Children's Health Services

Hyperinsulinism Around the World:- Australia

Dr Louise Conwell, Dr Ristan Greer

on behalf of Congenital Hyperinsulinism Group, Brisbane

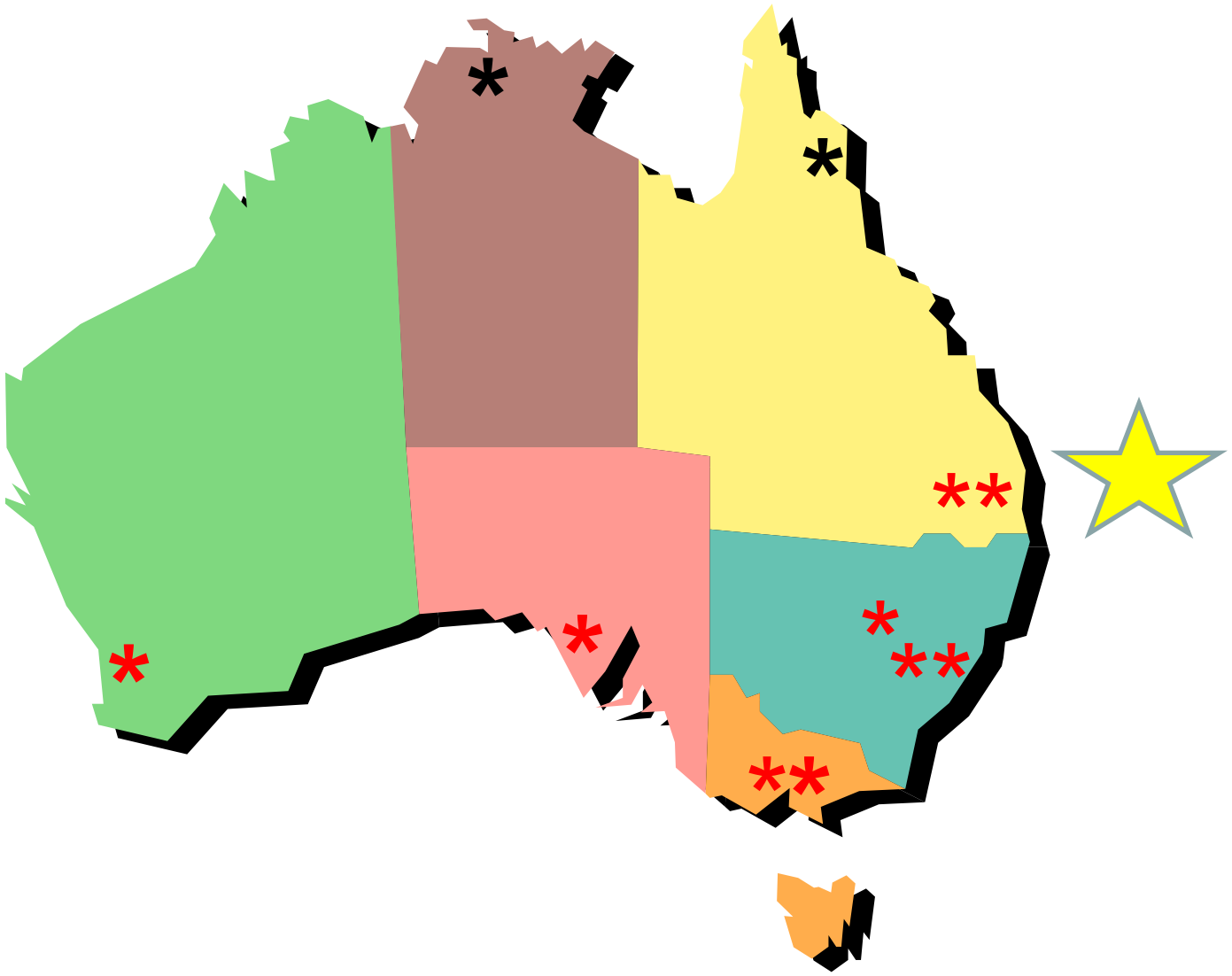
Queensland Health

Queensland Government

Congenital Hyperinsulinism Group
Brisbane, Australia

Congenital Hyperinsulinism Group
Brisbane, Australia

Paediatric Endocrinology Centres in Australia



Royal Children's Hospital

Mater Children's Hospital

Queensland Children's Hospital opening 2014

School of Medicine
University of Queensland

Children's Health Services

Queensland Health

Queensland Government

Congenital Hyperinsulinism Group Brisbane, Australia

- Paediatric Endocrinologists, Royal and Mater Children's Hospitals
  - Dr Louise S. Conwell
  - A/Prof Andrew Cotterill
  - Dr Mark Harris
  - A/Prof Gary Leong
  - Prof Jennifer Batch
  - Dr Sarah McMahon
  - Dr Michelle Jack (previous research)

Congenital Hyperinsulinism Group Brisbane, Australia

- Clinical Researcher, Queensland Children's Medical Research Institute, University of Queensland
  - Dr Ristan Greer
- Department of Nuclear Medicine, Radioisotope Laboratory and Queensland PET Service, Royal Brisbane and Women's Hospital
