were found in right breast. The right breast was enlarged with mass effect suggestive of hematoma. (*Figure 5*)
5. Fractures were noted in posterior parts of right 3rd, 4th, 5th, 6th and 7th ribs. Fracture in right 7th rib was mildly displaced. The anterior parts of right 6th and 7th ribs were depressed downwards resulting in gapping right 5th intercostal space. (*Figures 6,7,8,9*)
6. Fractures were noted in scapular spine and superior border of right scapula. (*Figures 8,10*)
7. Evidence of multiple areas of subcutaneous bruising were noted in back of chest wall bilaterally, in front of right chest and in anterior abdominal wall. Oedematous thickening was noted in anterior and right lateral abdominal wall extending downwards to involve lateral aspect of right iliac bone. (*Figures 21,22*)
8. Flattened wedge shaped collapse tissue was noted in lower right chest cavity suggestive of collapsed lung or hemothorax. (*Figure 9*)

(B) ***Evidence of contralateral contusion in left chest wall:***

1. A prominent deep and broad curved trough bordered by raised thickened skin folds was noted in left chest wall, roughly along 7th intercostal space extending from the spine towards the left anterior chest wall. (*Figure 11*) The left 7th rib was displaced medially and superiorly. The abnormalities were contralateral to the penetrating injury in right chest wall suggesting that the left chest wall was forcefully compressed against an elongated hard object.
2. Bruising in skin overlying left scapula and left chest wall was noted. Subcutaneous oedema was noted in left lateral and posterior chest wall.
3. Fracture with callus formation was noted in left 11th rib (*Figure 12*) suggestive of healing rib fracture. Left 12th rib was absent (anatomical variant).

(C) ***Evidence of fractures and dislocation in fingers and right foot:***

1. Dislocation was noted in distal phalange of radial side finger of tridactyl right hand. (*Figure 13*)
2. Undisplaced crack fracture was noted at base of distal phalange of middle finger in tridactyl left hand. (*Figure 14*)
3. Transverse fracture was noted in medial cuneiform of right foot with wider separation on plantar

surface. (*Figure 15*)

(D) ***Evidence of empty heart:***

1. Residual connective tissue structure representing the heart was located in left side of thorax. It was collapsed into a clump with a clear central line. Heart chambers cannot be delineated (contrasting with findings in another tridactyl 'Maria' where heart chambers and major vessels could be distinguished). (*Figure 16*)
2. Findings could have indicated 'empty heart' due to exsanguination.

(E) ***Evidence of penetrating injury in pelvic floor:***

1. Well defined defect was found in anterior perineum and pelvic floor as well as involving the lower anterior right wall of the vagina. (*Figures 17,18,19*). The defect could be due to deep penetrating injury with trajectory directed mainly superiorly (*Figure 24*).
2. Following the trajectory, band shaped hematoma was found in medial posterior wall of the lower uterus located anterior to sacral promontory . (*Figures 19,20,23,24*) Fetal lower limb bones were located anterior to the hematoma.
3. Epidural hematoma in lower lumbar and sacral spine displacing the thecal sac towards the right side was noted. (*Figures 22,23*) It extended into perineural sheath of right first sacral foramina. (*Figure 21*)

(E) ***Significant negative findings:***

1. No evidence of head injury.
2. No foreign body was identified at site of injury.
3. No evidence of artificial mummification.

(F) ***Other findings***:

1. Tridactyl hands and feet.
2. Grossly abnormal facial features and elongated skull.
3. Intra-abdominal pregnancy bearing single fetus in breech presentation was noted. The bones were completely collapsed and dislodged, likely due to post-mortem changes.
4. Ten metallic objects of various shapes were found in head, chest, shoulder and wrists suggestive of subcutaneous implants.

CONCLUSION:

1. The cause of death can be determined based on the CT findings.
2. The evidences obtained highly suggest the possibility of brutal penetrating and blunt injuries leading to fatal haemorrhage.
3. The right chest wall was penetrated by a large object with significant force to have caused multiple rib fractures, rib displacement and fracture in right scapula, collapse right lung or hemothorax, rupture liver and retroperitoneal hematoma.
4. Fractures and dislocation in both hands could have been defensive action undertaken by 'Montserrat'. She was then pushed against an elongated hard object resulting in a deep impression formed in her left chest wall. The left buttock area appeared flattened suggesting that it had landed on a flat surface.
5. Another penetrating injury occurred in the pelvic floor and may have resulted in hematoma in uterine wall as well as epidural hematoma in distal thecal sac.
6. Multiple bruising from contusion injuries together with internal bleeding from ruptured internal organs ensured. 'Montserrat' eventually succumbed to exsanguination.

Final verdict on cause of death: traumatic injuries.

