
Dr Peter De Cruz
On behalf of the Austin & RCH Intestinal Transplant Team
Intestinal Transplantation = Trying to Fix Train-Wrecks

RIDE A TRAIN THEY SAID.....

IT WILL BE FUN THEY SAID....
If only fixing train-wrecks were easy…
The Magnitude of the Carnage pre-Tx...
The Patient Immediately Post-Tx ...
Intestinal Transplant Overview

Who we transplant & who is involved?
Which organs we transplant?
What sort of service we provide?
Barriers to intestinal transplant in Australia
Possible solutions for the Future
How & When to refer for transplant?
Who do we transplant & who is involved?
Who do we Transplant?
Patients with TPN failure:

- Impending/Overt liver failure due to TPN-induced liver injury
- Thrombosis of two or more central veins (IJ, SC, SVC, IVC)
- Two or more episodes/year of catheter related sepsis → hospital
- Single episode of line-related fungaemia, septic shock, ARDS
- Frequent episodes of severe dehydration despite IV fluids + TPN
Prerequisites for Intestinal Tx in Australia

Irreversible intestinal failure

+ TPN Failure

OR

Complex abdominal visceral pathology (Desmoids)
30% mortality in world’s best Intestinal Failure Centres

Cause of death:
- < 2 years of TPN = Primary disease
- >2 years of TPN = Complications related to PN
Intestinal Transplant is indicated when anticipated 5 year survival is <57 %
Indications

Adults

- Short Gut: 64%
- Ischemia: 24%
- Trauma: 7%
- Crohn's: 11%
- Volvulus: 8%
- Other Short Gut: 10%
- Other: 9%
- Retransplant: 7%
- Tumor: 13%
- Motility Disorder: 11%
Indications

Pediatric

Short Gut 63%
Motility Disorder 18%
Malabsorption 8%
Retransplant 8%
Other 4%
Tumor 1%

Gastrochisis 22%
Volvulus 16%
N. Enterocolitis 14%
Atresia 4%
Ischemia 1%
Other Short Gut 3%
Trauma 1%

Total Percentage 100%
History of Intestinal Transplantation

- 1st human bowel transplant Boston 1964 (not reported)
- 1st human multivisceral transplant (Starzl) in Pittsburgh, 1983
  - 6yo girl: died immediately post-op from haemorrhage
- Advent of tacrolimus 1989
- 1st “successful” (enteral autonomy) liver-intestinal Tx (Grant) 1990
- ~3000 ITx conducted since 1985
- 82 centres worldwide
  - Nth America accounts for 76% of world activity
  - ~40 active centres
Intestinal Transplant in Australia

- Adult and Paediatric intestinal transplant (ITx) program developed in Australia in 2009

- Built upon success of Victorian Liver Transplant Unit
  - Established in 1988
  - 1000 liver transplants

- Pre 2009 IF pts either died or sent overseas for ITx
Intestinal Transplant in Australia

• New “hybrid” program built upon best-practice

• Staff training and up-skilling at high-volume IF & ITx centres
  Surgeons: Pittsburgh USA, Birmingham UK
  Physicians: Pittsburgh, Birmingham, Cambridge, St Mark’s, Salford UK
  Dietitian: Pittsburgh USA
  Pathologist: Pittsburgh USA, Birmingham UK
  Nursing staff: Pittsburgh USA

• Australia’s first ITx in July 2010

• Australia’s first combined ITx and Kidney transplant October 2015
Intestinal Rehabilitation: How do we achieve nutritional autonomy?

A Multidisciplinary Approach is Essential

• Photo from the Trout in Oxford
An Intestinal Transplant Program for Australia
Australia’s 1st ITX - BC – 33yo male
“Chronic Intestinal Pseudo-obstruction”

1977
- Bowel obstruction
- Bilat hydronephrosis
- Pyeloplasty
- Laparotomy
- Colostomy

1979
- Constipation
- Large B obstruction
- Recto sigmoid
- Multiple SB resection
- PN
- IFALD
- TX

1994
- Duodenal bypass
- SB resection
- Jejunostomy
- Right nephrectomy
- Total colectomy
- J Pouch
- AV Fistula take down
- Cholecystectomy
- Infarction R liver
- AV fistula

1998
- 1998

2000

2010

Total laparotomies 17
Outpatient visits 120 / 2 yrs
Pre Tx State BC

PN related complications:

• Recurrent line sepsis
  » multiple bacterial + candidal

• Thromboses
  – Patent: SVC, IVC, RIJ, RSCV
  – Left saphenous vein thigh AV fistula
  – Venous obstruction left leg

• IFALD
Pre Tx State BC

• Residual gut 90 cm jejunum?

