

# The Current Status and Future Prospective of Global Liver Transplantation

**Po-Huang Lee M.D.Ph.D.**

Department of Surgery, college of Medicine, National Taiwan  
University Hospital

Chairman, Committee of medicine and Biotechnological  
Development  
CEO, E-Da medical group



1902—Alexis Carrel  
Developed more effective vascular anastomosis technique (end-to-end suture with triangular support)



1940s—Peter B. Medawar  
Described lymphocytes as "immunocompetent cells" and defined the immunological specificity of second-stage phenomenon



1952—Jean Dausset  
Described major histocompatibility complex genes in humans

C. Machado  
© Novartis



1967—Folkert O. Beizer  
Improved preservation of tissues, developing cold solution applied by perfusion machine



1954—Joseph Murray  
Performed first successful kidney transplant

1954—Rupert E. Billingham  
With Brent and Medawar, reported use of lymphoid cells to transfer immunity to skin grafts



1960s—Roy Calne  
Introduced cyclosporine into clinical practice



1963—Thomas Starzl  
Performed first successful liver transplantation



1963—James D. Hardy  
Performed first successful lung transplantation  
1964—Tried first xenogenic transplantation of heart



1966—Richard Lillehei  
Performed first successful pancreas transplantation

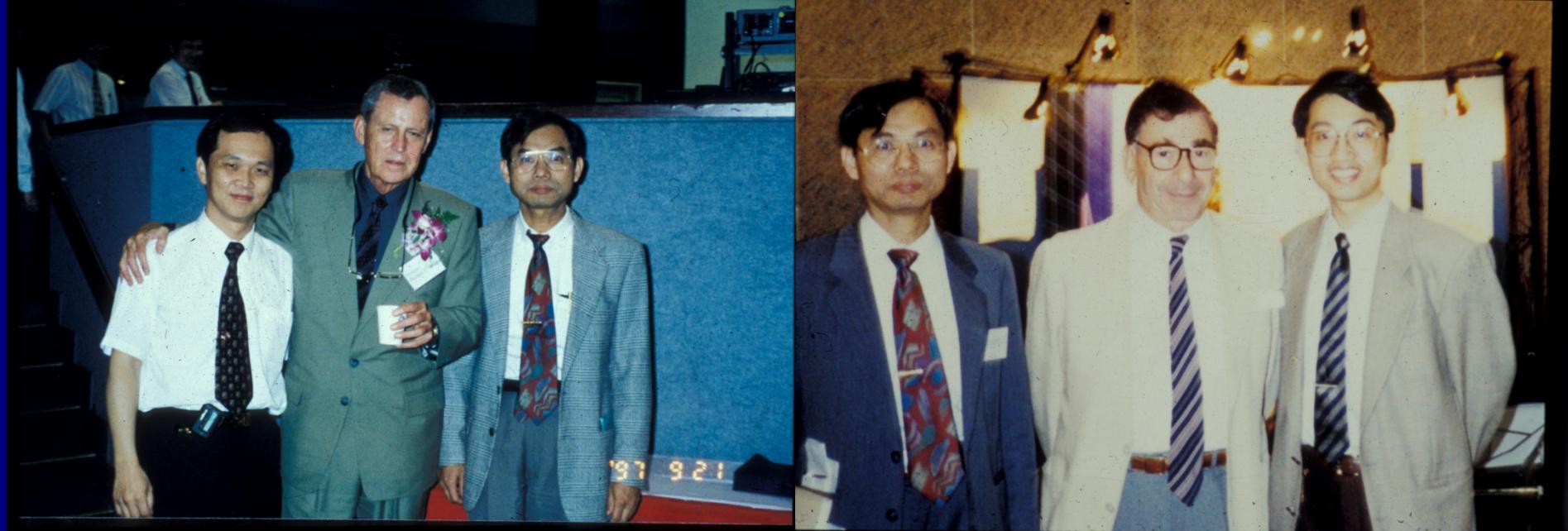


1967—Christiaan Barnard  
Performed first homologous heart transplantation

C. Machado  
© Novartis

# 器官移植的里程碑

- 1900 首次成功角膜移植(von Hippel)
- 1902 狗之腎臟移植實驗(Ul Iman)
- 1944 移植器官排斥之免疫學試驗(Medawar)
- 1950's 免疫耐受性(Billinghan, Brent and Medawar)
  - 首次腎臟移植(Hume)
  - 組織配型之開發(van Rood and Dausset)
  - 首次同卵雙胞胎腎移植(J. Murray)
- 1960 使用藥物抑制腎移植之排斥(Calne)
- 1963 肝臟移植(Starzl)
- 1966 首次人類胰臟移植(Lillehei)
- 1967 國際移植醫學會成立
- 首次人類心臟移植(Barnard)
- 1979 環孢黴素首度使用於腎移植病人(Calne)
- 1981 首次心肺移植(Reitz and Shumway)
- 1982 合作性移植研究開始(Opelz)
- 1989 第1000000例腎臟移植
- 1992 首次狒狒肝臟移植給人類
- 1994 全球腎臟移植數目 22853  
全球肝臟移植數目 6050  
全球心臟移植數目 3020  
全球其他器官移植數目 12500



THE IMMUNOSUPPRESSIVE EFFECTS OF FR 900506  
IN RATS RECEIVING HETEROtopic CARDIAC ALLOGRAFTS

P. Lee

N. Murase

S. Todo

L. Mokowka

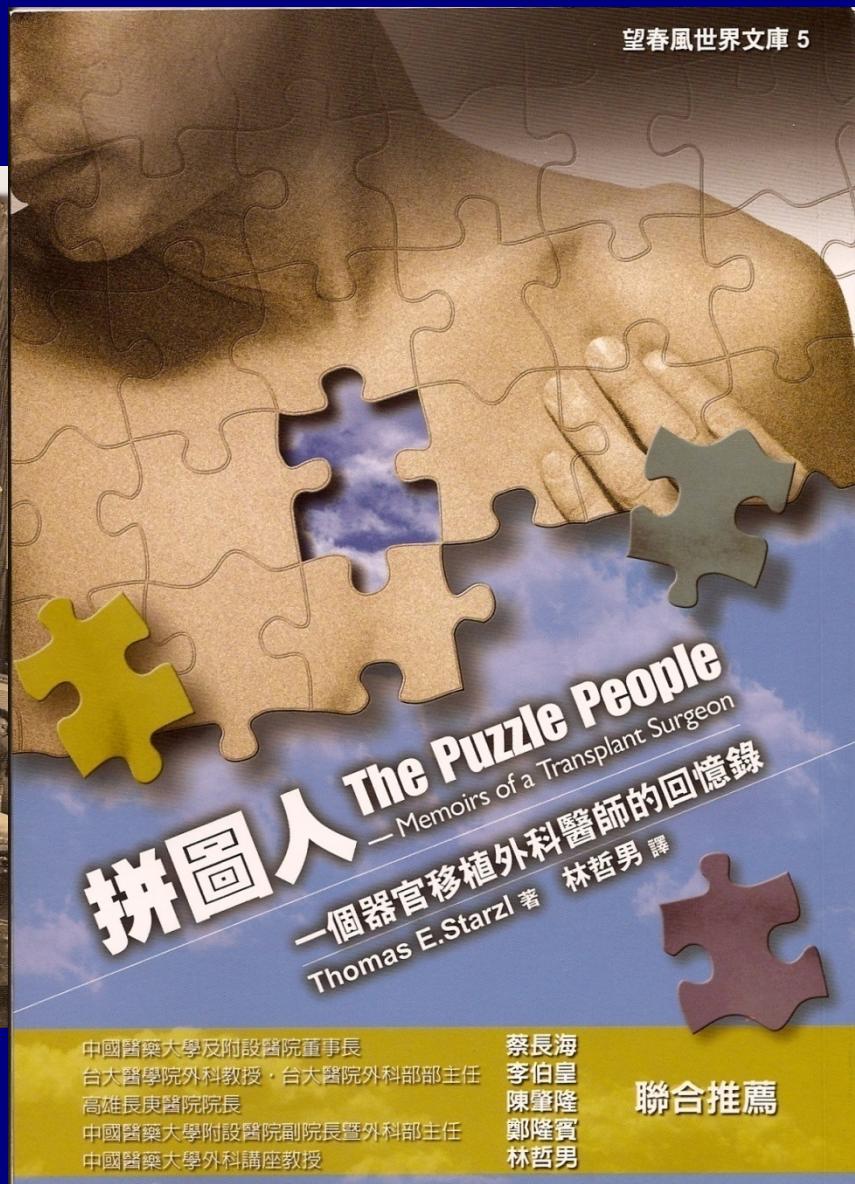
T. Starzl

Department of Surgery, 3601 Fifth Avenue, Falk Clinic 4  
West, Pittsburgh, Pennsylvania 15213

The immunosuppressive effects of FR 900506 were studied in Lewis rats given ACI heterotopic heart allografts. Intramuscular doses of 0.02 mg/kg daily for 2 weeks extend graft survival slightly, and with doses up to 1.28 mg/kg 2 weeks, there is long-term graft survival. If only 3 daily doses were given starting on day 4 after transplantation, graft survival for almost 3 months was accomplished in 4 of 6 animals who still bear functioning hearts.

TABLE 3  
FR 900506 GIVEN I.M. AFTER TRANSPLANTATION:  
GRAFT SURVIVAL OF LEWIS RATS RECEIVING ACI HEARTS

Treatment	Rat No.	Graft Survival (Days)	Median (Days)
1.28 mg/kg on days 0, 1	3	22, 31, 53	31
1.28 mg/kg on days 2, 3	3	30, 49, >48	49
1.28 mg/kg on days 0, 1, 2	3	23, 35, 36	35
1.28 mg/kg on days 4, 5, 6	6	23, 51, >84, >87, >87, >87	>87



# Milestones of Organ Transplantation in Taiwan

---

1968/05/27	Living-related kidney transplantation (NTUH)
1969/05/24	Cadaveric kidney transplantation (NTUH)
1983/11/09	Bone marrow transplantation (NTUH)
1984/03/	<b>Cadaveric liver transplantation (CGMH)</b>
1985/08/	The Transplantation Society of Taiwan
1987/06/21	Transplantation legislation
1987/07/17	Heart transplantation (NTUH)
1987/09/17	“Brain death declaration” legislation
1989/10/13	<b>Liver transplantation (NTUH)</b>
1991/07/10	Lung transplantation (VGH)
1992/04/05	<b>Pediatric liver transplantation (NTUH)</b>
1994/06/	Living related liver transplantation (CGMH)
1994/11/23	Pancreatic transplantation (NTUH)
1995/12/09	Lung transplantation (NTUH)
1997/12/26	<b>Living-related liver transplantation (NTUH)</b>
2000/08/09	<b>Adult-to-adult living-related liver transplantation (NTUH)</b>
2002/03/07	Taiwan Organ Registry and Sharing Center
2003/01/29	Revision of Transplantation Legislation
2004/11/22	Kidney transplant across ABO (NTUH)
2005/03/25	Kidney transplant with cross-matching positive (NTUH)
2007/10/27	Intestinal transplantation (Far-East General Hospital)

---

## Initiation of Liver Transplantation in Taiwan

---

CGMH – LK	1984.3
GVH – TAIPEI	1985.6
NTUH	1989.10
CGMH – TAIPEI	1991.7
GVH – TAICHUNG	1992.7
KSMU	1993.4
TSGH – TAIPEI	2000.8

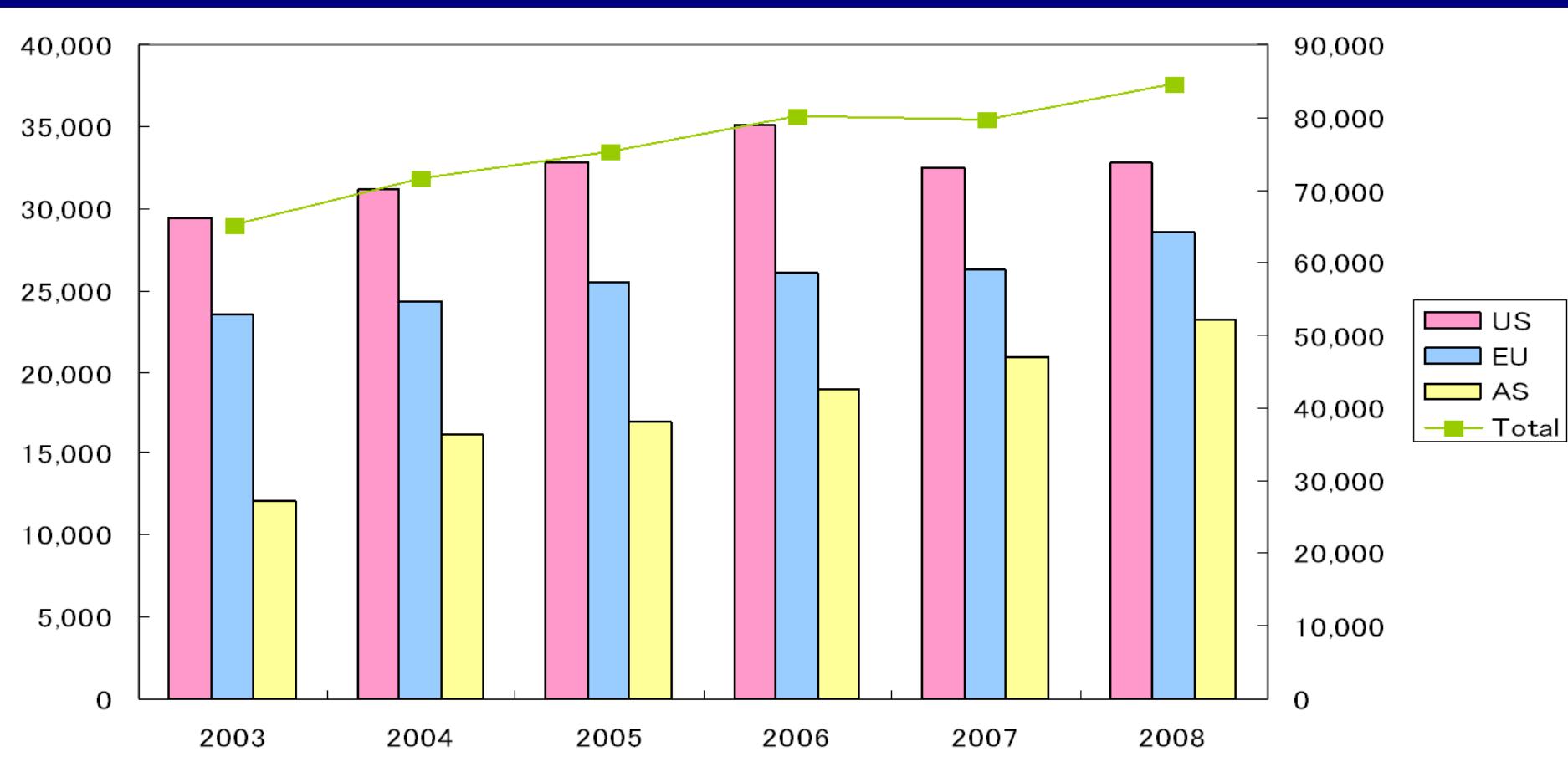
---





# Global Transplant number trend

-Kidney, Liver, Heart total



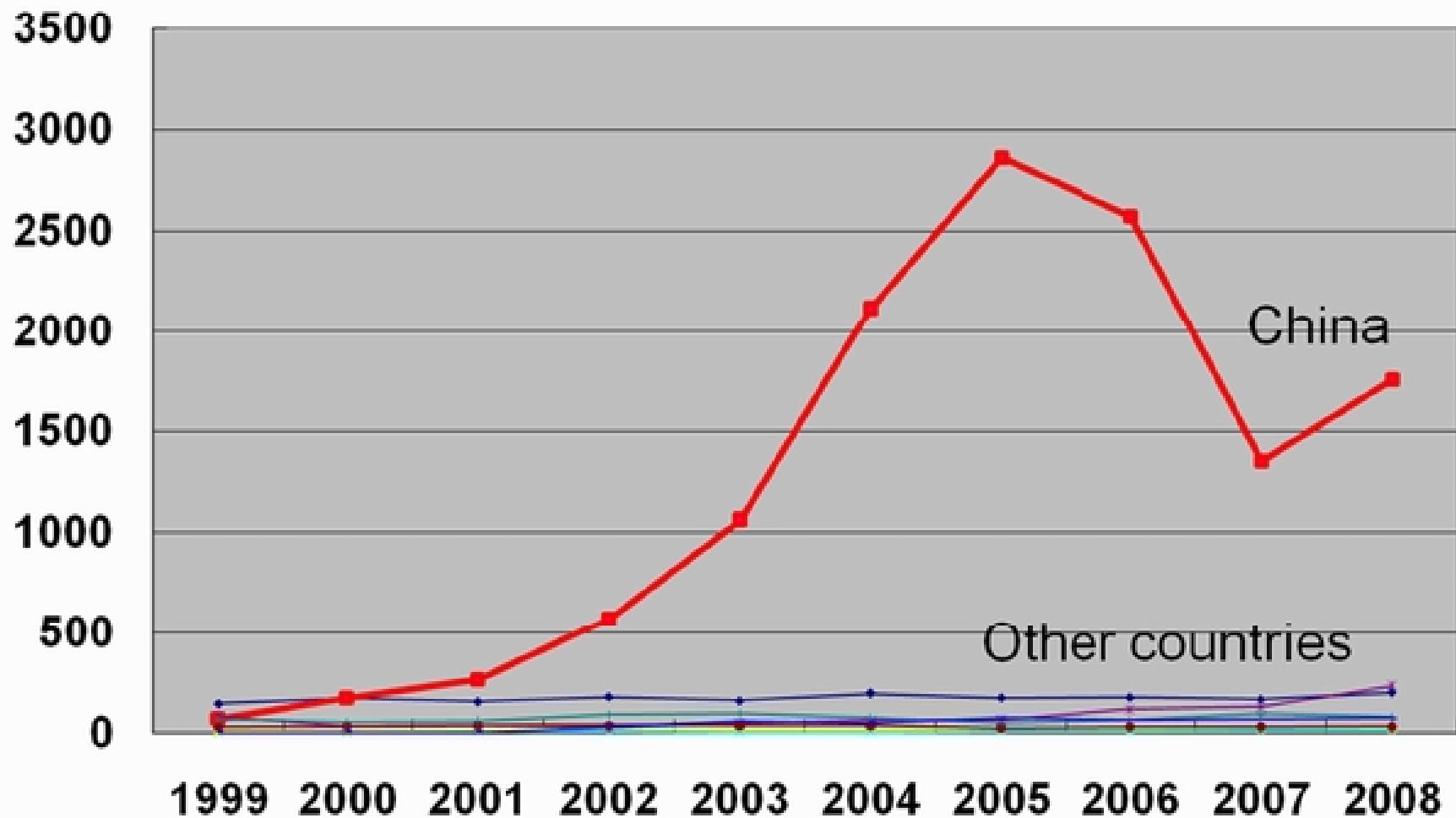
US including 4 countries; US, Canada, Brazil, Argentina

EU including 22 countries; UK, France, Germany, Spain, Italy, Belgium, The Netherland, Switzerland, Austria, Denmark, Norway, Sweden, Finland, Portugal, Poland, Czech. R, Slovakia, Slovenia, Hungary, Croatia, Greece, Romania, Turkey

AS including 11 countries; Japan, China, Korea, Taiwan, Hong Kong, Singapore, Malaysia, Thailand, Philippines, Australia, New Zealand