REMARKS:

1. "Montserrat" can be described as a dehydrated corpse. CT evidence provided documentary proof that 'Montserrat' had been a living biological entity with humanoid features. It was not an Egyptian style artificial mummy nor had it been fabricated.
2. Soft tissues in solid organs (except for brain tissue that could persist because of saponification) had vanished and largely replaced by air. However, residual connective tissues, tendons, ligaments, fascia, bones and blood products persisted allowing for detailed anatomical and pathological differentiation.
3. Clinical visual inspection may be challenging due to the rigid crouching posture. The positions of both hands and both lower limbs could have obscured many important findings. As a non-invasive examination, virtual autopsy employing advanced 3D image construction and virtual dissection based on the provided high resolution CT scan data proved invaluable in this archaeological find.
3. Measurements had not been quoted and may be better made on the original CT scans.

Figures and legends:

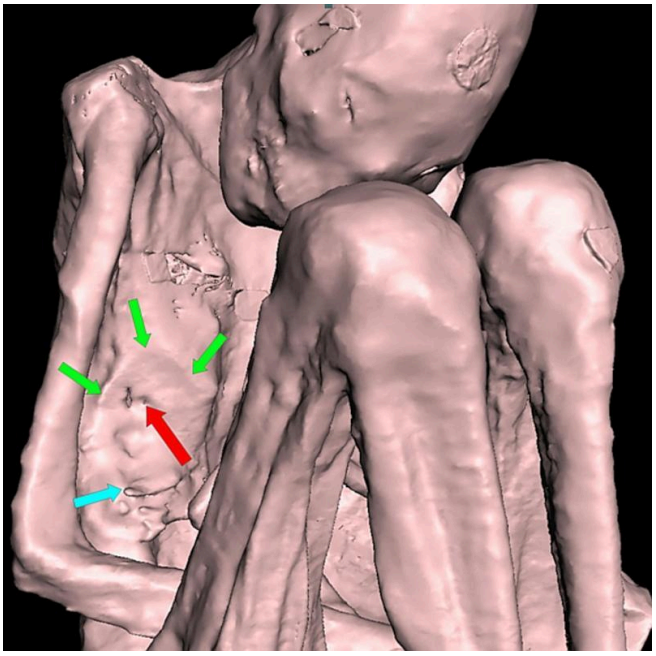

Figure 1
Front view showing puncture wound in right chest (red arrow) with surrounding cup shaped impression in skin. Right breast is involved and distorted. Blue arrow indicated right nipple.

Figure 2
Oblique section of CT scan following a broad deep penetrating tract (green arrows) leading from the puncture hole in skin (red arrow) in right side of thorax. The tract extends to hematoma in right peri-renal space (blue arrow).

Figure 3
Front view showing trajectory of simulated puncturing object (in violet colour) above the right nipple (red arrow).

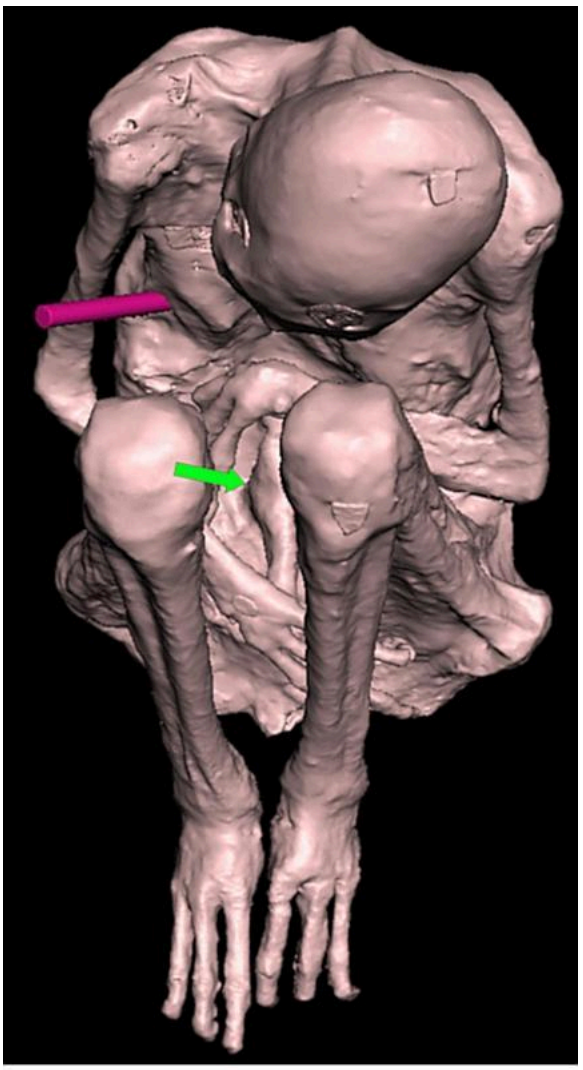

Figure 4
Top view showing trajectory of simulated puncturing object (in violet colour). A broad midline fold in anterior abdominal wall is also observed (green arrow).