  - Prof David MacFarlane, Dr Frank Fiumara
  - Louise Campbell
  - Damion Stimson
  - Dr Matthew Griffiths

Congenital Hyperinsulinism Group Brisbane, Australia

- Paediatric Surgeons, Royal and Mater Children's Hospitals
  - Dr Rosslyn Walker
  - Dr Kelvin Choo
- Pathology Departments, Mater Children's Hospitals
  - Dr David Cowley
  - Ivan McGowan
- Adult Endocrinologist and Genetics Researcher, Royal Brisbane and Women's Hospital, University of Queensland
  - A/Prof Emma Duncan

Congenital Hyperinsulinism Group Brisbane, Australia

- Previous research
- Australian Paediatric Surveillance Unit Survey 2005-6
- 18F-DOPA PET/CT imaging available - 2010
- Development of a clinical national framework for care of infants and children with hyperinsulinism of infancy
- Genetics Research

Previous Research

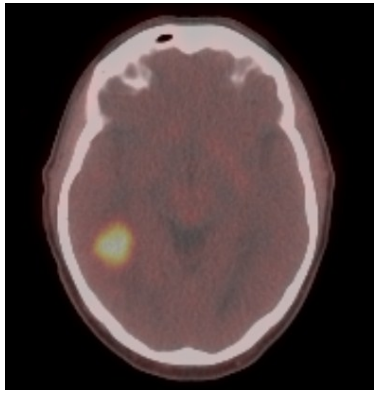
- Genetic diagnosis compared to clinical features
- Outcome in Australian children with hyperinsulinism of infancy
  - ➢ Early rather than late extensive surgery in severe cases lowers the risk of diabetes
- Histological findings in persistent hyperinsulinaemic hypoglycaemia of infancy: Australian experience

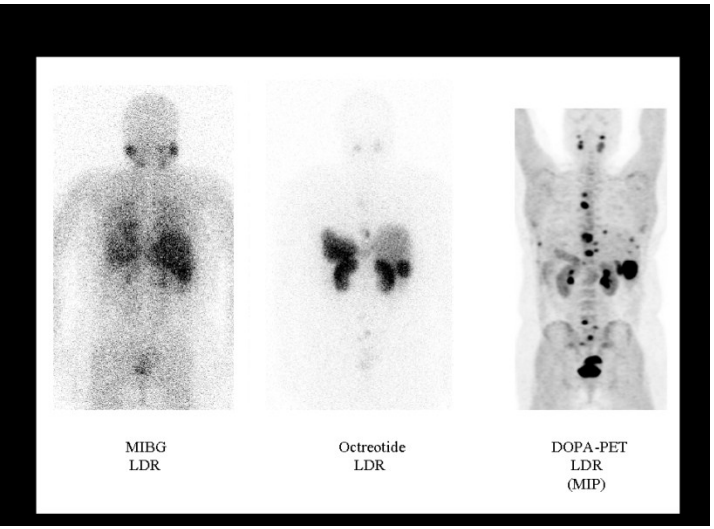
Australian Paediatric Surveillance Unit Survey 2005-6