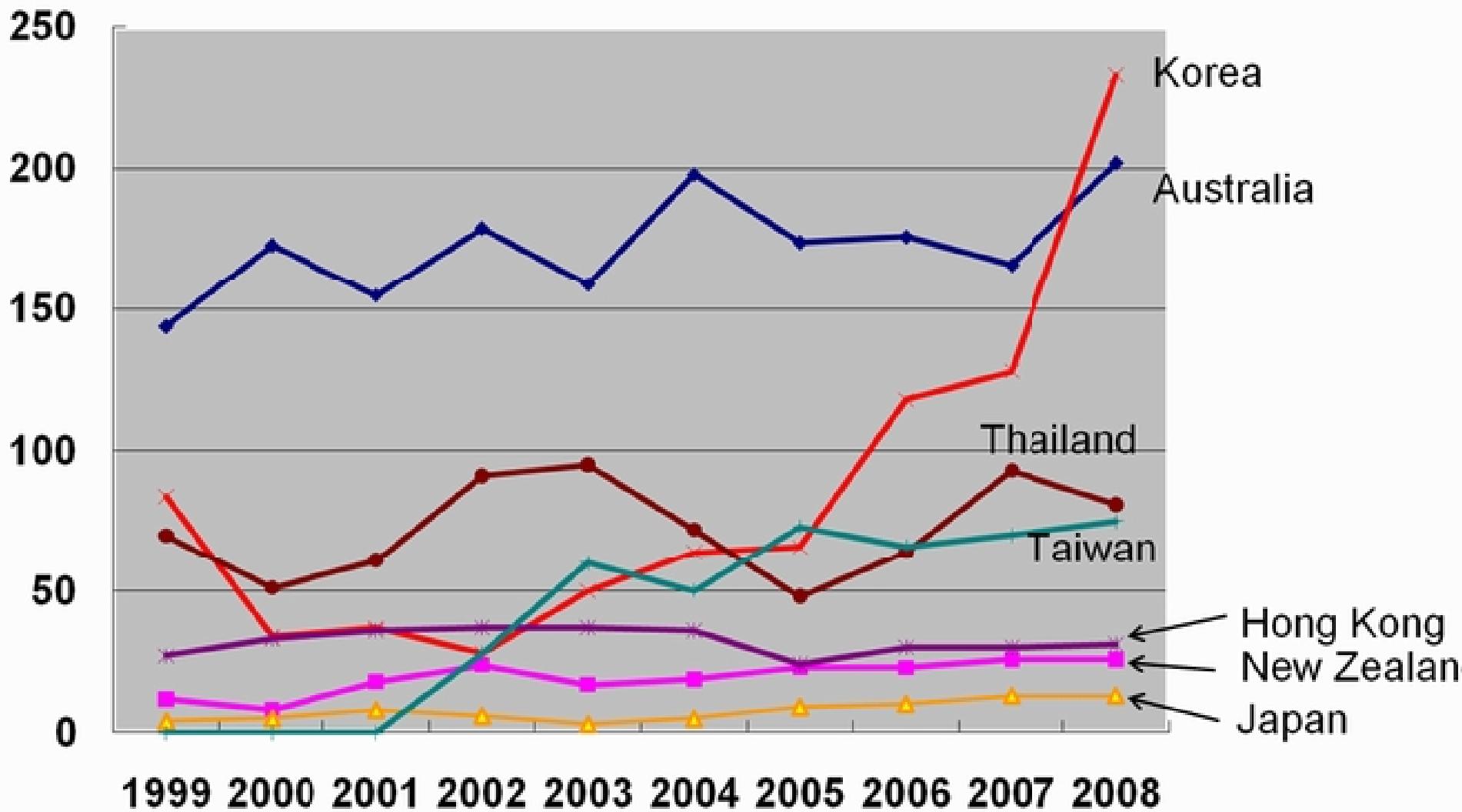
Data from 2008 IRODaT

# Annual number of DDLT in Asia and Oceania China and other countries

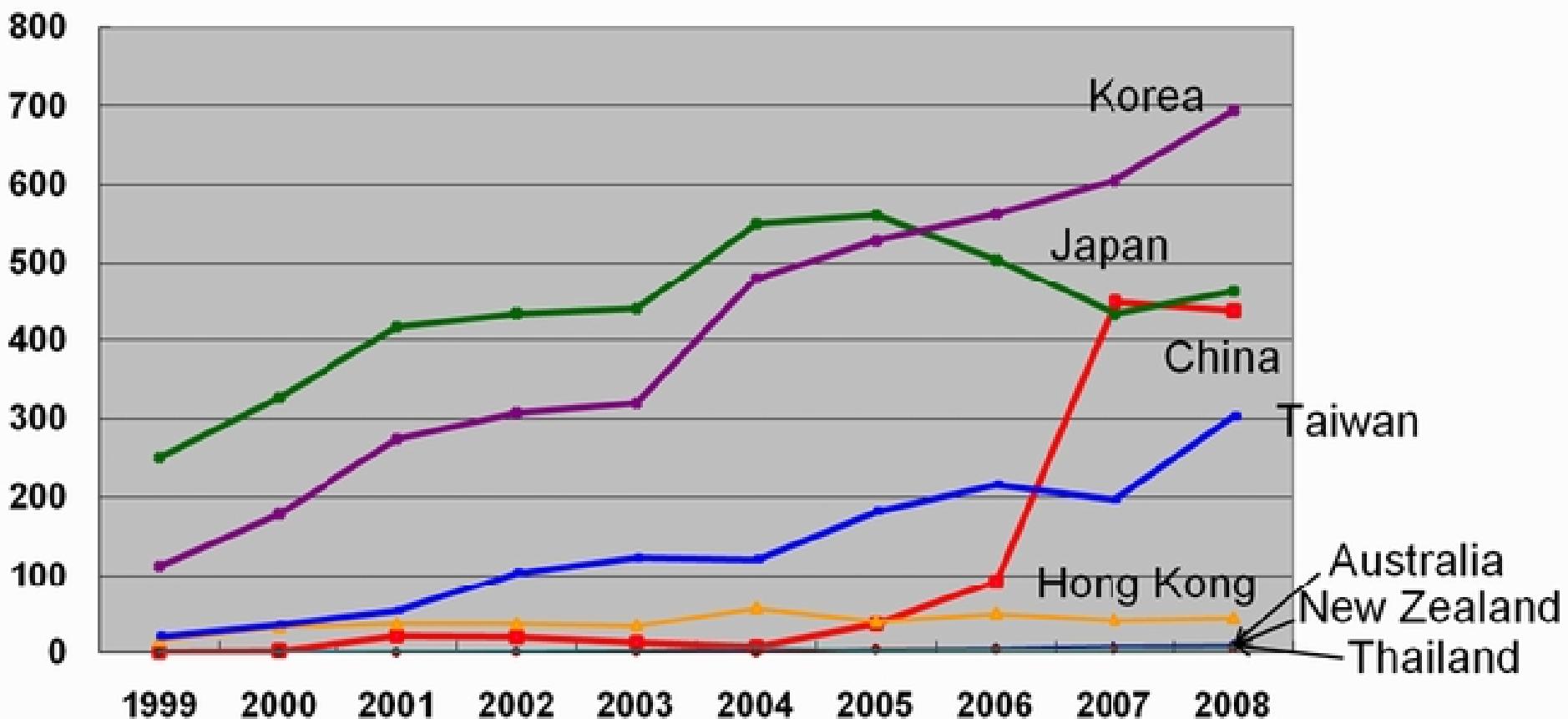


# Annual number of DDLT in Asia and Oceania

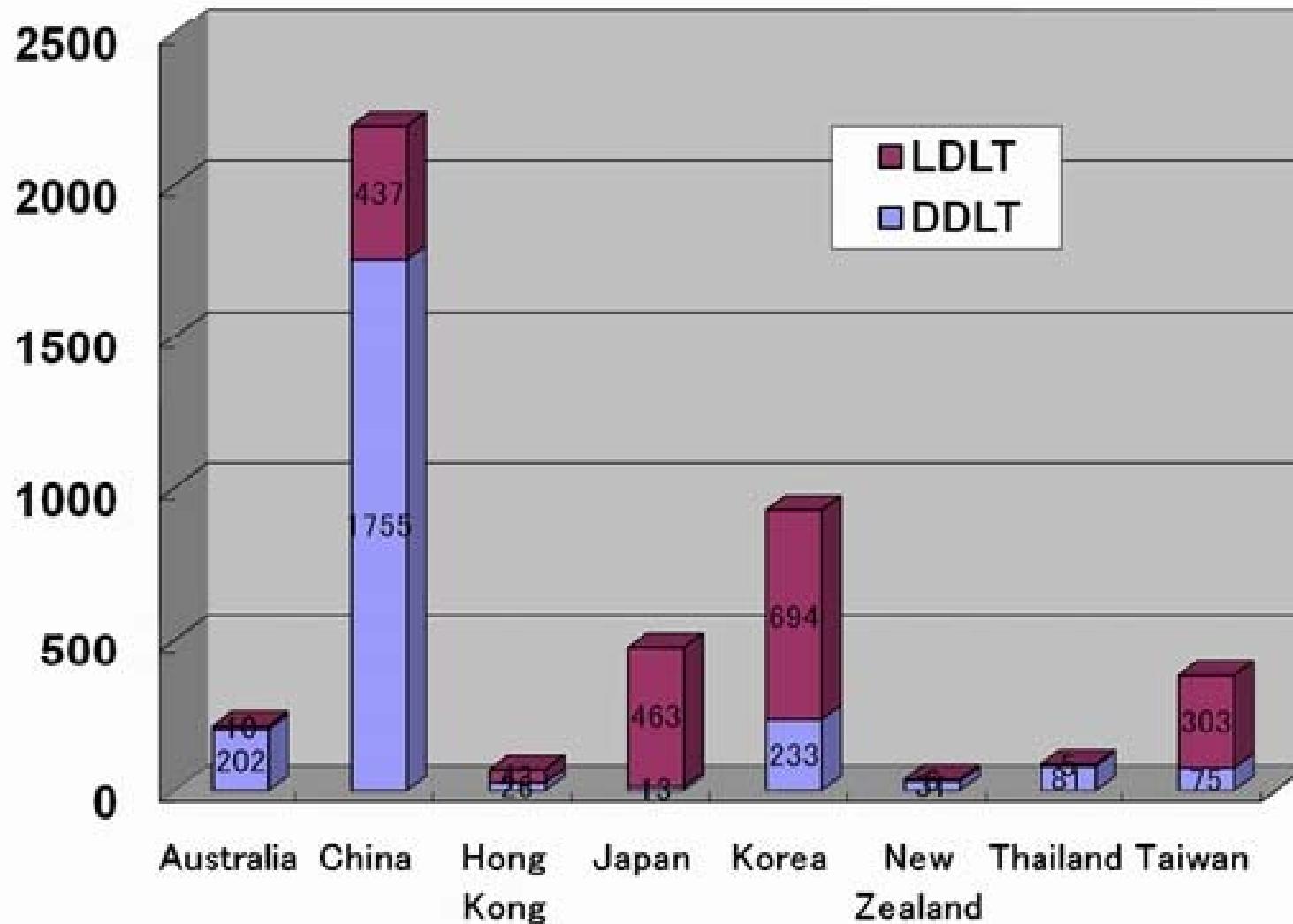
## Countries except China



# Annual number of LDLT in Asia and Oceania



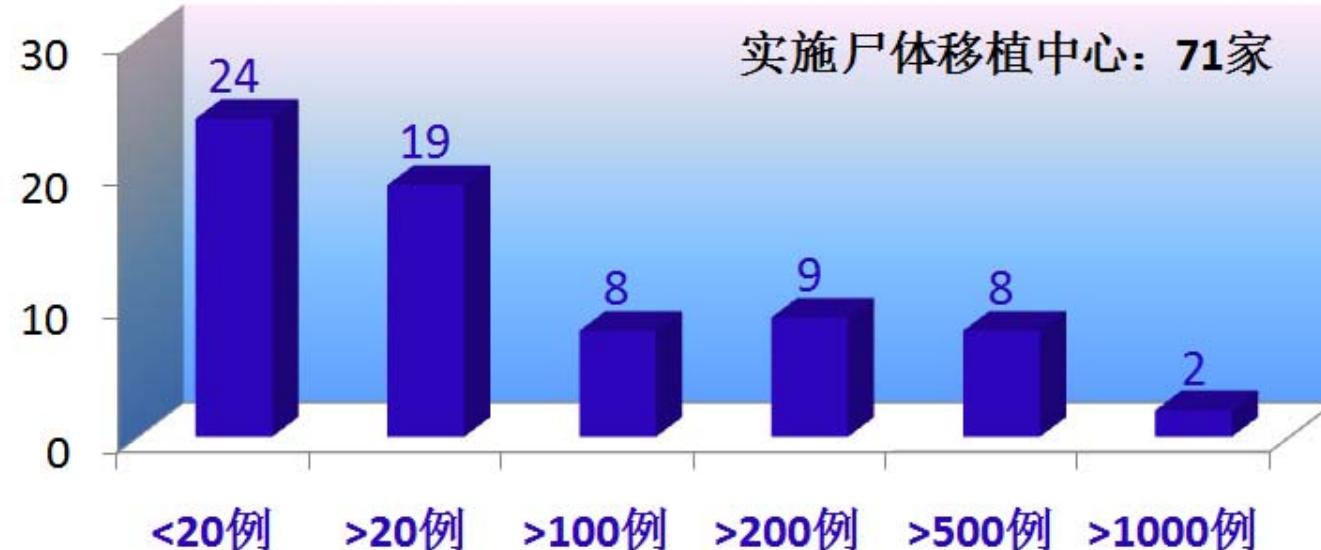
# DDLT and LDLT in Asia and Oceania (2008)