Figure 5
Coronal CT scan showing right breast containing gap (red arrow) and large hematoma (green arrow).

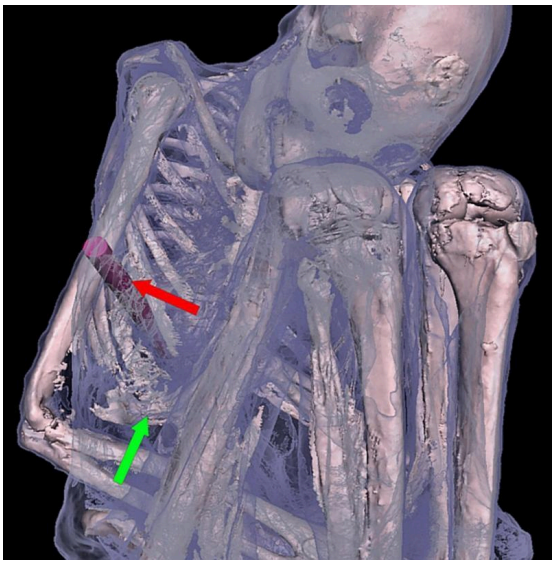

Figure 6
Front view showing underlying bones through transparent skin. The simulated puncturing object (in violet colour) caused widening of right 5th intercostal space (red arrow) and downward displacement of anterior ends of right 6th and 7th ribs. Such displacement suggests substantial size of the puncturing object. Green arrow points to hematoma in right breast.

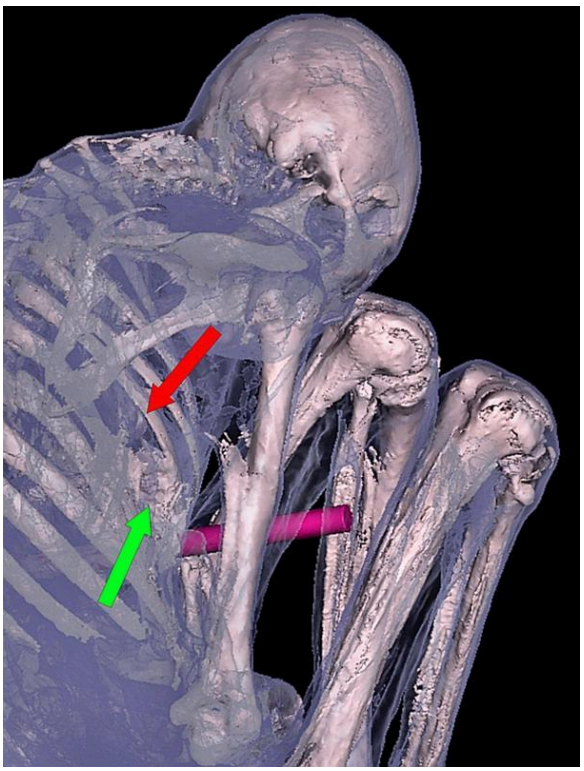

Figure 7
Side view showing bones through transparent skin layer. The simulated puncturing object (in violet colour) is associated with hematoma beneath entry site (green arrow) . There is gross widening of right 5th intercostal space (red arrow).

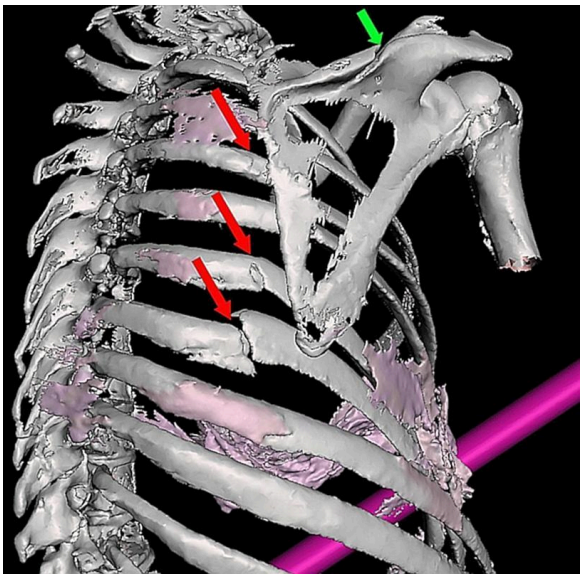

Figure 8
Posterior view of right thoracic cage showing multiple rib fractures (red arrows), fracture in right scapula spine (green arrows) and multiple bruising in chest wall (coloured pink). Gaps in scapula and humerus are due to computer artefacts.

