

CT Head Isocentre Audit

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CT Head Isocentering- Why is it important?

- Dose
 - Tube Current Modulation
 - Bowtie Filters
- Image Quality
 - Shaffiq et al (2020) found that the mean of the noise increased approximately 5% above and below the isocentre at 5cm [1]



Misalignment and the effect on eye dose

- Anam et al (2019) found that misalignment of +2cm from isocentre the CTDI value decreased by 3% (compared to isocentre) but by misalignment of -2cm CTDI increased by 20%.

But at +2cm or higher noise increased by 10% [2]

- Perisinakis et al (2013) found that by elevating a patient's head by 4 cm above the isocentre resulted in peak eye-lens reduced by 18% in a CT brain perfusion protocol [3]

Methodology

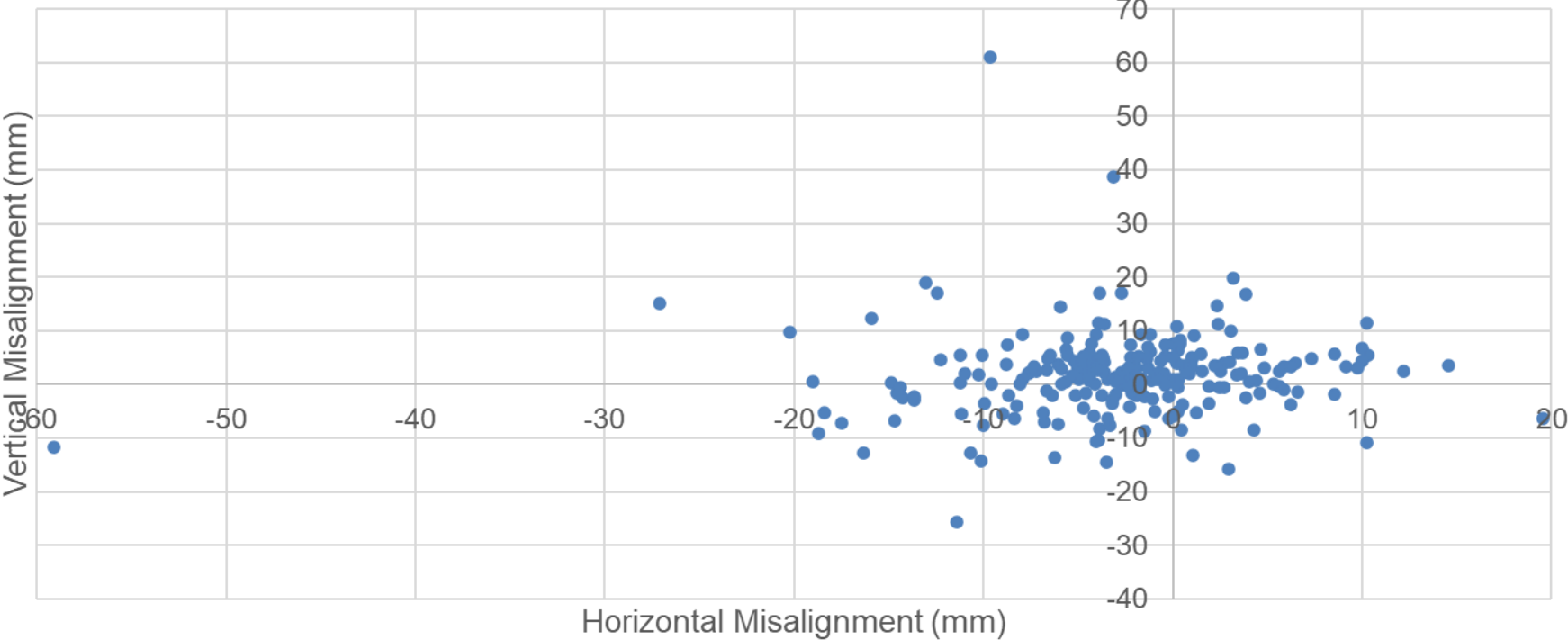
- Edge Detect
 - Using IQ Works on central CT Head slice
 - Edge detect can not work correctly if artefacts are in the images or a head rest is seen close to the head on the image
- 225 Adult patients across 5 different CT Scanners at BHRUT
- 27 patients aged 0-1
- 32 patients aged 1-5
- 33 patients aged 5-10