# 中国肝移植：中心分布

1993-2009.8

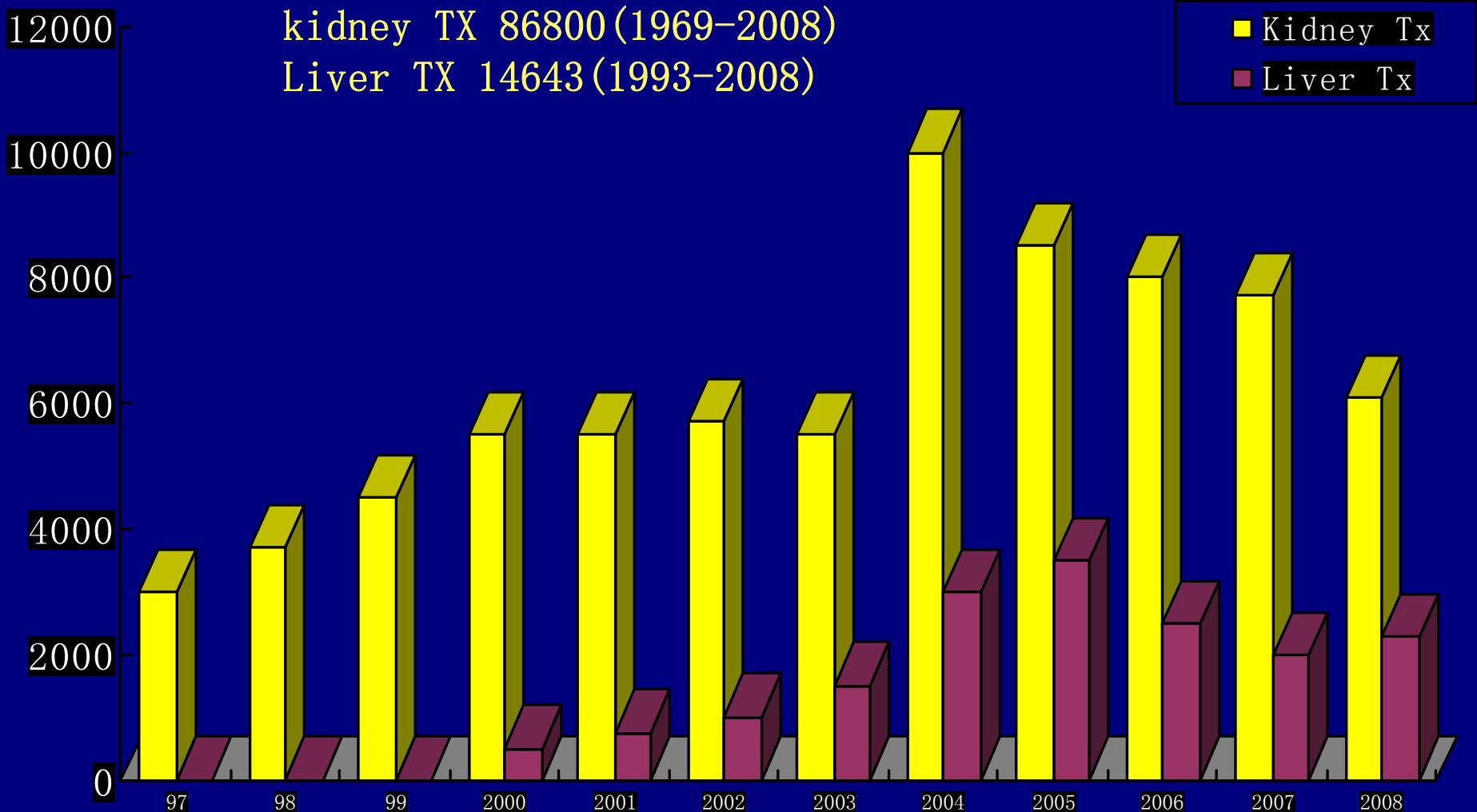
尸体肝移植中心



活体肝移植中心

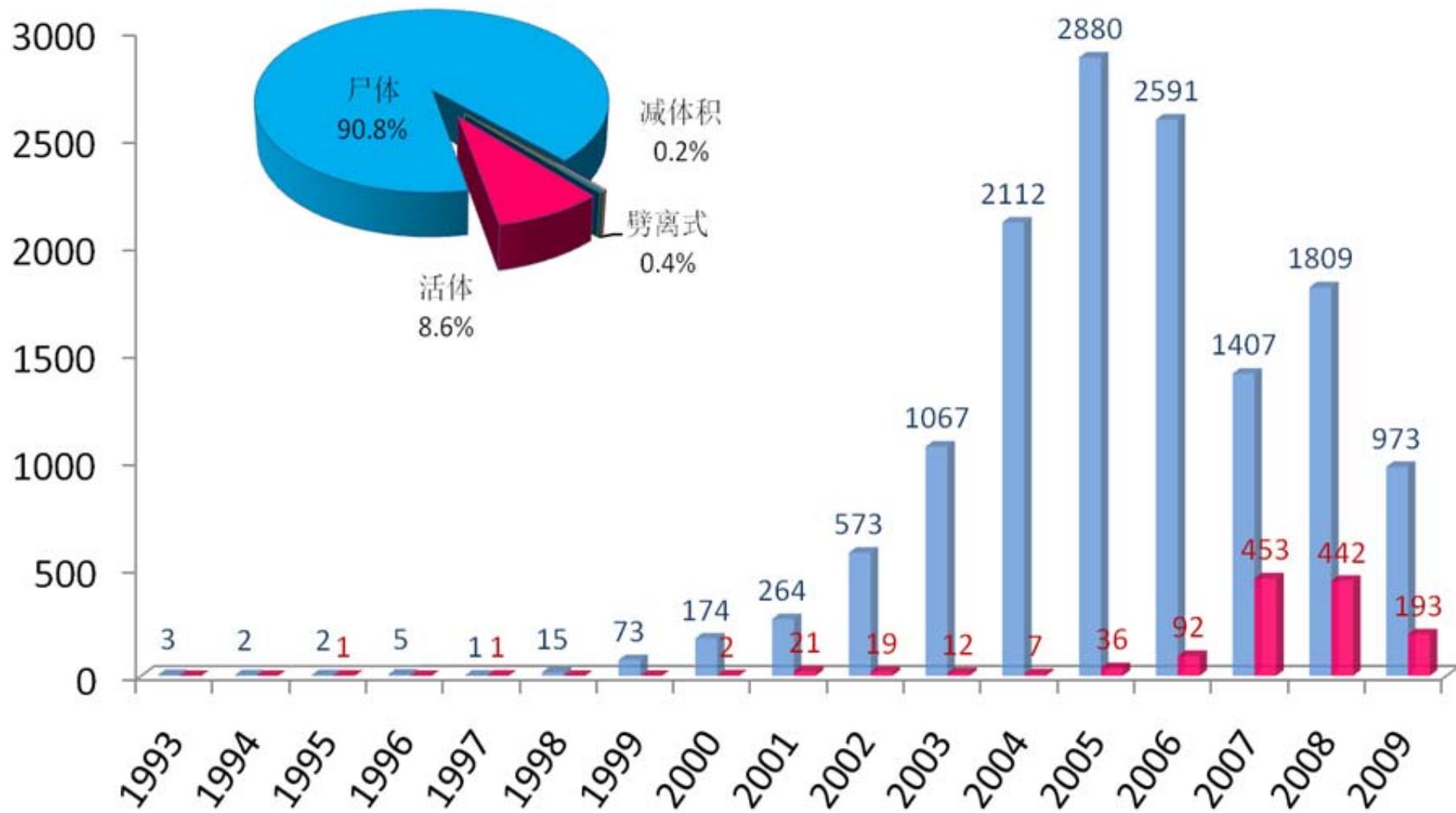


# Number of Kidney and Liver Transplants Performed in China over the past decades by year



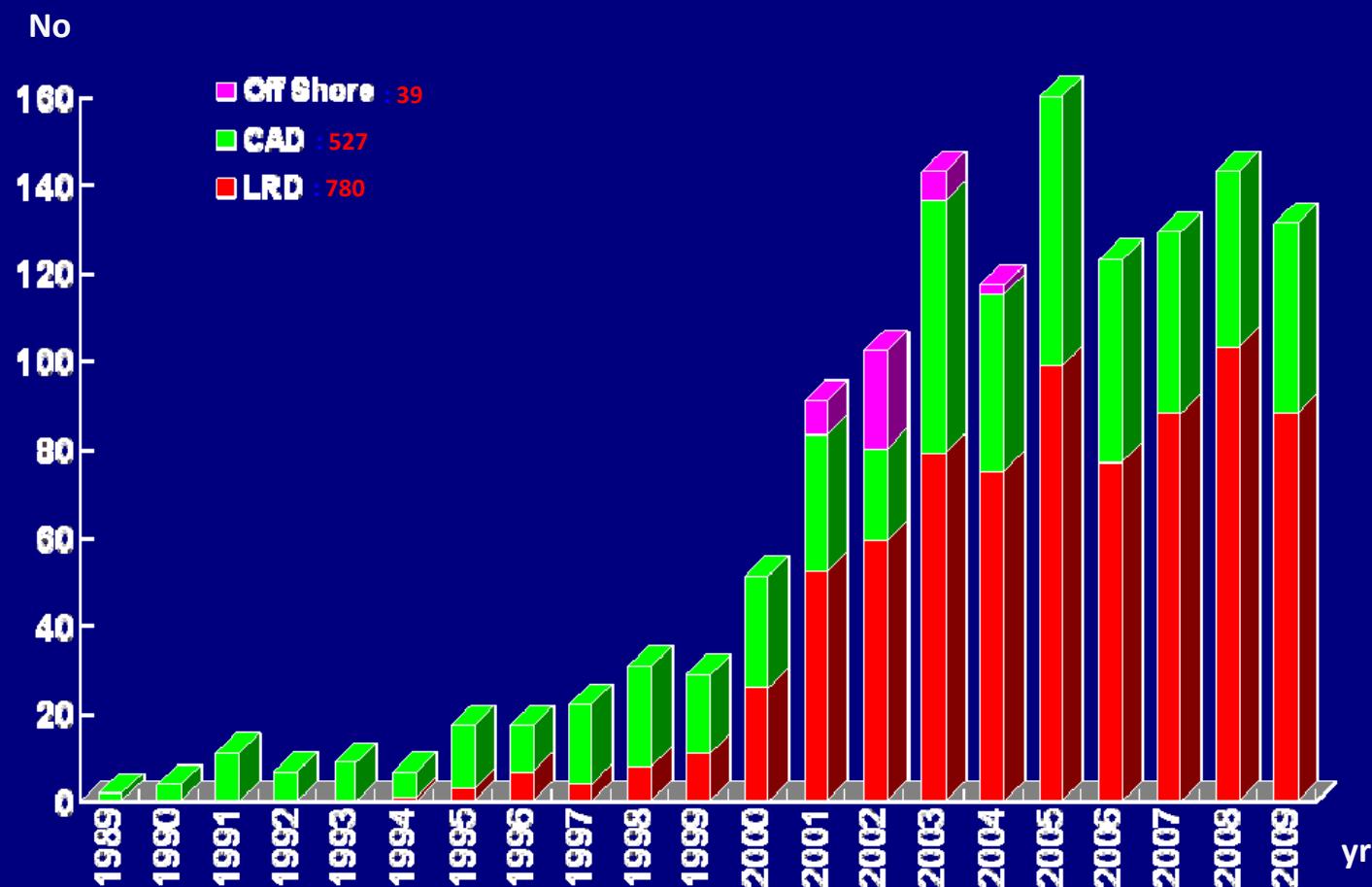
# 中国肝移植供肝类型

## 1993-2009.8

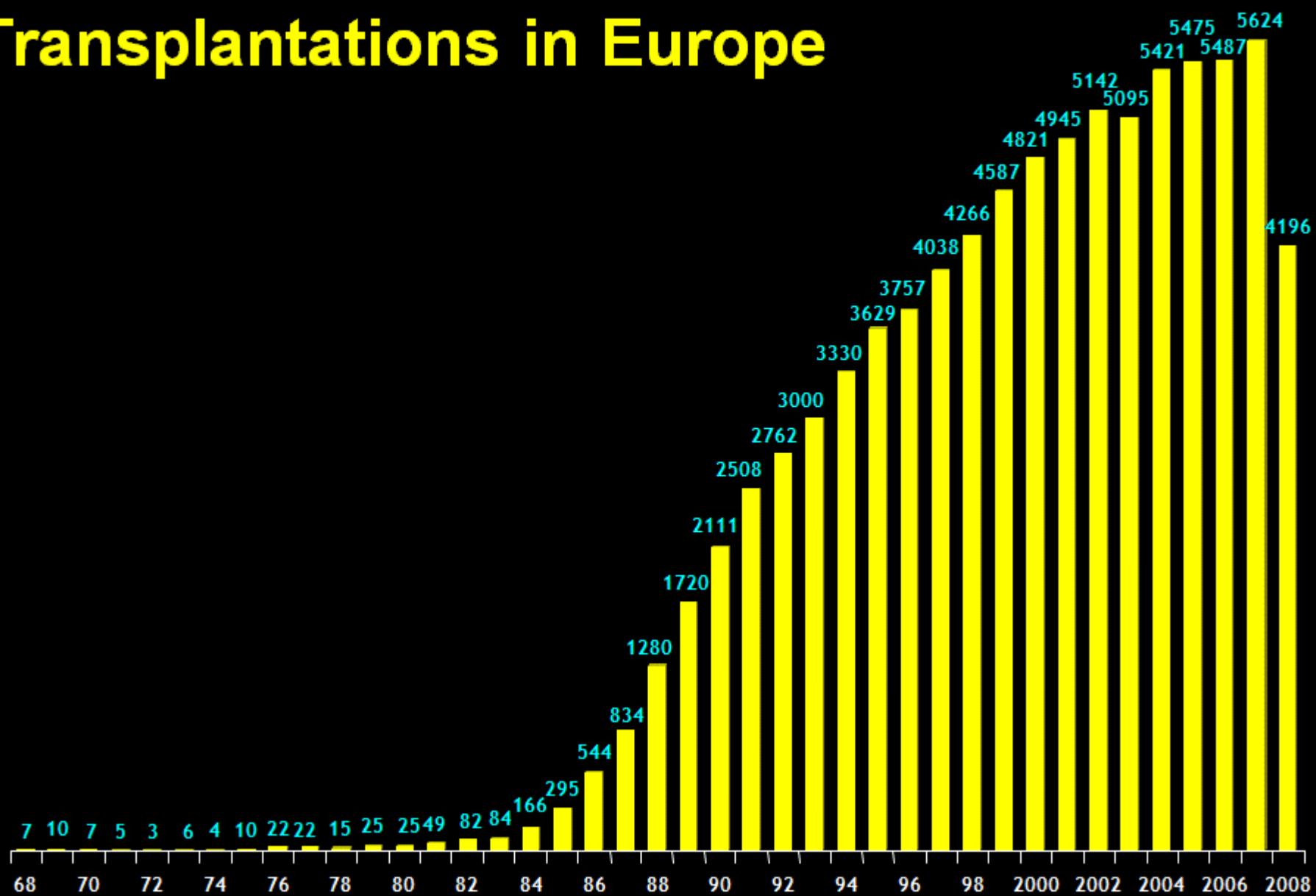


# Liver Transplantation in Taiwan

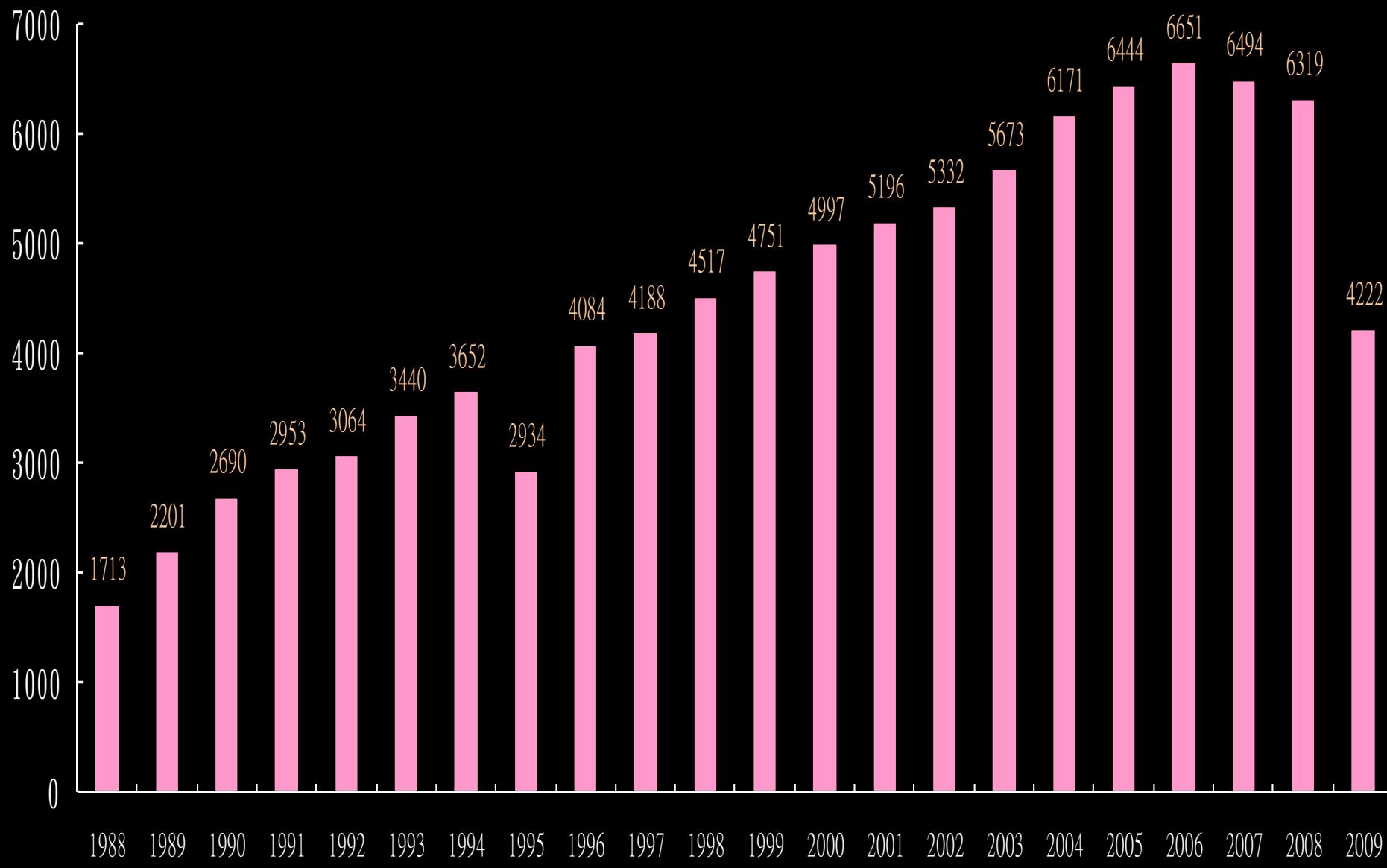
(1989~2009 Nov.)



# Evolution of 85,446 Liver Transplantations in Europe



# Evolution of 98686 Liver Transplantations in US(1988.1.1~2009.8.31)



# Patients Registered on Waiting List for Transplantation in Taiwan

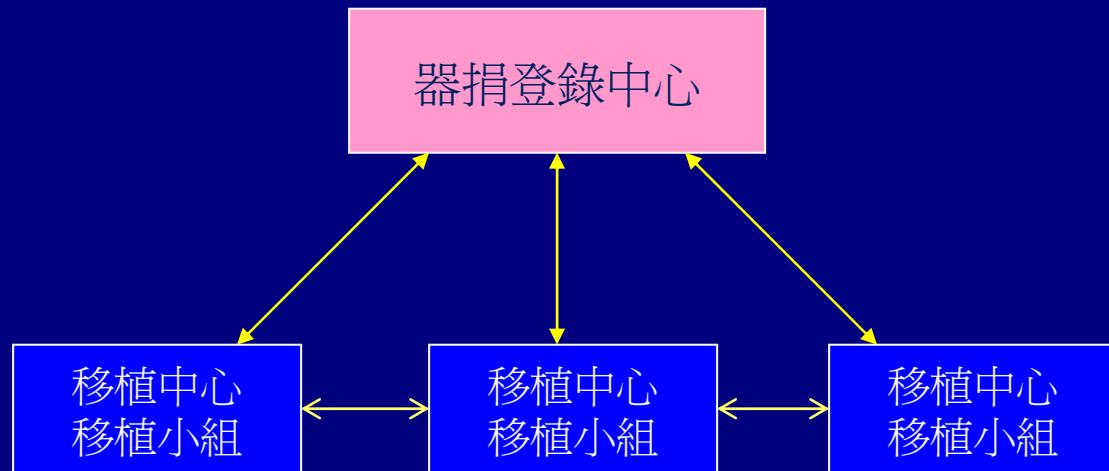
Organ	Area				Total
	North	Middle	South	East	
Kidney	2362	1288	1558	138	5346
Liver	437	170	154	9	770
Heart	99	5	14	0	118
Lung	14	1	2	0	17
Total	2912	1464	1728	147	6251 (2009/10/21)

Organ	Total Centers		2005	2006	2007	2008	2009
Heart	18						
Liver							
CLT	22						
LRLT	12	<b>Deceased donor number</b>	153	165	151	195	145
Lung	9						
Kidney	35	<b>Deceased donation rate</b>	6.65	7.17	6.59	8.48	
Bone	9						

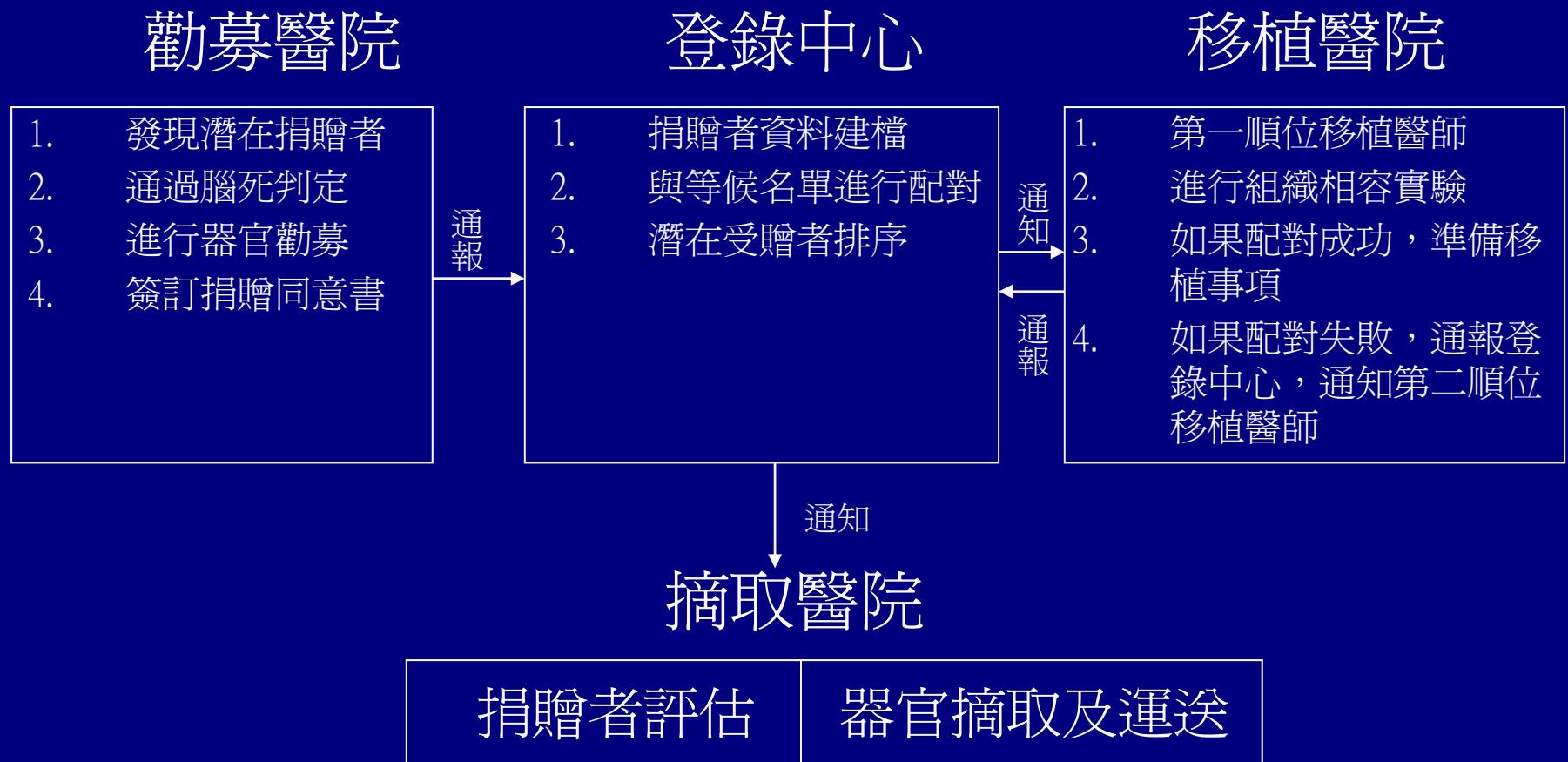
( 2007/06/ )

# 台灣移植網

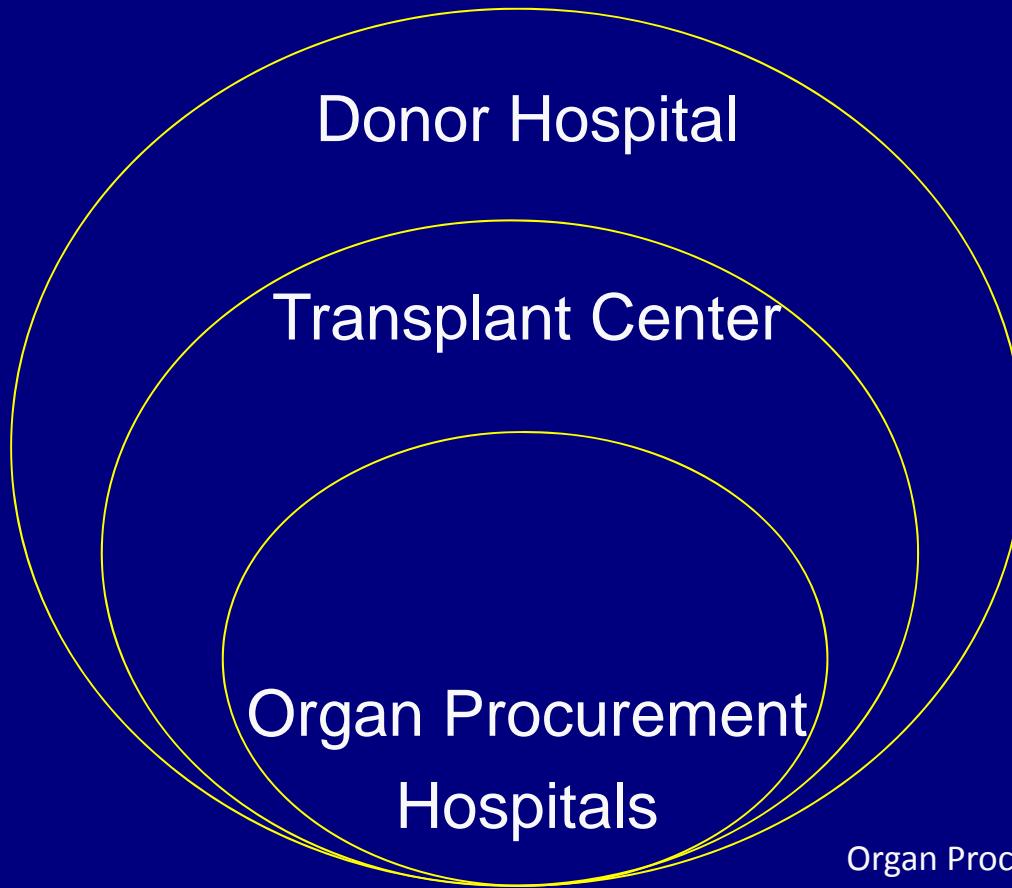
- Ø 中華民國器官捐贈協會
- Ø 衛生署財團法人器官捐贈登錄中心
- Ø 醫學中心移植小組



# 器官捐贈配對流程



# Relationship of Donor Hospitals, Transplant Centers and Organ Procurement Hospitals in Taiwan



Organ Procurement Hospital: 4-5

Transplant Center: 20 or more

Donor Hospital: 200

# Liver Transplantation – European organ allocation European gap among donors and recipients



## Deceased organ donor utilization for a transplant

Donor country	population (millions)	2004	2005	2006	2007	2008	pmp	2007/2008
(A) Austria	8,3	181	200	201	181	168	20,2	-7,2 %
(B) Belgium	10,7	220	237	273	291	265	24,8	-8,9 %
(HR) Croatia	4,4	0	0	0	33	79	17,8	139,4 %
(D) Germany	82,2	1052	1185	1227	1285	1184	14,4	-7,9 %
(L) Luxembourg	0,5	1	3	6	1	9	18,6	800,0 %
(NL) Netherlands	16,4	228	217	200	257	201	12,3	-21,8 %
(SI) Slovenia	2,0	36	21	30	22	36	17,8	63,6 %