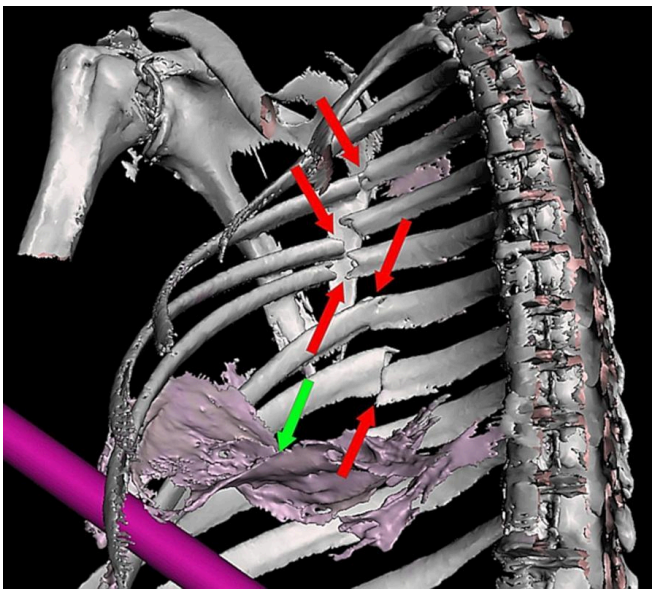

Figure 9
Inside view of right thoracic cage showing multiple rib fractures (red arrows). Simulated path of penetrating object is shown in violet. Flattened structure in pink (green arrow) could represent hemothorax or collapsed lower lobe of contused right lung.

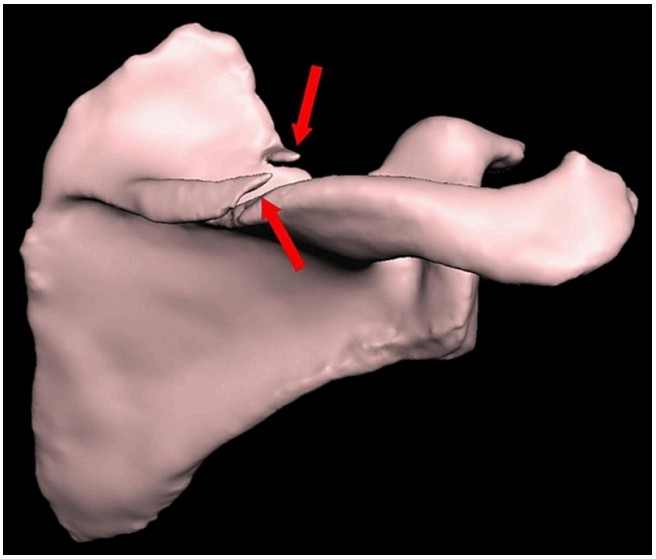

Figure 10
Reformed virtual 3D model of right scapula showing displaced fracture in spine and chip fracture at superior border of scapula.

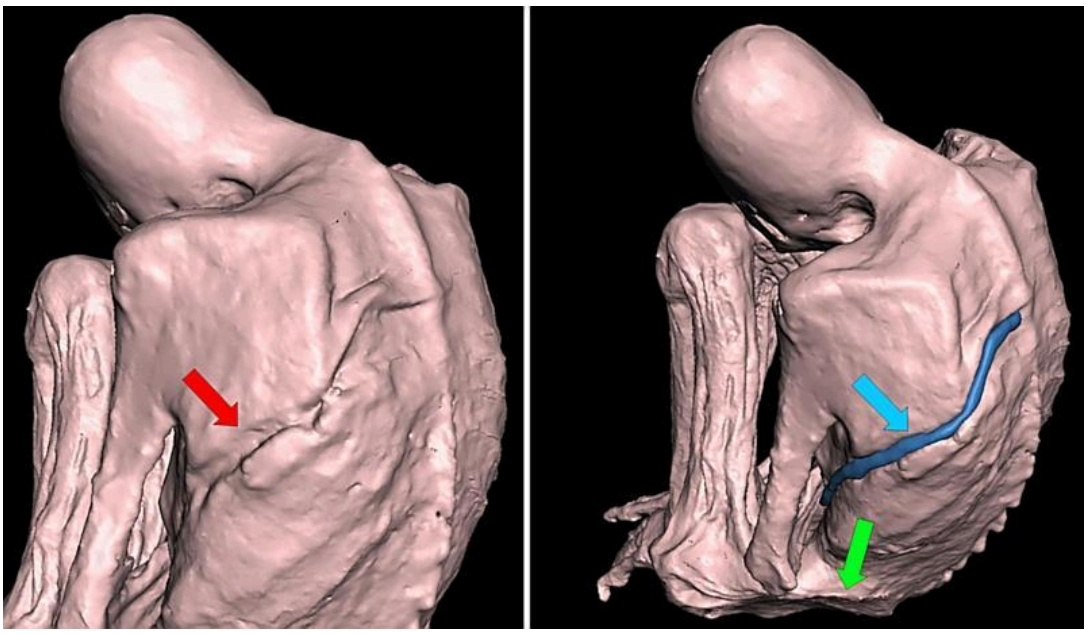

Figure 11
An oblique deep trench-like groove (red arrow) is seen in posterior and lateral aspect of left chest wall below the scapula. A simulated cast (blue arrow) is shown suggestive of the chest wall impressed against an elongated hard object. It was bordered by elevated thickening skin folds. Note the flat surface that could be a landing zone in left buttock (green arrow).

