APASL STC «Liver Cirrhosis: Common and Rare Complications
Almaty, November 1-2, 2024

Modern capabilities and experience of liver transplantation in Kazakhstan

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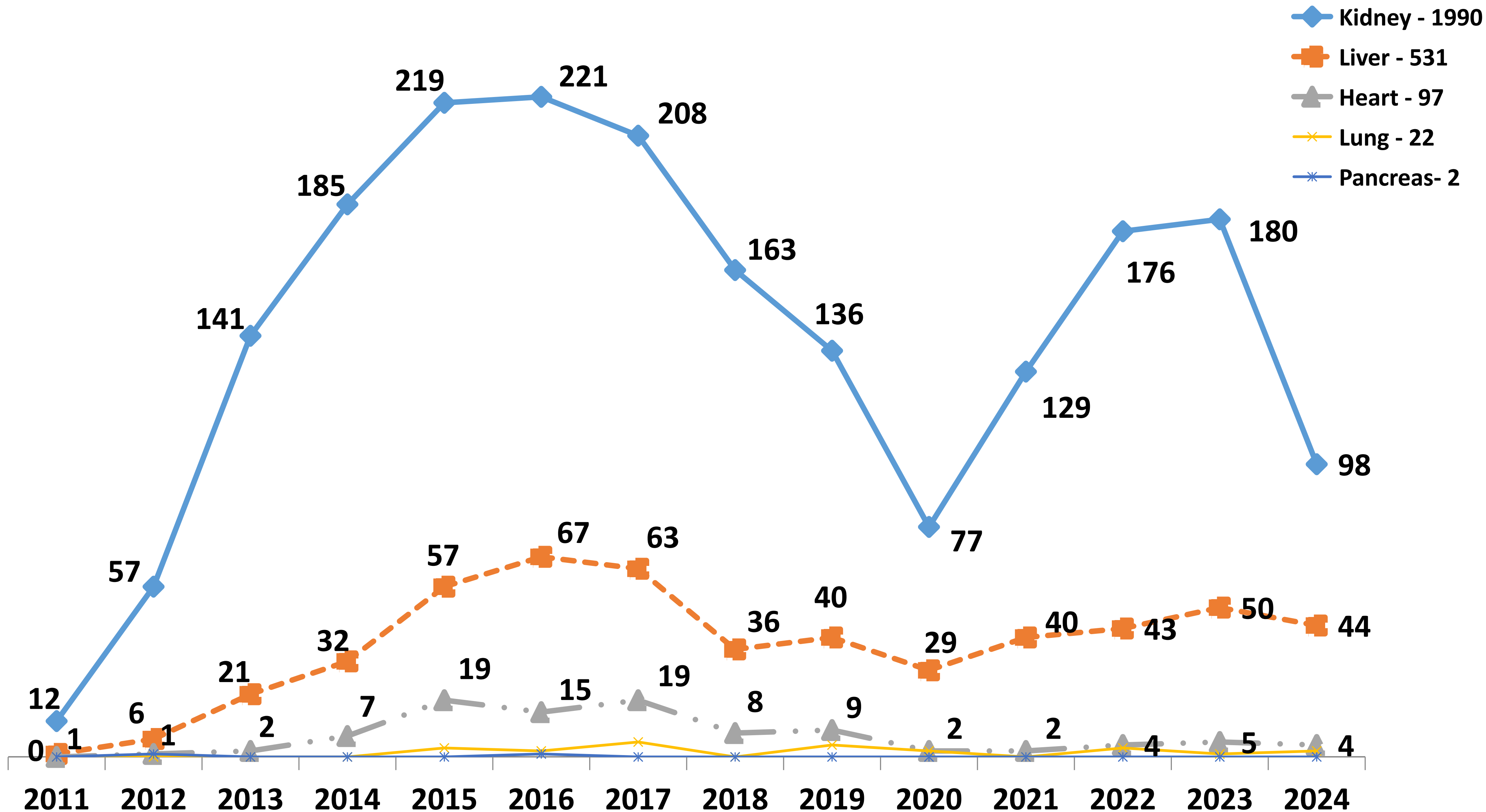
History

- **1979: First kidney transplantation from deceased donor**
- **1997: First liver transplantation from deceased donor**
- **2011: First liver transplantation from living donor**
- **2012: First cardiac transplantation**
- **2012: First heart-lung complex transplantation**
- **2012: First pancreas transplantation**
- **2013: First pediatric liver transplantation**
- **2016: First lung transplantation**
- **2019: First liver transplantation from two living donors - «dual graft»**

Transplantation in Kazakhstan

(с 2011 по 2024, n = 2642)



Development prospects

1. Current status of cadaveric donation

2. Improvement of normative and legal acts of the Republic of Kazakhstan

3. Living donor transplantation

Liver transplantation

DDLT

Country	pmp
USA	26,65
SPAIN	24,19
ITALY	24
BELGIUM	23,1
CROATIA	21,7
PORTUGAL	19,53
FRANCE	19,3
AUSTRIA	18,6
NORWAY	16,5
SWEDEN	16,3
CZECH REPUBLIC	16,26
SWITZERLAND	15,7
UNITED KINGDOM	13,28
CANADA	12,93
LITHUANIA	12,31
FINLAND	11,1
NEW ZEALAND	11
NETHERLANDS	10,8
AUSTRALIA	10,16
IRELAND	10
BELARUS	9,94
IRAN	9,7
ISRAEL	9,68
BRAZIL	9,1
POLAND	8,9
SLOVENIA	8,53
GERMANY	8,4
ARGENTINA	8,34
DENMARK	7,9
SLOVAK REPUBLIC	7,8
URUGUAY	7,15
HUNGARY	6,91
CHILE	6,9
ESTONIA	6,76
SOUTH KOREA	6,65
UAE	5,5
COSTA RICA	3,8
ROMANIA	3,75
CHINA	3,7
GREECE	3,4
COLOMBIA	3,3
SINGAPORE	2,71
HONG KONG	2,33
PANAMA	2,3
SAUDI ARABIA	2
QATAR	1,88
TURKEY	1,7
LATVIA	1,7
MEXICO	1,6
ECUADOR	1,5
THAILAND	1,5
MOLDOVA	1,15
SRI LANKA	1,13
MACEDONIA	1
PERU	1
BULGARIA	0,92
UKRAINE	0,92
JAPAN	0,7
MONGOLIA	0,6
MALAYSIA	0,49
INDIA	0,3
VIETNAM	0,11
KAZAHSTAN	0,1
DOMINICAN REPUBLIC	0,09
PHILIPPINES	0,01

IRODaT

DATABASE

38.710 DONATION
116 COUNTRIES REPORTED
SINCE 1996

WORLDWIDE LIVER TRANSPLANT FROM DECEASED DONORS 2022

63-rd place

0.1 per 1 million population

WORLDWIDE LIVER TRANSPLANT FROM DECEASED DONORS 2022 (pmp)

LDLT

WHO Collaborating Centre on Donation and Transplantation · World Health Organization · ONT Organización Nacional de Trasplantes · GODT Global Observatory on Donation and Transplantation

Country
Mongolia(n=73)
Rep of Korea(n=1086)
Türkiye (n=1462)
Saudi Arabia(n=374)
Georgia(n=11)
Singapore(n=16)
Japan(n=336)
Belgium(n=28)
Canada(n=91)
India(n=3174)
Kazakhstan(n=41)
Oman(n=10)
USA(n=597)
Pakistan(n=401)
Netherlands(n=26)
Colombia(n=75)
Argentina(n=59)
Chile(n=23)
Rep of Moldova(n=4)
Qatar(n=3)
Jamaica(n=3)
Azerbaijan(n=10)
Iran (n=83)
Israel(n=7)
Czech Republic(n=8)
Poland(n=28)
Armenia(n=2)
Thailand(n=42)
Switzerland(n=5)
Italy(n=32)
China(n=749)
Germany(n=41)
Belarus(n=4)
UK(n=27)
Costa Rica(n=2)
France(n=25)
Brazil(n=61)
Austria(n=2)
Romania(n=4)
UAE(n=2)
Norway(n=1)
Mexico(n=20)
Peru(n=5)
Spain(n=5)
Cuba(n=1)
Bolivia (n=1)
Tunisia(n=1)