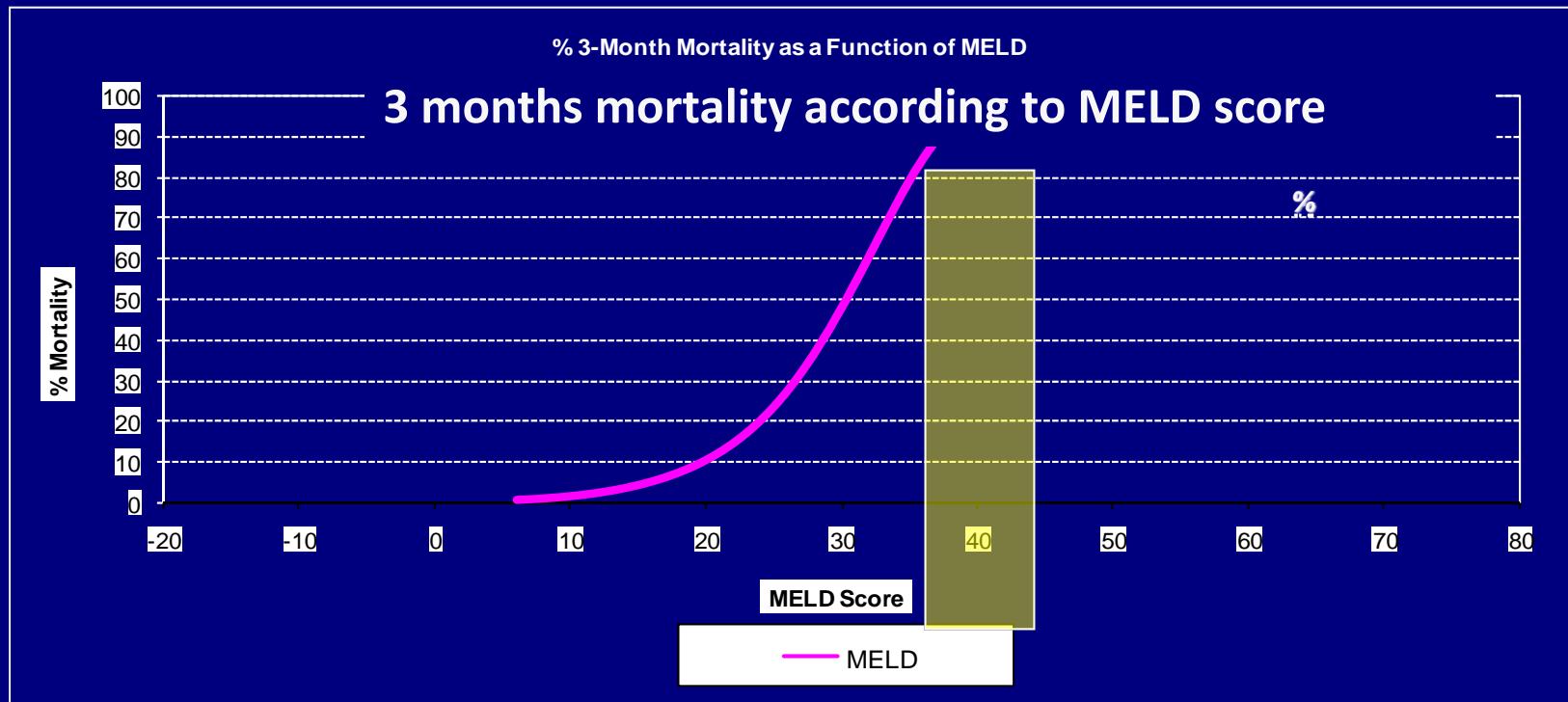
*Deceased donation rate is decreasing*



# Allocation by MELD Score

Based on 3 parameters:

- INR
- Bilirubin
- Creatinine





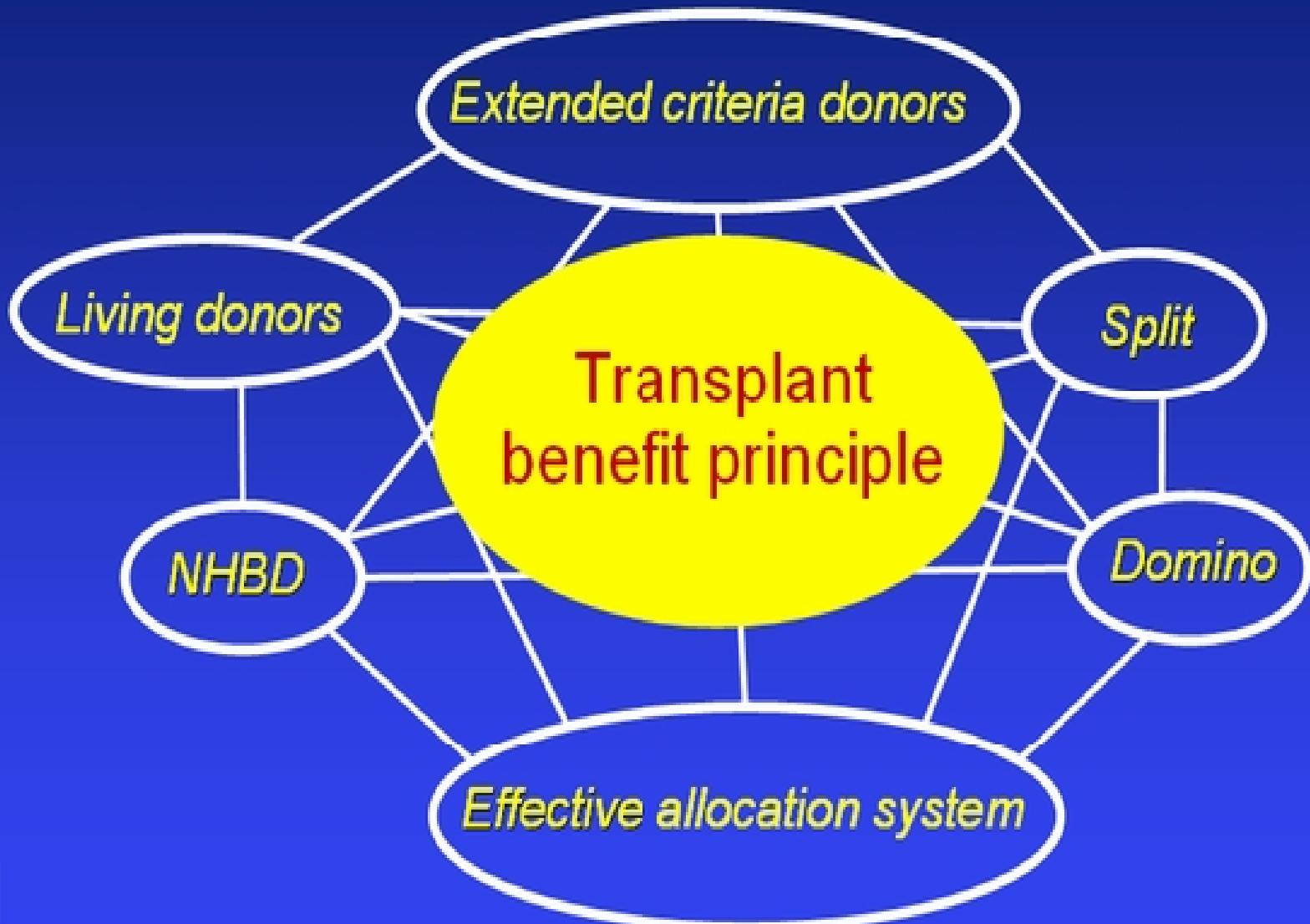
*The MELD system is gradually spreading in European countries due to its efficacy in predicting deaths and the transparency given to the allocation system*

*The dark sides of MELD as sharing system need to be faced and solved with less competition and more collaboration among Centers*

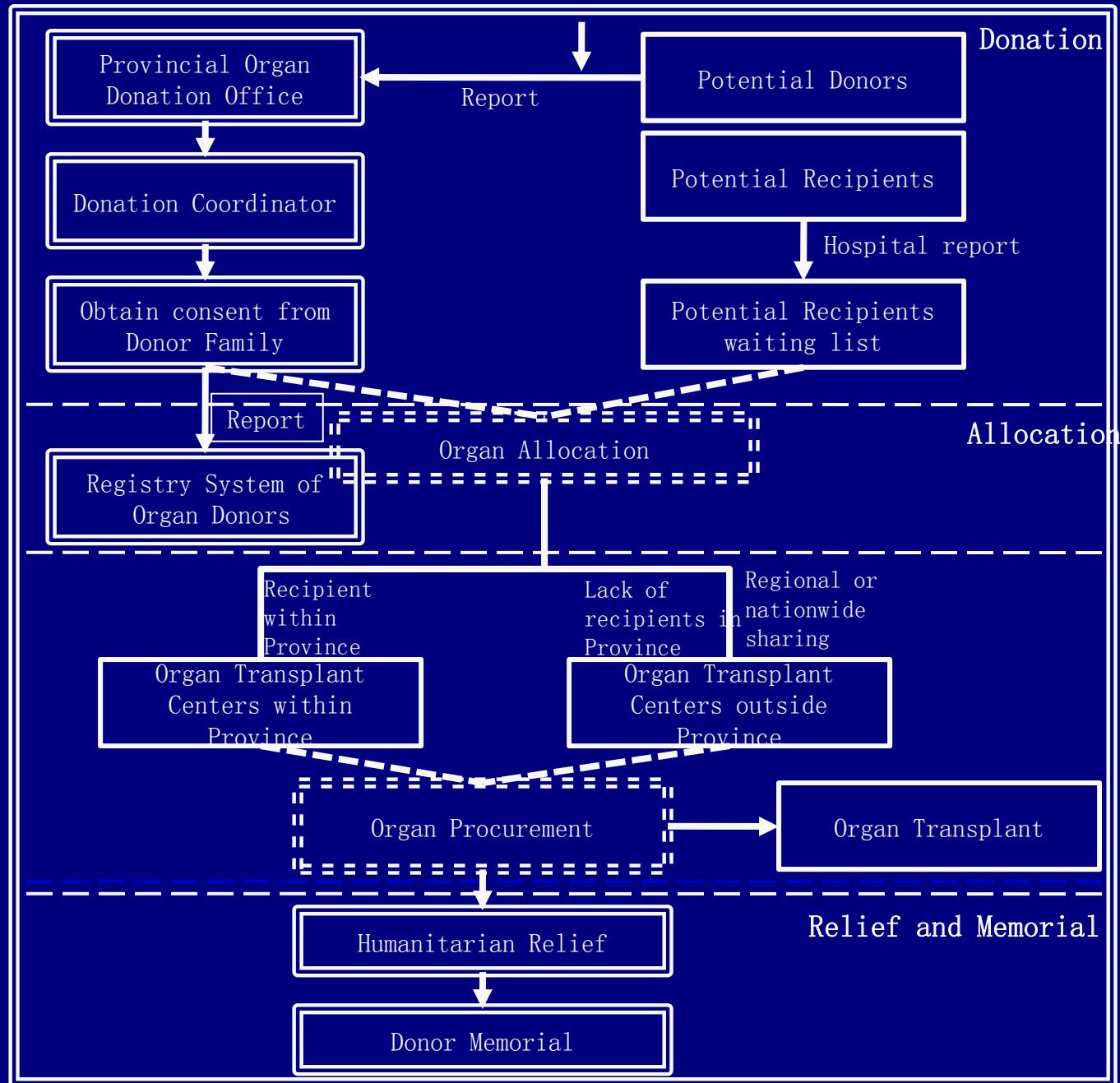
*MELD system must not limit the procedures to expand the donor pool like split and extended criteria donors*

*The policy of the transplant survival benefit may help to find the best donor-recipient matching*





# China Organ Donation and Allocation Flow Chart



# 活體器官移植

親屬活體器官移植

非親屬活體器官移植

器官買賣

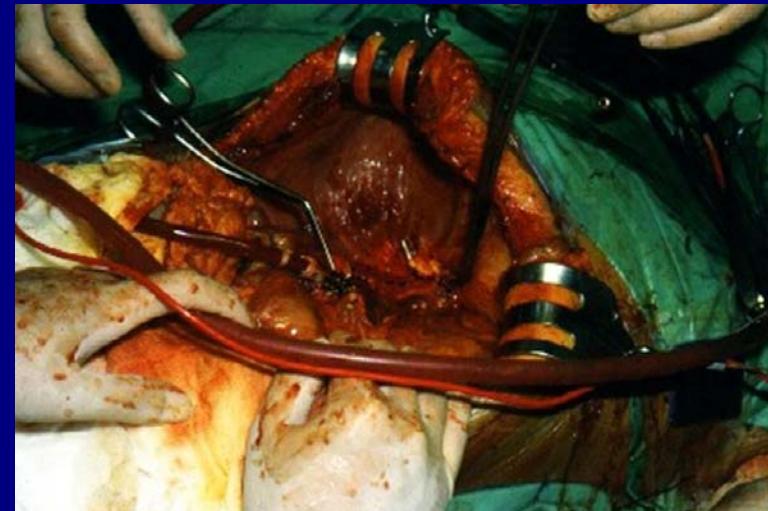
# 亞洲對腦死及活體器官捐贈立法之國家

國名	通過年代	允許活體捐贈	對捐贈者有限制	要求
台灣	1987	是	是	五等血親內，結婚二年以上， 育有子女，婚後一年生病需移植
日本	1997	未明示*	否	需單位倫委會同意
香港	1998	是	否	需人體器官科技委員會同意
韓國	1999	是	否	非商業行爲

\*為一般民眾接受

# 肝移植方式

- 正位肝臟移植
- 部分肝臟移植
  - 活體肝臟移植
  - 尸肝移植
  - 輔助肝臟移植



臺北  
臺大醫院期盼了廿年，又苦心籌劃了三年，十三日下午四時五十分，終於進行了該院第一例人體肝臟移植手術，由外科醫師李伯皇主刀，臺大外科主任陳楷模為移植小組召集人，手術在十四日凌晨四時左右完成。這是國內第五次進行換肝手術。

換肝者是現年四十八歲、血型A型一型一罹患原發性膽汁性肝硬化的女病人周淑娥，捐贈者是血型O型，現年十八歲因車禍死亡的山地籍青年人，院方在十三日凌晨十二時及上午八時，作了兩次腦死判定，家屬同意捐出死者眼角膜、心瓣膜、肝臟及兩枚腎臟。

陳大樓、內科醫師賴明陽、神經科主任陳榮基及血液科主任沈銘鍾，院十三日曾透過ICRT及交通專線前往臺大捐血，結果反應熱烈，民衆前往臺大捐血，結果反應熱烈，臺大外科主任陳楷模為移植小組召集人，手術在十四日凌晨四時左右完成。這是國內第五次進行換肝手術。

換肝者是現年四十八歲、血型A型一型一罹患原發性膽汁性肝硬化的女病人周淑娥，捐贈者是血型O型，現年十八歲因車禍死亡的山地籍青年人，院方在十三日凌晨十二時及上午八時，作了兩次腦死判定，家屬同意捐出死者眼角膜、心瓣膜、肝臟及兩枚腎臟。

陳大樓、內科醫師賴明陽、神經科主任陳榮基及血液科主任沈銘鍾，院十三日曾透過ICRT及交通專線前往臺大捐血，結果反應熱烈，民衆前往臺大捐血，結果反應熱烈，臺大外科主任陳楷模為移植小組召集人，手術在十四日凌晨四時左右完成。這是國內第五次進行換肝手術。

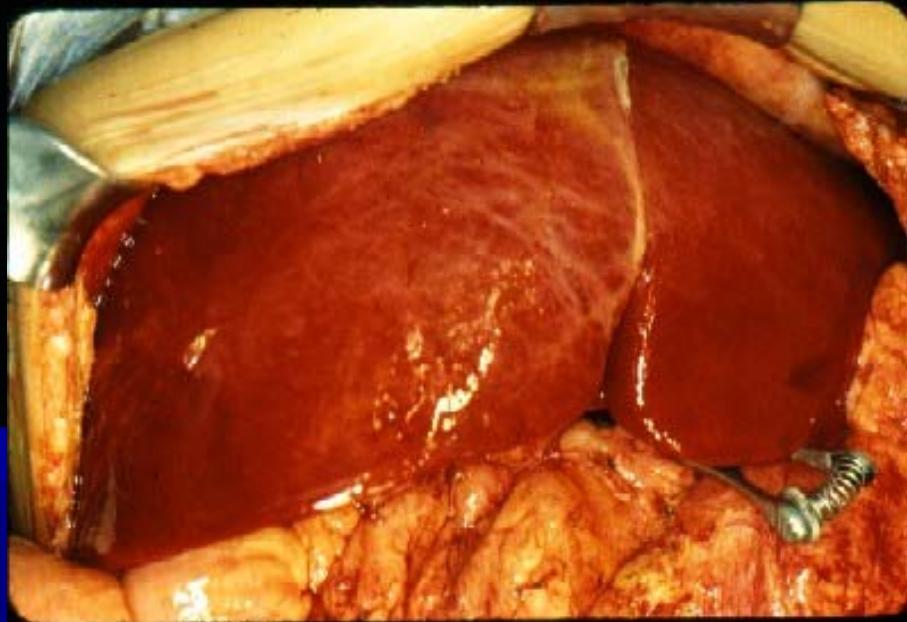
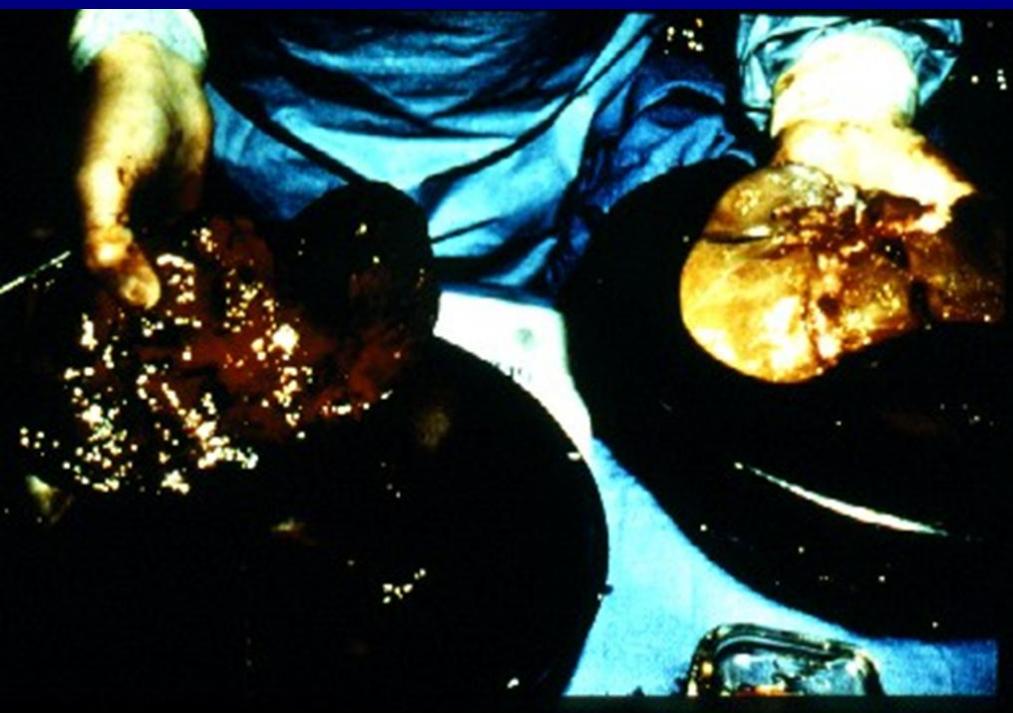
臺大醫院完成首例肝臟移植

