INTESTINAL FAILURE, REHABILITATION & TRANSPLANTATION: Indications, Techniques and Outcomes

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Director, Intestinal Transplant Program
Dumont-UCLA Transplant Center
Los Angeles, CA
DISCLOSURES

• Peer-Peer Speakers Bureau for NPS Pharma
• All immunosuppressant drugs used in intestinal transplantation are OFF LABEL
• Most antibiotics used in intestinal transplantation are OFF LABEL
Short Bowel/Gut Syndrome
Short Bowel/Gut Syndrome
DEFINITIONS

Intestinal Failure

Condition resulting “from obstruction, dysmotility, surgical resection, congenital defect, or disease associated loss of absorption and is characterized by the inability to maintain protein-energy, fluid, electrolyte or micronutrient balance”.
Intestinal Failure
Functional Causes

• Chronic Intestinal Pseudo-obstruction
• Adhesions
• Fistulae
Intestinal Failure
Mucosal Causes

• Microvillous inclusion disease
• Tufting enteropathy
• Congenital neuroendocrinopathy
Intestinal Failure
Surgical Causes (ADULT)

- IBD
- Trauma
- Volvulus
- Mesenteric venous thrombosis
- Mesenteric arterial thrombosis
- Embolic phenomenon
- XRT
- Adhesions
- Fistulae
- Tumor (GIST, Desmoid; FAP)
Intestinal Failure
Surgical Causes (CHILDREN)

- In utero volvulus
- JI atresia
- Gastrochisis
- Omphalocele
- Meconium ileus
- Hirschsprung Disease
- NEC
- Post-Natal volvulus
- Pseudoobstruction
The Journey

Intestinal Failure → Enteral Autonomy
The Journey

Intestinal Failure → Parenteral Nutrition Support → Enteral Autonomy
The Journey

Intestinal Failure

- Parenteral Nutrition Support
- Enteral Feeding Regimen

Enteral Autonomy
The Journey

Intestinal Failure

Parenteral Nutrition Support

Enteral Feeding Regimen

Medical Therapy Glutamine GH/GLP2

Enteral Autonomy
The Journey:

- Parenteral Nutrition Support
- Enteral Feeding Regimen
- Medical Therapy Glutamine GH/GLP2
- TPN Alterations (Lipids)

Intestinal Failure → Enteral Autonomy
The Journey

- Parenteral Nutrition Support
- Enteral Feeding Regimen
- Medical Therapy Glutamine GH/GLP2
- TPN Alterations (Lipids)
- Intestinal Failure

- Autologous Reconstructive Surgery

- Enteral Autonomy
The Journey

Intestinal Failure

Parenteral Nutrition Support

Enteral Feeding Regimen

Medical Therapy Glutamine GH/GLP2

TPN Alterations (Lipids)

Autologous Reconstructive Surgery

Fistula Management
Stricture/adhesion Management
Ostomy Management
Lengthening Procedure (S.T.E.P)

Enteral Autonomy
The Journey

Parenteral Nutrition Support

Enteral Feeding Regimen

Medical Therapy Glutamine GH/GLP2

TPN Alterations (Lipids)

Intestinal Failure

Autologous Reconstructive Surgery

Intestinal Transplantation

Fistula Management
Stricture/adhesion Management
Ostomy Management
Lengthening Procedure (S.T.E.P)

Enteral Autonomy
Parenteral Nutrition Support
Predictor(s) of survival on TPN include:

A. Monthly income in USD
B. Height
C. Weight
D. Bowel length
E. None of the above
LONG-TERM PARENTERAL NUTRITIONAL SUPPORT AND INTESTINAL ADAPTATION IN CHILDREN WITH SHORT BOWEL SYNDROME:
A 25-YEAR EXPERIENCE

RUBÉN E. QUIRÓS-TEJERA, MD, MARVIN E. AMENT, MD, LAURIE REYEN, RN, FAYE HERZOG, RN, MICHELLE MERJANIAN, MD,
NANCY OLIVARES-SERRANO, MD, AND JORGE H. VARGAS, MD

Objective To analyze the outcome of children with short bowel syndrome (SBS) who required long-term parenteral
nutrition (PN).

Study design Retrospective analysis of children (n = 78) with SBS who required PN >3 months from 1975 to 2000.
Statistics: univariate analysis, Kaplan-Meier method, and Cox proportional regression model were used.

