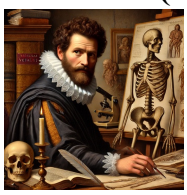
Andreas Vesalius (1514-1564)



AI generated image

1

Anatomy before Vesalius

Ancient
Hippocrates (c. 460–370 BCE) – The "Father of Medicine," who laid the foundations of medical practice, including early anatomical observations based on clinical experience.
Aristotle (384–322 BCE) – A philosopher and biologist who studied comparative anatomy and classified animals, providing insights into human anatomy through dissections of animals.
Galen of Pergamon (129–216 CE) – The most influential anatomist before Vesalius. He compiled extensive anatomical knowledge based on animal dissections, which dominated medical thought for over a thousand years.

2

Anatomy before Vesalius

Early Renaissance Anatomists
Razi (Rhazes) (854–925 CE) – A Persian physician who his challenges weakened the absolute authority of Galenic medicine, paving the way for later scholars
Ibn al-Nafis (1213–1288 CE) – An Arab physician who described pulmonary circulation centuries before William Harvey. He also critiqued Galen's anatomical ideas.
Mondino de Liuzzi (1270–1326 CE) – An Italian anatomist who revived human dissection in medieval Europe and wrote *Anathomia*, one of the first dissection manuals.

3

Razi (Rhazes)

- His challenges **weakened the absolute authority of Galenic medicine**, paving the way for later scholars like **Ibn al-Nafis** (who corrected Galen's ideas about blood circulation) and eventually **Andreas Vesalius**, who dismantled Galenic anatomy through human dissections.
- Despite his critiques, **Galen's influence remained strong** in Europe, and even Vesalius was trained in Galenic traditions before disproving many of them.
- Razi was one of the first major physicians to question Galen's theories, marking an important step toward **more empirical, observation-based medicine**.

4

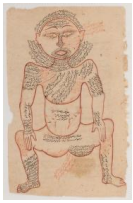
Mansur's Anatomy (Tashrih-i Mansuri, c. 1390 CE)

Illustrated anatomical work with **six full-body diagrams**

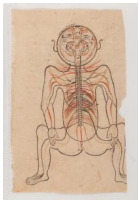
- Focused on **theoretical anatomy** rather than hands-on dissection.
- Heavily **Galenic**, meaning it contained errors from ancient sources.
- **Mansur's Anatomy** was an important step in the history of anatomical illustration, but it was still rooted in **pre-existing knowledge** from Galen and Avicenna.

5

Internal organs



Muscular system



Nervous system

6

Key Differences

Feature	Mansur's Anatomy (1390 CE)	Vesalius' Anatomy (1543 CE)
Approach	Theoretical, Galenic	Empirical, based on dissection
Illustrations	Simple schematic drawings	Highly detailed, lifelike woodcuts
Dissection	No human dissection	Extensive human dissections
Influence	Islamic medicine, Galen	Renaissance medicine, direct observation
Errors	Retained Galenic mistakes	Corrected many Galenic errors
Circulation	Liver-centered circulation	Critiqued Galen, precursor to Harvey's findings

7

Mondino de Luzzi

Mondino's major work, *Anathomia corporis humani*, written in 1316, is considered the first example of a modern dissection manual and the first true anatomical text.

The earliest edition of the work was printed in Padua between 1475 and 1478, and more than 40 editions are thought to exist.

By the 14th century, the practice of anatomy had come to involve the dissection of a cadaver according to prescribed rules; *Anathomia* was intended as a handbook to guide this process.

Much of the medical information included in *Anathomia* is derived from commentaries on Hippocrates, Aristotle, and Galen written by Islamic scholars.

