



Intestinal Transplantation: New developments, indications and results

R. Margreiter, B. Spechtenhauser,
R. Ladurner, A. Königsrainer

Univ.-Klinik für Chirurgie,
Klinische Abteilung für Allgemein-
und Transplantationschirurgie
Anichstraße 35
A-6020 Innsbruck, Austria
Tel.: 0043/512/504/22600
Fax: 0043/512/504/22602
E-mail: raimund.margreiter@uibk.ac.at

Introduction

New powerful immunosuppressants made intestinal transplantation a routine procedure at a few specialized centers. Still the number of transplants is limited due to the fact that the

need for such transplants is calculated to be not more than 1/Million population and year. In this article new developments in the field, indications and results will be briefly discussed.

New developments

The bowel can either be transplanted alone, together with the liver or as component of a multivisceral transplant. Whereas the surgical techniques of isolated bowel and multivisceral transplantation are rather straight forward, combined liver intestine transplantation was associated with a number of problems and has therefore recently been changed (1). The graft now includes not only the liver and the bowel

but also the head of the pancreas with the duodenum. Since closure of the abdominal wall following bowel transplantation has been a major problem in many patients, the technique of abdominal wall transplantation has been developed by Tsakis and coll (2). Another new development is the use of magnifying endoscopes for non-invasive graft monitoring (3).

Indications

Primary diseases leading to transplantation are different in pediatric and adult patients. Whereas in children gastroschisis, volvulus, narcotizing enterocolitis, pseudoobstruction and intestinal atresia were the most common

indications, intestinal failure in adults was mainly due to ischemia, Crohn's disease and trauma. Primary diseases and percentages according to the international transplant registry are depicted in Tables 1 and 2 (4).





PRIMARY DISEASES

Tab. 1: Adults

Ischemia	23%
Crohn's Disease	14%
Trauma	10%
Short Gut Other	9%
Desmoid	9%
Motility	8%
Volvulus	7%
Retransplant	6%
Other Tumor	5%
Gardner's	3%
Miscellaneous	5%

Tab. 2: Children

Gastroschisis	21%
Volvulus	17%
Necrotizing Enterocolitis	12%
Pseudo – Obstruction	9%
Intestinal Atresia	8%
Retransplant	8%
Aganglionosis/Hirschsprung	7%
Microvillus Inclusion	6%
Short Gut Other	5%
Malabsortion	3%
Motility – Other	1%
Tumor	1%
Other	2%

As of May 31st, 2003 a total of 989 intestinal transplants were performed in 923 patients worldwide. Of these 433 (44%) were isolated transplants, 386 (39%) combined bowel-liver transplants and 170 (17%) multivisceral transplants.

We have performed at our center a total of 24 intestinal transplants of which 15 were isolated bowel transplants and 9 multivisceral transplants. Patient characteristics and primary diseases are summarized in Tables 3 and 4.



MULTIVISCERAL TRANSPLANTATION

Tab. 3: Patient Characteristics

No.	Initials	Age	Sex	Indication	date of transplant
1	R.W.	51	m	Pseudoobstruction	21.11.1994
2	T.M.	35	m	Crohn's disease	14.08.1998
3	A.A.	39	m	Ischemia	13.10.1999
4	H.M.	10	m	Volvulus	15.10.1999
5	Z.K.	2	f	Tumor	13.12.1999
6	H.M.	10	m	Retransplantation (aneurysm graft artery)	14.01.2000
7	A.S.	48	m	Ischemia	12.02.2000
8	H.S.	37	f	Crohn's disease	10.04.2000
9	J.R.	38	f	Retransplantation (chronic rejection)	11.10.2000
10	O.S.	24	f	Pseudoobstruction	01.08.2001
11	E.P.	38	m	Volvulus	08.02.2002
12	H.J.	38	m	Polyposis	20.02.2002
13	H.S.	37	f	Retransplantation	05.06.2002
14	B.M.	4	f	Volvulus	29.01.2003
15	S.H.	60	f	Crohn's disease/ Glomerulonephritis	07.07.2003