期盼二十年 筹劃近三年

中央日報 國際版  
78.10.15

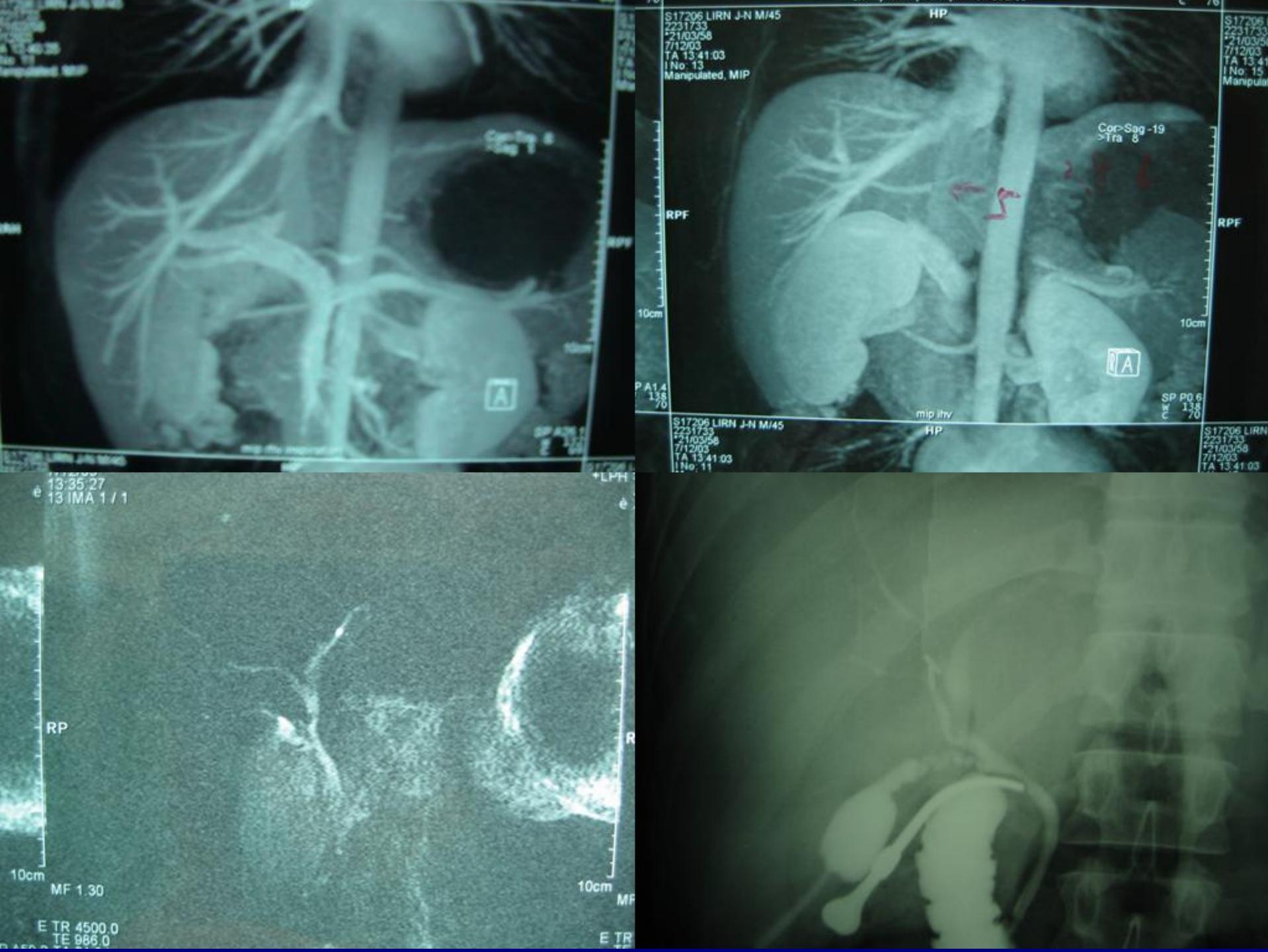
據了解，臺大醫院想發展換肝工作有一段漫長的歷史，早在二十年前首創「手指切肝法」的國內切肝手术，即有心推展肝臟移植，當時特別選派陳楷模赴美學習肝移植，無奈用血共有一萬CC，補助經費的中美醫學基金會認為以臺灣的環境及設備尚未發展，未予准許，而改習腎臟保存。

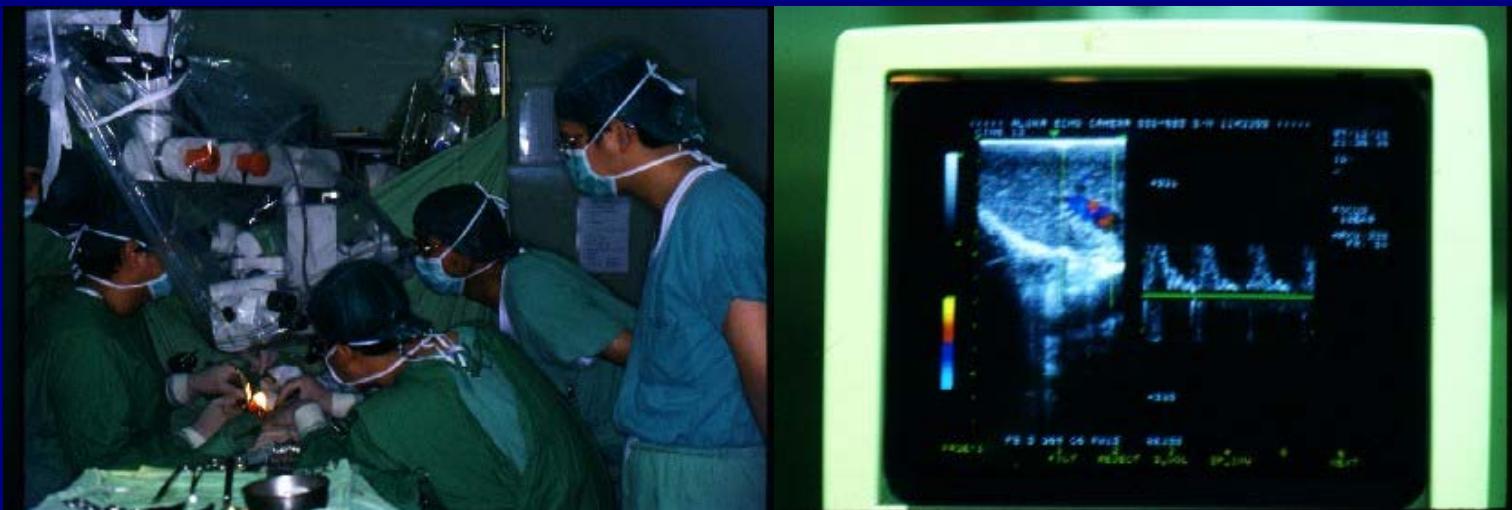
七十三年陳楷模任臺大外科主任後，又秉承「師訓」，選派李伯皇赴美學習移植，待其返國後作了近百隻的動物實驗，此次總算真的做了手術。

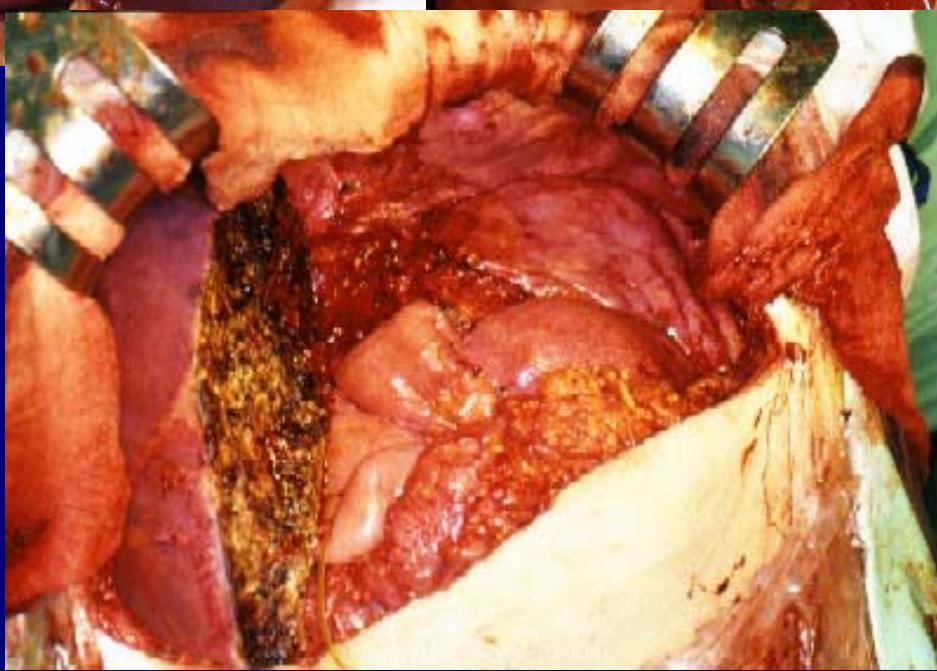
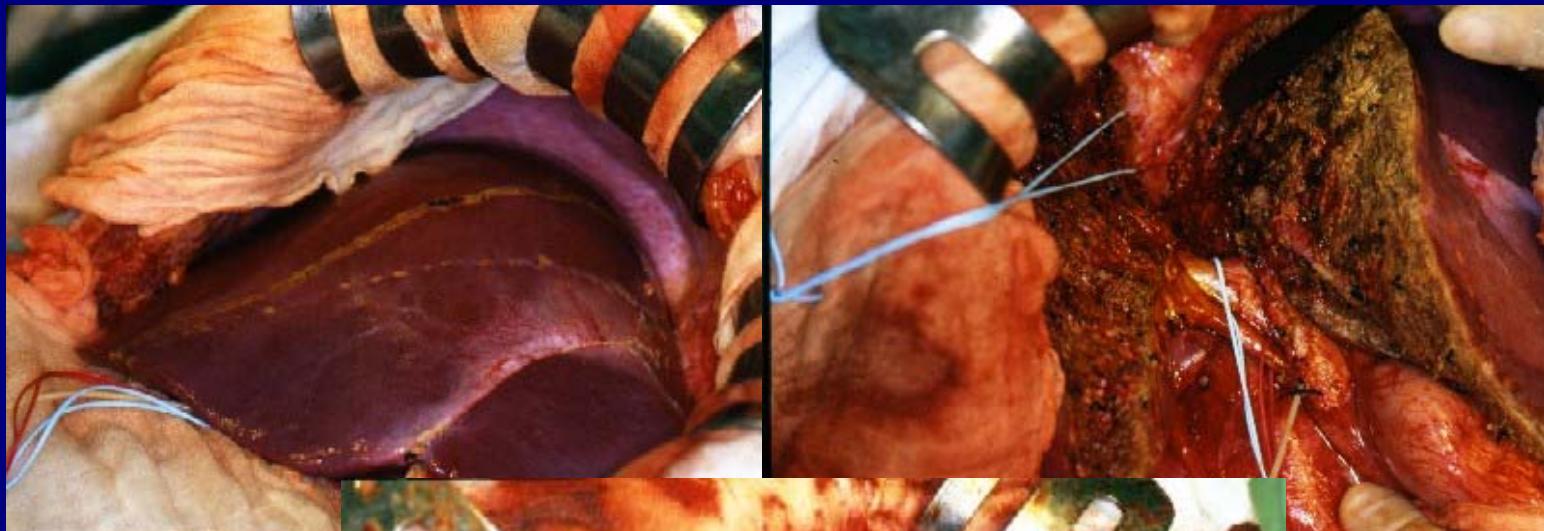


- \* Living-related liver transplantation
- \* ABO mismatched liver transplantation
- \* Split liver graft
- \* Dual graft
- \* Domino Tx
- \* APOLT









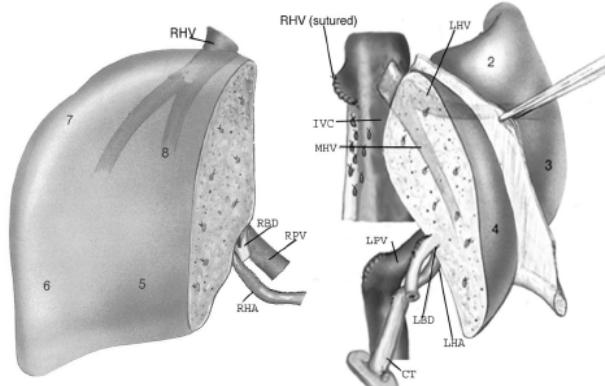
# Critical liver mass for liver resection and partial liver transplantation

	Normal liver(%)	Cirrhotic liver(%)	Donor volume in LRLT(%)	Graft-body-weight-ratio
Europe	28(15-40)	50(30-80)	35(30-50)	0.8(0.6-1.2)
North America	25(15-30)	50(25-90)	35(30-45)	0.8(0.8-1.0)
Asia	30(20-40)	50(30-80)	35(30-45)	0.8(0.6-0.8)
Australia	28(25-30)	50(40-50)	35	-
South America	28(25-40)	45(40-80)	38(35-40)	0.8(0.8-1.2)
Overall	28(15-40)	50(25-90)	40(30-50)	0.8(0.6-1.2)

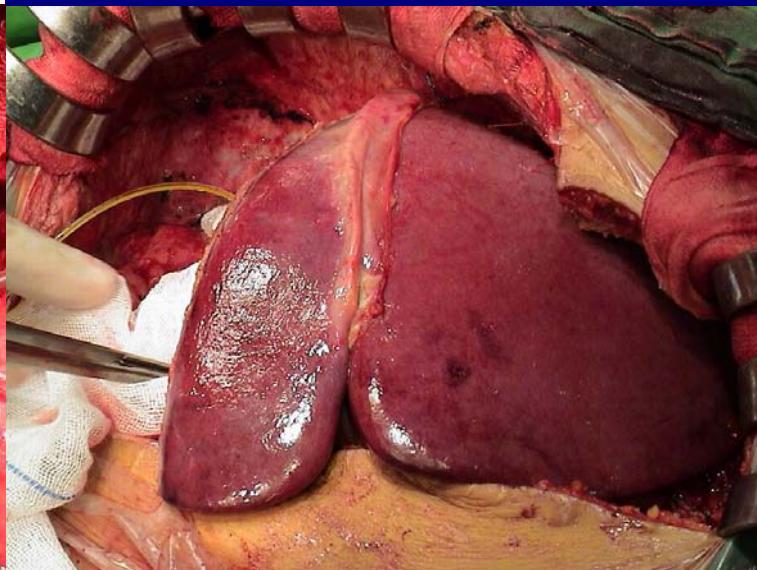
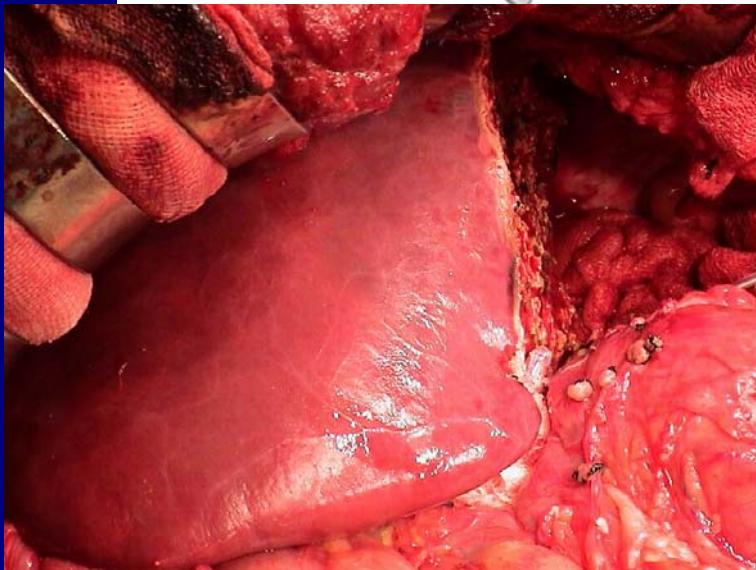
## Reported Donor Mortality

- Left lateral segmentectomy for pediatric recipient  
01.% - 0.2% (1/123 in Europe, 1/400 in U.S.)
- Right hepatectomy (estimated)  
0.2% - 0.5%

Liver Transpl. 2002;8:174-188



# Split liver transplantation



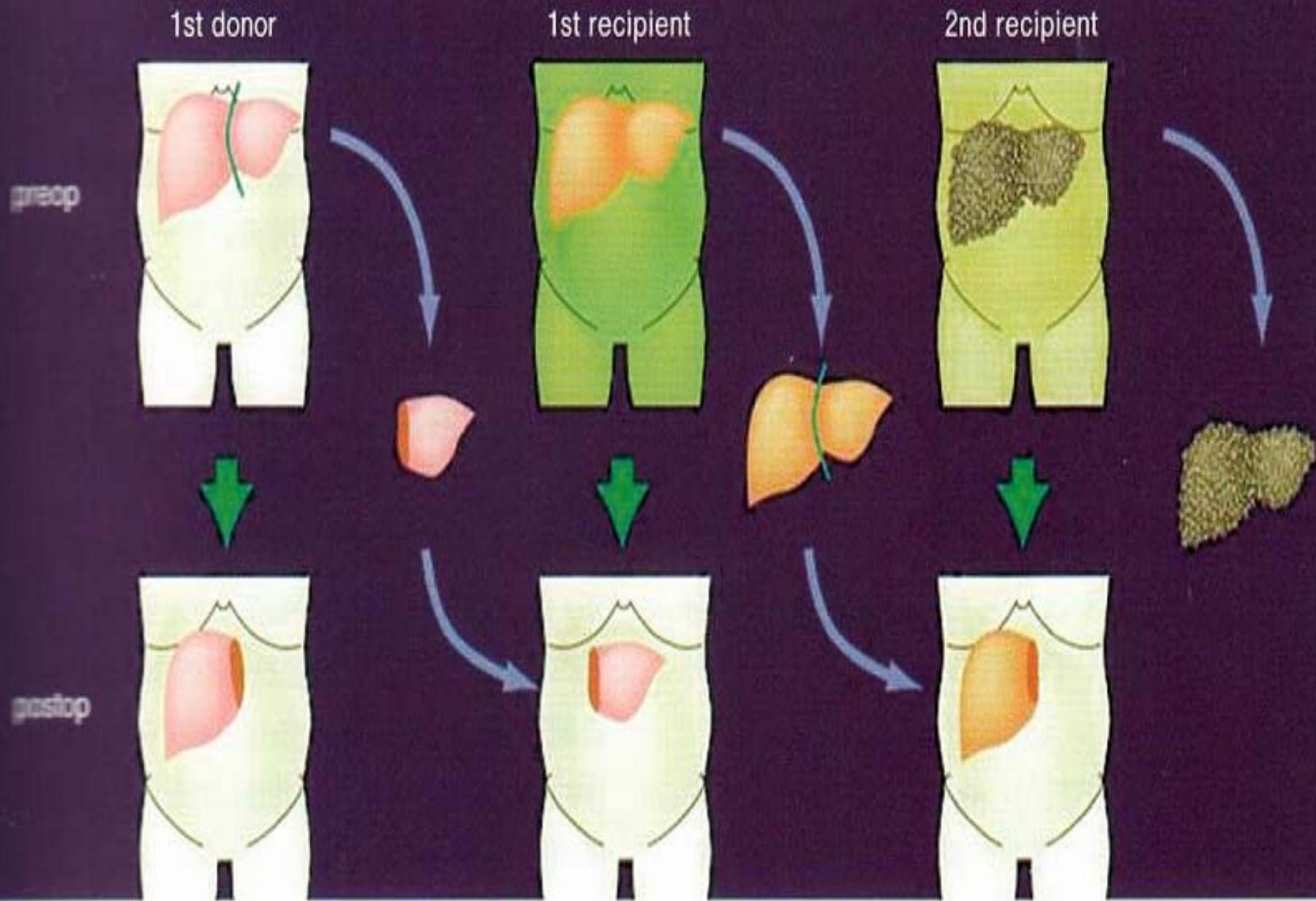
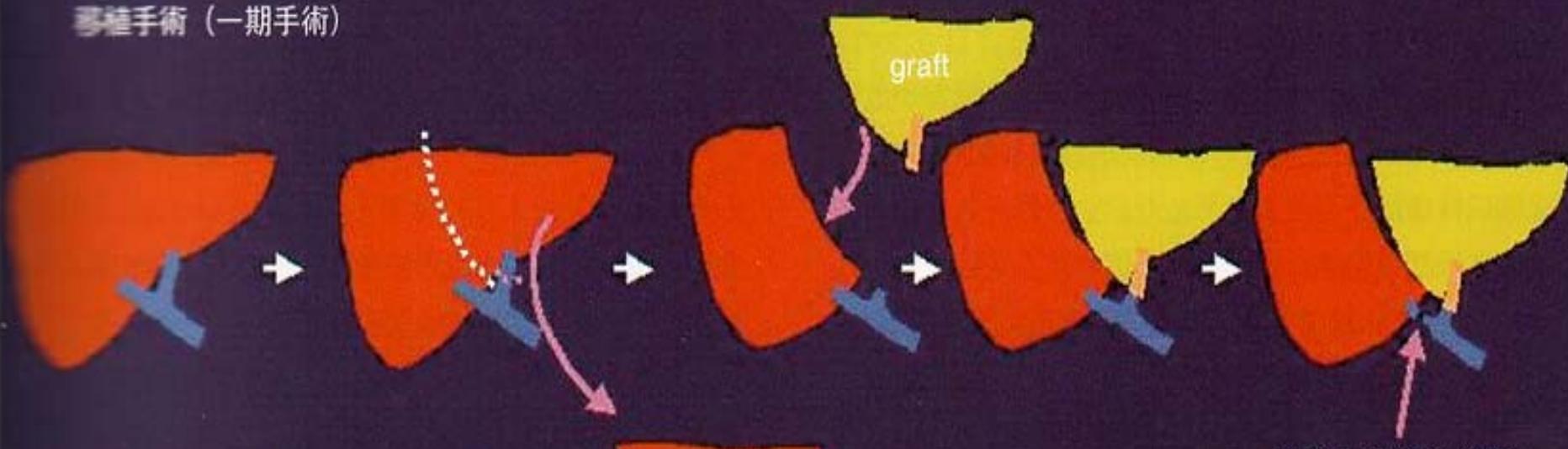


