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# Causes of Death After Liver Transplantation in 4000 Consecutive Patients: 2 to 19 Year Follow-Up

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THE RESULTS after liver transplantation (LTx) have improved significantly over the last two decades.<sup>1</sup> However, a significant number of patients die both in the short- and long-term posttransplant period. The aim the present study is to evaluate the causes of death and the rate of death after liver transplantation from a single center.

## MATERIAL AND METHODS

The study subjects are 4000 consecutive patients who underwent LTx since the inception of the program at our institution from February 1981 to April 1998. All patients were followed until November 1999. Mean follow-up was  $9.4 \pm 3.8$  years (median 9.6: range 2 to 19 years). The details of the population have been described elsewhere.<sup>2</sup>

## RESULTS

### Causes of Death

One thousand six hundred thirty-three patients (40.8%) have died during the follow-up period. The causes of death at various time intervals from transplant are shown in Table 1. Infection has remained the most common cause of death at all time points, comprising 28.4% of the deaths. This was

followed with recurrent or de novo cancers (11.6%), cardiovascular (8.3%), and respiratory (7.0%) causes. The rate of death is shown in the Fig 1. Nearly three fourths of these died within the first 3 months (20.4%). As expected, the highest mortality occurred in the first year after LTx. Mortality after 2 years is about 3 to 4% per year, often as a result of age-related complications. Overall survival has improved significantly over time.

## REFERENCES

1. Starzl TE, Iwatsuki S, Van Thiel DH, et al: Hepatology 2:614, 1982
2. Jain AB, Kashyap R, Reyes J, et al: Ann Surg 232:490, 2000

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Table 1. Causes of Death

Years Posttransplantation	1	2	3	4	5	6	7	8	9	10	>10	Total n (%)
Patient at risk (n)	4000	2940	2685	2478	2261	2018	1732	1511	1238	958	735	
Infection (bacterial, viral, fungal)	372	38	13	16	4	6	8	1	3	1	2	464 (28.4)
Malignancy (recurrent/de novo)	42	45	28	18	11	19	12	6	3		6	190 (11.6)
Cardiovascular	42	14	6	1	13	17	13	9	6	5	9	135 (8.3)
Respiratory	37	20	14	7	8	3	3	4	5	4	9	114 (7.0)
Intraoperative	99	4	1	2	4	2		1				113 (6.9)
Multisystem organ failure	45	16	9	5	6	9	5	7	3	1	3	109 (6.7)
Liver failure (recurrent)	21	15	15	7	10	6	3	2	1	2		82 (5.9)
Gastrointestinal	31	6	2	4	5	1		1	1		1	52 (3.2)
Central nervous system	20	2	2	4	1	5	3		1		4	42 (2.6)
PTLD	8		5	6	2	3	1	1	1		2	29 (1.8)
Renal failure				8	5	1		3			1	18 (1.1)
Rejection (acute/chronic)	4	2	1	1	1	2	2		1		4	18 (1.1)
Primary nonfunction	13		1									14 (1.1)
Miscellaneous	27	15	7	12	10	12	8	10	7	5	5	118 (6.1)
Unknown	55	20	18	5	5	7	4	5	4	1	11	135 (8.3)
Total n (%)	816 (20.4)	197 (6.7)	122 (4.5)	96 (3.8)	85 (3.7)	93 (4.6)	62 (3.5)	50 (3.3)	36 (2.9)	19 (1.9)	57 (7.7)	1633

PTLD, posttransplant lymphoproliferative disease.

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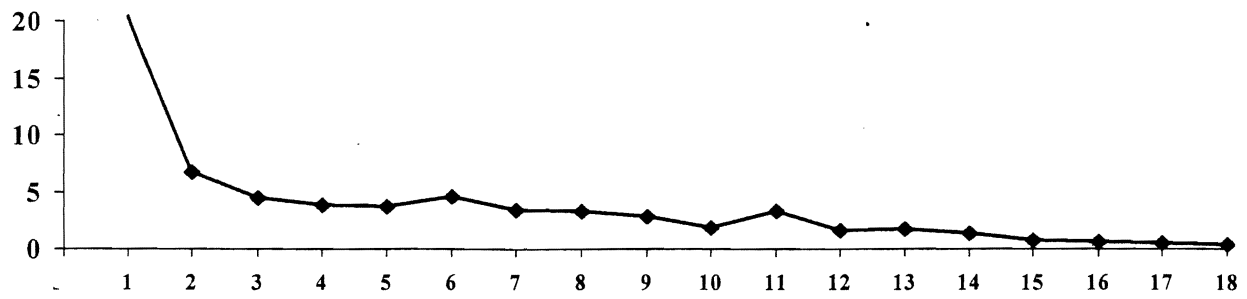


Fig 1. Proportion of death (X axis) vs years posttransplant (Y axis).