0.0 5.0 10.0 15.0 20.0

LD Liver Transplants pmp

11-th place

2.1 per 1 million population

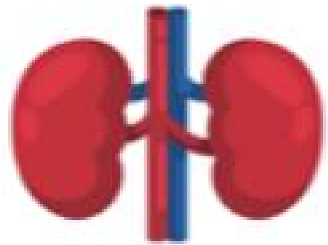
Liver transplants activities from living donors (pmp)
2022

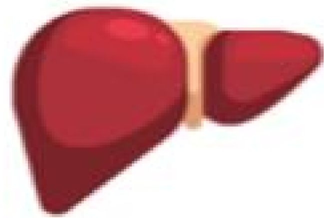
9 061 living liver transplants

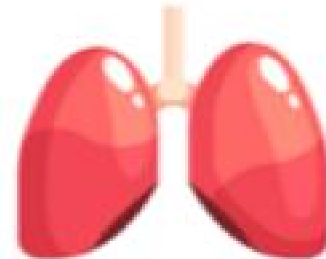
Living Liver transplants performed in 47/91 countries

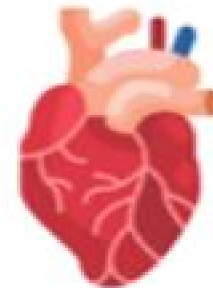
Waiting list of patients for organ transplantation in Republic of Kazakhstan

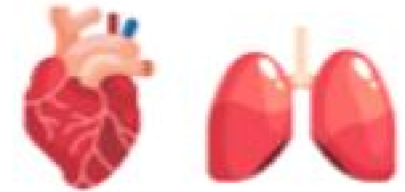
as of August, 2024 - 4,100 patients











Kidney	Liver	Lung	Heart	Heart + Lung
Adolescent 3661	Adolescent 197	Adolescent 18	Adolescent 136	Adolescent 2
Children 85	Children 10	Children 0	Children 5	Children 3

Incorrect statistics

transplant.kz

Lack of statistics of patients with liver cirrhosis in the Republic of Kazakhstan

<table>
<tr><th colspan="4">On dispansery record with hepatitis C,B & D, n=53 789</th></tr>
<tr><td colspan="2">F0-3
46456</td><td colspan="2">F4
7333</td></tr>
<tr><td colspan="2">Viral Hepatitis «B+D»</td><td colspan="2">Viral hepatits «C»</td></tr>
<tr><td>22566
F0-3</td><td>2258
F4</td><td>31223
F0-3</td><td>5075
F4</td></tr>
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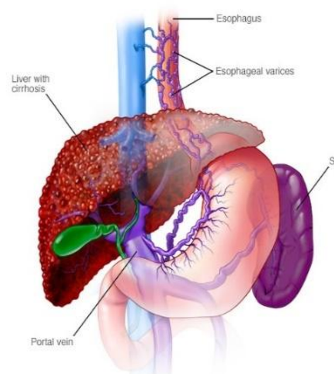
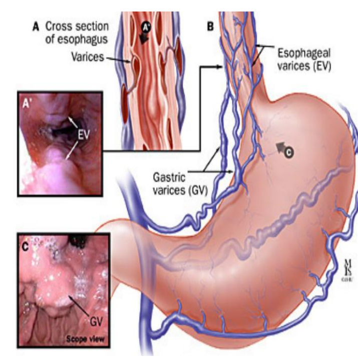
Data from JSC "Research institute of cardiology and internal diseases" 2020



Patients who found themselves in surgical hospitals of the Republic of Kazakhstan for the period 2017-2022 with LC and bleeding from esophageal and gastric varices. With primary bleeding, the mortality rate is 30%, with repeated bleeding it is 70%. The number of patients on the waiting list has not changed in the last 5-6 years. But during this time, 2,348 patients died. The data of waiting list are considered formal.



11431 patients have been hospitalized in 6 years, The fatal outcome was 2,348 (20.5%) cases

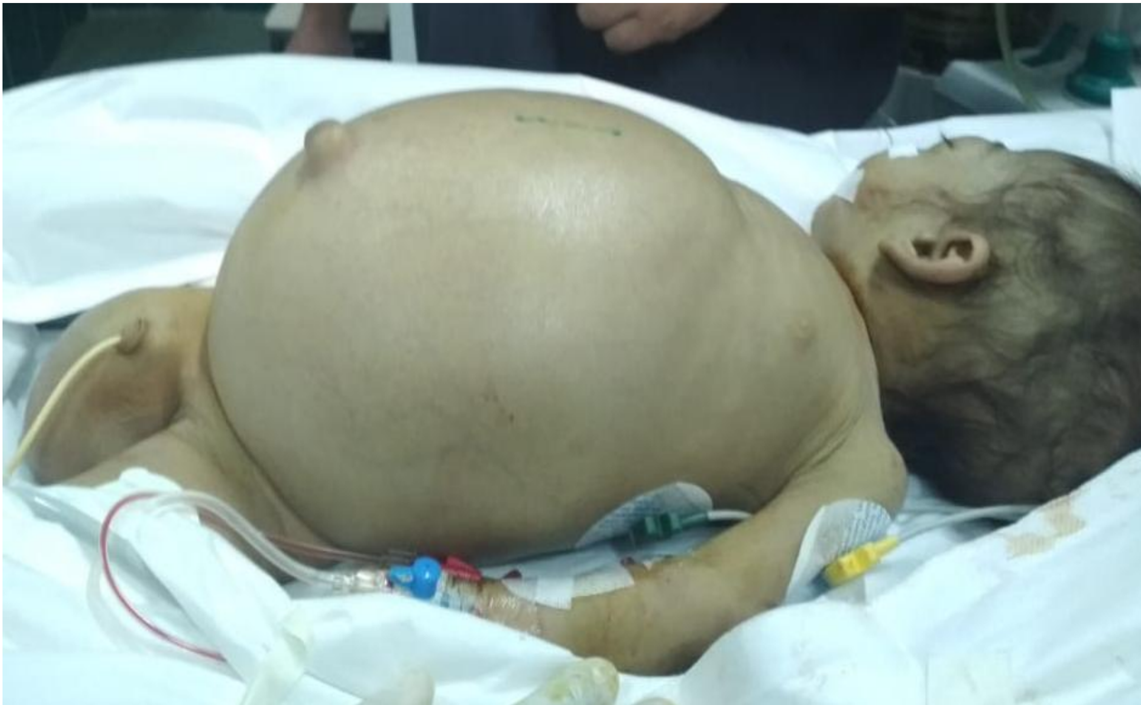
Cirrhosis of the liver is mainly diagnosed after hospitalization in a surgical hospital

The main problems with PDLT

- **In the Republic of Kazakhstan, there is no banal screening (early diagnosis) for the detection of biliary atresia (acholia/hypocholia of the stool, blood biochemistry, ultrasound OBP and MRCPe) (1,2,3). There are no statistics.**

- **At the time of applying to transplant centers:**

- **82% of children with biliary atresia already have cirrhosis of the liver**
- **in extremely serious condition (total bilirubin is above 300 mmol/ l and the patient cannot perform Kasai surgery) and with low weight (5-6 kg)**