- Our definition of aligned is within 1 cm of the isocentre



Results Adult Patients

Horizontal Misalignment vs Vertical Misalignment



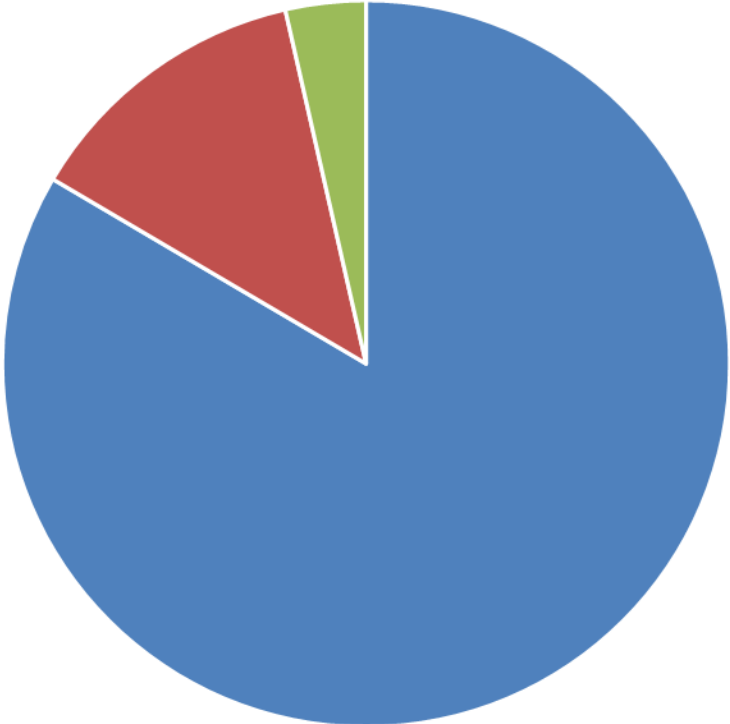
Results Adult Patients

Total Adult CT Head Examination Alignment

Maximum anterior
misalignment:
2cm

Max posterior
misalignment:
-5.9 cm

83% Aligned



■ Aligned ■ Below Isocentre ■ Above Isocentre



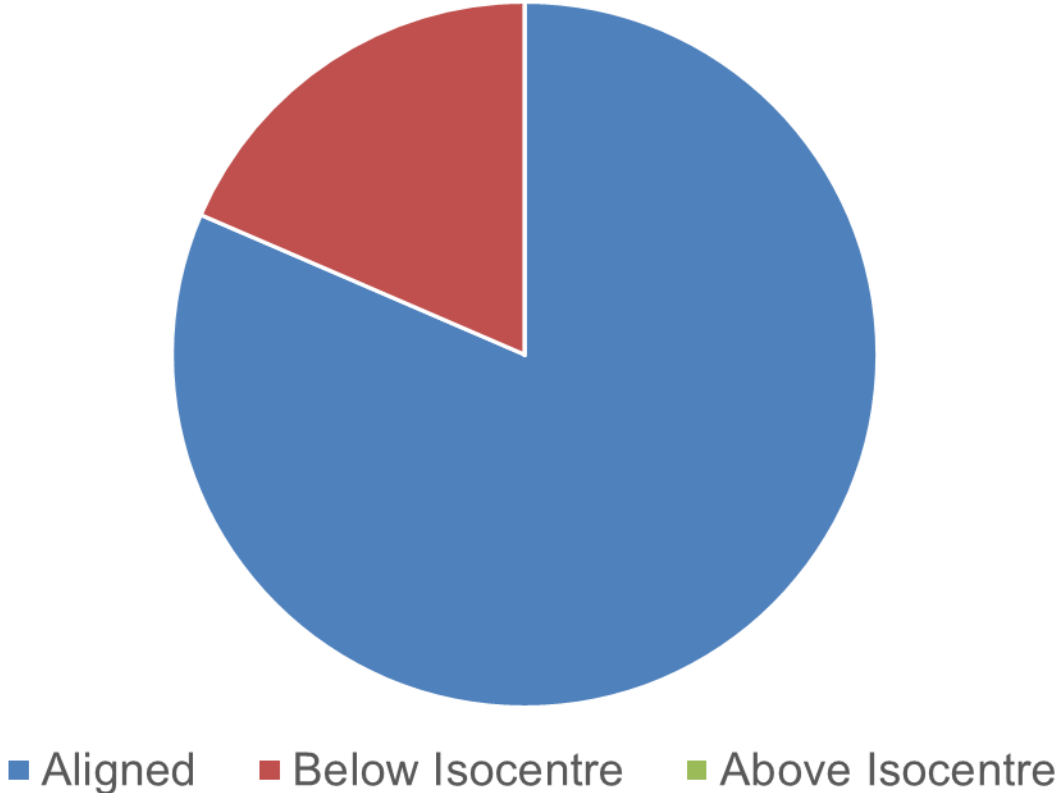
Results Paediatric 0-1

Maximum anterior
misalignment:
0.99cm

Max posterior
misalignment:
-1.33cm

81% Aligned

Paediatric 0-1 Head CT Alignment



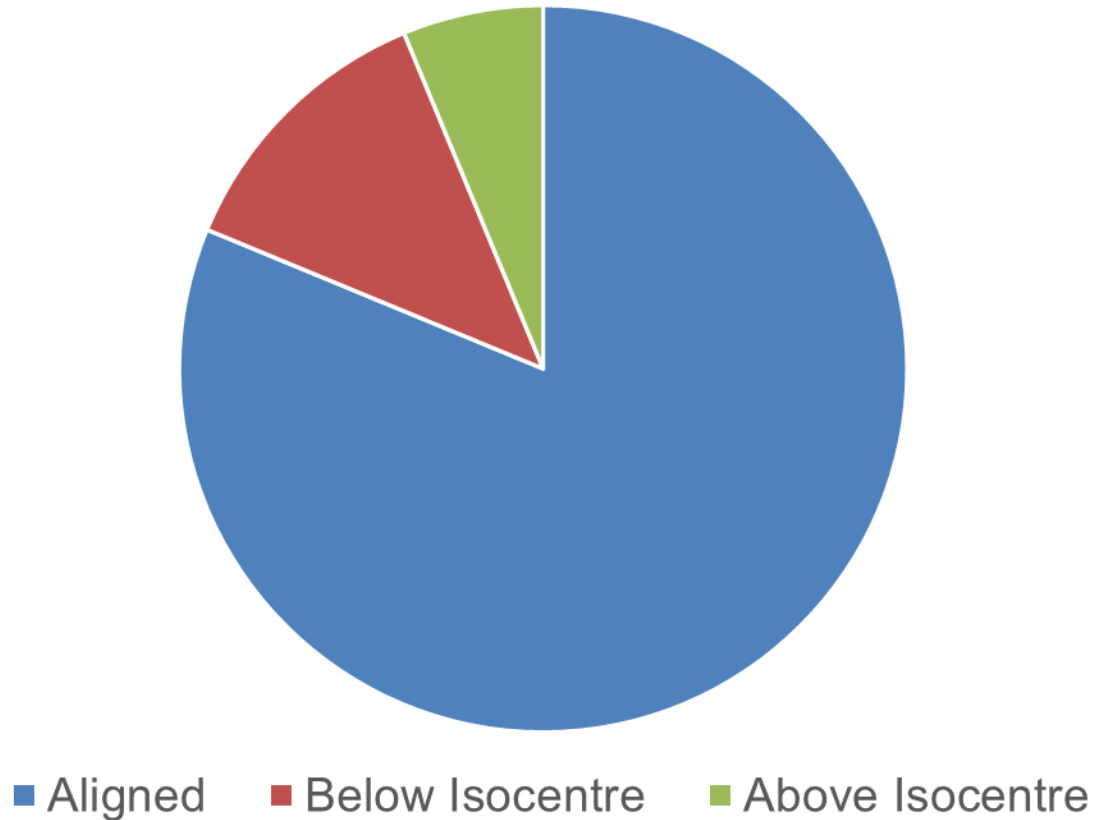
Results Paediatric 1-4

Maximum anterior
misalignment:
1.1cm

Max posterior
misalignment:
-2.6cm

81% Aligned

Paediatric 1-4 Head CT Alignment



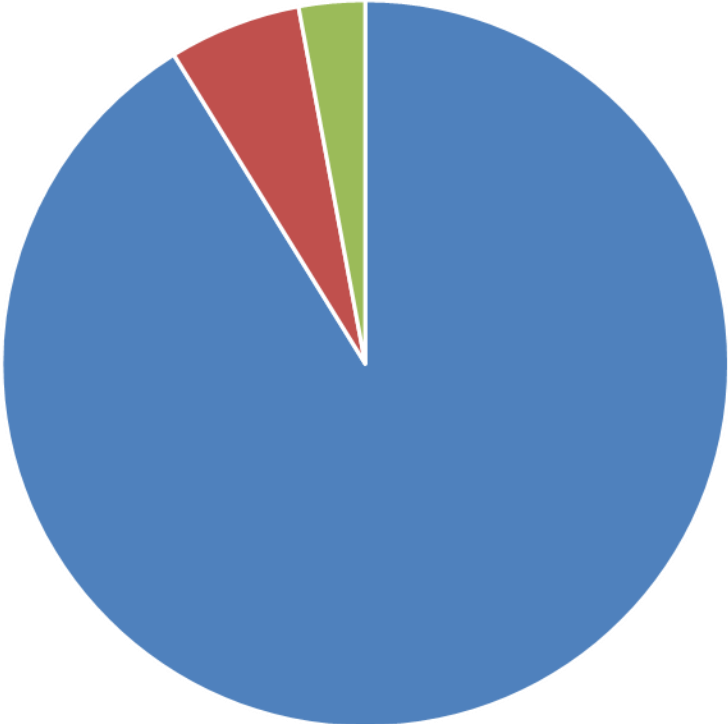