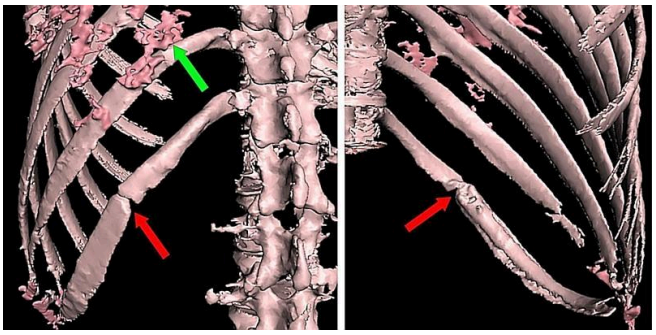

Figure 12
Fracture (red arrow) in left 11th rib shown in posterior view (left image) and inner view (right image). Callus formation in inner view suggests healing fracture. The left 12th rib is absent (normal variant). Chest wall bruising are coloured pink (green arrow).

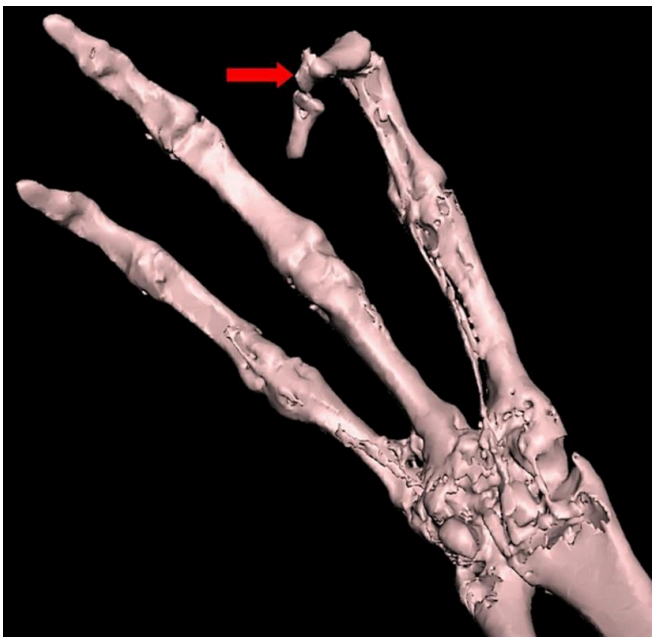

Figure 13
Dislocation is seen in distal phalange of radial side finger of right tridactyl hand.

Figure 14
Undisplaced fracture is noted at base of distal phalange of middle finger in left tridactyl hand.