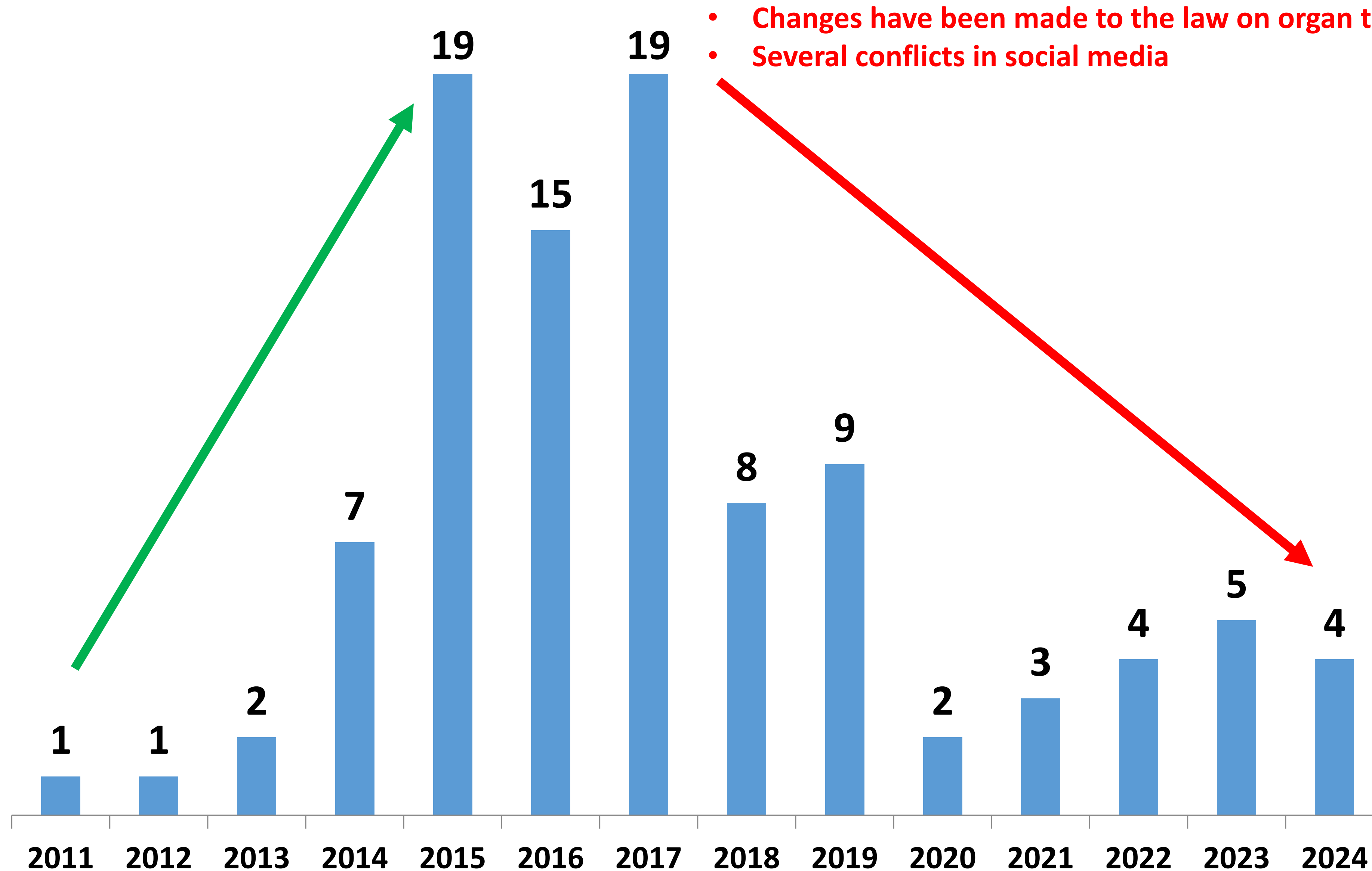


1. El-Guindi M.A., El-Said H.H., Hussein M.H., Nassar Rel-S., Sira A.M. Urinary urobilinogen in biliary atresia: A missed, simple and cheap diagnostic test. Hepatol. Res. 2016; 46 (2): 174–82.
2. Gu Y.H., Yokoyama K., Mizuta K. et al. Stool color card screening for early detection of biliary atresia and long-term native liver survival: a 19-year cohort study in Japan. J. Pediatr. 2015; 166 (4): 897–902.
3. Mogul D., Zhou M., Intihar P., Schwarz K., Frick K. Cost-effective analysis of screening for biliary atresia with the stool color card. Journal of pediatric gastroenterology and nutrition. 2015; 60 (1): 91–8.

Deceased donation in Kazakhstan 2011-2024

(n = 99)

- Changes have been made to the law on organ transplantation
- Several conflicts in social media



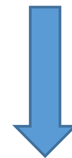
Liver transplantation from a deceased donor

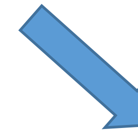
The Law on Transplantology: Codecs of the Republic of Kazakhstan dated July 7, 2020 No. 360-VI LRK "On the health of the people and the healthcare system» Chapter 24. DONATION AND TRANSPLANTATION

We have a presumption of consent, but notification and consent of relatives are required

Problematic issues

Shortage of donor organs





Refusal of relatives

Poor donor detection

Presumption of consent with mandatory notification relatives

Currently, up to 90% are being performed in our country liver transplantation from a living donor

Development prospects

1. Current status of cadaveric donation

2. Improvement of normative and legal acts of the Republic of Kazakhstan

3. Living donor transplantation

Normative and legal acts of the Republic of Kazakhstan

The Codecs of the Republic of Kazakhstan "On the health of the people and the healthcare system"

Chapter 27. Transplantation of tissues (parts of tissue) and (or) organs (parts of organs)

Article 169. Transplantation of tissues (parts of tissue) and (or) organs (parts of organs) and conditions for their removal

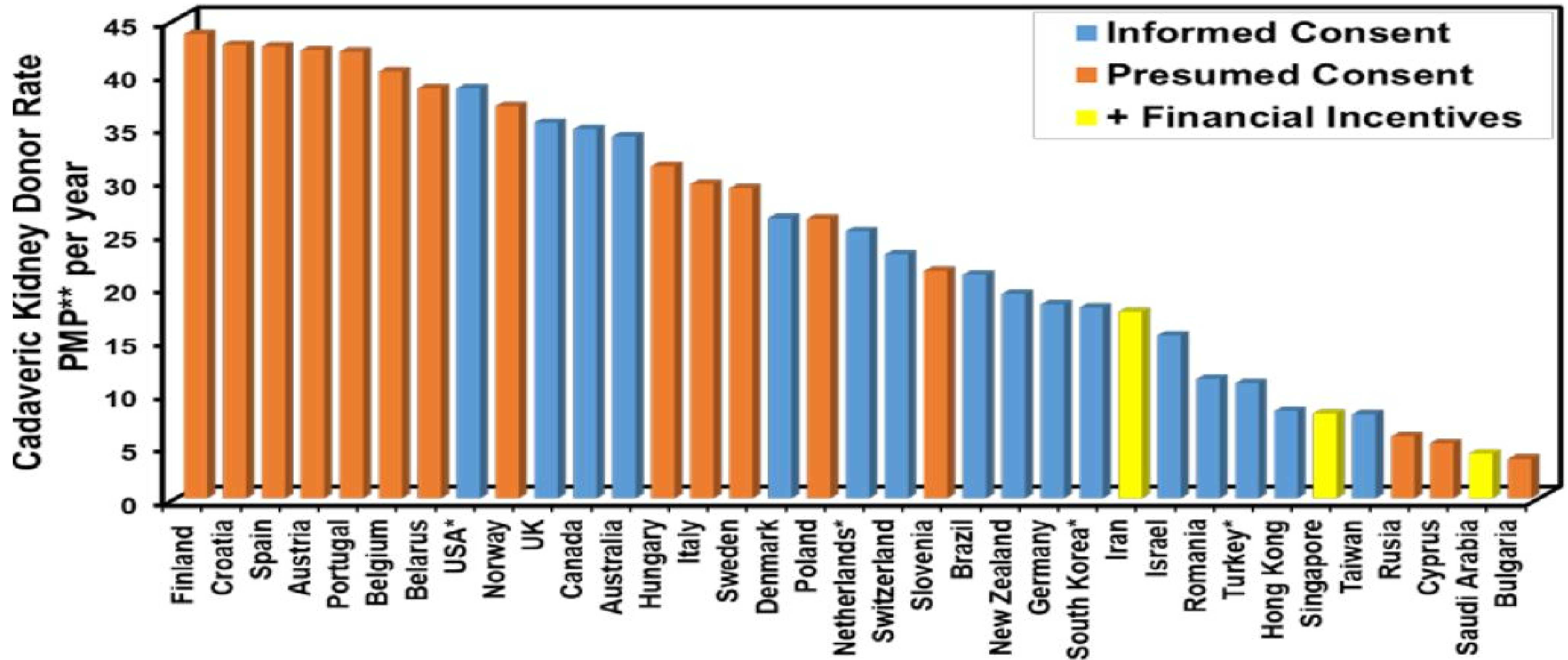
Article 170. Procedure for transplantation of tissues (parts of tissue) and (or) organs (parts of organs)

Article 171. The rights of the donor and recipient

OPT IN system

OPT OUT system

WHAT TYPE OF CONSENT IS USED IN THE WORLD



In Saudi Arabia, the rate of kidney transplantations from deceased donor is 35% of the total number of kidney transplantations. For example, in USA this indicator is 63.1%, in Europe – 69.5%, in the Middle East – 30.2%, in South Asia – 19.4%, in Africa – 6.2%, respectively