Issues identified:-

- Few with definitive diagnosis (channelopathy/enzymopathy)
- Importance of clinician awareness
- High proportion ongoing diazoxide need

18F-DOPA PET/CT imaging available in Australia (Southern Hemisphere) from 2010

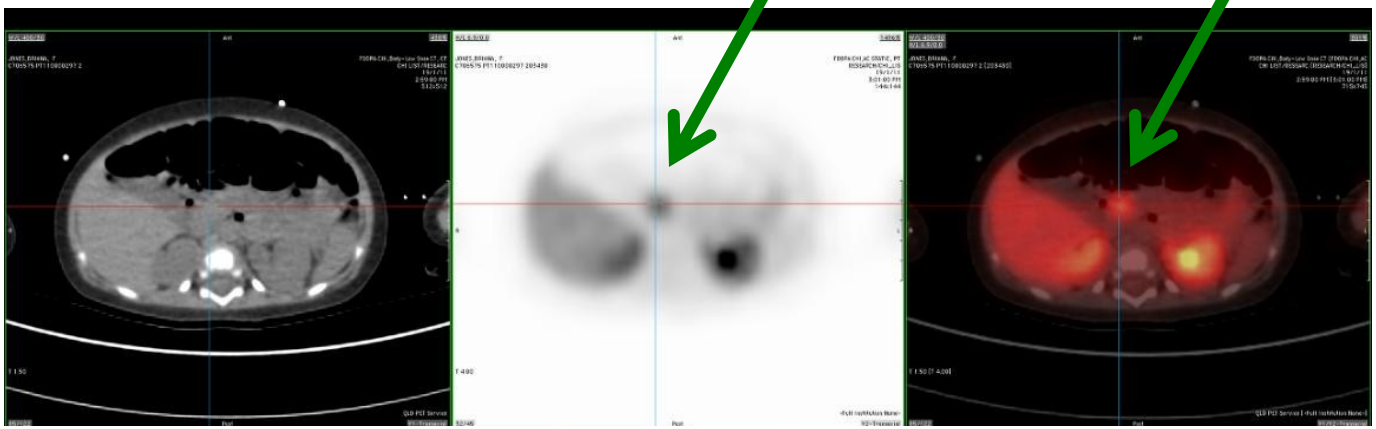




- Journey to PET / CT
  - Addiction research – dopamine function in brain nerves in early abstinence from alcohol
  - Brain tumour assessment (glioma)
  - Movement disorders
    - Parkinson's disease
  - Neuroendocrine disorders
  - Congenital hyperinsulinism opportunisitic!!

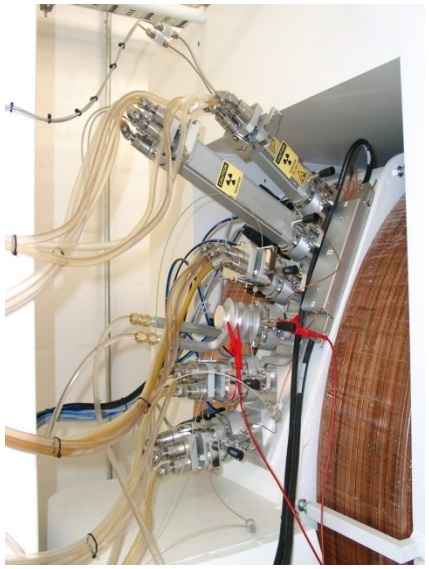
18F-DOPA PET/CT imaging available in Australia (Southern Hemisphere) from 2010