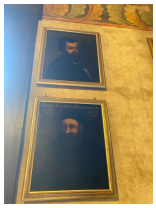
8

Andreas Vesalius (1514-1564)

- Vesalius was born as Andries van Wesel on 31 December 1514 in Brussels
- His great-grandfather, Jan van Wesel, probably born in Wesel, received a medical degree from the University of Pavia and taught medicine at the University of Leuven.
- His grandfather, Everard van Wesel, was the Royal Physician of Emperor Maximilian.
- His father, Anders van Wesel, served as apothecary to Maximilian
- In 1532 he decided to pursue a career in medicine at the University of Paris. He studied the theories of Galen. His doctoral thesis, *Paraphrasis in nonum librum Rhazae medici* was a commentary on the ninth book of Rhazes.

9

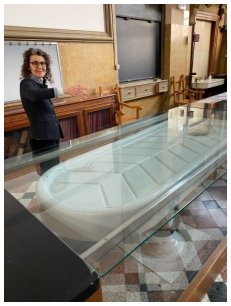
On the day of his graduation he was immediately offered the chair of surgery and anatomy at the University of Padua. It was founded in 1222 by a group of students and teachers from the University of Bologna, and it is the second-oldest university in Italy, as well as the world's fifth-oldest surviving university.



10

On the day of his graduation he was immediately offered the chair of surgery and anatomy at the University of Padua.

11



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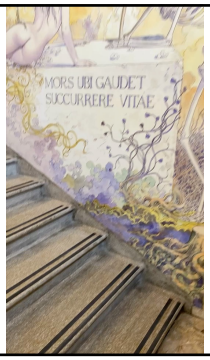
MORS UBI GAUDET
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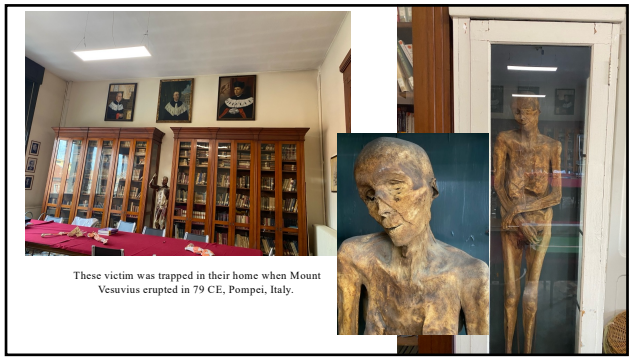


23

De Humani Corporis Fabrica (1543)
(On the Fabric of the Human Body)

De Humani Corporis Fabrica Libri Septem

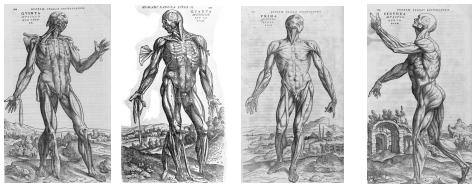
Divided into **seven books**, covering bones, muscles, veins, arteries, nerves, internal organs, and the brain.

Disproves many of Galen's anatomical errors using evidence from human dissection.

Large, **intricate woodcut illustrations**, designed for scholars and advanced students.

Focused on **scientific accuracy**, sometimes making it difficult for beginners.

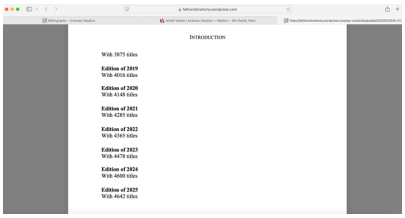
24



25

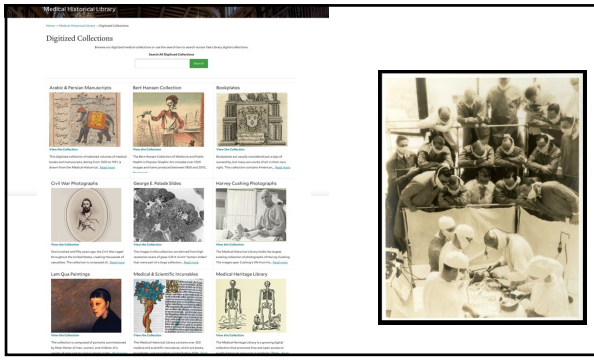
Vesaliana

Dr. Harvey Cushing listed all publications on Vesalius and his works, the so-called Vesaliana.