Agreement for donation

Presumed Consent (opt-out)

Austria, France Columbia, Norway, Italy, Singapore, Belgium, Canada, England

Refusal for donation is up to 5%

Presumption of disagreement (opt-in)

USA, Brazil, Israel

Donation refusal up to 25%

Japan, South Korea, India, Saudi Arabia

Donation refusal up to 60-65%

An Example

Austria, Great Britain → **opt-in** → **opt-out** → **Deceased donation increased 8 times**

Development prospects

1. Current status of cadaveric donation

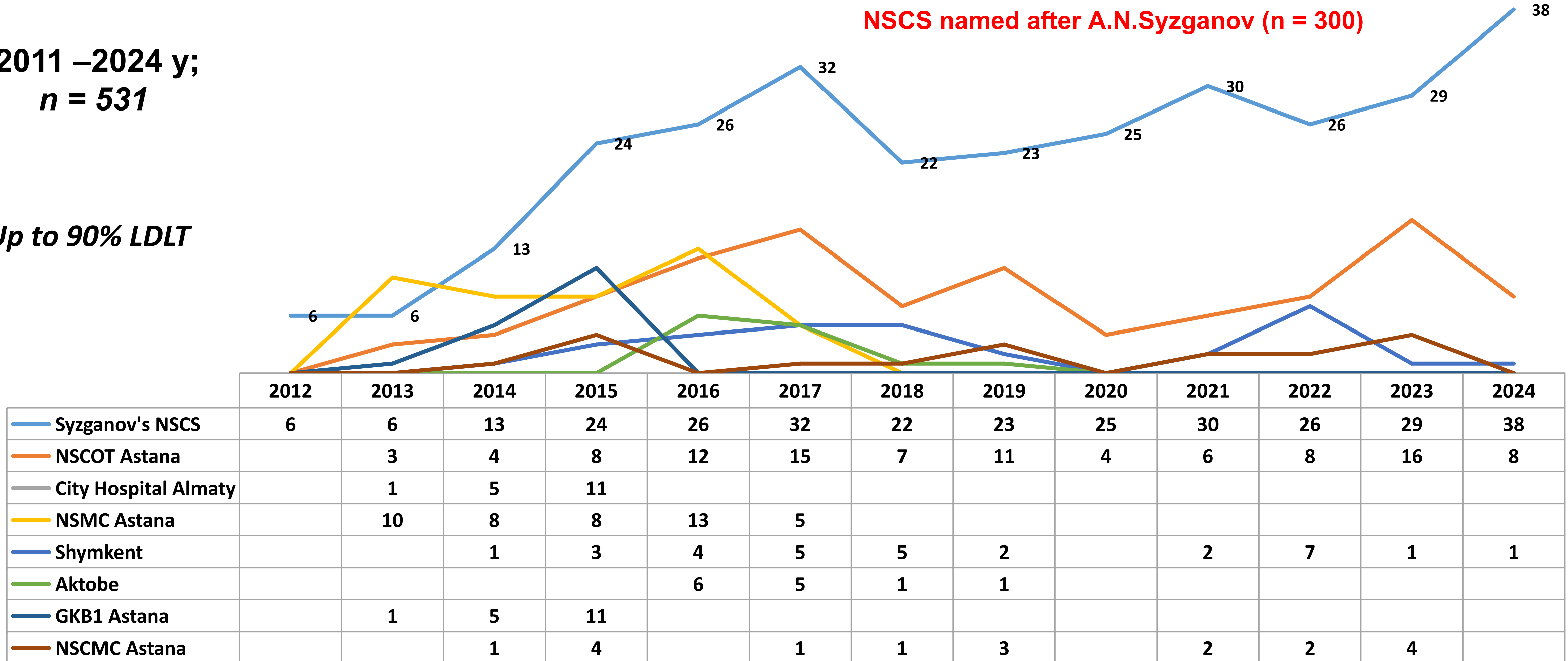
2. Improvement of normative and legal acts of the Republic of Kazakhstan

3. Living donor transplantation

Potential of liver transplantation in Kazakhstan

2011 –2024 y;
***n* = 531**

Up to 90% LDLT



		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
	Syzganov's NSCS	6	6	13	24	26	32	22	23	25	30	26	29	38
	NSCOT Astana		3	4	8	12	15	7	11	4	6	8	16	8
Stopped	City Hospital Almaty		1	5	11									
Stopped	NSMC Astana		10	8	8	13	5							
	Shymkent			1	3	4	5	5	2		2	7	1	1
Stopped	Aktobe					6	5	1	1					
Stopped	GKB1 Astana		1	5	11									
	NSCMC Astana			1	4		1	1	3		2	2	4	

Syzganov's NSCS — NSCOT Astana — City Hospital Almaty — NSMC Astana — Shymkent — Aktobe — GKB1 Astana — NSCMC Astana

Of 8 centers where liver transplantation was performed before today only 4 centers are functioning

Expanding the donor pool

Medical

1. ABO incompatible
2. GRWR 0,6 – 0,8
3. RAPID technique LDLT
4. DUAL Graft

Xeno-organ donors?
(Future)

Non-Medical

1. Unrelated donors
2. Altruistic donors
3. Underage donors (juvenile)

Donor selection

Donor Selection

- Age
- BMI
- Steatosis
- Adequate graft volume

Safe donor selection criteria

- ≤35 years and no fatty change 30% remnant liver volume (RLV): Acceptable
- ≤35 years and ≤15% fatty change 30–35% RLV: Acceptable
- ≤35 years and ≤30% fatty change ≥35% RLV: Acceptable
- 35–55 years and ≤15% fatty change >35% RLV: Acceptable

Adequate graft volume

- GRWR >1%
- GRWR >0.8% + Young Donor (<35 years)
- GRWR >0.7% + Young Donor + low MELD (<20)
- No/minimal steatosis

S.G. Lee et al. American Journal of Transplantation, 2015; 15:17

Selection of living donors (2020-2023), n=286

	Stage I	Stage II	Stage III
Type of survey	Laboratory and instrumental studies	Computed tomography with volumetry and MRCP	Liver biopsy
Contraindicated for donation	11.8% (n=34)	33.2% (n=95)	5.5% (n=16)

50.5% (n=145) were rejected to donate

Complications after LDLT

Complications in living liver donors

Transient liver failure:

The "50-50 criteria" proposed by Silvio Balzan (2005) reflects hepatocellular failure if, on the 5th day after surgery, the prothrombin time index (PTI) is below 50 and the total bilirubin level is above 50 µmol/L.

Ann Surg 2005 Dec; 242(6): 824–829

Biliary complications

Bile leakage, biloma, stricture.

Other complications:

- Thrombosis of PV.
- Infections
- Hernia
- Hemorrhages

Turk J Surg. 2020 Jun; 36(2): 192–201. Published online 2020 Jun 8

Complications in recipients

Vascular complications:

- Thrombosis, stenosis, pseudoaneurysm of the hepatic artery.
- Thrombosis and stenosis of the PV.
- Thrombosis of the IVC, stenosis, and thrombosis of the hepatic veins.