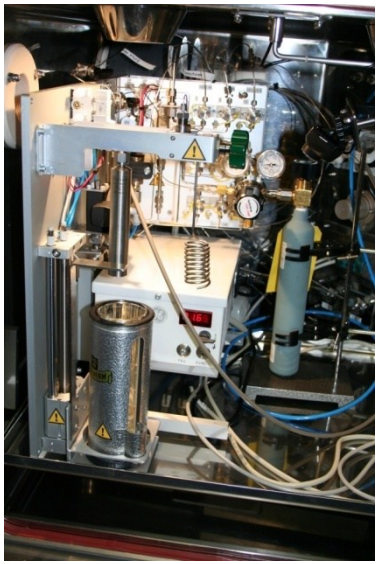
- 5 cases to date (Poster at Medical Conference)
  - Age 5 months to 35 months
  - 4 diffuse / 1 focal
  - No adverse events

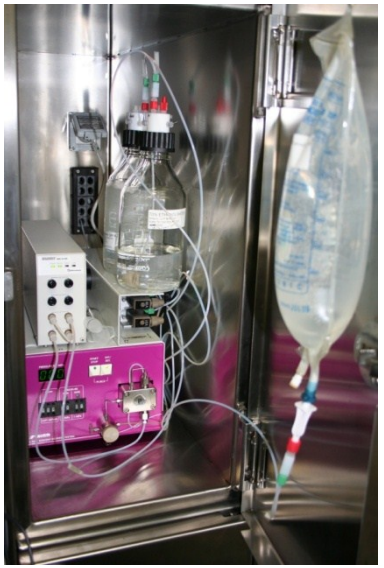


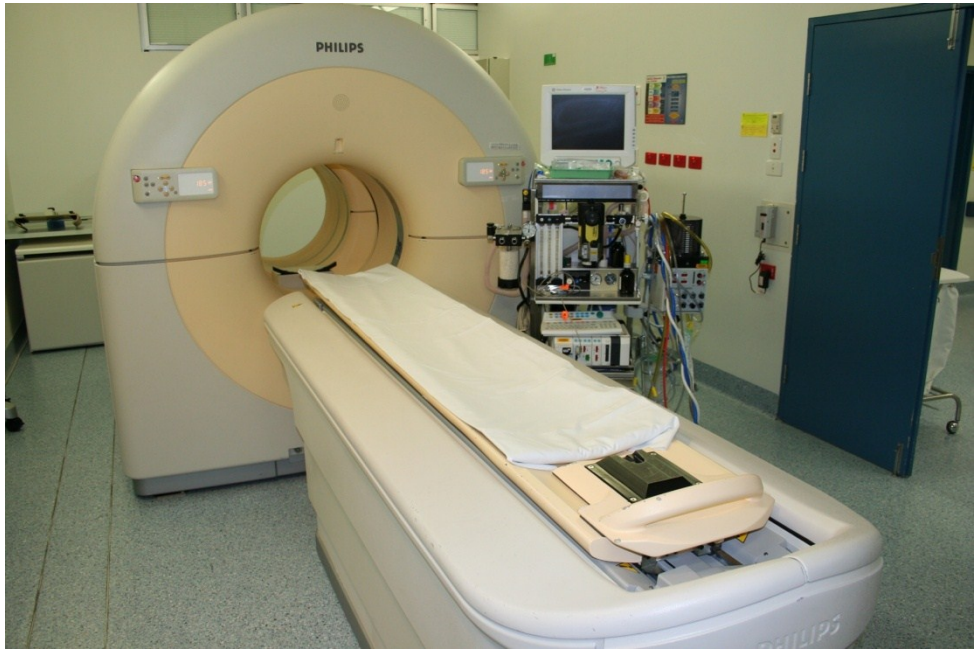
Focal uptake in pancreatic head

Cyclotron, Radiosynthesiser, PET / CT









18F-DOPA PET/CT imaging in Congenital Hyperinsulinism – first 12 months of the Australian experience

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[4] Department of Nuclear Medicine and Queensland PET Service, Royal Brisbane and Women's Hospital, Brisbane, Queensland
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Background