https://fatherofanatomy.wordpress.com/2016/01/04/bibliography/

26



27

The first complete English translation of Andreas Vesalius' *De Humani Corporis Fabrica* was done by William Richardson and John Carman **in 1998 at the University of Auckland.**

Emeritus Professor John Carman (Anatomy Departemnt) and Dr. Will Richardson (Classics) have collaborated on the translation of the sixteenth-century work by Vesalius—*On the Fabric of the Human Body*. John Carman details the process of ensuring anatomical accuracy in the translation of this most important work.

The first complete German translation of *De Humani Corporis Fabrica* by Andreas Vesalius was **"Über den Bau des menschlichen Körpers"**, translated by Karl Sudhoff and published between **1923 and 1926.**

28

29

INTERNAL MEMORANDUM

To: John Carman
From: Will Richardson
Date: 20 Sept. 1991
Telephone Extension: 7044

Dear John,

I applied for short leave 1992-3 in order to work in Auckland on my Vesalius translation, and have just had the interview with the leave committee. They were happy with my plans, but wanted me to try and find some way whereby I would not be working at home or in my departmental office. Do you think there would be a spare desk anywhere in the Medical School where I might be able to work over that period? It would be very handy to be in the Med. School for easy access to the library and also for periodic sessions which I hope you would permit me to have with you when I struck problems!

I haven't worked any more on the Vesalius since I saw you last: too many other things to do! But I have a couple more chapters nearing completion and will pass them on to you when I eventually get them done.

With best wishes,

Sept '92 - May '93

INTERNAL MEMORANDUM

To: Jean
From: Will
Date: 24/4
Telephone Extension: 7044

Herewith my final version of Chapters I and II with [illegible] summary. Both Chapters differ slightly from version 1 left with you.

WJ.

30

De Humani Corporis Fabrica Epitome (1543)
(*A Summary of the Fabric of the Human Body*)

A **condensed summary** of the *Fabrica*, making anatomy easier to understand.
Focused on **practical learning** with clear, labeled illustrations.
Meant for medical students who didn't have time for the full *Fabrica*.
Some illustrations were **designed to be cut out and assembled** into a 3D model of the human body.

31

From the forward of the Epitome

But I have assumed that there is no need to demonstrate here our negligence in learning Anatomy, the base and foundation of the whole art of medicine, and how very necessary it is that we, who have enlisted in the practice of medicine, should be thoroughly acquainted with the parts of the human body;

Ancient medicine has now been almost restored in very many schools to its former splendor, and those who dedicate themselves to it are beginning to understand sufficiently how slight and how feeble work in Anatomy has been from the times of Galen to the present; and he, although he is easily the foremost of the leaders in this field, never worked on a human body, and is now understood to have described (not to say, imposed on us) the parts of a monkey rather than those of a man, whose fabric differs from a monkey's in innumerable areas.

32

THE ORGANS THAT SERVE TO PROPAGATE THE SPECIES

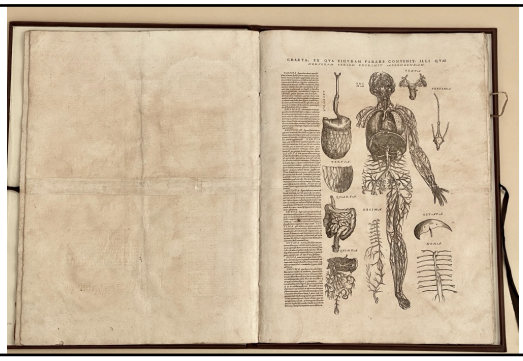
CHAPTER 6

In the beginning, for the purpose of the conservation of the species, the designer of the human fabric constructed two humans, so that a man should present the primary principle of the infant, while a woman should receive it, and nourish the little infant that grew from this principle as a member of her own body until the infant had become strong enough to be brought out into the air that surrounds us. The man and the woman have received organs suited and special to these functions, and in these organs is implanted such powerful pleasure, such an enticement to generation that animals incited by it, whether young animals or foolish animals lacking reason, apply themselves to the propagation of the species as if they were extremely wise.

