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SIMULATION, TRAINING, AND PHANTOM SOLUTIONS BROCHURE

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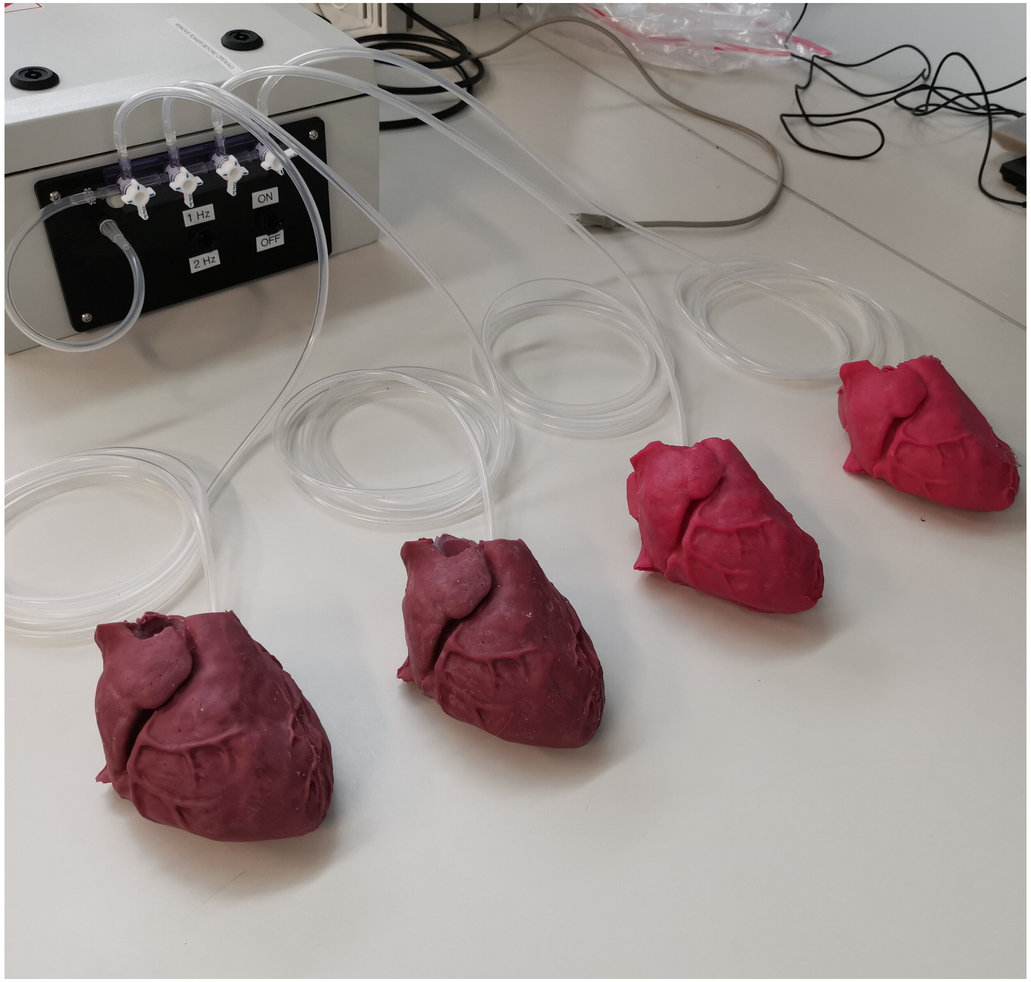
BEATING HEART SIMULATOR



Insight Sugery created an anatomically accurate beating heart that can be cut and sutured, while beating, in order to allow surgeons to train in the field.

A mechanism was designed to create the artificial 'heartbeat' capable of varying speeds to mimic different physiological situations.

THIS SOLUTION CONSISTS OF:

- Anatomically accurate adult-sized heart (based on patient scans) with realistic tissue-mimicking properties
- The heart model mimics the suturing and cutting properties of a real heart while beating to allow the surgeons to interact with the models for training purposes
- The solution can provide variable heart beating speeds to mimic numerous clinical scenarios for up to 4 hearts at the same time
- Suitable for use in challenging environmental conditions, simple to assemble and transport

KIDNEY SURGICAL SKILLS SIMULATOR

Medical professionals in hostile environments still require cutting-edge surgical training. This kidney model can be used to show life-saving surgical techniques around the world.