Results We identified 78 patients. Survival was better with small bowel length (SBL) >38 cm, intact ileocecal valve (ICV),
inact colon, takedown surgery after ostomy (all P < .01), and primary anastomosis (P < .001). PN-associated early persistent
cholestatic jaundice (P < .001) and SBL of <15 cm (P < .01) were associated with a higher mortality. Intestinal adaptation was
less likely if SBL <15 cm (P < .05), ICV was removed, colonic resection was done (both P < .001), >50% of colon was resected
(P < .05), and primary anastomosis could not be accomplished (P < .01). Survival was 73% (57), and 77% (44) of survivors had
intestinal adaptation.

Conclusions SBL, intact ICV, intestinal continuity, and preservation of the colon are important factors for survival and
adaptation. Adaptation usually occurred within the first 3 years. Need for long-term PN does not preclude achieving productive
adulthood. Patients with ICV even with <15 cm of SBL and patients with SBL >15 cm without ICV have a chance of intestinal
OUTCOME PREDICTORS

SURVIVAL
- SMALL BOWEL LENGTH
- ILEOCECAL VALVE
- COLONIC RESECTION
- ENTEROSTOMA
- PN COMPLICATIONS
- PN LIVER DISEASE

ADAPTATION
- SMALL BOWEL LENGTH
- ILEOCECAL VALVE
- COLONIC RESECTION
- ENTEROSTOMA
- CHOLECYSTECTOMY
- #INFECTIONS
- TIME ON TPN
TPN Complications

Catheter Sepsis
Catheter Occlusion
Vascular thrombosis
Cholelithiasis
Liver Disease
Bone Disease
Nephrolithiasis
Renal Function
Death
Survival on TPN

Figure 1. Mortality rates of patients receiving HPN compared with general population.

Figure 2. Kaplan–Meier plot of survival.
Medical Therapies
Glutamine and Growth Hormone

“In the last decade, most IF research has been focused on exploring the potential of these substances as supportive IF treatment. However, clinical trials so far have not demonstrated reproducible or meaningful clinical benefits with the use of glutamine or growth hormone.”

Glucagon-like Peptide-2

• Naturally occurring GI hormone
• Secreted by enteroendocrine L cells
  – Ileum and colon
  – Stimulators: fiber, SCFA, CHO, fat
• Trophic hormone
  – Enhances digestion
  – Enhances absorption
  – Increased mucosal mass
• Short half life: 7 minutes

Clin Exp Gastro 2011
Teduglutide (Gattex®)

- Modified GLP-2
  - Glycine substitution to prevent rapid inactivation by dipeptidyl peptidase IV (DPPIV)
  - Extends half life
  - Greater biologic potency
- NPS Pharma (Bedminster, NJ)
- FDA approval for SBS in December 2012
## Glucagon-like Peptide 2 (GLP2)

<table>
<thead>
<tr>
<th>REF</th>
<th>N</th>
<th>OUTCOME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gut 2011</td>
<td>83 (32 HD) (35 LD) (16 PD)</td>
<td>HD: no significant effect @ 20/24 wk&lt;br&gt;LD: 16/35 RR (p=0.007)&lt;br&gt;PD: 1/16 RR</td>
</tr>
<tr>
<td>CEG 2011 (unpublished extension study)</td>
<td>65 pt</td>
<td>LD: 75% sustained RR @ 1yr&lt;br&gt;HD: 75% sustained RR @ 1yr&lt;br&gt;PD-LD: 100% RR&lt;br&gt;PD-HD: 28% RR</td>
</tr>
<tr>
<td>STEPS (unpublished Phase 3)</td>
<td>86</td>
<td>LD: 63% (27/42) RR @ 24 wk&lt;br&gt;PD: 30% (13/43) RR @ 24 wk</td>
</tr>
</tbody>
</table>

HD = 0.1 mg/kg/d; LD 0.05 mg/kg/d; PD PLACEBO
TPN Alterations to Minimize Complications
Omegaven® is derived from?