The man has two testes[a], covered by skin, which here is called the scortum[b], and by the fleshy membrane. The testes are made of a substance that is white and continuous, and very particular; this is contained by a strong membrane[c] which is very closely attached in a circle all around this substance, and which receives the insertion and connection of all the things that implant into the testis, and ….

The enumeration of all the parts that enter into the fabric of the human body ends here; there follows in the succeeding pages a representation of those parts, much condensed, to the extent that it was possible, and complete, to be examined in the order that we prescribed at the very beginning.

33



34

Figure F

All the figures printed on this page are intended to form together one figure, which is to be pasted, from the head, or however you think more convenient, on that figure which presents the system of the nerves, and can be seen on the sheet marked m [M], that is, the last of all.

That is for the information of those who meet with copies of these pages that have not been prepared, and who make them up by their own care and attention: in that process both in pasting and in cutting the individual figures away from excess paper, and in applying colours if that seems useful, each should take as much care as he wishes. Then for firmer paper it will be very useful to paste a sheet under the whole of this page, before the whole page is divided into as many pieces as it contains figures. *To [each of] those figures I shall assign a number to explain in which place each is to be attached, and to assist the work of students as much as I can.*

The FIRST figure, which is the principal figure and the foundation, so to speak, of all the others, we have drawn, like all the others that appear here, to the scale of the figure presenting the image of a naked woman; this figure first must be cut away from the rest of the page all around its outside, but with a slightly wider piece retained at the top of the head, from which it can be pasted afterwards, as soon as the other parts have been attached to it.

The SECOND figure presents the oesophagus and the anterior area of the stomach together with the upper membrane of the omentum, and with the vessels and the *nervi* of these parts; this figure must have some others pasted on to it before it is attached to the first.

For the THIRD, which represents the posterior region of the whole area of the lower membrane that lies under the colon where that extends along the stomach, is to be pasted to the upper membrane of the omentum in such

35

Terminology in the Fabrica & *Epitome*

-The *Epitome* does differ from the *Fabrica* significantly in the matter of anatomical terminology.

-That was very various in the sixteenth century, within Latin and between Latin and the other languages of earlier texts and practitioners, Greek, Arabic, and Hebrew

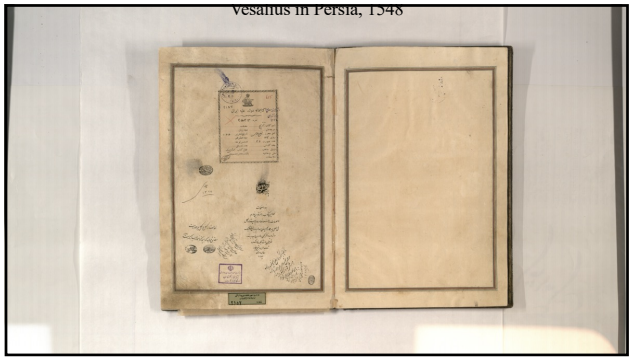
-Vesalius had already recorded not only Greek terms, but also Arabic and Hebrew in the *Tabulae Anatomicae*.

-In the *Fabrica* he records Greek, Arabic, and Hebrew, as well as Latin, throughout, and discusses differences of terminology and of the application of terminology.

-The *Epitome* offers both less than the *Fabrica* and more: it does not mention Arabic or Hebrew, but in the margins it offers very many Greek terms that the *Fabrica* does not

36

Vesalius in Persia, 1548



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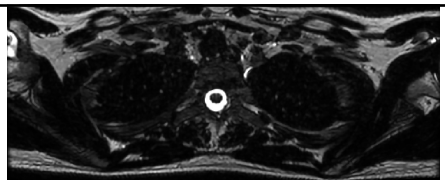
Is anatomy a "dead" subject?