図1 ドミノ術式の概略

移植手術（一期手術）



残肝切除（二期手術）

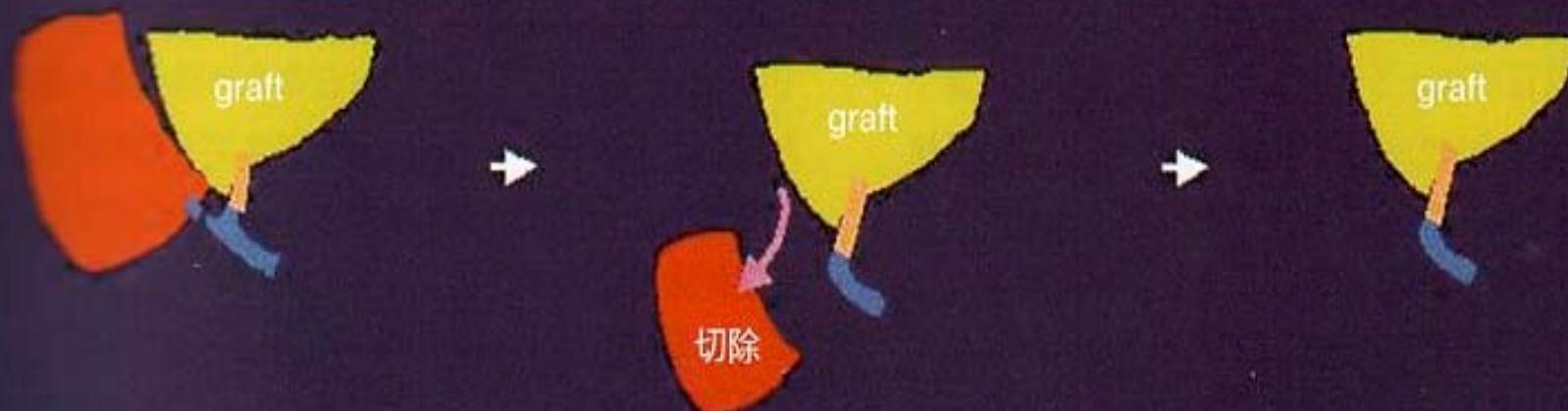
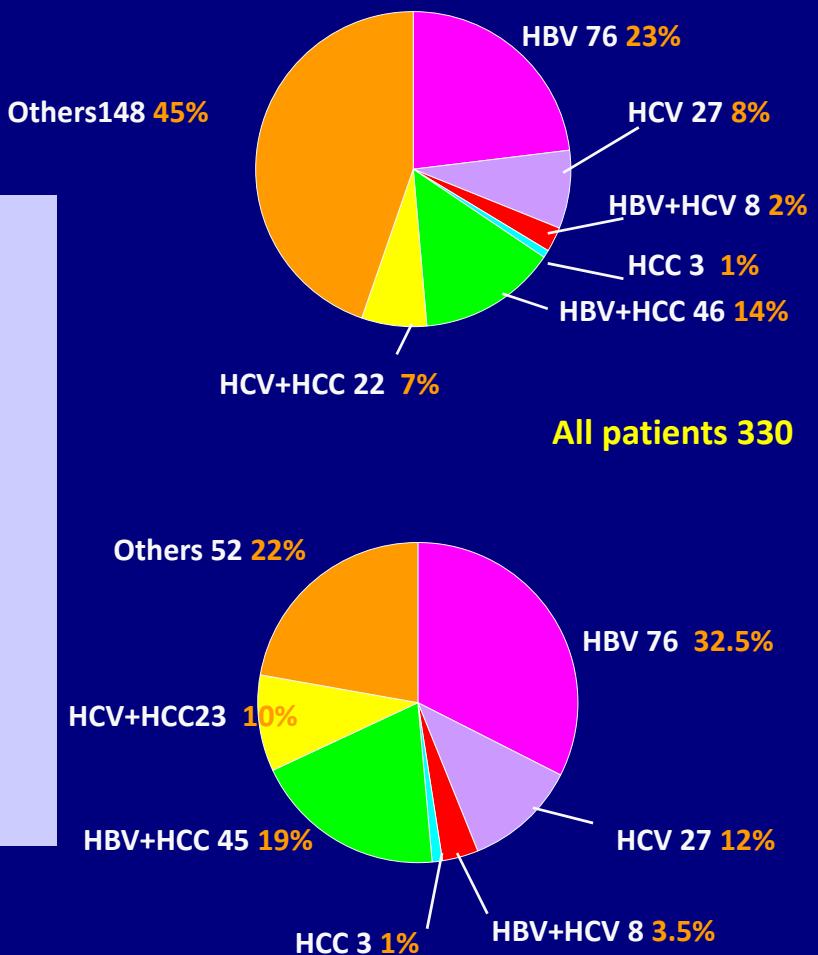
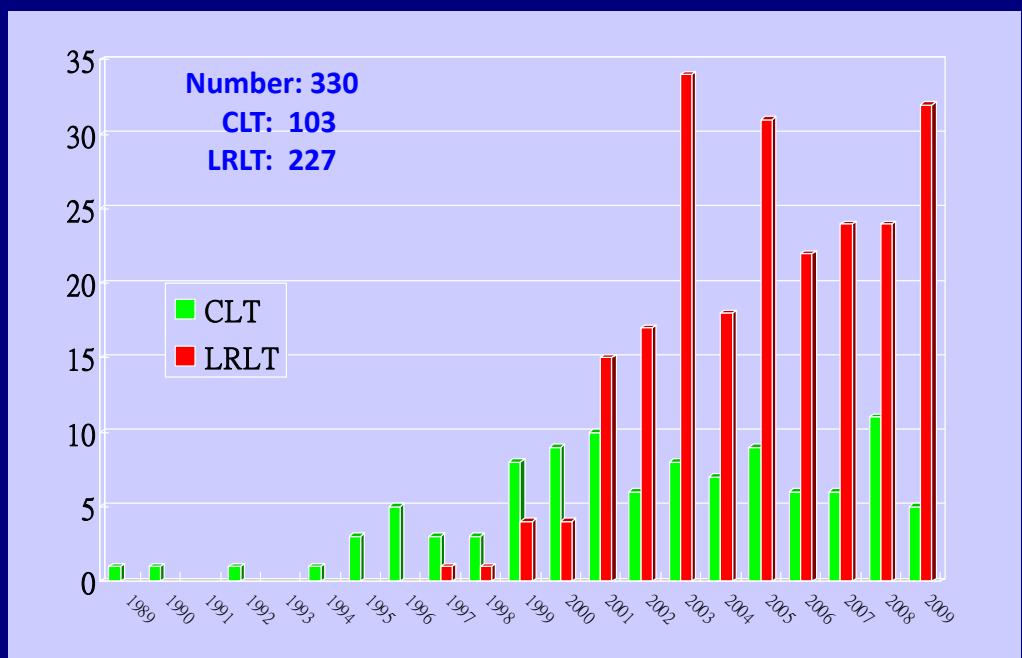


図2 temporary APOLT の方法

# Liver Transplantation in National Taiwan University Hospital (NTUH) (1989 Oct. ~ 2009 Nov.)



Ø Cadaveric liver transplantation : 103

Whole graft 85

Reduced-sized 14

( 7 lateral segmentectomy,  
6 extended right lobectomy  
1 left lobectomy)

Split graft 4 (2 right lobe ,2 left lat)

Ø Living-related liver transplantation : 227

Right lobe without MHV 133

Left lobe with MHV 11

Lateral segment 67

S2+S3+partial S4 16

# Successful rate of liver transplantation in NTUH (survive over 30 days after operation)

Ø Cadaveric liver transplantation

90/98 (91.8%)

Ø Living-related liver transplantation

184/193 (95.3%)

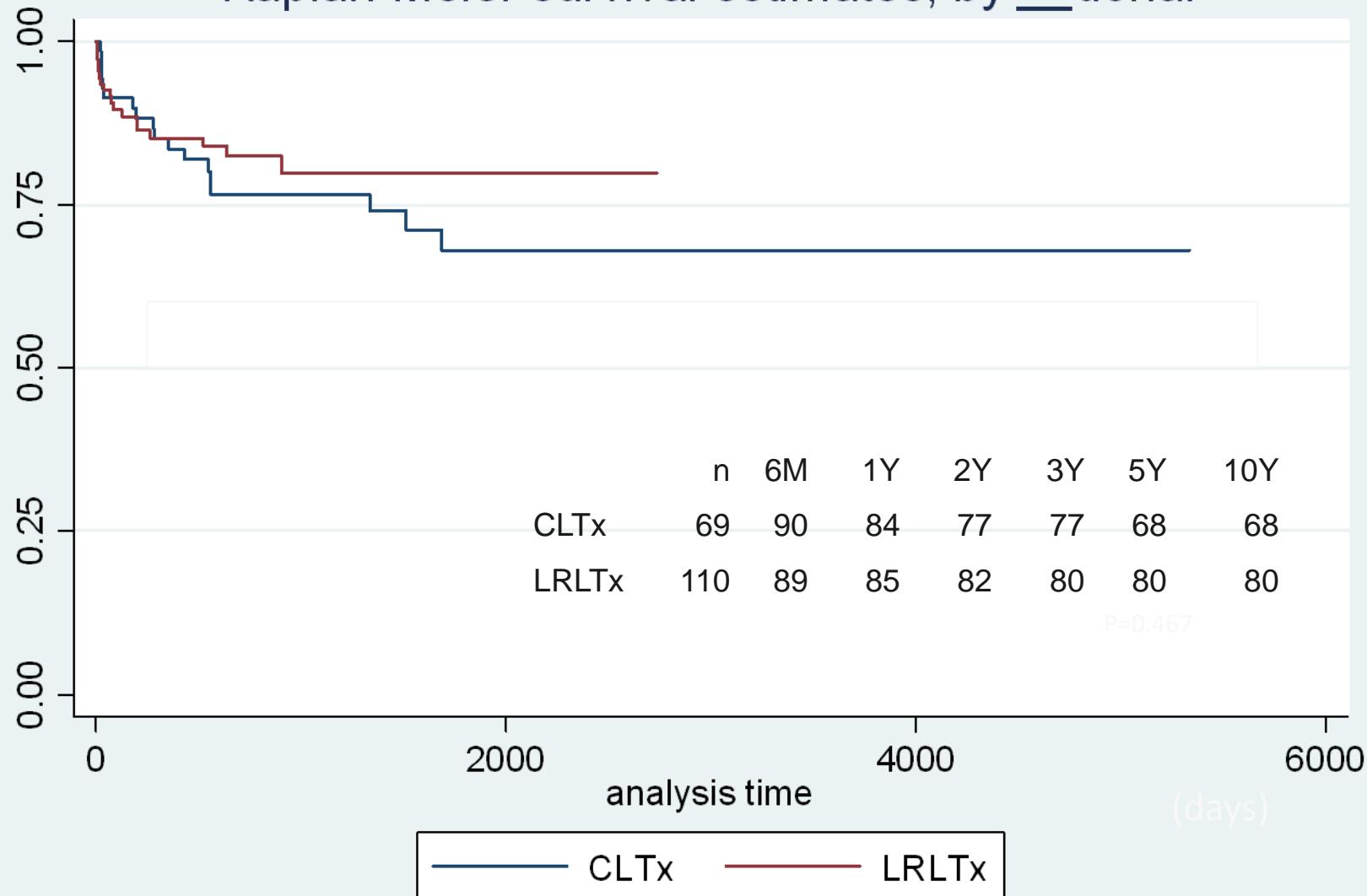
# 1997-2005年全民健保器官移植存活率統計-肝臟(依3年存活率排序)

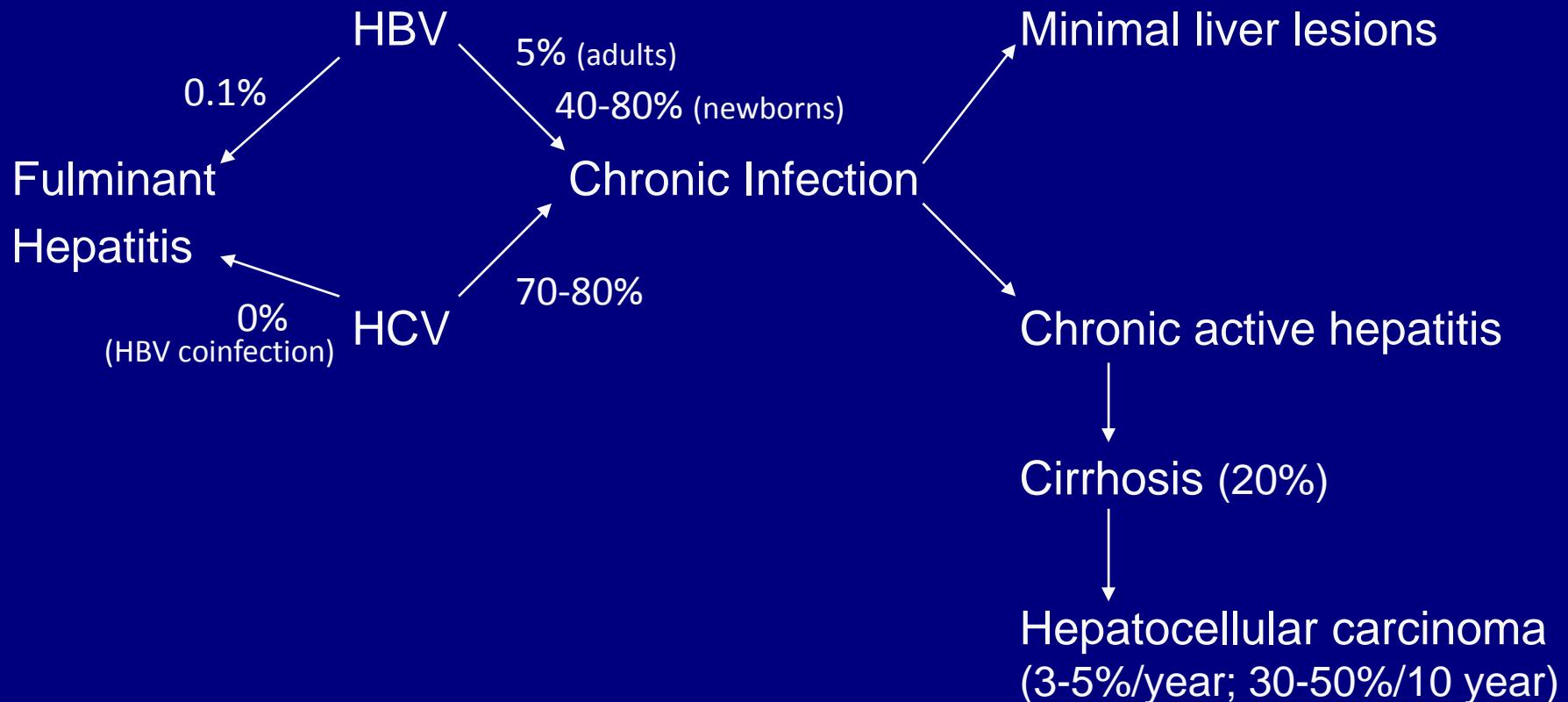
院所名稱	案例數	年齡中位數	存活率			
			3個月	12個月	36個月	60個月
財團法人長庚紀念醫院高雄分院	262	35	97%	95%	90%	88%
國立台灣大學醫學院附設醫院	164	46	91%	86%	83%	73%
財團法人彰化基督教醫院	22	56	91%	81%	81%	
財團法人長庚紀念醫院林口分院	95	48	88%	80%	76%	76%
中國醫藥大學附設醫院	24	53	83%	78%	65%	
行政院國軍退除役官兵輔導委員會台北榮民總醫院	49	51	77%	72%	52%	

註：移植案例數>10始納入排序

## Kaplan-Meier survival estimates, by \_\_ donar

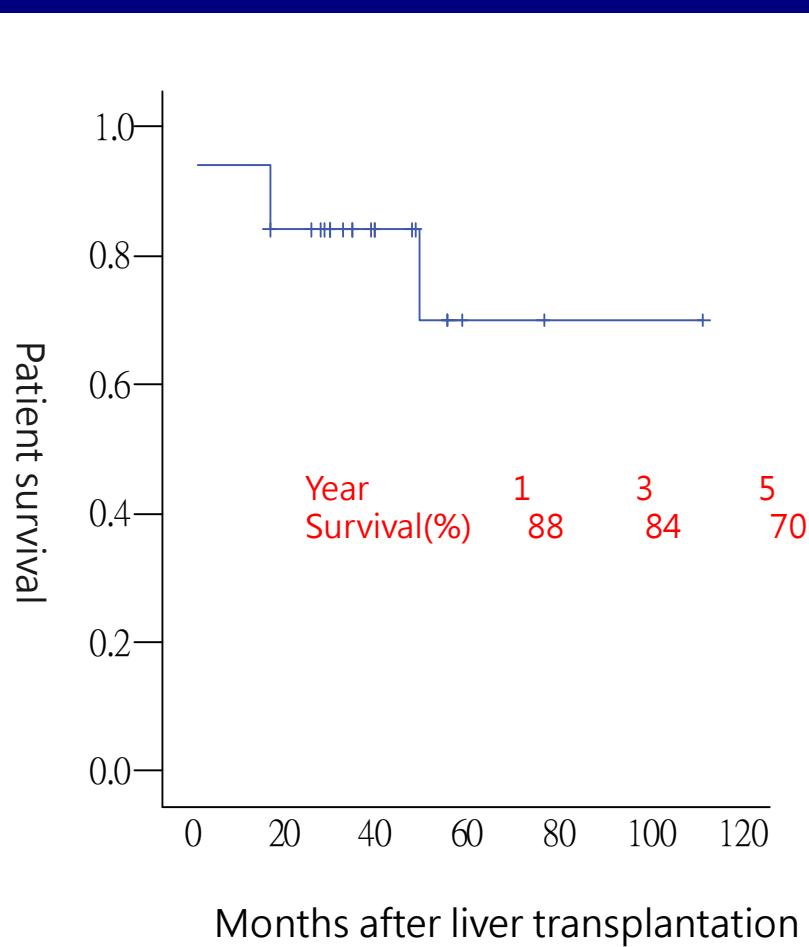
Survival rate



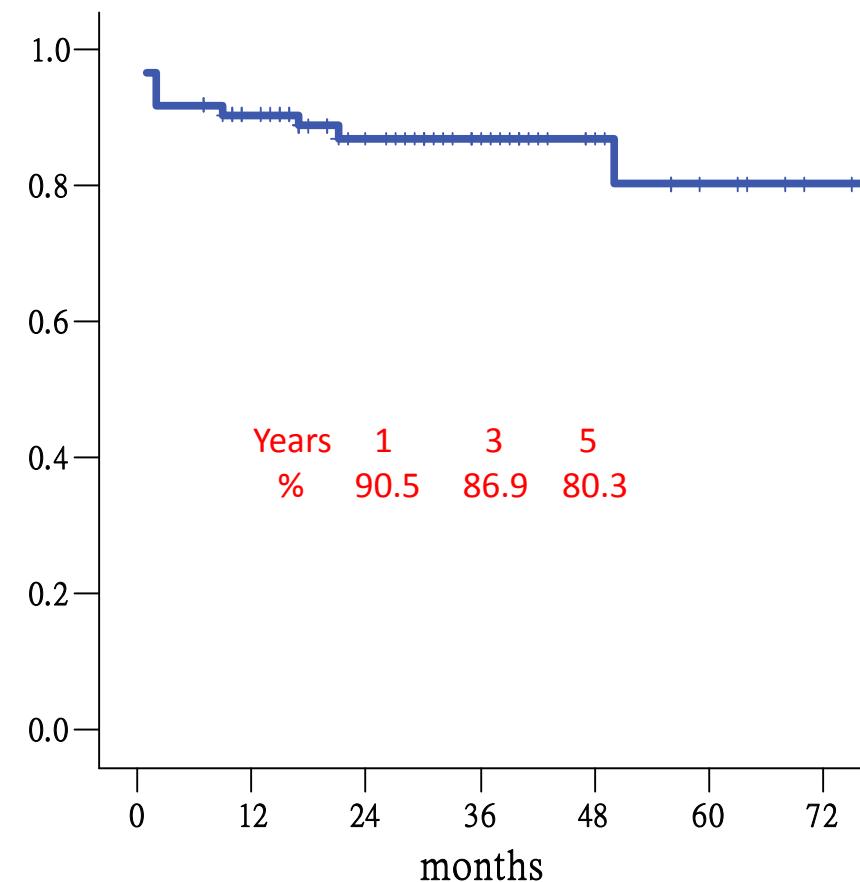


Schematic representation of the natural course of hepatitis B virus (HBV) and hepatitis C virus (HCV) infections. The figure emphasizes in particular the high rate of chronic HBV and HCV infection as well as the risk of chronic active hepatitis, cirrhosis, and hepatocellular carcinoma.