A. Pig oil
B. Vegetable oil
C. Fish oil
D. Whale blubber
Fish Oil Emulsions
Omegaven®
Not US FDA Approved
Prospective, Case Controlled Trial of 24 weeks of Intravenous Fish Oil in Children with Intestinal Failure Associated Liver Disease

Kara Calkins*1, Stephen Shew2, James Dunn2, Douglas Farmer2, and Robert Venick1,2

1Department of Pediatrics, 2Department of Surgery
University of California, Los Angeles

*Supported by NIH grant T32GM75776-6
## Study Design

### INCLUSION CRITERIA
- Clinical evidence of IFALD
- Direct bilirubin (DB) ≥ 2 mg/dL
- Expected Parenteral Nutrition (PN) course > 30 d
- > 2 weeks of age, < 18 years
- > 60% kcal from PN

### EXCLUSION CRITERIA
- Inborn error of metabolism
- ECMO
- Seafood, egg or Omegaven™ allergy
- Liver disease other than IFALD
- Fatal chromosomal disorder
- Unable to obtain consent or tolerate laboratory draws
**PROSPECTIVE FO COHORT**

Satisfies Inclusion Criteria

- FO
  - Omegaven™ 1 gm/kg/d IV
  - X 24 weeks or until death/transplant

**RETROSPECTIVE SO COHORT**

Satisfies Inclusion Criteria

- SO
  - Intralipid™ 0.5 – 4 gm/kg/d
  - X 24 weeks or until death/transplant
## Demographics

<table>
<thead>
<tr>
<th></th>
<th>FO</th>
<th>SO</th>
<th>p-value</th>
</tr>
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<tr>
<td>Age at Start of Study (d)</td>
<td>148.9±99.5</td>
<td>172±245.8</td>
<td>0.29</td>
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<tr>
<td>Age at End of Study (d)</td>
<td>282.7±119.4</td>
<td>324.8±250.5</td>
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</tr>
<tr>
<td>Gestational Age (weeks)</td>
<td>33.8±4.2</td>
<td>34.0±3.8</td>
<td>0.90</td>
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<tr>
<td>Birth Weight (kg)</td>
<td>2.2±0.6</td>
<td>2.2±0.8</td>
<td>0.85</td>
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<tr>
<td>Male</td>
<td>3</td>
<td>13</td>
<td>0.12</td>
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# Baseline GI Characteristics

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<th></th>
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<tr>
<td><strong>GI diagnosis</strong></td>
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<td></td>
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<tr>
<td>gastroschisis</td>
<td>4</td>
<td>8</td>
<td>0.37</td>
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<tr>
<td>NEC</td>
<td>2</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>atresia</td>
<td>2</td>
<td>5</td>
<td></td>
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<tr>
<td><strong>Small bowel length (cm)</strong></td>
<td>25±19</td>
<td>27±17.8</td>
<td>0.78</td>
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<tr>
<td><strong>Ileocecal Valve</strong></td>
<td>6</td>
<td>11</td>
<td>0.13</td>
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<tr>
<td>100% colon</td>
<td>7</td>
<td>11</td>
<td>0.69</td>
</tr>
<tr>
<td>Small bowel connected to colon</td>
<td>7</td>
<td>11</td>
<td>0.69</td>
</tr>
</tbody>
</table>
**p-value < 0.0001**
Time to Resolution of Cholestasis

Percent resolved

Weeks

p-value<0.0001

FO
SO
STEP
STEP means:

A. The act of putting one foot in front of the other
B. One part of a house that allows access to the upper floors
C. A surgical procedure that lengthens the intestine
D. All of the above
STEP

Kim et al., JPS 2003
STEP

\[ L = \text{Length of Bowel} \]

\[ S = \text{Length of Each Cut} \]

\[ N = \# \text{ of cuts} \]

\[ \text{New Length} = L + (S \times N) \]
International STEP Registry Data

HB Kim, MD
Boston Children’s Hospital
Pediatric Intestinal Failure and Rehabilitation Symposium (PIFRS)
Chicago, IL 2010
STEP Registry

• 111 patients
• 9/2004 – 1/2010
• 50 worldwide centers

HB Kim, MD
111 Patients

97 STEP

14 Lost

3 Poor data

9 Death 4 SBT 8 TPN 14 TPN+EN 45 100%EN

14 Repeat STEP (3rd STEP=2)

2 Death 1 SBT 4 TPN+EN 3 100%EN
111 Patients

97 STEP

14 Lost

3 Poor data

9 Death 4 SBT 8 TPN

14 Repeat STEP (3rd STEP=2)

48/94 = 51%

2 Death 1 SBT 4 TPN+EN

45 100% EN

14 TPN+EN

3 100% EN
EFFECT?
Transplantation
July 28, 2009. 7 AM. At UCLA
Mr. Wanchao Wu had a small bowel transplant by Dr. Farmer & his team
Intestinal Transplantation
Indications