MULTIVISCERAL TRANSPLANTATION

Tab. 4: Patient Characteristics

No.	Initials	Age	Sex	Indication	Date of transplant
1	B.D.	48	m	Pancreatic cancer	26.12.1989
2	B.J.	41	f	Gardner syndrome	17.06.1997
3	M.F.	62	m	Neuroendocrine tumor	27.11.1997
4	G.L.	66	m	Ischemia	07.08.1998
5	J.R.	38	F	Gardner syndrome	03.07.2000
6	F.Y.	0,75	f	Tumor	13.08.2002
7	Z.K.	6	f	reTX/chronic rejection	07.11.2002
8	Q.M.	60	m	Tumor	19.02.2003
9	G.R.	21	f	Gardner syndrome	17.02.2004



Immunosuppression

The majority of patients received induction therapy with an antilymphocyte preparation. Maintenance immunosuppression was mainly based on tacrolimus which was combined in most instances with steroids and mycophenolate mofetil or azathioprine. In more recent series campath was used as induction therapy and rapamycine for maintenance. The

majority of our patients received antithymocyte globulin or an IL-2 antagonist for induction. Except for the first patient who was given cyclosporine all other patients received tacrolimus together with azathioprine and steroids and only few patients mycophenolate mofetil.

Results

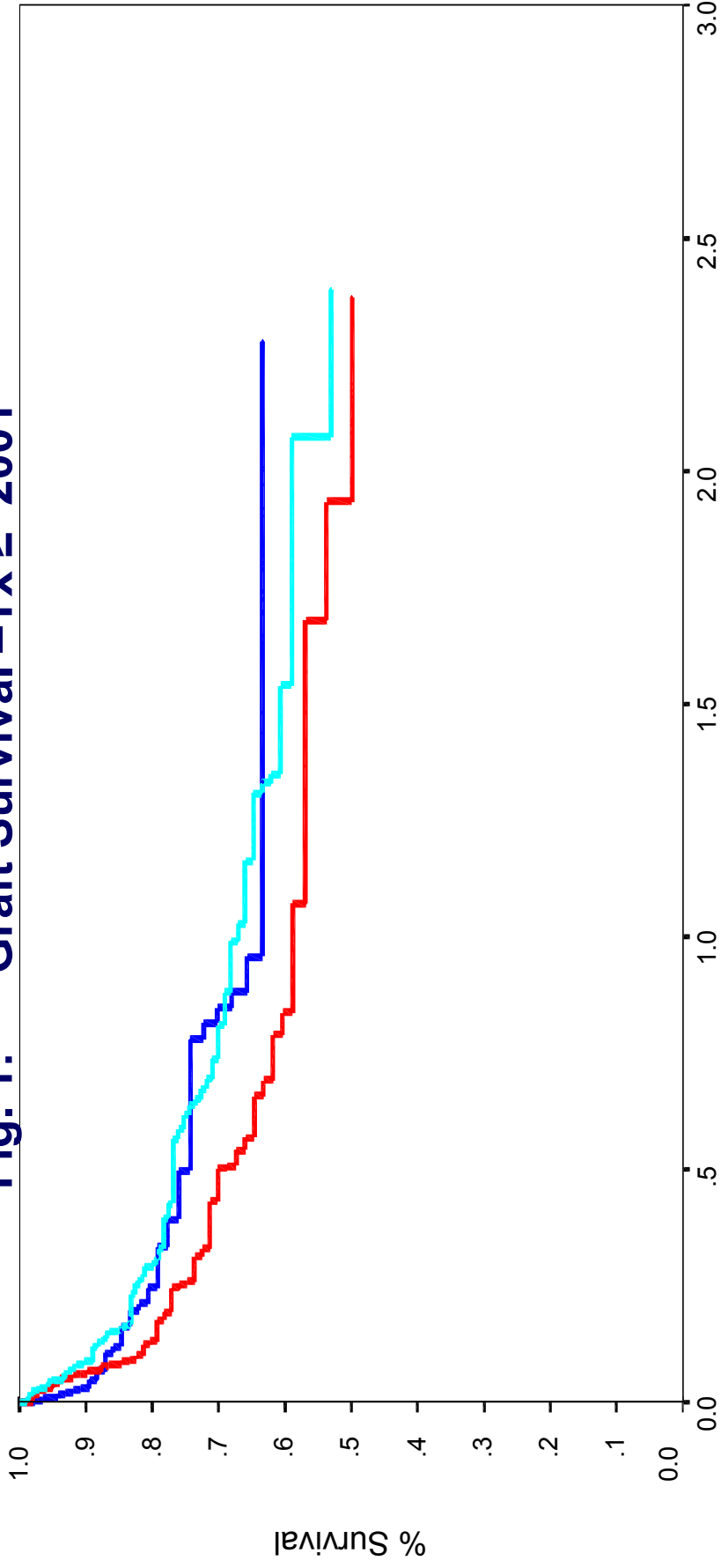
Taking all patients reported to the registry together one year graft survival is around 55% at one year irrespective of the type of transplant. Considering only patients that were transplanted after the year 2000 a graft survival at one year for recipients of an intestine alone reached 70 %. Patient survival in particular for recipients of a bowel alone transplant was calculated to be around 80 % at one year (Fig.1). Over 80 % had full function of