• Recurrent admissions
  – Dehydration
  – Stomal output 3 – 10 L

• PN/IVT > 6 L / night

• Q of L
Pre-transplant
• Unemployed
• >120 hospital appointments in 2 years
• TPN 14h/d
• Pension for 17 yr
• 17 laparotomies
• Complications

Post-transplant
• Enteral autonomy
• Off pension
• Working full-time
• Paying taxes
• Living in rural Victoria
Costs: Intestinal Failure V Intestinal Transplantation (accumulative)

- Home TPN Patient
- Admitted Patient
- Intestinal Transplantation

Year 1 Year 2 Year 3 Year 4 Year 5
Which organs do we transplant?
Isolated Intestine Tx

Liver-Intestine Tx

Multivisceral Tx

(Intestine, Liver ± Stomach ± Pancreas ± Kidney)
What sort of service do we provide?
Austin & RCH Intestinal Transplant Program

- Assessment of Suitability for Intestinal/Multivisceral Transplant
- Advice regarding Intestinal Rehabilitation
- Pre-Transplant Work-up
- Intestinal/Multivisceral Transplant
- Post-Transplant Management and Follow-up
AIM

• To analyse the outcomes of patients treated by our service over the past 5 years
Methods

• Retrospective audit
• Data collection:
  – Patient demographics
  – Underlying disease
  – Nutrition support
  – TPN complications
  – Transplant program status
Results: Demographics

- **60 PATIENTS**
  - Mean age: 40 years (38 adults)
  - Mean age: 6 years (22 children)

**IF Aetiology:**
- SBS
- Dysmotility
Results: Location

Patient Home State/Country

Value %

VIC: Paediatric - 40%, Adult - 60%
NSW: Paediatric - 30%, Adult - 70%
QLD: Paediatric - 20%, Adult - 80%
TAS: Paediatric - 5%, Adult - 95%
WA: Paediatric - 10%, Adult - 90%
ACT: Paediatric - 2%, Adult - 98%
NZ: Paediatric - 3%, Adult - 97%

Austin Health

Intestinal Transplant Unit
Results: Nutrition Support

Nutrition Support at Referral

- **TPN**: Paeds 70, Adults 50
- **TPN + EN**: Paeds 20, Adults 20
- **EN + IVF**: Paeds 5, Adults 10
Results: TPN-complications

No. of Patients presenting with PN-related complications

- Liver Failure
- Recurrent Sepsis
- Loss Venous Access

Paediatric
Adult
Results: Patient Outcomes

1. Adult: 1791 days
2. Paed: 1161 days
3. Paed: 490 days
4. Adult: 16 days
What are the barriers to Intestinal Transplant in Australia?
Barriers to ITx in Australia

• Donor shortage
  – Median donor age 58 years

• Funding arrangement/ “Tyranny of Distance”
  – Lack of consensus between State Governments
  – 56% of pt’s referred from interstate

• High rate DSA
  – Highly HLA-sensitised
  – Increases waiting periods

• Complex late-stage patients
  – High rate of co-morbid medical conditions
B

Visceral Allograft Survival (%)

N=156

- Undetectable DSAs before & after transplant (n=88)
- Preformed DSAs with undetectable levels after transplant (n=30)
- Newly detectable (de novo) DSAs after transplant (n=19)
- DSAs before and after transplant (n=19)

\[ p=0.000 \]

Time After Transplantation (month)

Number of grafts at risk

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<th>12</th>
<th>24</th>
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What are the possible solutions?
Possible Solutions

• Establishment of Organ and Tissue Authority (2009)
• Application for National Centre Funding
• Innovative strategies to reduce antibody burden
  – Novel desensitization strategies
• Program promotion & links with other Australian/NZ HPN centres & alignment of activity with AusPEN HPN registry
• Development of ASIT – Australian Intestinal Transplant Forum
• Link with ISIT – International Small Intestinal Transplant Forum
How & when to refer for Intestinal Transplant consideration?
When to refer for Intestinal Transplantation

If in doubt … Ask

• Irreversible Intestinal Failure (TPN dependent)
  + TPN failure = ≥ 1 of:
  • Impending/Overt Intestinal Failure Associated Liver Disease (IFALD)
  • Recurrent Catheter Related Blood Stream Infections (Line sepsis)
  • Central Venous Thrombosis (IJ, SC, SVC, IVC)

• Complex abdominal pathology – Desmoid tumours
Referral Process

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Conclusion

• ITx is now an available and life-saving option for patients with IF in Australia and NZ

• Pt characteristics and indications for ITx in the Australian pt group are consistent with international literature

• Early referral to specialist centre is imperative

• Ongoing challenges to overcome
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“The history of medicine is that what was inconceivable yesterday, and barely achievable today, often becomes routine tomorrow.”

Thomas E. Starzl
The Future of Intestinal Transplant in Australia