Irreversible **Intestinal Failure** associated with one or more life-threatening complications:

- Liver Disease
- Loss Vascular Access
- Recurrent Catheter Sepsis
- Complex fluid and electrolyte management
- Non-reconstructible GI Tract
Intestinal Transplantation
Graft Options
CORE OPTIONS
1. Isolated Intestine
2. Liver Intestine
3. Multivisceral
4. Modified Multivisceral
5. Isolated Liver

ACCESSORY OPTIONS
1. Stomach
2. Pancreas
3. Colon
4. Kidney
COMBINED LIVER-INTESTINAL IMPLANTATION
Multivisceral Implantation
Modified Multivisceral Implantation
Pretransplant Predictors of Survival After Intestinal Transplantation: Analysis of a Single-Center Experience of More Than 100 Transplants

Douglas G. Farmer, 1,7 Robert S. Venick, 2 Joanie Colangelo, 1 Yvonne Esmailian, 1 Hasan Yersiz, 1 John P. Duffy, 1,3 Galen R. Cortina, 4 Kanela Artavia, 5 Khiet Ngo, 2,6 Suzanne V. McDiarmid, 2 and Ronald W. Busuttil 1

Introduction. Outcomes after intestinal transplantation (ITx) have steadily improved. There are few studies that assess factors associated with these enhanced results. The purpose of this study was to examine peri-ITx variables and survival.

Methods. A review of a prospectively maintained database was undertaken and included all patients undergoing ITx from 1991 to 2010. The study endpoints were patient and graft survival. Data collection included 44 variables. Survival was computed using Kaplan-Meier methods. Univariate analysis was conducted (log-rank test) with significance set at P less than or equal to 0.20. Multivariate analysis of significant variables was conducted using model reduction by backward elimination variable selection method with significance set at P less than 0.05.

Results. Eighty-eight patients received 106 ITx. The majority of recipients were male, Latino, and children. The leading causes of intestinal and liver failure were gastrochisis and parenteral nutrition. Grafts transplanted were isolated intestine (24%), liver-intestine (62%), and multivisceral (14%). Overall 1- and 5-year patient and graft survival were 80% and 65%, and 74% and 64%, respectively. Significant univariate survival predictors were weight less than 20 kg, children, liver-inclusive allograft, panel reactive antibody less than 20%, absence of donor-specific antibody, negative crossmatch, warm ischemia time less than 60 min, absence of recipient splenectomy, interleukin-2 receptor antagonist induction, and era. Significant multivariate survival predictors were absence of donor-specific antibody, absence of recipient splenectomy, and liver-inclusive graft type.

Conclusion. This large, single-center ITx experience confirms a marked improvement in outcome over time. Several important factors were associated with survival, and these factors can potentially be adjusted before ITx. These findings should refocus future efforts on strategies to improve treatment and prevent graft loss.

Keywords: Intestinal transplantation, Small bowel transplantation, Multivisceral transplantation, Outcomes.

(Transplantation 2010;90: 1574–1580)
0 = No risk factors
1 = DSA+ OR non-Liver graft
2 = DSA+ AND non-liver graft
Patient Survival Based on # of Multivariate Risk Factors Present

0 = No risk factors
1 = DSA+ OR splenectomy
2 = DSA+ AND splenectomy

Time Post-Transplant (months)

Patient Survival

p = 0.0004
The liver, spleen and preformed antibodies are important predictors of survival after intestinal transplantation: Analysis of a single center, 20 year experience

Douglas G Farmer, Robert S Venick, Laura Wozniak, Yvonne E Esmailian, Hasan Yersiz, Kanela Artavia, Laurie Reyen, Susan Ponthieux, Erin Core, Villy Hwang, Anna Zafar, Galen Cortina, Sue V McDiarmid, Ronald W Busuttil

Intestinal Transplant Program
Dumont UCLA Transplant Center

XIth International Small Bowel Transplant Symposium
Washington, DC, September 2011
Predictors of outcome after intestinal transplantation: An analysis of over 125 cases at a single center


Intestinal Transplant Program
Dumont UCLA Transplant Center

XIIIth International Small Bowel Transplant Symposium
Oxford, UK, June 2013
Introduction

• Intestinal transplantation (ITx) has had remarkable advancement over the past 2.5 decades.
  – 80-90% 1-year survival has been reported
• Outcomes are still limited by rejection and infection.
  – Medium term survival still lags (5-yr 40-50%)
• Few large studies are available to analyze factors that affect long-term results.
AIM