41

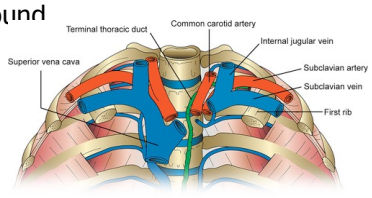


Dynamic studies of the human thoracic duct and lymphovenous junction using heavily T2 MRI: pilot study

Lomani O'Hagan, Alys Clark, Anthony Phillips, John Windsor, SA Mirjalili

42

Background



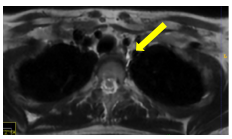
Hinton et al. Clinical anatomy 35(4):447-453

- Effective lymphatic drainage is critical to homeostasis
- Impaired lymph drainage contributes to edema, and subsequently to organ failure

43

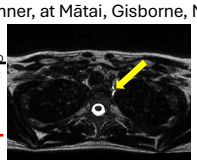
Heavily T2-weighted MRI

- Highlights **slow moving/near stationary** fluid (such as cerebrospinal fluid, lymph)
- No exogenous contrast, can be used to characterize healthy lymph anatomy
- Pilot study to determine feasibility in four healthy volunteers
- Imaging conducted on GE 3-T Scanner, at Mātai, Gisborne, NZ



Conventional 2D Single Shot Fast Spin Echo (SSFSE)

0.74x0.74x3.3mm voxels

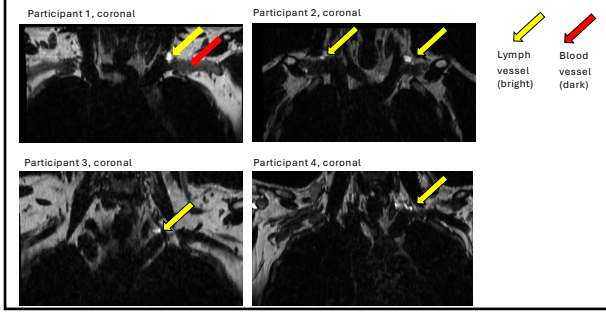


3D GE "Cube" acquisition

0.59x0.59x0.8mm voxels

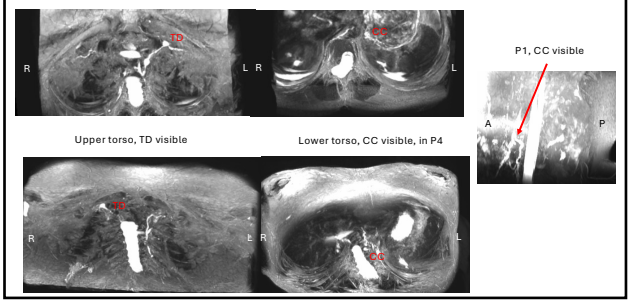
44

3D GE Cube images to identify lymph vessels



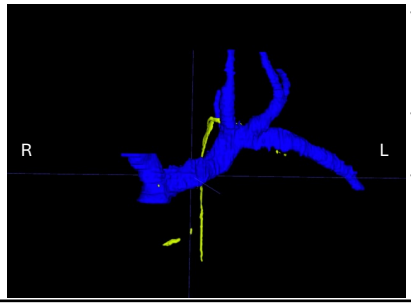
45

3D Maximum intensity projections (P1/P2/P4)



46

3D major lymph vessel tracing (P4)