Biliary complications

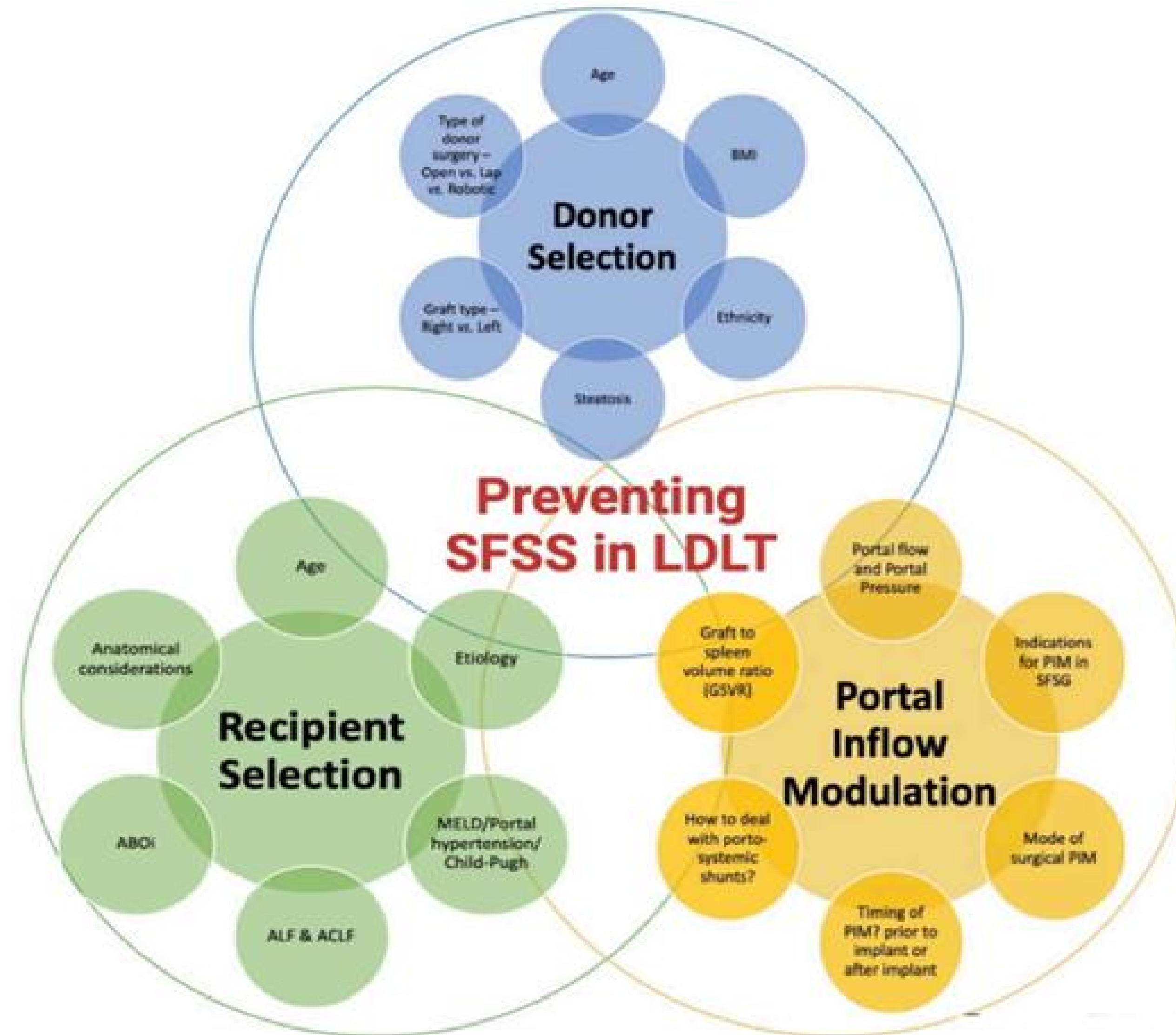
- Bile leakage, biloma, stricture, calculi, and stenosis of the sphincter of Oddi.

Other complications:

- Primary dysfunction.
- SFSS
- Acute and chronic rejection.
- Non-compliance with requirements.
- Infections
- Recurrence of disease (hepatitis C, hepatitis B, autoimmune hepatitis, primary sclerosing cholangitis, HCC).

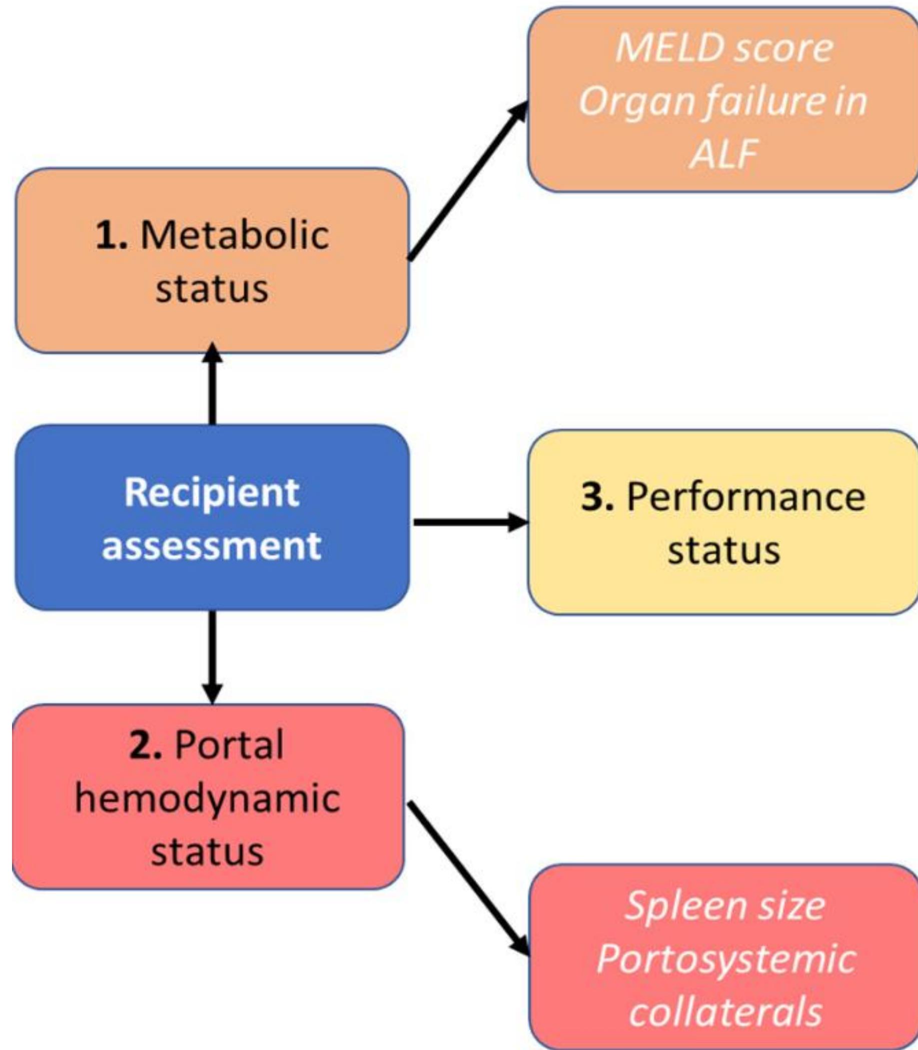
B.Bozkurt et al. Chirurgia, 112 (3), 2017

Factors to be considered for preventing SFSS in LDLT



Hakeem, A. R., et al. Preventing Small-for-size Syndrome in Living Donor Liver Transplantation: Guidelines From the ILTS-iLDLT-LTSI Consensus Conference. Transpl 2023

Preoperative Recipient Evaluation



Recipient evaluation in chronic liver disease traditionally involves an assessment of the model for end stage liver disease (MELD) score

Important preoperative parameters
- Spleen size
- extent, distribution of portosystemic collaterals
- status of the portal vein (diameter, presence of any thrombosis)

Can predict intraoperative portal hemodynamics

Kishore GS Bharathy et al. Transplantology 2023

Outflow Reconstruction

RHV MHV LHV V8 V5 RPV PPV LPV S1

Right posterior (RHV, PPV)

Monosegment (LHV, S2, LPV)

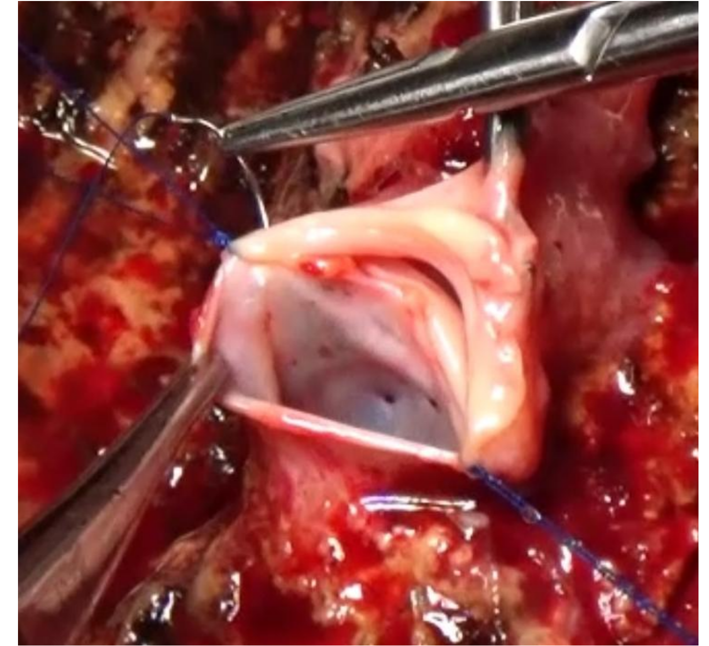
Left lateral (LHV, LPV)