• Review a large, single center experience

• Perform an analysis of factors (including pre-transplant, operative, and post-transplant variables) that impact outcome.
Materials & Methods

• Retrospective analysis of prospectively maintained database
• Single center experience
• IRB approved
• Include all ITx recipients from 1991 - 2012
• Endpoints
  – Patient death
  – Graft loss
### VARIABLES

<table>
<thead>
<tr>
<th>DEMOGRAPHIC</th>
<th>PRE-TRANSPLANT CHARACTERISTICS</th>
<th>LABORATORY DATA</th>
<th>PERI-OPERATIVE DATA</th>
<th>POST-OPERATIVE</th>
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<tbody>
<tr>
<td>AGE</td>
<td>GI DIAGNOSIS</td>
<td>TOTAL BILIRUBIN</td>
<td>GRAFT TYPE</td>
<td>Ventilator time</td>
</tr>
<tr>
<td>AGE GROUP</td>
<td>GI ANATOMY</td>
<td>CONJUGATED BILIRUBIN</td>
<td>COLD ISCHEMIA TIME</td>
<td>ICU time</td>
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<tr>
<td>GENDER</td>
<td>ILEOCECAL VALVE STATUS</td>
<td>ALANINE AMINOTRANSFERASE</td>
<td>WARM ISCHEMIA TIME</td>
<td>Hospital length</td>
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<td>ETHNICITY</td>
<td>CENTRAL VENOUS CATHETER HISTORY</td>
<td>ASPARTATE AMINOTRANSFERASE</td>
<td>TOTAL ISCHEMIA TIME</td>
<td>Acute Rejection</td>
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<tr>
<td>HEIGHT</td>
<td>CENTRAL VENOUS CATHETER INFECT</td>
<td>GGT</td>
<td>DONOR SPLEEN MANAGEMENT</td>
<td>Chronic Rejection</td>
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<tr>
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<td>INFECTION HISTORY</td>
<td></td>
<td>RECIPIENT SPLEEN MANAGEMENT</td>
<td>Reoperations</td>
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<td>WEIGHT</td>
<td>OPERATIVE HISTORY</td>
<td>ALBUMIN</td>
<td>ESTIMATED BLOOD LOSS</td>
<td>Nutrition data</td>
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<td>TIME ON TPN</td>
<td>FIBRINOGEN</td>
<td>TIME ON WAIT LIST</td>
<td>PTLD</td>
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<td>DEGREE OF LIVER DISEASE</td>
<td>INTERNATIONAL NORMALIZATION RATIO</td>
<td>ABDOMINAL WALL MANAGEMENT</td>
<td>CMV Viremia</td>
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<tr>
<td></td>
<td>MELD/PELD SCORE</td>
<td>PLATELET COUNT</td>
<td>IMMUNOSUPPRESSION REGIMEN</td>
<td>EBV Viremia</td>
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<td>LOCATION</td>
<td>ABO GROUP</td>
<td></td>
<td></td>
<td>Infectious enteritis</td>
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<td>MECHANICAL VENTILATION</td>
<td>EBV SEROLOGY</td>
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<td>RENAL REPLACEMENT THERAPY</td>
<td>CMV SEROLOGY</td>
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<td>CREATINE CLEARANCE</td>
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<td>DONOR SPECIFIC ANTIBODIES</td>
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<td>HLA CROSSMATCH STATUS</td>
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<td>PANEL REACTIVE ANTIBODIES</td>
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</table>
Materials & Methods

• Primary endpoints: Survival
  – Calculated using Kaplan-Meier method

• Univariate analysis
  – Log-rank test (categorical)
  – Cox proportional hazard model (continuous)

• Multivariate analysis
  – Backward elimination variable selection method
Results

• 127 ITx were performed in 104 patients
  – 72% children
  – 13.5 ± 15.5 yrs old
  – Actual MELD/PELD 15 ± 11
  – Adjusted MELD/PELD 34 ±10
  – 43% hospitalized (24% ICU)
  – cGFR 110 ± 58 ml/min/1.73m²
• 115 ITx
  – 7 kidney inclusive
  – 11 colon inclusive
  – 0 stomach inclusive
Results

- Total ischemia time: 7.5 ± 2.0 hrs
- 24% required native splenectomy
- 40% had donor spleen transplanted and removed >1 hr post reperfusion
Results