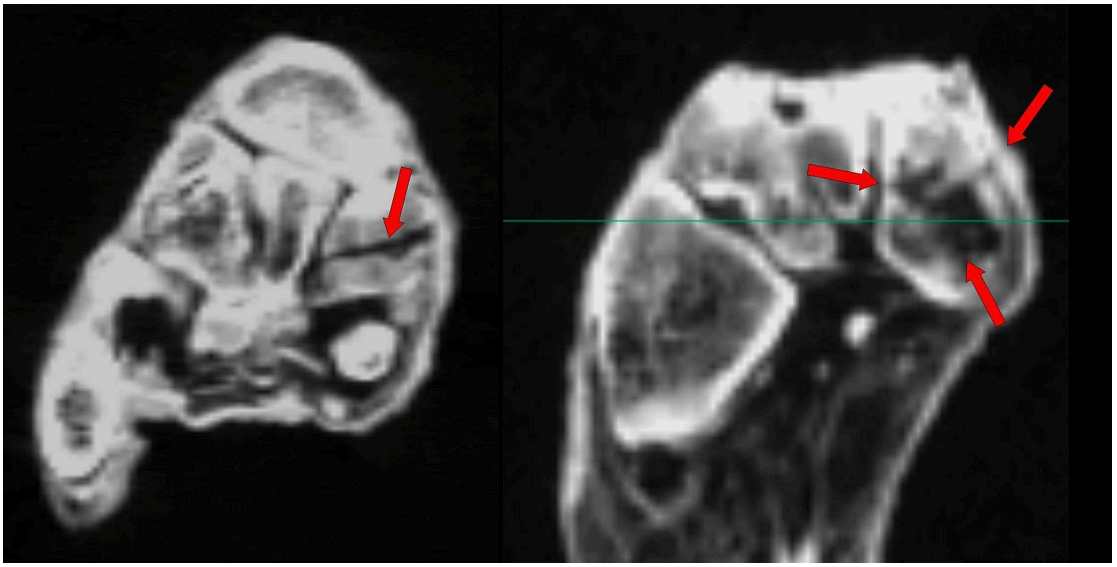

Figure 15
CT scan (left image) of right foot showing transverse fracture (red arrow) across medial cuneiform bone. CT scan (right image) of right foot showing widening of fracture (red arrows) in plantar surface of medial cuneiform bone.

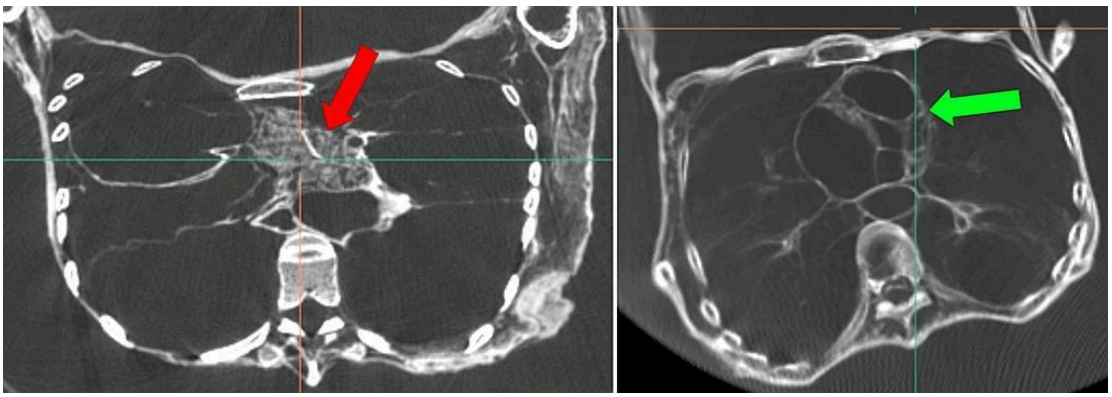

Figure 16
Image on left shows CT scan of 'Montserrat' at thoracic region. Red arrow indicates the collapsed structure representing the heart containing a distinct central line.
For comparison, image on the right shows CT scan of another tridactyl 'Maria' with normal looking heart chambers (green arrow).

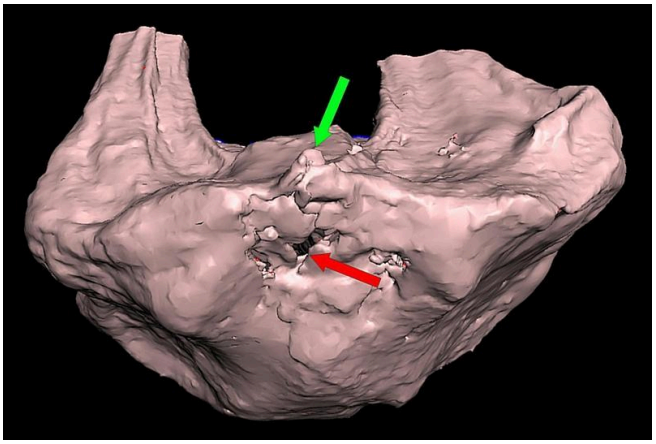

Figure 17
Inferior view of 'Monserrat' showing irregular puncture wound (red arrow) in perineum. Green arrow points to clitoris.

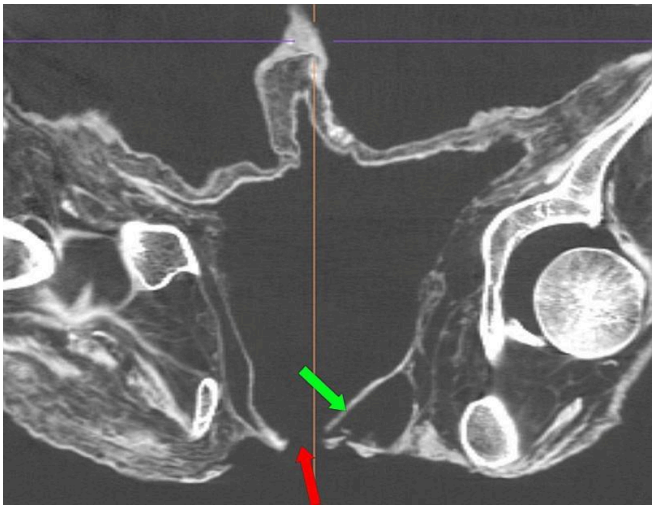

Figure 18
Coronal CT scan of 'Monserrat' showing gapping wound (red arrow) in pelvic floor that also involves right side of vagina (green arrow).