their intestinal graft that is patients had no intravenous alimentation. More than 80 % of patients had a modified Karnofsky performance score of 90-100% and 10% between 61% and 89%.

Our own results are similar to those reported from the registry and are summarized in Tables 5 and 6.



Fig. 1: Graft Survival –Tx ≥ 2001



Years Post Tx

	0	1	2
Multivisceral	86	26	8
Intestine	168	63	15
Intest + Liver	99	31	8

INTESTINAL TRANSPLANTATION

Tab. 5: Outcome

No.	Initials	Immunosuppression	Rejection	Complications	Outcome
1	R.W.	ATG, FK, AZA, P	-	CMV-Enteritis	died 11 months MOF
2	T.M.	ATG, FK, MMF, P	-		alive, 66 months
3	A.A.	Basiliximab, FK, AZA, P	d 24 exfoliative type	wound dehiscence	died 3 months, MOF, sepsis
4	H.M.	Basiliximab, FK, AZA, P	-	aneurysm arterial extension	retransplantation 3 months
5	Z.K.	Basiliximab, FK, AZA, P	d 3	chronic rejection	retransplant 35 months
6	H.M.	FK, AZA, P	d 3	acute liver failure, liver TX	died 11 months
7	A.S.	Basiliximab, FK, AZA, P	d 9 d 23	bowel obstruction	died 11 months aspergillosis
8	H.S.	Daclizumab, FK, AZA, P	m 24 chronic rejection	abdominal wall reconstruction	
9	J.R.	FK, AZA, P		Nocardia infection	died 8 months, Nocardia
10	O.S.	ATG, FK, AZA, P			alive 30 months
11	E.P.	ATG, FK, AZA, P			alive 24 months
12	H.J.	Daclizumab, ATG, FK, AZA,			alive 24 months
13	H.S.	Daclizumab, ATG, FK, AZA,	d 25		alive 46 months
14	B.M.	ATG, FK, AZA, P		abdominal wall	died 4 months PTLD
15	S.H.	ATG, FK, AZA, P		PTLD	died 6 months PTLD

MULTIVISCERAL TRANSPLANTATION

Tab. 6: Outcome

No.	Initials	Immunosuppression	Rejection	Complications	Outcome
1	B.D.	ATG, CyA, AZA, P	d 12	CMV enteritis pneumonia	died 9 months tumor recurrence
2	B.J.	ATG, FK, AZA, P			alive 80 months
3	M.F.	ATG, FK, AZA/MMF, P		Herpes genitalis	died 42 months tumor recurrence
4	G.L.	ATG, FK, MMF, P		necrotizing pancreatitis	died 29 day MOF
5	J.R.	Daclizumab, FK, AZA, P	d 11	chronic rejection Nocardia infection	retransplant
6	F.Y.	Basiliximab, FK, AZA, P		abdominal wall reconstruction	alive 18 months
7	Z.K.	Basiliximab, FK, AZA, P		abdominal wall reconstruction	alive 50 months
8	Q.M.	ATG, FK, AZA, P			alive 12 months
9	G.R.	ATG, FK, AZA, P			alive 1 month



Conclusions

The results of intestinal transplantation continue to improve. Performing transplants in patients waiting at home and induction therapy are associated with improved survival. Most

intestinal recipients are free of parenteral nutrition and able to perform normal daily activities.

References

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