INDUCTION IMMUNOTHERAPY

- 9% IL2RA
- 33% ANTIBODY
- 58% NONE
Results

- Acute Rejection
  - 42% without ACR
  - Median 1 ACR/graft
- Chronic Rejection: 11 pt (9%)
  - 3.4 ± 2.4 yrs post-ITx
- GVHD: 3 pt (2.4%)
- Tissue invasive CMV Dz: 8 pt (6%)
- PTLD: 14 pt (11%)
- Infectious Enteritis: 76 pt (60%)
Graft and Patient Survival
## Univariate Analysis Graft

<table>
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<tr>
<th>FACTOR</th>
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<th>VARIABLE B</th>
<th>HR</th>
<th>P VALUE</th>
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<td>ERA</td>
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<td>POST-2000</td>
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<td>INDUCTION</td>
<td></td>
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<td>ITX TYPE</td>
<td>NON-LIVER INCLUSIVE</td>
<td>LIVER INCLUSIVE</td>
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<td>PRA</td>
<td>&gt;20%</td>
<td>&lt;20%</td>
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<td>DSA+</td>
<td>YES</td>
<td>NO</td>
<td>0.09</td>
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<td>T-XM+</td>
<td>YES</td>
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<tr>
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<td>ADULT</td>
<td>CHILD</td>
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<tr>
<td>WIT</td>
<td>&gt;60 MIN</td>
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<td>SEVERE ACR</td>
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<td>NO</td>
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<td>INTUBATION</td>
<td>&gt; 7 DAYS</td>
<td>&lt;7 DAYS</td>
<td>0.07</td>
<td></td>
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</tbody>
</table>
Graft Survival Based on Severe ACR (Y/N)

Survival Plot

The graph shows two lines representing survival over time for two conditions, labeled 'N' and 'Y'. The line for 'Y' shows a higher survival rate compared to 'N'. The p-value for this comparison is p=0.0005.
# Univariate Analysis Patient

<table>
<thead>
<tr>
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<th>VARIABLE B</th>
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<td>DSA+</td>
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<td>NO</td>
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<td>T-XM+</td>
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<td>NO</td>
<td>0.19</td>
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<td>DONOR SPLEEN</td>
<td>REMOVED</td>
<td>TX-THEN REMOVED</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>RECIPIENT SPLENECTOMY</td>
<td>YES</td>
<td>NO</td>
<td>0.006</td>
<td></td>
</tr>
<tr>
<td>WIT</td>
<td>&gt;60 MIN</td>
<td>&lt;60 MIN</td>
<td>0.0006</td>
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<tr>
<td>ERA</td>
<td>&lt;2000</td>
<td>&gt;2000</td>
<td>0.001</td>
<td></td>
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<tr>
<td>CIT</td>
<td>&gt;10 HR</td>
<td>&lt;10 HR</td>
<td>0.01</td>
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<tr>
<td>M/PELD</td>
<td>&gt;16</td>
<td>&lt;16</td>
<td>0.03</td>
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<tr>
<td>INDUCTION</td>
<td>IL2RA</td>
<td>NON-ILRRA</td>
<td>0.01</td>
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</table>
Patient Survival Based on CMV Viremia

\[ p = 0.01 \]

- <0.3 episodes of viremia/pt-yr
- >0.3 episodes of viremia/pt-yr
CONCLUSIONS
CONCLUSION 1

• TPN therapy required for all
• Long-term TPN management appropriate in some cases
• Emphasize PN weaning
• Minimize PN associated complications
CONCLUSION 2

- Fish oil based lipid formulations appear to be safer in short-term for infants and children with early IFALD
- No long-term data
- Other emulsions in development
CONCLUSION 3

• Medical consideration should be given to the use of GLP2 analog in select patients
• Close monitoring and follow-up required
• End point of therapy remains to be determined
• Cost analysis needed
CONCLUSION 4

• Surgical options should be considered in all
• STEP best applied to patients with
  – dilated small bowel segments
  – Dependent on PN for 25-75% of calories
  – Absence of advanced hepatic fibrosis/cirrhosis
CONCLUSION 5

• Reserve transplantation for patients who
  – Fail with adaptation
  – Develop 1 or more life-threatening TPN complications
  – Careful patient selection, operative planning
  – Choose the correct organs!
XIV INTERNATIONAL SMALL BOWEL TRANSPLANT SYMPOSIUM

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The Transplantation Society
Thank You!