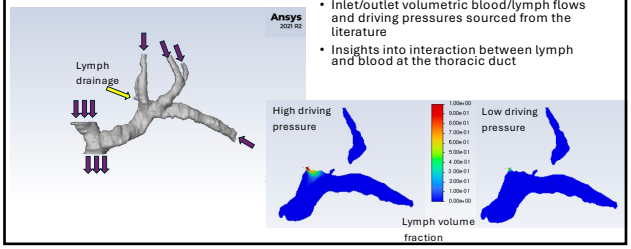


- Major lymph vessels can be semi-automatically extracted from imaging
- Venous structures manually segmented
- Direct connections between lymphatics and circulation visible in 3/4 pilot participants

47

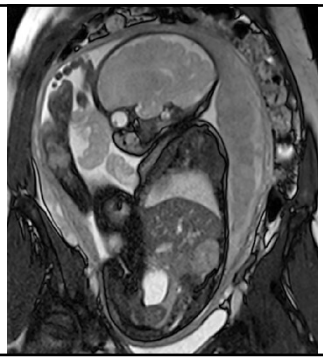
Flow modelling

- Computational fluid dynamics (CFD) can be used to simulate the impact of lymphatic and blood vessel anatomy on lymph function



- Inlet/outlet volumetric blood/lymph flows and driving pressures sourced from the literature
- Insights into interaction between lymph and blood at the thoracic duct

48



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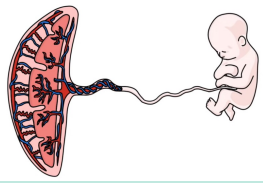
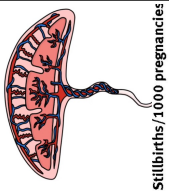


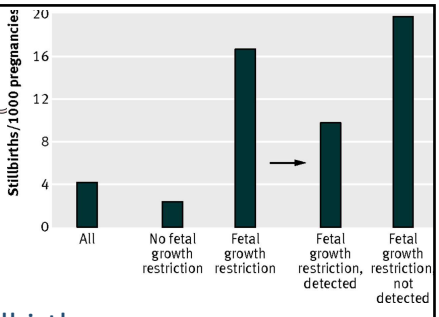
Fetal Growth Restriction (FGR)

When a fetus, due to pathological processes, does not reach their growth potential.

- Fetal factors
- Maternal factors
- Placental factors

50





FGR & Stillbirth

Gardosi et al. BMJ 2013.

51

Supine sleeping position is a modifiable independent risk factor for late stillbirth

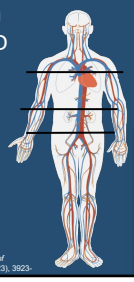
3-FOLD INCREASE IN STILLBIRTH >28 WEEKS

IN FGR PREGNANCIES: 15.7-FOLD INCREASE

www.sleepsafe.org.nz
Cronin R.S. et al. (2019). EClinicalMedicine 10, 49-57.
McCowan LME et al. (2017) PLoS ONE 12 (6)

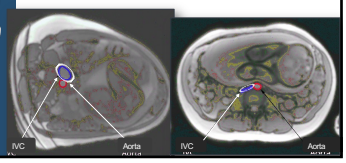
52

Maternal Blood Flow in Supine vs. LLD Position



In the supine position (compared to Left lateral decubitus):

- IVC blood flow – 85% reduction
- Azygos vein flow - 220% increase
- Cardiac output - 16.4% reduction
- Abdo Aorta flow – 32.3% reduction



Humphries, A, et al. (2019). *The Journal of Maternal-Fetal & Neonatal Medicine*, *32*(23), 3923-

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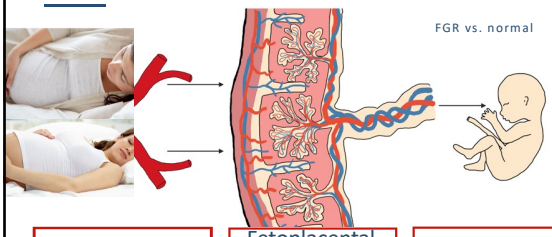
Aims:



