Creating a craniosynostosis protocol

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Introduction

• Craniosynostosis is the premature fusion of the skull sutures.

• The resulting asymmetric calvarial (skullcap) growth causes characteristic cranial deformities.

• The clinical outcome varies between minor cosmetic deformity to severe head growth restriction with mental retardation and cranial palsies
Introduction

A & C: axial plane and a 3D image in a patient suffering from right sided coronal craniosynostosis.

B & D show axial plane and a 3D image in a patient suffering from left sided coronal craniosynostosis.
Introduction

• The overall goal is the early detection and characterisation to enable appropriate treatment.

• Delayed diagnosis and treatment may lead to:
  - deformity which may be difficult to correct
  - potentially irreversible neurological issues

• Specific imaging goals include detailed characterization of the number of sutures, extent of suture involvement, and complexity of 3D skullcap deformity.
CR-Xray Craniosynostosis protocol at RSCH

LAT and AP skull CR x-ray

Effective dose approximately 0.03mSv
GE VCT XT CT craniosynostosis protocol

Vazquez Castelo et al (2012)

100 patients
3 dose level groups
DLP range 40-281 mGy.cm

Effective dose 0.40-2.6 mSv

Dose conversion coefficient of 0.011mSv/mGy.cm

GE VCT XT CT craniosynostosis protocol

<table>
<thead>
<tr>
<th>Technical Parameters</th>
<th>Protocol Head Group 1</th>
<th>Protocol Craniosynostosis Group 2</th>
<th>Protocol Craniosynostosis Group 3</th>
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<td>Tube Voltage (kVp)</td>
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<td>mA range</td>
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<td>&gt;7.28-23.22 ((\bar{X} = 18.6))</td>
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<td>Reconstruction algorithm</td>
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<td>Soft tissue &amp; bone</td>
<td>Soft tissue &amp; bone</td>
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CT cranisynostosis protocol at RSCH

Low dose 3D reconstructed CT head scan 69.26 mGy.cm

Effective dose approximately 0.42 mSv or 1.87 mSv???
The total lifetime cancer risks are as follows:

- CR x-ray (0.03mSv) = 1 in 200,000
- CT (0.42mSv) = Kursheed et al (2002) 1 in 47,000
- CT (1.87mSv) Chappel et al, (2002) = 1 in 10,000.

- Natural childhood cancer risk = 1 in 500 (Stiller, 2007)
Discussions

• Given the effective dose using a CT scan is approximately 10-60 times greater than CR X-ray and that patients may require sedation should the use of CT be justified for craniosynostosis?

• Do other centres use CT for craniosynostosis imaging and if so how was this justified?

• What do other centres use to calculate effective dose/risk for paediatric CT imaging?
Discussions


Or


Or


Which one is correct ????????????????????
References