Right (RHV, V8, V5, RPV)

Extended right (RHV, MHV, RPV)

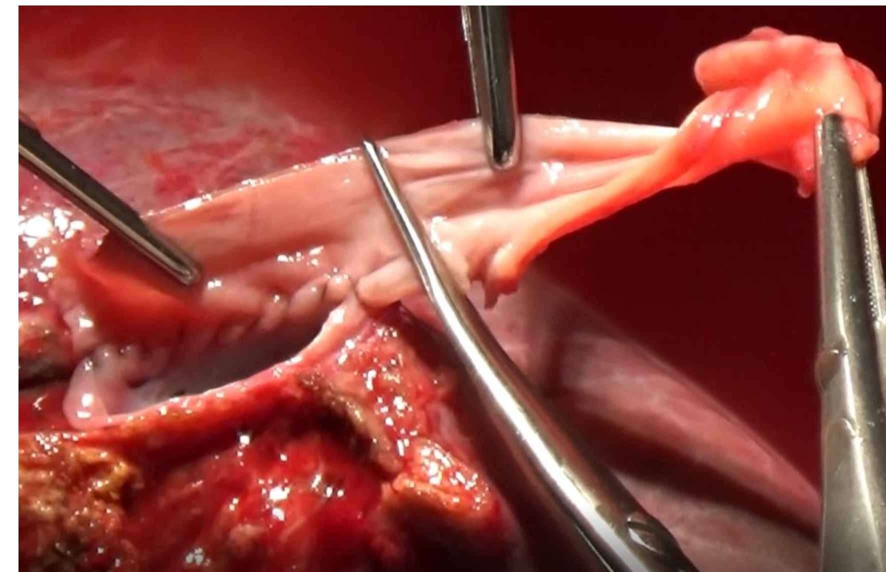
Left (MHV+LHV, LPV)

Left with left-side S1 (MHV+LHV, LPV, S1)

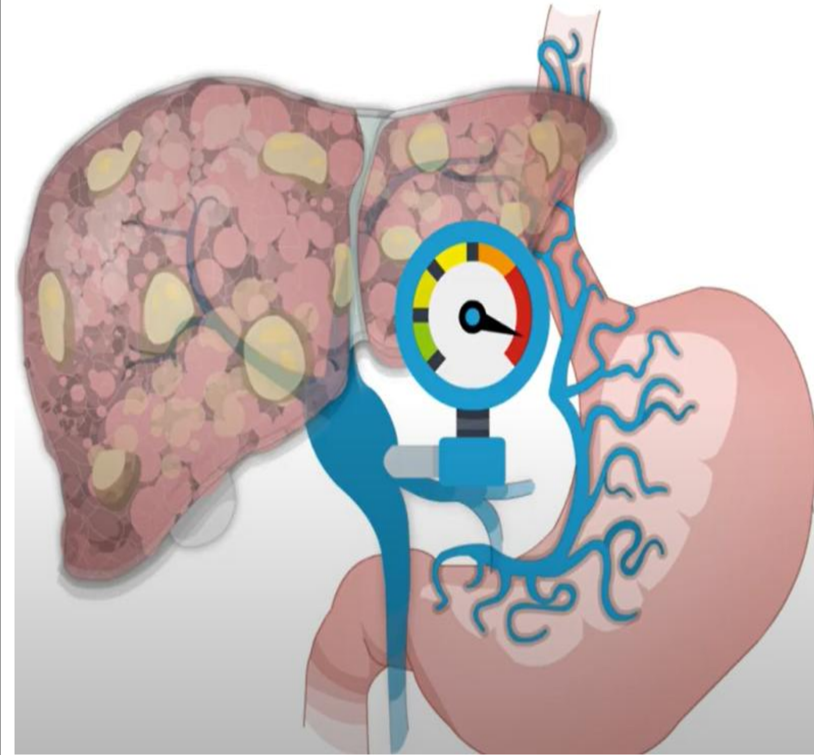


Definition, pros and cons of graft types.

Graft Type	Definition	Advantages	Disadvantages
right liver graft (RLG)	right liver without MHV	larger than LLG	congestion unless reconstruction of V5 and V8 complicated anastomosis of the BD
extended right liver graft (ERLG)	right liver with MHV	no congestion	more burden for donors
left liver graft (LLG)	left liver with MHV	less burden for donors	possible twisting of the graft can easily cause outflow block
left liver graft with S1 (LLG with S1)	left liver with MHV + left-side caudate lobe	slightly larger than LLG	complicated reconstruction of bile duct, inflow and outflow of S1



Shintaro Yagi International journal of surgery 2020



Assessment of blood flow through the PV

Portal pressure measurement after reperfusion

	Hypoperfusion	Hyperperfusion
Portometry	< 10 mmHg.	> 15 mmHg.
Ultrasound Dopplerography (portal blood flow volume depending on the graft)	< 90 ml/min/100g.	> 250 ml/min/100g.
Density of liver parenchyma	Soft	Hard

Graft Inflow Modulation
Early vs. Late

Early - During liver transplantation

- Usually performed to lower portal vein pressure (PVP) and/or portal vein flow (PVF) to the graft, increasing hepatic artery flow (HAF) → the result of deliberate protocols

Late - Within the first two postoperative weeks

- Intended as a rescue procedure in case of hyperbilirubinemia, to reduce massive ascites, and to improve the HAF or portal hyper-perfusion altering the hepatic artery buffer ratio-HABR→ splenic artery embolization but also other surgical GIM techniques

Troisi et al. Transplantation Reviews, 2017

Type of GIM

Pharmacological:

- **Somatostatin**

Surgical:

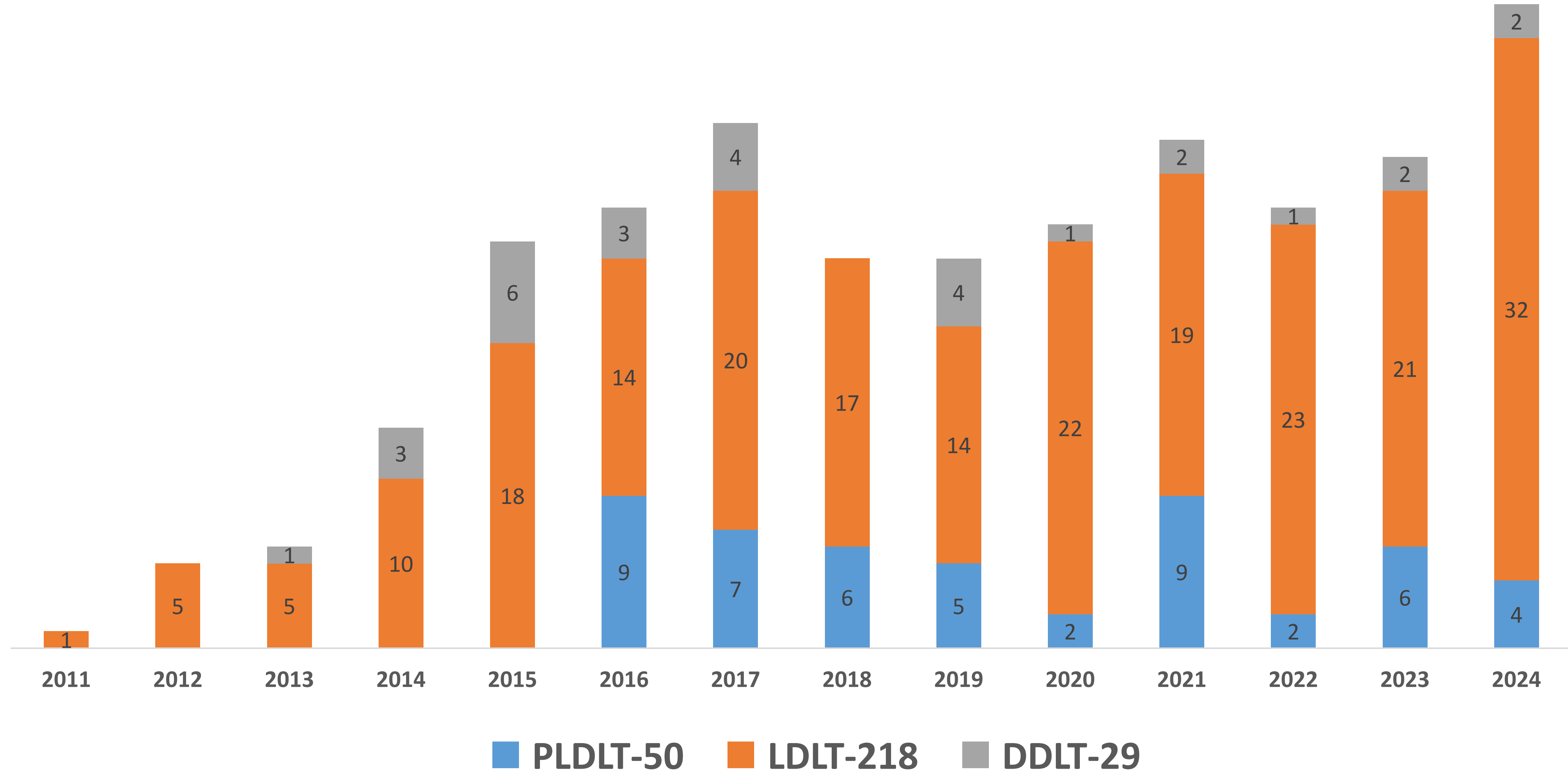
- **Splenic artery Ligation/Embolization (SAL, SAE)**
- **Splenectomy**
- **Splenic Devascularization**
- **Shunts: Existing shunts vs. Surgical shunts**