Figure 19
Midline sagittal CT scan showing gapping wound in pelvic floor and vagina (red arrow). Localized hematoma in posterior wall of uterus (green arrow) is noted in front of sacral promontory. Fetal lower limb bones are seen just anterior to the hematoma. Epidural hematoma (blue arrow) is seen below 4th lumbar vertebral level.

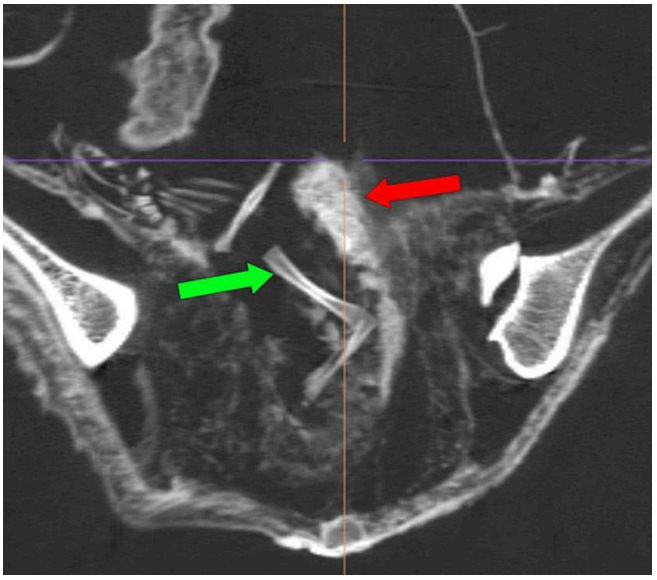

Figure 20
Coronal CT showing localized hematoma (red arrow) in medial wall of lower uterus. Foetal lower limb bones (green arrow) are seen adjacent to the hematoma .

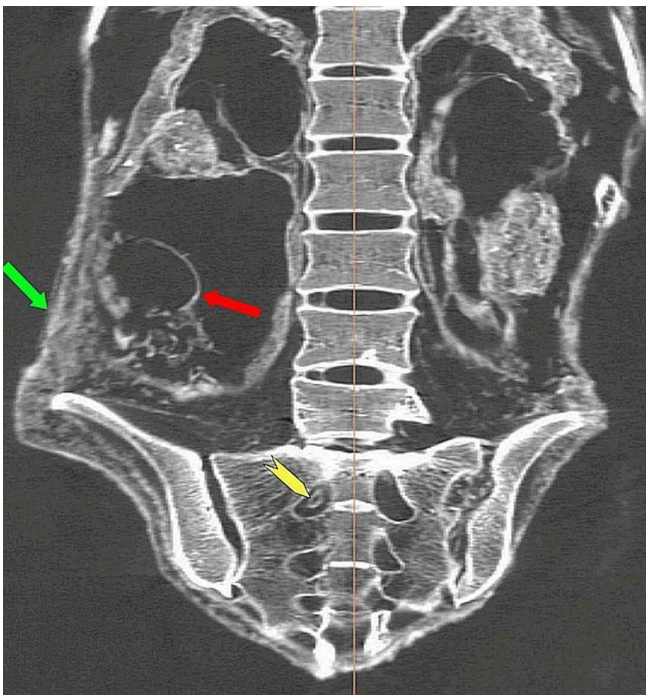

Figure 21
Coronal CT scan showing epidural hematoma extending to perineural sheath of right first sacral nerve root (yellow arrow). Foetal skull (red arrow) is noted in uterus located in right side of abdomen. Oedematous wall thickening (green arrow) is noted in right side of abdomen and pelvis.