Blood Flow to the placenta

Fetoplacental Oxygen Saturation

Blood Flow to the Fetus

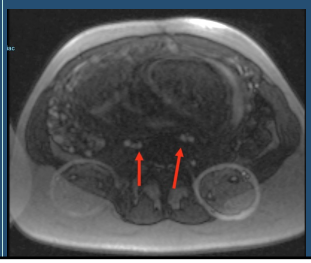
54

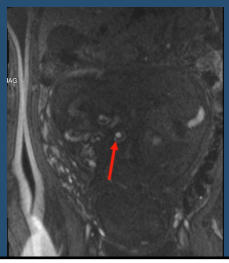
Method: MRI Scan

- 1.5T MRI
- Randomised Supine and Left Lateral positions
- 25-30 minutes in each position
- FGR – pre-scan CTG

55

Method: Phase Contrast MRI





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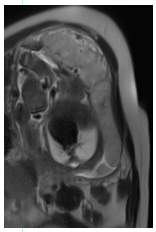
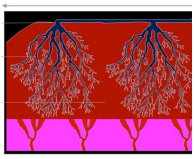
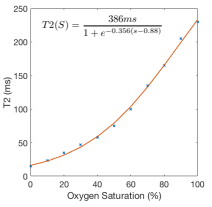
Method:

Diffusion-rElaxation Combined
Imaging for Detailed Placental Evaluation (DECIDE)



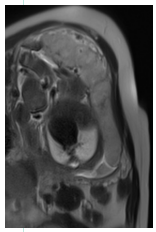


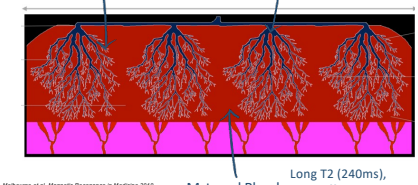


Aughwane et al. MICCAI 2018.

57

Method:
DECIDE MRI = T2 + DWI





Melbourne et al. Magnetic Resonance in Medicine 2019
Melbourne et al. Placenta. 2021.
Aughwane et al. BJOG 2021

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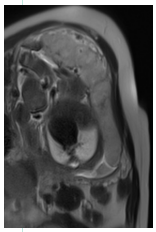
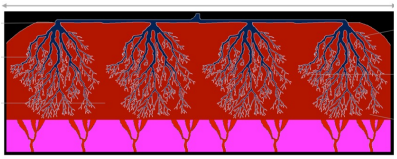
Method:
DECIDE MRI = T2 + DWI



Placental Flux (mm^2s^{-1})=
Diffusivity (mm^2s^{-1}) x Fetal blood oxygen saturation (%)



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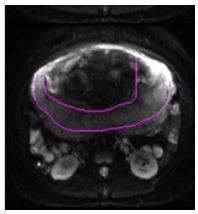
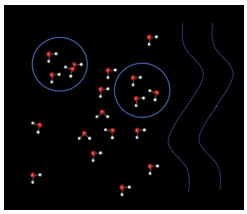
Diffusion weighted imaging = Perfusion and Tissue structure





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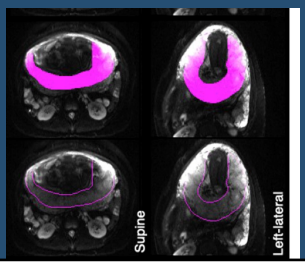
Method:
DECIDE (Diffusion + T2 MRI)



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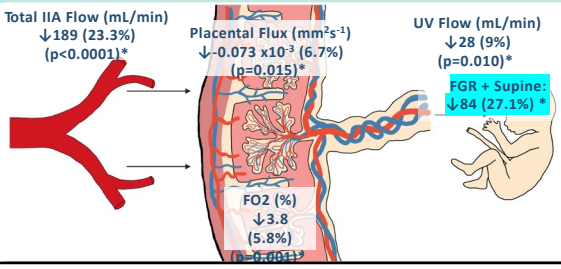
Results:
Effect of Supine vs. LLD position



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Thank you

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