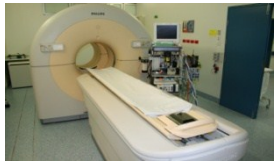
- 18F-DOPA PET/CT became available in Brisbane, Australia, in early 2010
- Only facility in the southern hemisphere
- Enables pre-operative distinction between focal and diffuse forms of Congenital Hyperinsulinism of Infancy (CHI)

Objective

- Review the cases of 18F-DOPA in CHI since imaging became available

Methods

- 18F-DOPA prepared by the electrophilic fluorination method
- Scan under GA
- Case records reviewed for
  - Clinical details
  - Metabolic and genetic investigations
  - 18F-DOPA result
  - Histology if surgery performed
  - Clinical outcome



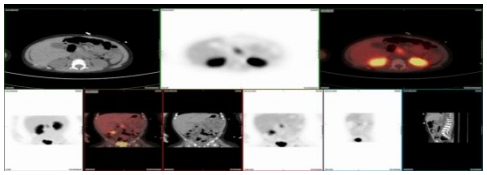
PET/CT Scanner with ancillary anaesthetic equipment.

Results

- Five PET/CT scans performed
- No adverse events

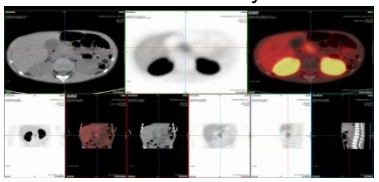
Case 1. A scan was performed when the male infant (paternal mutation KCNJ11) had continuing hypoglycaemia post partial pancreatectomy at 5 months. Diffuse disease was confirmed by PET/CT and a near-total resection at 7months. He is well at 11 months with no medication.

Case 1 diffuse



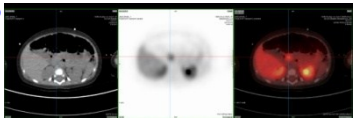
Case 2. A male, (genetics not available) had a scan at 35 months in the context of high-dose diazoxide, with glucose instability. PET/CT suggested diffuse disease, confirmed by histology following pancreatic tail and body resection.
Surgery resulted in decreased diazoxide requirement and improved metabolic stability.

Case 2 diffuse



Case 3. A female (paternal mutation ABCC8) on multiple medical therapies was scanned at 6 months showing a focal lesion, confirmed at resection. She is well at 17 months with no medication.
In this case, PET/CT avoided multiple operations and lifelong diabetes, and a decreased time at risk of hypoglycaemia and neurological damage.

Case 3 focal



Case 4. A male (paternal mutation ABCC8) with continuing diazoxide had a scan at 4yrears showing diffuse uptake.
His parents were reassured of the need for continuing diazoxide and lack of indication for pancreatectomy.

Case 5. A female, (GLUD-1 mutation identified) had a scan at 14 months of age, 10 days after presentation with seizures and a requirement for intensive medical management. The scan showed diffuse uptake.
This baby was controlled on diazoxide after initial metabolic instability.

Conclusions

PET/CT has been safe and useful in planning surgery for infants and children with CHI, correctly identifying both focal and diffuse disease. Children undergoing surgery should undergo PET/CT to confirm or distinguish focal and diffuse disease and facilitate surgical planning.

A clinical national framework for care of infants and children with hyperinsulinism of infancy (HI):- integrating

(i) genetics
(ii) 18F-DOPA PET/CT
(iii) medical
and/or (iv) surgical management
for best patient outcome.

Acknowledgements

- Royal Children's Hospital Foundation, Brisbane
- Queensland Children's Medical Research Institute

Genetics Research:-

“Evaluating the efficacy of next generation DNA sequencing in the diagnosis of disorders of beta cell function”.

Potential benefits

- Faster, less expensive
- Identify new mutations

PhD Project

- Dr Stephanie Johnson
- A/Prof E Duncan, Dr M Harris, Dr L Conwell

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