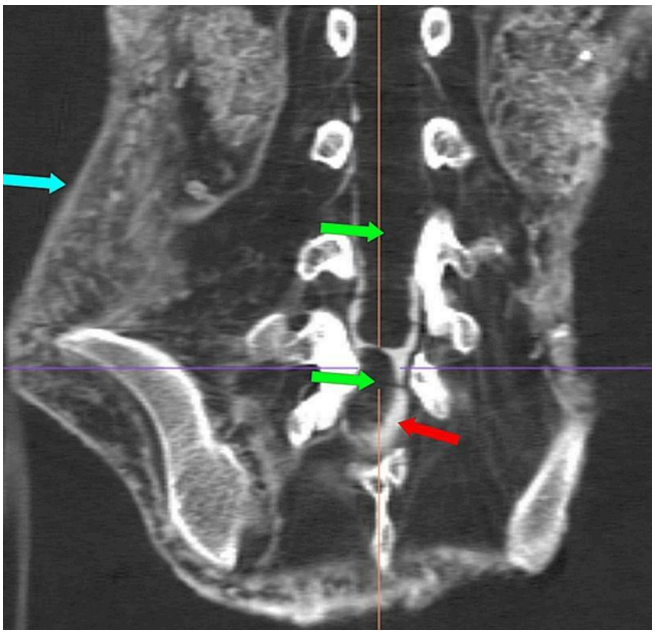

Figure 22
Coronal CT scan showing epidural hematoma (red arrow) in lumbar & sacral spine causing displacement of the thecal sac (green arrow) towards the right side. Note oedematous thickening (blue arrow) in right abdominal wall.

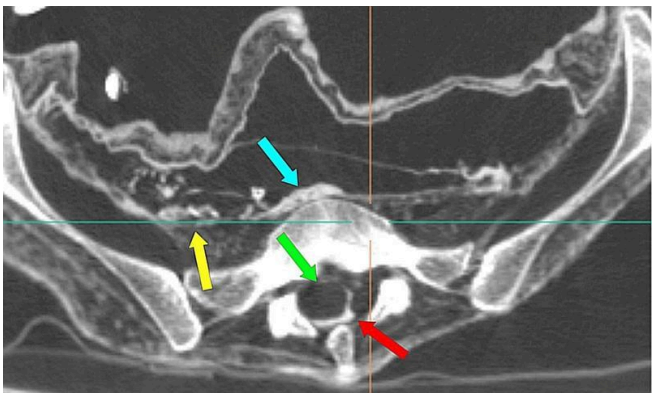

Figure 23
Axial CT scan showing epidural hematoma (red arrow) in sacral spine causing displacement of the thecal sac (green arrow) towards the right side. Note hematoma in posterior wall of uterus (blue arrow) adjacent to sacral promontory. Fetus (yellow arrow) is seen in right side of abdomen.

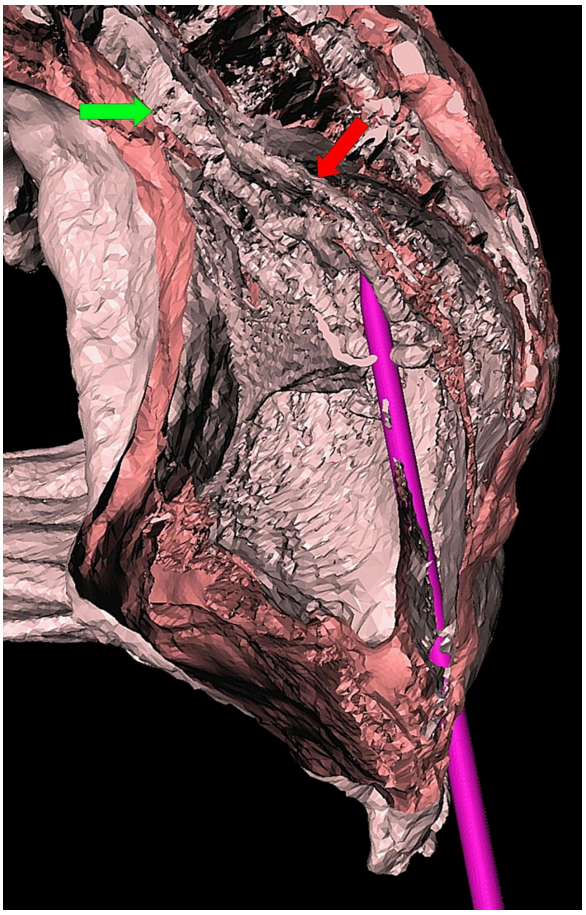

Figure 24
Proposed trajectory of penetrating object through pelvic floor. Red arrow points to hematoma in posterior wall of uterus. Green arrow points to fetal cranial bones.

ABOUT DR. FUNG

Dr. K H Fung is a retired radiologist with over 40 years of experience in diagnostic radiology. His special interests include 3D medical visualization, interventional radiology and neuro-intervention.

Dr. Fung is also an artist in the domain of intersection of art and science utilising his expertise in 3D medical visualization. Dr. Fung was the first place co-winner in the '2007 International Science & Engineering Visualization Challenge' organized by Science magazine and National Science Foundation (USA). His artworks had been exhibited in museums in various countries including USA, Europe, China, Australia and Hong Kong.

He had current exhibits in 2025 in the Hong Kong Museum of Medical Sciences (featuring stereoscopic 3D and 4D medical imaging and art) and in Nina Park (featuring the Nina wood fossils collection) in Hong Kong.

Through his collaboration with Science Photo Library, his interdisciplinary artworks bridging art and science had been made available to various international renowned digital media, magazines, books, and journals.

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