THIS SOLUTION CONSISTS OF:

- Highly anatomically accurate and made of materials which mimicked the behaviour of human tissue when subject to cutting and suturing, allowing the trainee to practice a partial nephrectomy
- Tough outer renal capsule differentiated in colour and feel from the kidney parenchyma
- Hollow collecting system with suturable shell, compromised of the minor and major calyces, renal pelvis and ureter
- Renal vein and artery with enterance and exit from the renal hilum

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PAEDIATRIC JUGULAR ACCESS SIMULATOR

Securing stable vascular access is an important skill required by clinicians. Sick children, complex surgeries, chronic illnesses, multiple hospitalisations and prolonged treatments can make vascular access challenging.

Obtaining vascular access in children may require multiple attempts and can be stressful for the child and family as well as the care provider.

The simulator is designed to lie flat on a table. The simulation consists of a 5-10kg baby model, extending from ear to chest area.

THIS SOLUTION CONSISTS OF:

- One baby main body (realistic external baby anatomy made in silicone)
- Replaceable inner section containing: External jugular: ID 2mm, OD 3mm (silicone) with circulating fluid Carotid: ID 4mm, OD 6mm (silicone) Internal jugular: ID 6mm, OD 8mm (silicone) with circulating fluid Sternocleidomastoid muscle (in flexible material) Clavicle and sternum (in hard material and encased in silicone)
- Suitable for ECMO training (Replaceable internal section being fully operable and replaceable)
- Four replaceable skin pads in silicone. Replaced each time after ECMO training will last 3-5 times with normal use for cannulation

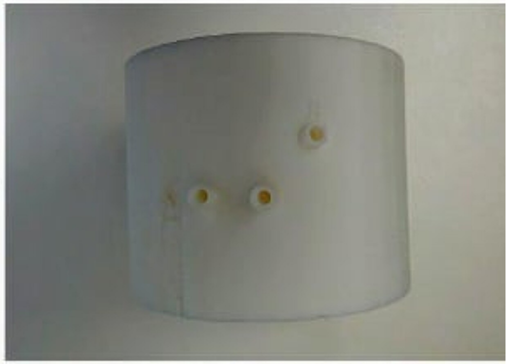
THYROID RESEARCH PHANTOM

SUMMARY

This simulator was created for the development of a radiotherapy protocol to accurately model radiation exposure to the tissues surrounding the thyroid gland (trachea, oesophagus, neurovascular structures and spinal cord) and improve the accuracy of radiation therapy in terms of the correct dosage limits.

THIS SOLUTION CONSISTS OF:

- A cylinder to mimic the shape of the neck
- Channels connect the thyroid and outer shell and allow the cavity to be filled with radioisotope
- A shell filled with a bio-mimetic medium that approximated the radiopacity of the neck tissue.



SKULL AND BRAIN PHANTOM

SUMMARY

This phantom contains full craniofacial skeletal structures, a brain with grey and white matter differentiation, dentition with amalgam fillings, and a removable, titanium orbital floor implant.

The phantom was requested for research into craniofacial CT imaging protocols involving metal artifact and validating electron density measures from dual-energy CT.

The skeletal craniofacial structures were 3D printed in bone-like material, which scanned at the correct Hounsfield Unit (HU) ranges for adult bone.

The brain was printed in a material mimicking grey and white matter, both of which represented grey and white matter respectively, scanning at the correct HU values.

The patient's teeth were segmented and filled with an amalgam during manufacturing, and a removable phantom-specific, titanium orbital floor implant was also 3D printed.

The imaging phantom realistically modelled adult bony craniofacial and brain anatomy, both of which scanned with appropriate HU ranges. By combining these structures with metallic-based objects (implants and fillings) that would be encountered in real patients, researchers at the University of Nebraska Medical School will have access to a research tool that can be scanned indefinitely, to explore a range of scan protocols and parameters, which could, in turn, influence clinical practice.

Additionally, by using known data for the phantom material constituents, dual-energy CT-based electron density measurements can be validated.

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