-Hemi-portocaval shunt (HPCS), Meso-caval shunt, Spleno-renal shunt, Porto-caval shunt

Troisi et al. Transplantation Reviews, 2017

Liver transplantation in the NSCS

12/2011 – 08/2024 (n=300)

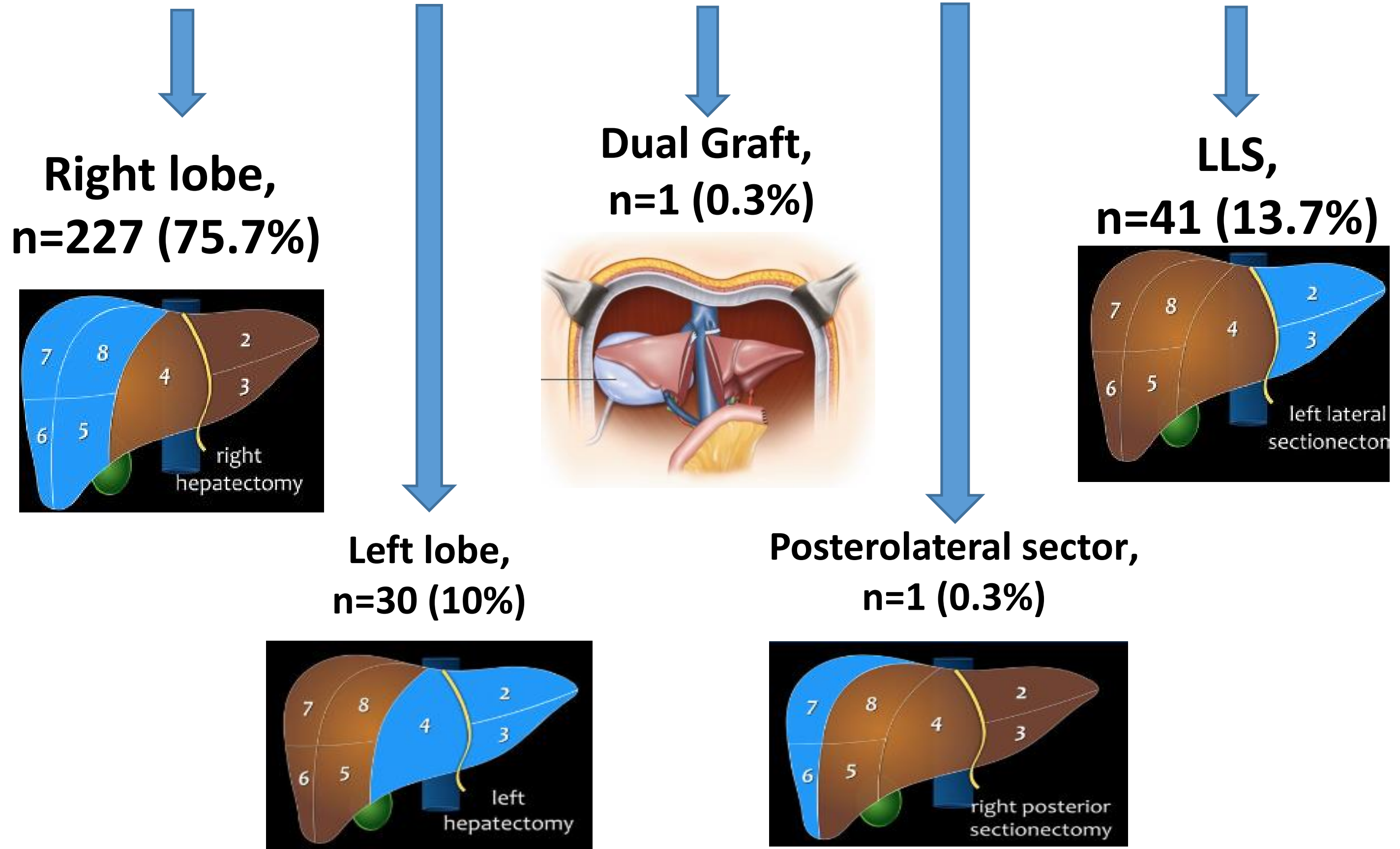


2011-09.2024yy

Syzganov's NSCS *(n=300)*

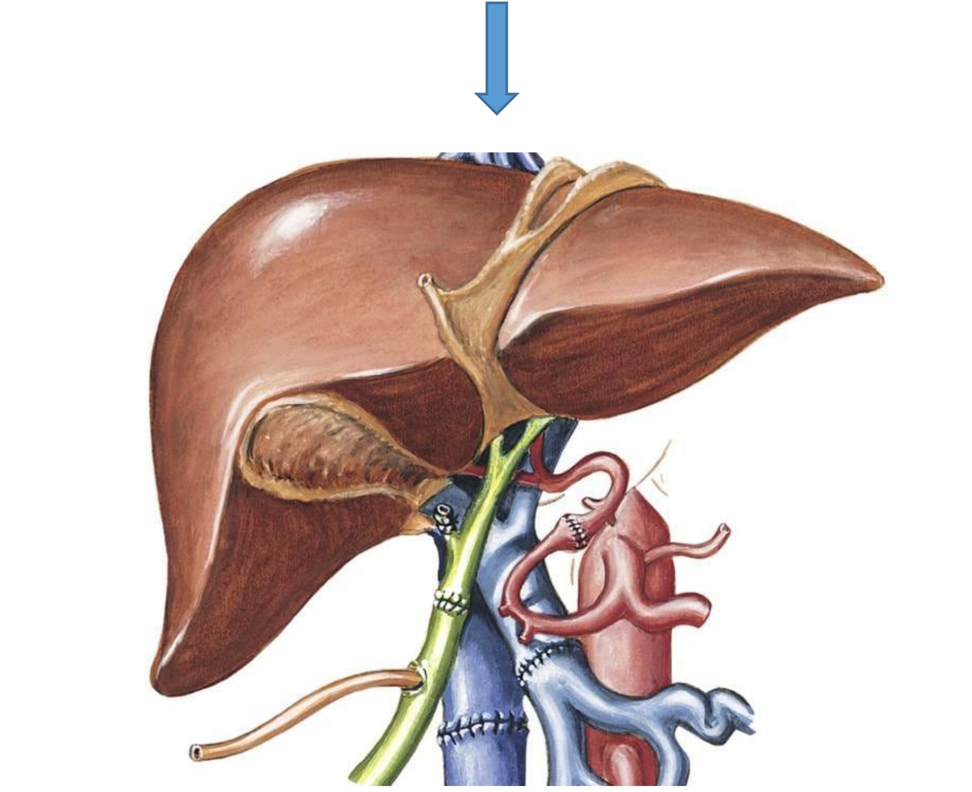
90.3%

LDLT n=271



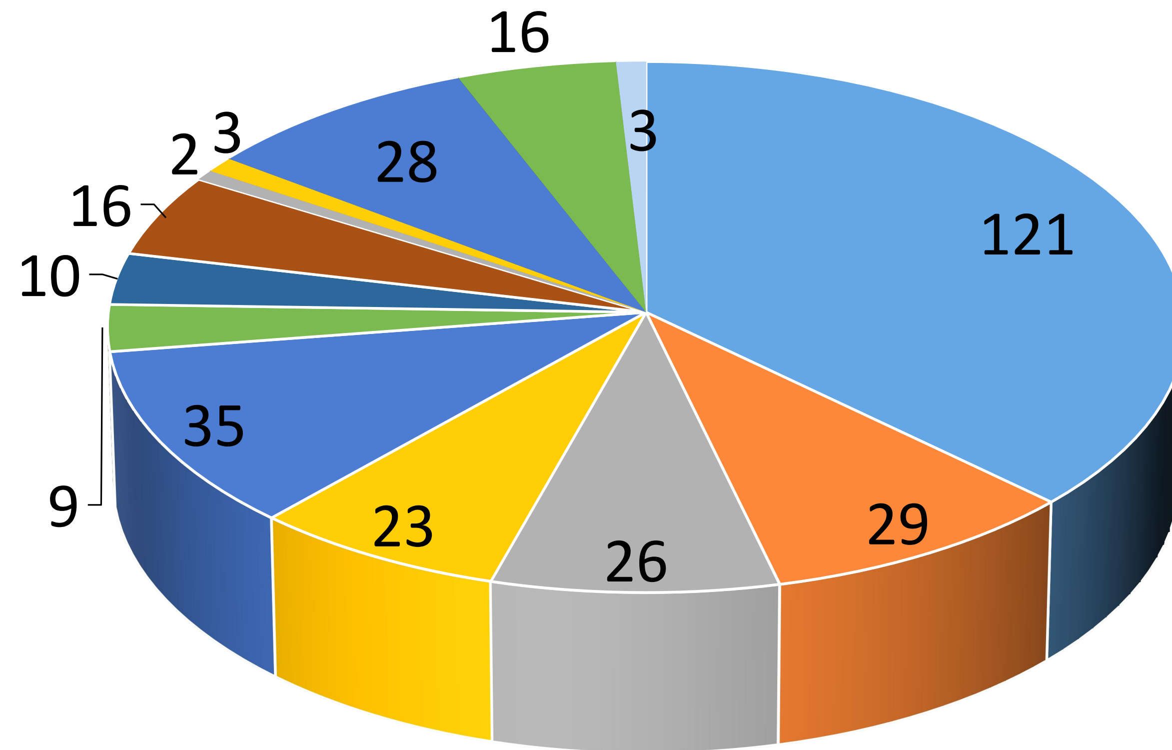
9.7%

DDLT n=29



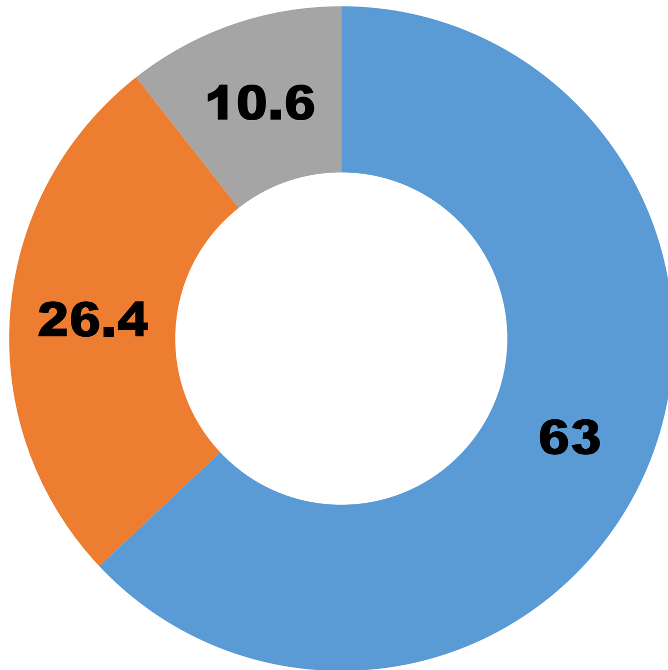