Patient survival after liver transplantation for acute liver failure in NTUH (1997~2005)



Patient Survival after liver transplantation for HBV-related liver disease in NTUH (1999~2005)



# Liver Transplantation for Patients with HBV-related Liver Disease in NTUH (1996~2007)

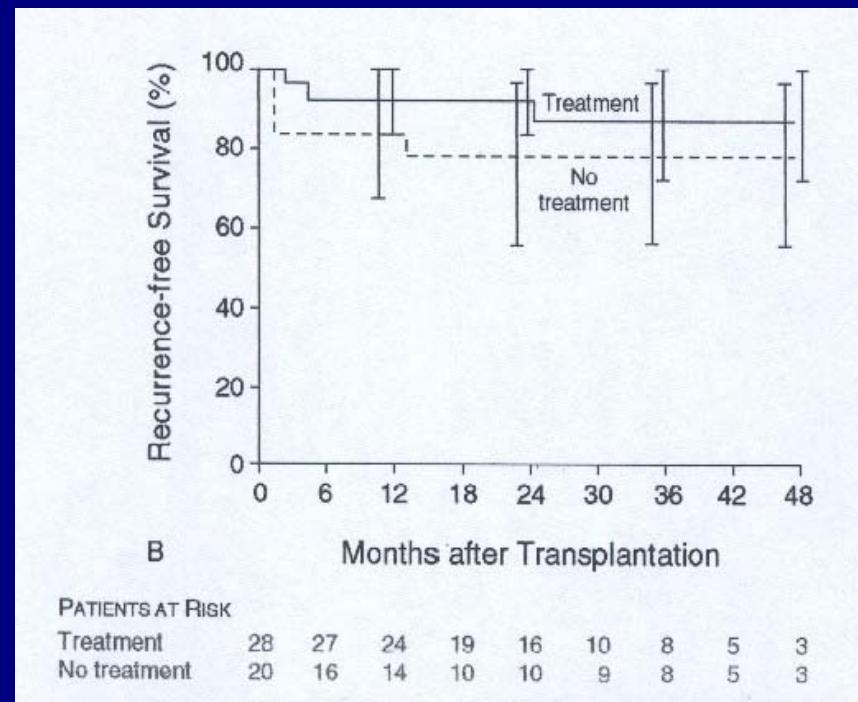
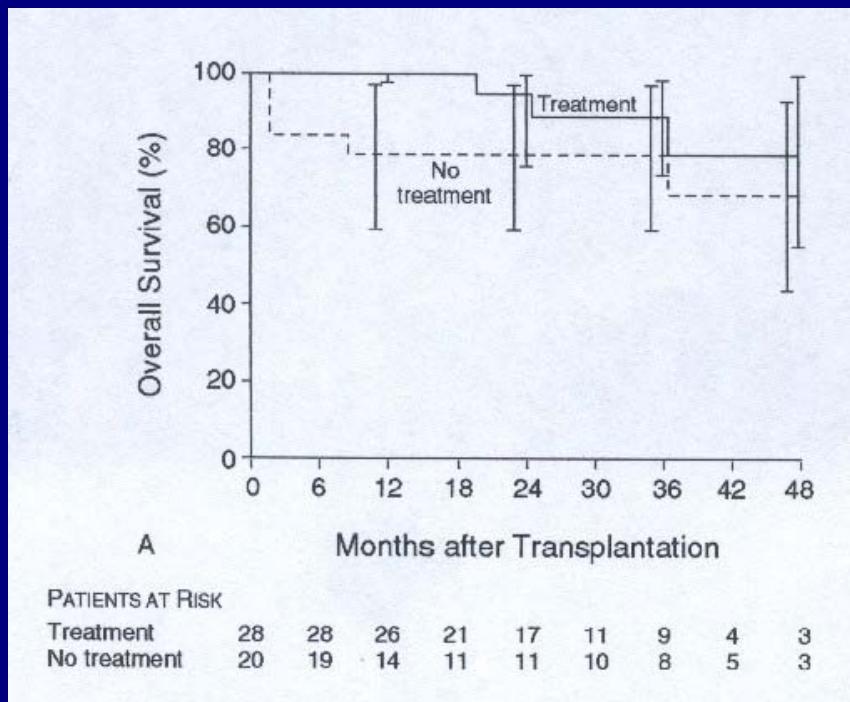
- 95 cases, Sex: M/F 71/24 , Age: 34~64 y/o ( $48.6 \pm 11.5$ ) Follow up  $40.8 \pm 28.6$  months
- Disease categories:

HBV-related acute hepatitis	25
HBV-related liver cirrhosis without HCC	36
HBV-related liver cirrhosis with HCC	34
- Type of graft: cadaveric graft (32), LRLT (63)
- Anti-HBs Ab titer in patients without HBV recurrence:  $194.9 \pm 73.6$  IU/l (83.9~375.2)
- 6 cases with HBV recurrence (**recurrence rate 6.3%**)  
4 case of them with YMDD mutation
- HBV recurrence risk: 1 year--1.1%, 3 year--2.7%, 5 year--4.2%

# 肝臟移植在肝癌治療的角色

贊成 - 沒有其他有效的治療方式  
在一些病人仍可得到痊癒  
預後與病例選擇有關  
輔助性化學治療可能減少復發

反對 - 易復發、高死亡率  
捐肝者來源有限  
肝炎再活化  
對長期預後相關的生物及解剖知識了解仍未清楚

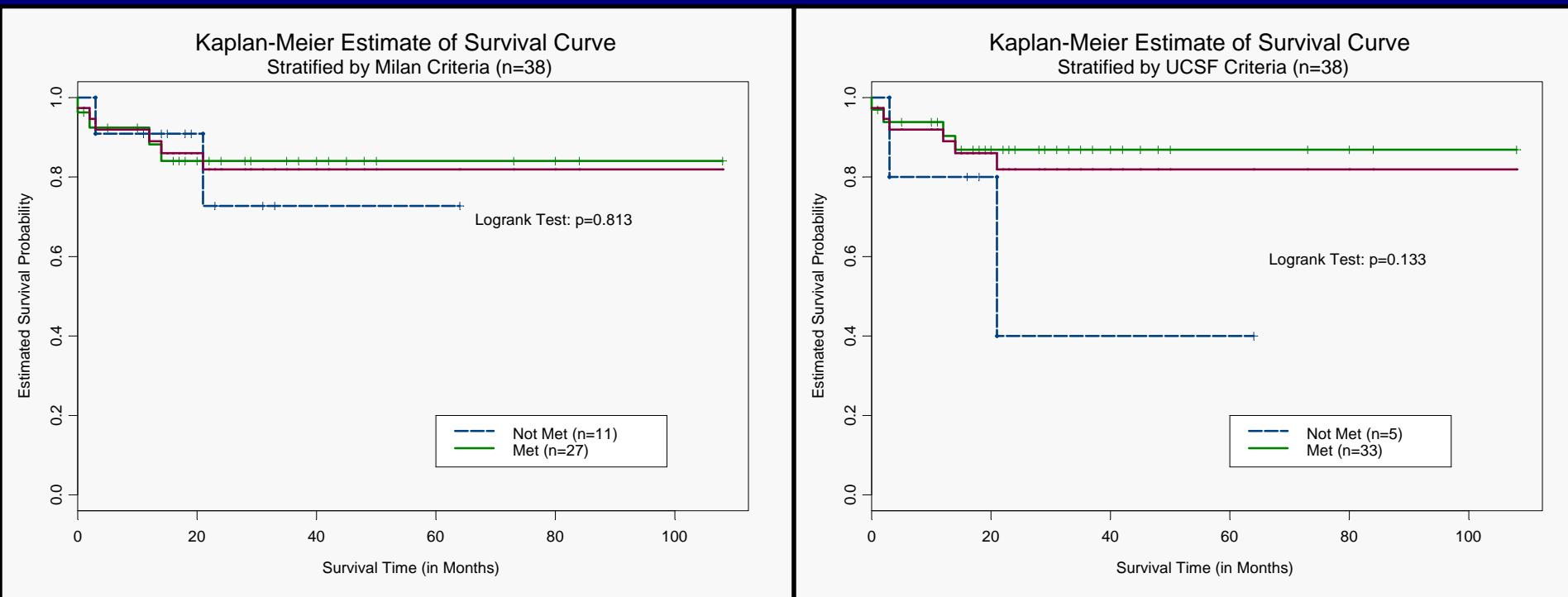


Effect of Anticancer Treatment before Transplantation on Overall Survival (Panel A) and Recurrence-free Survival (Panel B) in 48 Patients with Cirrhosis and Hepatocellular Carcinomas.

# Criteria of OLT for HCC in Taiwan

- Milan criteria
  - single tumor, <5cm
  - multiple tumor
    - </= 3 tumor
    - largest diameter
    - <3cm
  - No major vessel involvement
- UCSF criteria
  - single tumor, <6.5 cm
  - multiple tumor
    - </= 3 tumor
    - largest tumor <4.5cm
    - Total diameter <8cm
  - No major vascular invasion

# Milan criteria or UCSF criteria?



Survival curve by Milan criteria

Survival curve by UCSF criteria

Patients beyond UCSF criteria had the worst prognosis

# 肝臟移植後可以回覆正常嗎？

- 恢復正常工作：50% - 75%
- 恢復全職工作：20% - 40%
- 恢復部分工作：10% - 50%
- 懷孕
  - 懷孕不至於導致母親的危險
  - 月經恢復正常
  - 45% - 60% 早產
  - 20% - 30% 小孩體重較輕



2001年12月28日

李教授：

摯誠感謝您參與拍攝《生命的脈動-第10集》節目，本節目現已順利製作完成，並陸續於世界各地播放，台灣地區則預計於2002年3月13日晚上10:00播出。

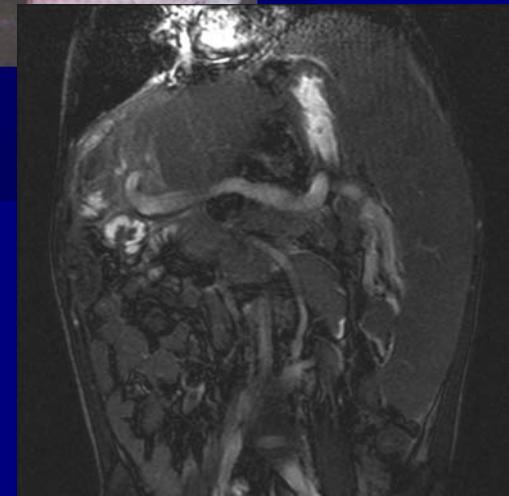
由於您及台大醫院所有醫療小組成員所提供的專業協助與指導，使全球Discovery頻道的觀眾得以透過鏡頭，見到台灣在專業領域中尖端優秀的醫療科技及團隊。

謹此附上本節目之節目帶供您留存，以表達我們的謝意，並祝您

新年快樂 萬事順心

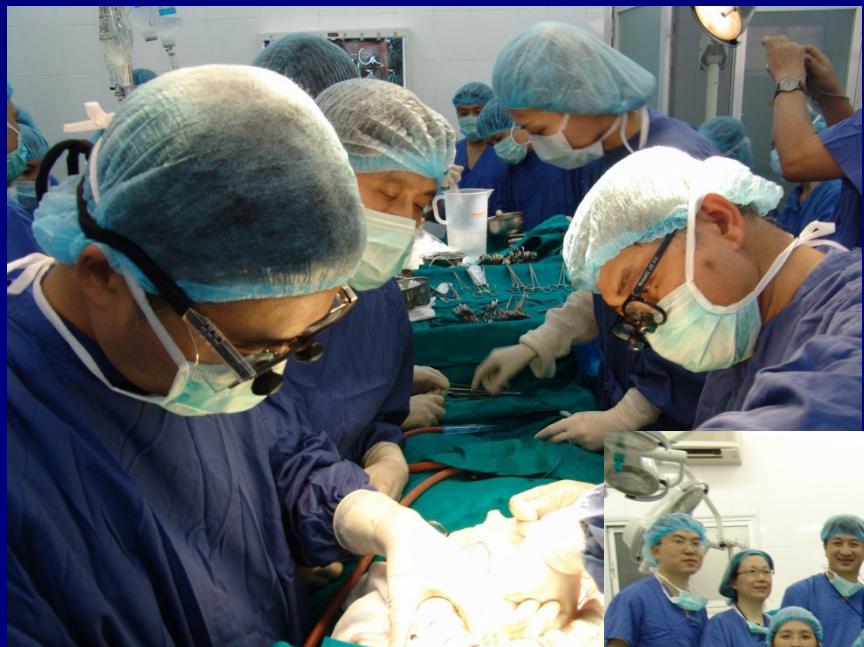
陳元玲

Discovery 亞洲電視網  
台灣區總經理









# Prospectives in Organ Transplantation

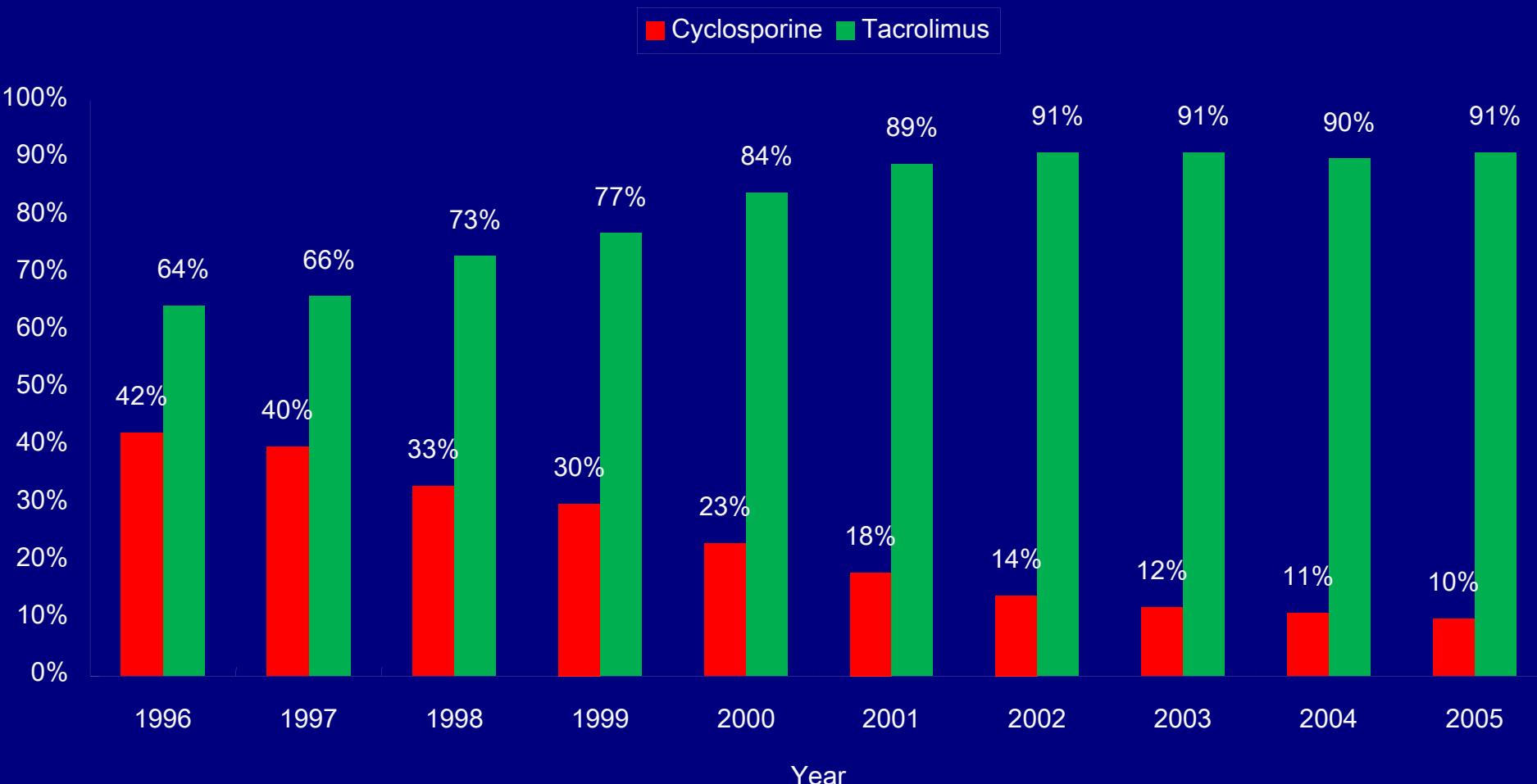
- Immunosuppression
- Expanding the organ donors
- Cell transplantation
- Artificial organs

Organ transplantation research center

Organ registry and sharing center

Organ donation promotion team

Immunosuppression Use for Maintenance, Prior to Discharge, 1996 to 2005  
Recipients with Liver Transplants



Source: 2007 OPTN/SRTR annual report

# New substances for immunosuppression

## FK778:

analogue of the active metabolites of leflunomide (Astellas), inhibits the de-novo synthesis of pyrimidines resulting in suppression of T and B cell proliferation, smooth muscle cell proliferation was inhibited; phase III kidney trials,

## JAK3 inhibitor:

antiproliferative agent (CP-690,550, Pfizer), delayed rejection+prolong kidney allograft survival as monotherapy in non-human primate models, non-reversible anemia

## AEB071 :

Protein kinase C-inhibitor (Novartis), phase I+II

## Anti-IL15 fusion receptor protein mutant: IL-15/Fc

## Humanized CD11a (antiLFA1) antibody: Efalizumab

## Second generation CTLA4Ig:

Belatacept/LEA29Y (BMS), clinical trials phase II and III, selective T-cell-costimulation-blocking agent (CD80/CD86)

# Expanding Donor Liver

Hepatitis donor

Elderly donor

Micro and macrosteatosis

Split liver transplantation

Living donor liver transplantation

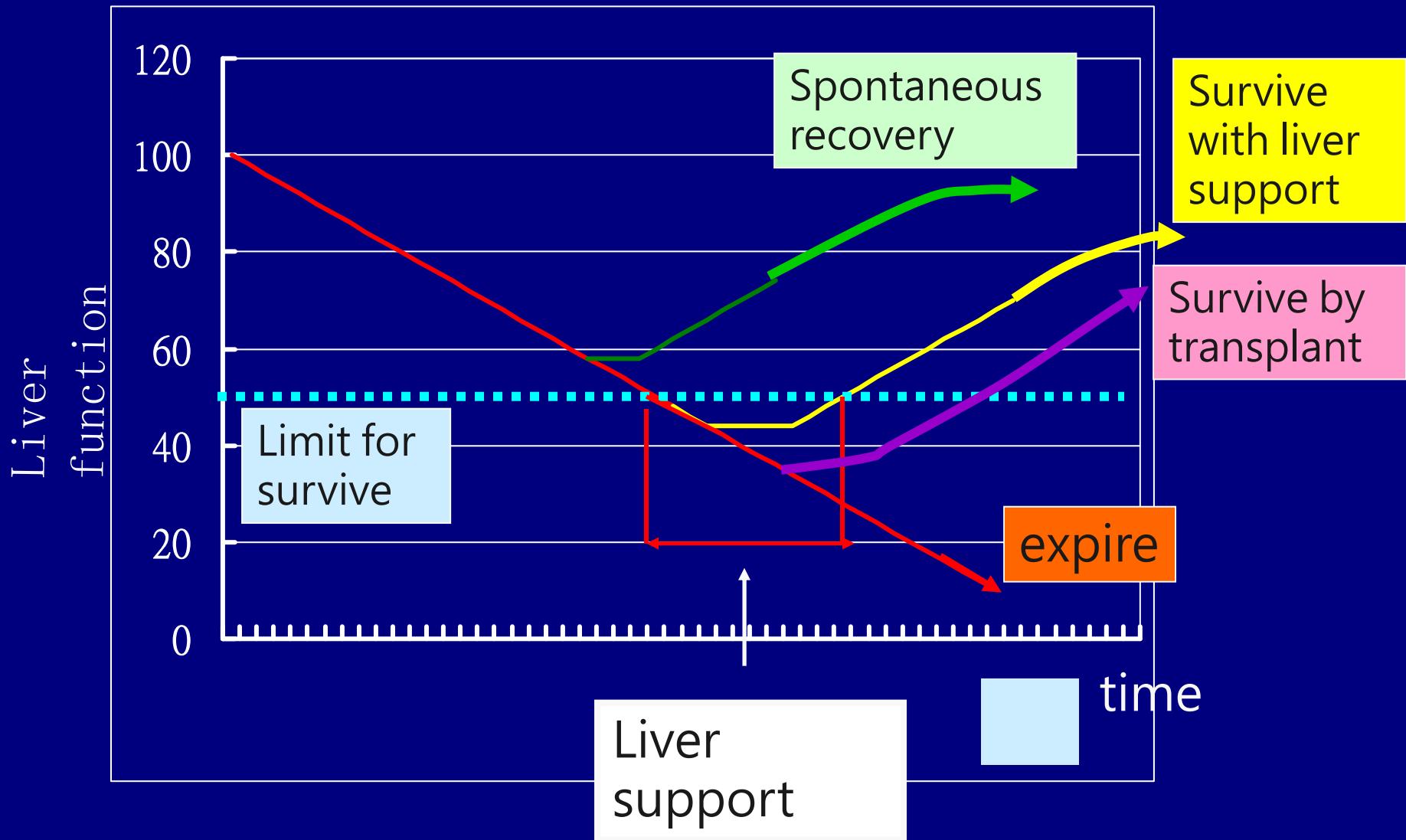
Domino liver transplantation

Non-heart beating donor – age<64yrs

Artificial and bioartificial organ

Xenotransplantation

# Outcome of Acute Liver Failure



# 雨過天晴

石英B肝帶原已有幾十年，在民國八十七年十二指腸潰瘍併發B肝發炎，住院治療二星期痊癒出院。

九十年因肝腫瘤住進台大醫院，由李伯皇教授手術治療；術後一切安好，定期回診，由每週一次漸漸延至二個月一次的門診。一切正常之後，當回診延至三個月一次時，那種快樂並非常人可以體會的。