Results Paediatric 5-10

Paediatric 5-10 Head CT Alignment

Maximum anterior
misalignment:
1.5cm

Max posterior
misalignment:
-1.9cm

91% Aligned



■ Aligned ■ Below Isocentre ■ Above Isocentre



Comparing to Literature Data

- A isocentering study on a phantom with the dimensions of a 5-year-old showed that dose to the supratentorial brain at 2cm above the isocentre has an increase of approximately 22% [4]



Bibliography

[1] Said Mohd Shaffiq Said Rahmata, Muhammad Khalis Abdul Karimb, Iza Nurzawani Che Isac, Mohd Amiruddin Abd Rahmanb, Noramaliza Mohd Noord, Ng Kwan Hoonge, 2020, Effect of miscentering and low-dose protocols on contrast resolution in computed tomography head examination,

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[2] C Anam, T Fujibuchi, T Toyoda, N Sato, F Haryanto, R Widita, I Arif and G Dougherty, 2019. The impact of head miscentering on the eye lens dose in CT scanning: Phantoms study,

<https://iopscience.iop.org/article/10.1088/1742-6596/1204/1/012022/pdf> J. Phys.: Conf. Ser. 1204 012022



[3] Kostas Perisinakis, Ioannis Seimenis, Antonis Tzedakis and Antonios E. Papadakis, John Damilakis, 2013, The effect of head size/shape, miscentering, and bowtie filter on peak patient tissue doses from modern brain perfusion 256-slice CT: How can we minimize the risk for deterministic effects?,

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[4] Euler, A., Saltybaeva, N. & Alkadhi, H. How patient off-centering impacts organ dose and image noise in pediatric head and thoracoabdominal CT. Eur Radiol 29, 6790–6793 (2019).

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