原定七月二日為回診日，時間還未到，五月十四日發現身體不適，五月十六日趕緊住進台大醫院肝膽內科，診斷結果為急性肝炎。住院期間，有許金川教授的照顧和治療，許教授也請肝炎權威賴明陽教授一起會診，石英的病情仍然持續的惡化。就在五月下旬，許教授告知肝臟移植是使石英康復最有效的治療方法。天啊！移植肝臟是多麼震撼的名詞，要如何去尋找肝臟？許教授知會移植小組之後，移植小組的李教授隨即到內科病房了解石英的病情；當見到李教授之時，心中燃起一絲希望。

在女兒和兒子表明願意捐贈的意願之後，台大移植小組就接手後續的工作，由移植小組召集人吳耀銘醫師帶領。抽血比對，女兒的血型不符合，無法捐贈，而由血型相同的兒子來捐贈。

六月六日，石英呈現重度肝昏迷，病情非常的危急、命在旦夕，緊急轉入加護病房，兒子也隨即住院，作手術前各項準備。

在分秒必爭的情況下，台大移植小組在不到四十八小時完成手術前的各項準備工作，充分發揮移植小組的團隊精神及工作效率。順利在六月八日早上七點三十分進入手術室，兒子在下午六點回到普通病房，石英直到九日凌晨一點才出手術室送入加護病房，搶救過程整整七十二小時。就我而言，醫護人員彷彿是一群救苦救難的活菩薩，李教授是我心中依靠的再世華陀，李教授二次救命之恩我們全家沒齒難忘。

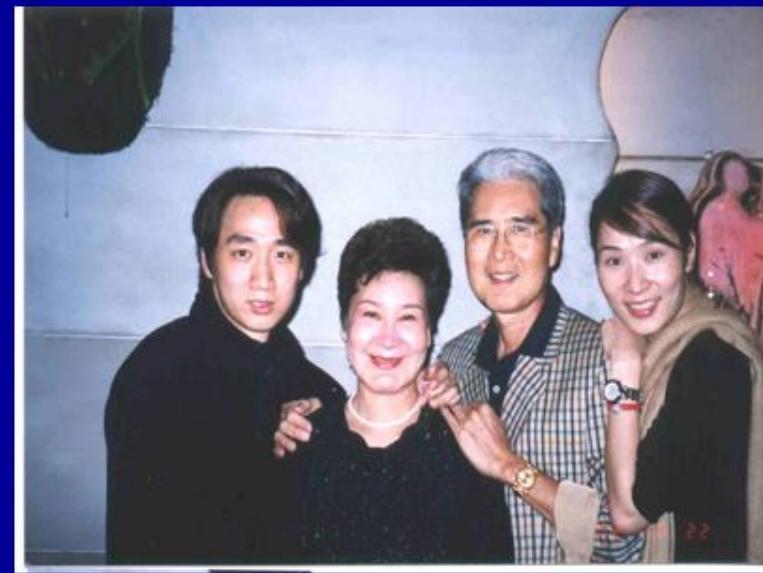
李教授所帶領的移植小組，個個仁心仁術。我兒子就很感激吳耀銘醫師，在他心裡最慌亂的時刻，對他精神鼓勵以及照顧，如同一位大哥般的慈愛。女兒對移植小組的兩位林小姐在手術後的各種生活應注意的小細節、用藥須注意的事項，每天來病房探望石英的恢復狀況，那種親切真是教人窩心。

台大醫院醫療體系的完整真的是不容質疑的，在由肝膽內科許金川教授仔細的診斷之後，確定必須作肝臟移植的手術之後將一切移交給肝膽移植小組李伯皇教授，其過程相當仔細和快速，在許多人的印象中，得到猛性肝炎通常都無生還的機會，但石英這次相當幸運的台大醫院的照料之下，在7月31日出院，在此同時，期待許多在等待肝臟移植的病患能早日得到適當的肝臟，希望在倡導愛肝保肝的同時，更多的人能勇於捐肝，捐肝一葉救人一命。

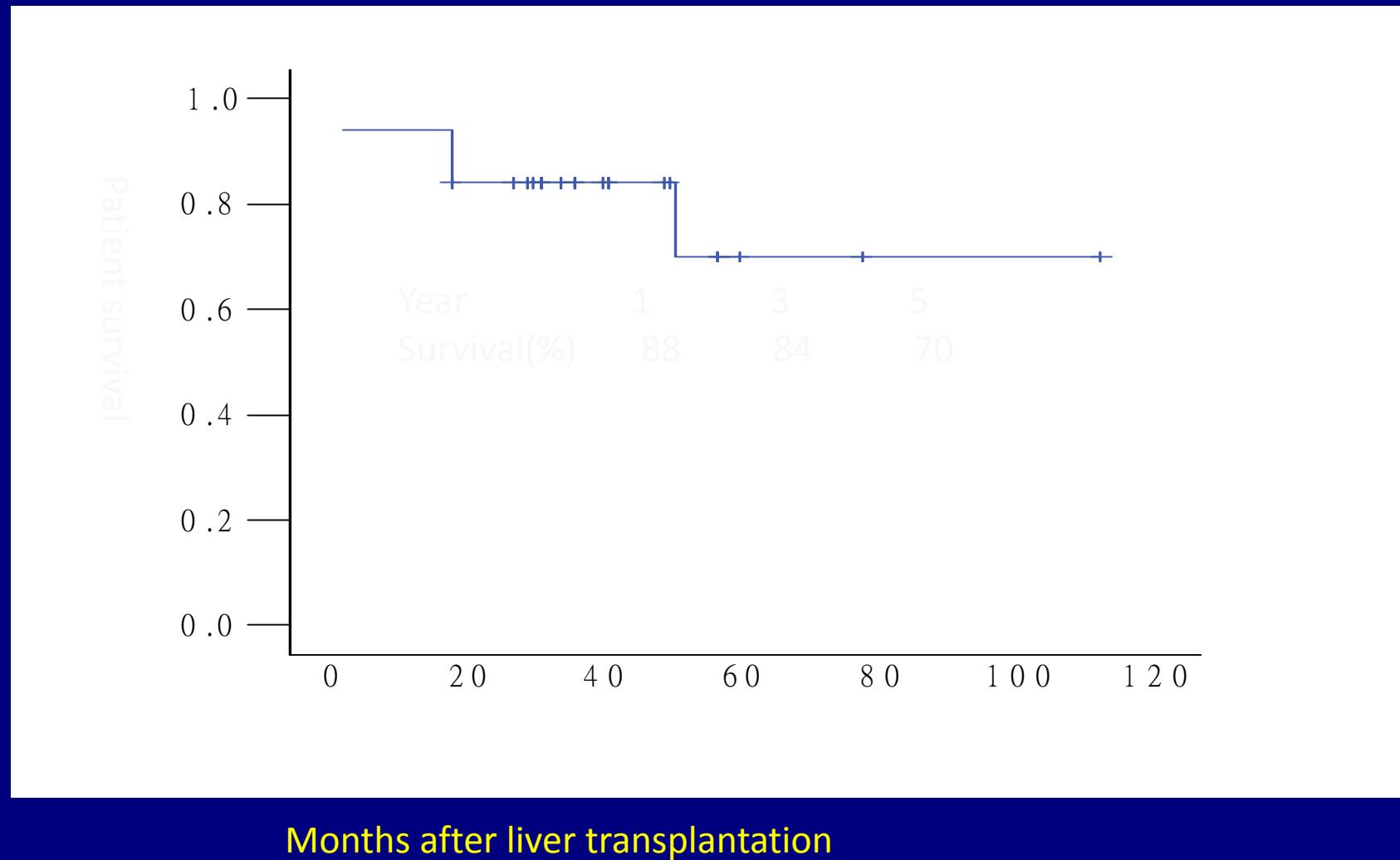
雖然腦死捐贈的家屬，有很多的不捨和往後的懊悔，換一個角度來想，讓春泥化為春草，讓極限的生命延長為無限的光輝，是多麼偉大無私的大愛，活肝捐贈者和親屬分享同肝共苦，你身中有我我心中有你的知己和親密，願人人都能長命百歲。

在此感謝臺大醫院特別是關心和照顧過石英的醫生和護理人員，謝謝你們！

家屬 吳盈



# Patient survival after liver transplantation for HBV-related acute liver failure in NTUH (1997~2005)



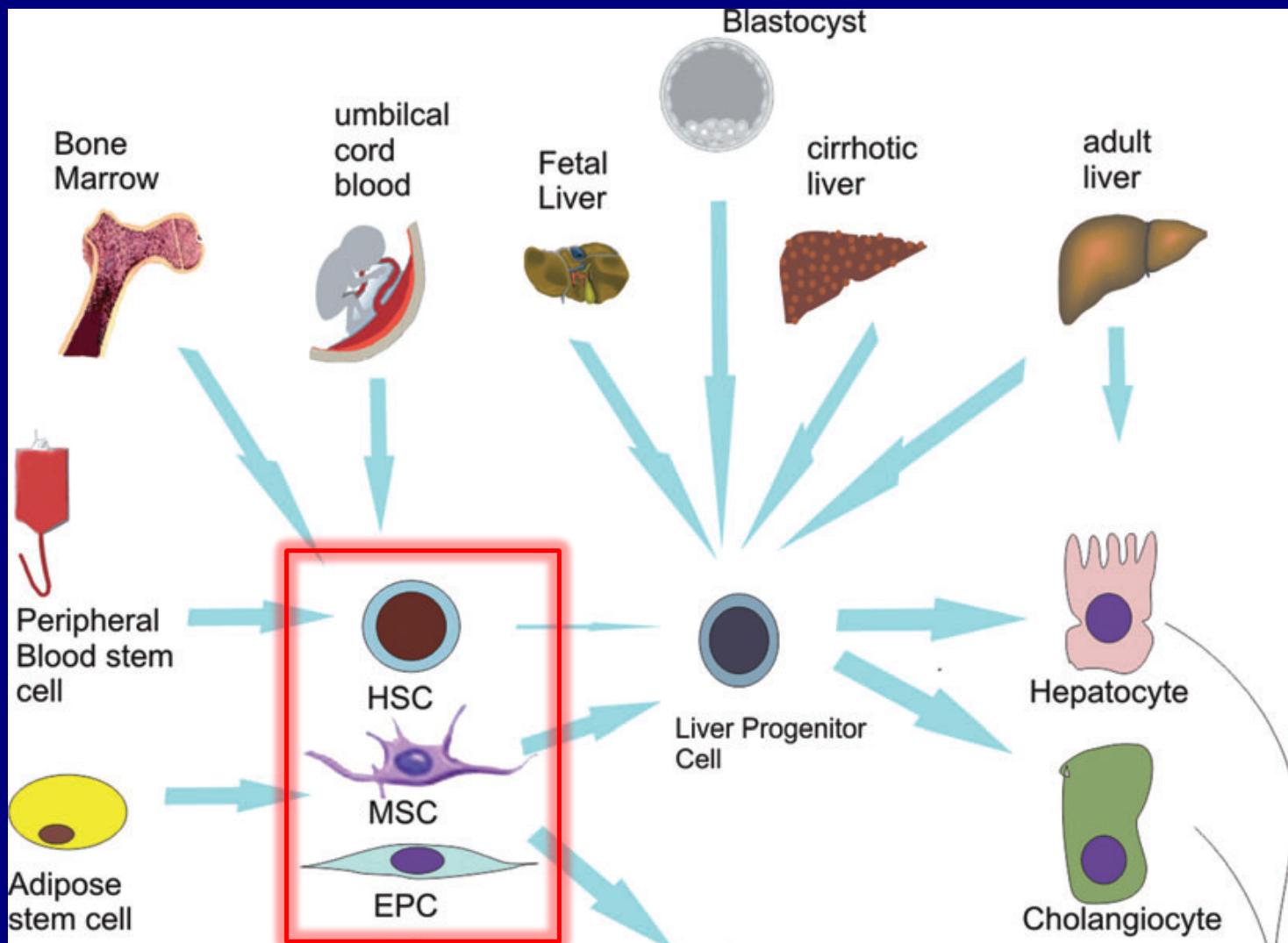
# Treatment of hepatic failure

- Liver transplantation
  - Orthotopic
  - reduced size
  - split
  - living-related ( adult-child, adult-adult)
  - heterotopic
  - auxiliary orthotopic
- Hepatocytes transplantation
  - Intraperitoneal, intraspleen, intrahepatic
- Study of liver metabolism, physiology, virology to improve treatment of hepatitis
- Liver regeneration
- Bioartificial liver
  - Mechanical artificial liver(MARS)
- Plasmapharesis

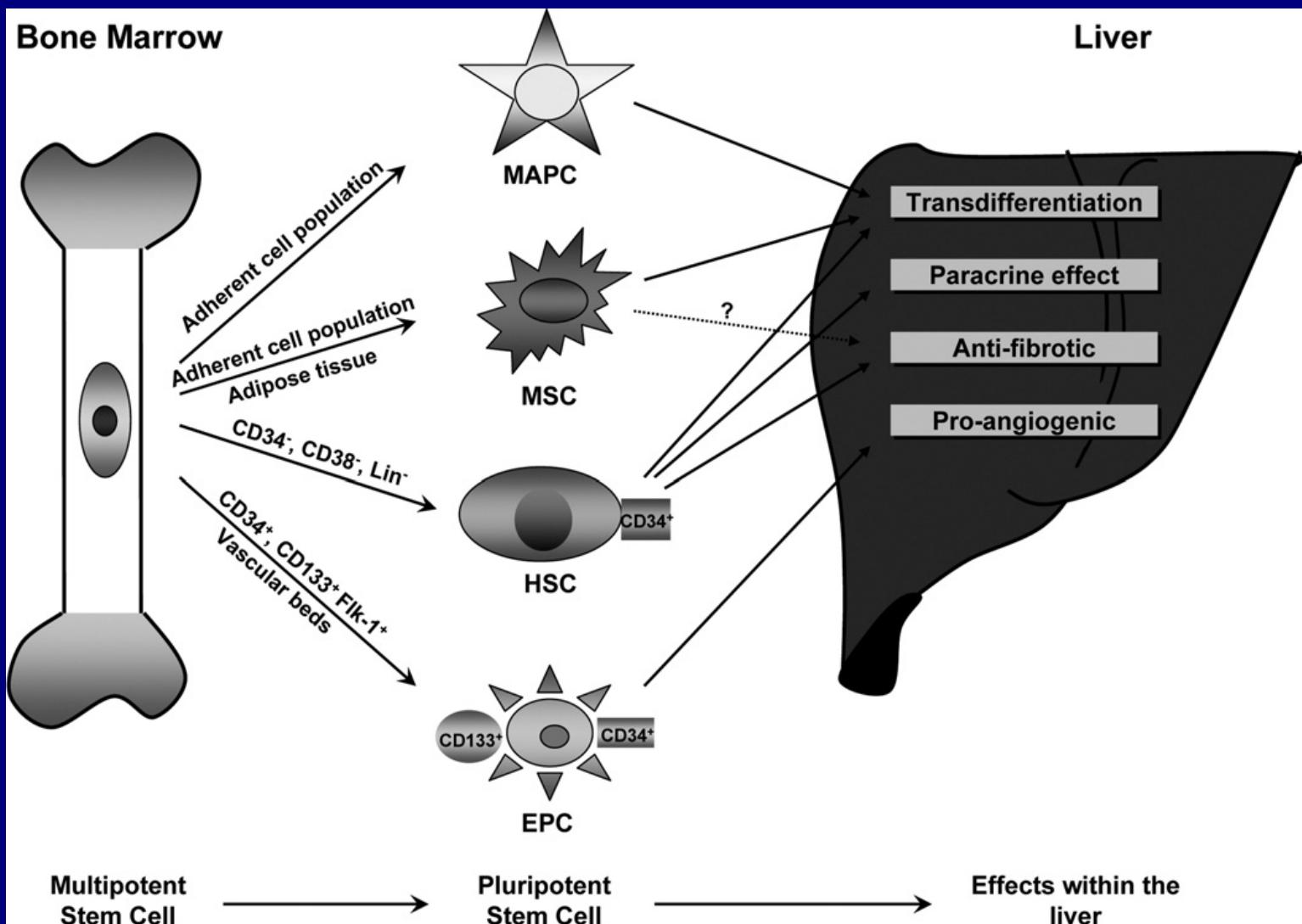
# 人工肝臟在急性肝衰竭的應用

1. 血液透析
2. 活性碳血液透析
3. 離子交換樹脂之血液透析
4. 血液吸附法
5. MARS肝臟支持系統
6. 體外循環肝臟透析
7. 交換循環
8. 生物性人工肝臟
9. 肝細胞移植

## Cell therapy : the use of living cells to restore, maintain or enhance tissue and organ function



# Bone marrow-derived stem cell subpopulations and their potential role in liver injury.



# 肝細胞移植的臨床經驗

肝細胞來源/疾病	案例	結果
<b>自體性的</b>		
慢性肝硬化	10	在 1~11 個月內仍可發現存活捐贈者細胞
家族性血膽固醇過高症	4	在第 18 個月 LDL 下降到 20%
<b>同種異體性的</b>		
慢性肝硬化	6	
飲酒 2, C 型肝炎 1	3	在第 2, 33 和 50 天時死亡
飲酒 3	3	肝性腦病變改善，存活大於 4 年
猛爆型肝衰竭	28	
( 腹腔內移植，胎兒肝細胞)	7	3 位病人復原，第三級和第四級肝性腦病變患者增加存活率
藥物 2, 未知 1	3	在兩週後 1 位病人自然復原，兩位死亡（在第 2 和 4 天）
藥物 5, B 型肝炎 3, 自發性 2, 全靜脈營養 1, 肝三葉切除術 1	12	1 位病人自然復原，6 位病人等候到肝臟移植（在第 1, 2, 2, 3, 5 和 10 天）5 位死亡（在第 2, 4, 5, 7, 35 天）
藥物毒性 3, 病毒型肝炎 2	5	肝性腦病變改善，3 位病人存活超過 3 天（第 12, 28 和 52 天）
懷孕的急性脂肪肝（胎兒肝細胞）	1	在 7 天內完全從第四級肝性腦病變中自然復原
Metabolic liver disease	12	
ornithine transcarbamylase (OTC)	1	臨牀上改善，在第 42 天死亡（肺炎）
	1	血清中 ammonia ↓ 可偵測到血清中 urea
	1	在第 11 天因為排斥而失去移植肝細胞，最後等候到肝臟移植
	1	血清中 ammonia 下降 40%，可偵測到血清中 urea，在第 2 個月因為排斥而失去移植肝細胞，最後等候到肝臟移植
Crigler-Najjar syndrome	1	在第 18 個月血清中膽紅素下降 50%，在 3 年內持續但移植肝細胞功能逐漸減少，最後等候到肝臟移植
	1	在第 5 個月血清中膽紅素下降 33%，最後等候到肝臟移植最後等候到肝臟移植
alpha-1-antitrypsin deficiency	2	在第 2 到 4 天等候至肝臟移植
inherited factor VII deficiency	2	Required exogenous factor VII 下降至 20%，在第 6 個月因為排斥而失去移植肝細胞，移植肝細胞
glycogen storage disease	1	低血糖有良好的改善，在 9 個月後血清中 triglyceride 下降 40%
infantile Refsum disease	1	在 18 個月後 pipecolic acid by 下降 40%

# Some Problems to Be Resolved in Organ Transplantation

1. Technical Problems
2. Immunological Barrier
3. The Ethical Issues
4. Moral and Social Problems
5. Economic Impacts

# 台灣器官移植之優劣勢

## 優勢

1. 國內各臨床移植團隊相當整齊，臨床成果水準不遜於國外先進國家之成績。
2. 各移植醫院積極進行各種臨床醫療及試驗。

## 劣勢

1. 移植醫院眾多，部分醫院無法累積足夠經驗。
2. 器官來源短缺，民眾未能建立器捐共識。
3. 移植之相關基礎研究不夠深化。
4. 目前仍缺少較早期之臨床試驗。
5. 移植病人醫療給付，在健保總額預算下，可能受到排擠。