Indications for liver transplantation

Syzganov’s NSCS 12/2011 – 08/2024 (n=300)



HBV+HDV HBV HCV HCC PBC PCH Crip LC AIH BCS ATC BA CMV Hepatonlastoma

Characteristic of living donors



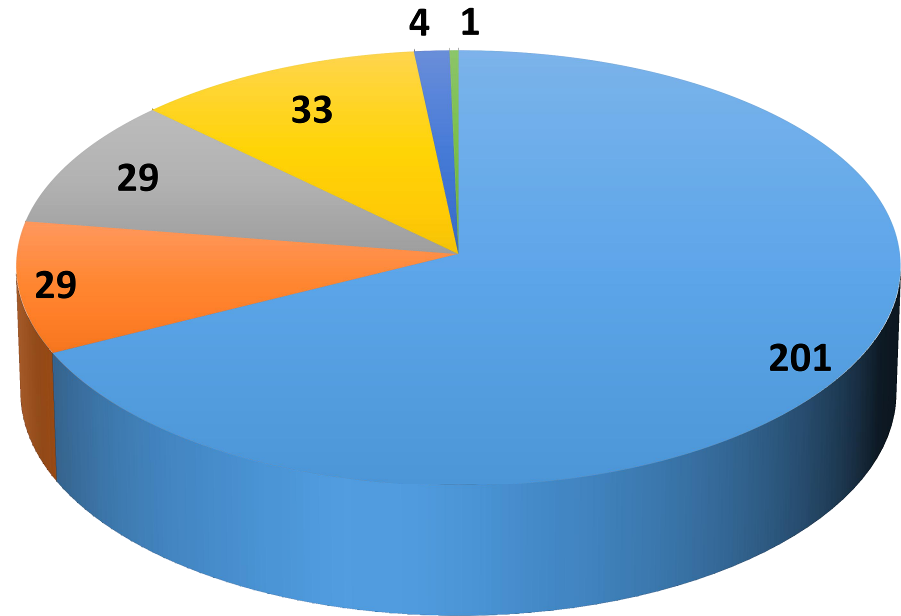
Type of relation of LDLT (%)

brother	son	sister	daughter	nephew	mother	father	wife
28.6	24.9	18	16.4	6.8	2.1	1.6	1.6

Liver Transplantation in NSCS

12/2011 – 09/2024 (n = 300)

Transplanted liver graft



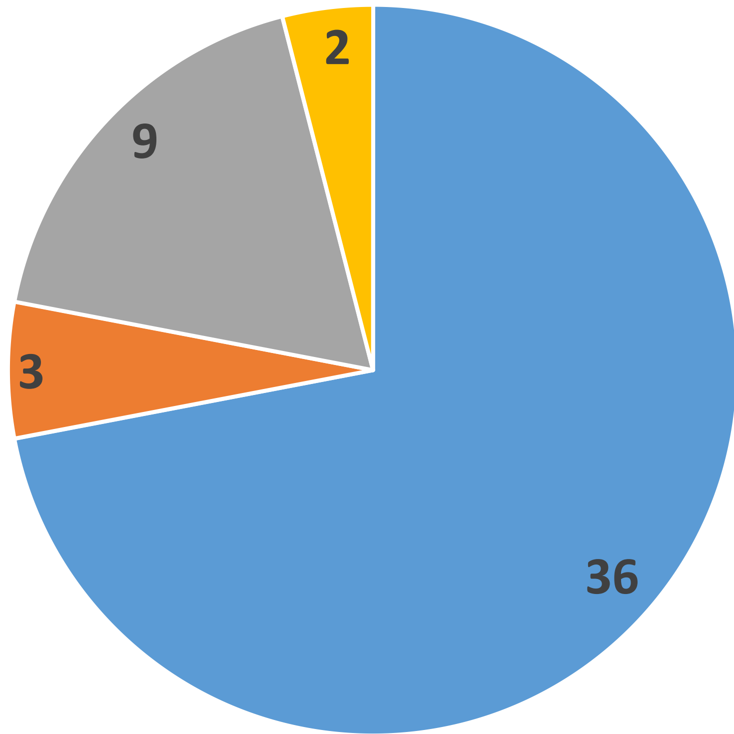
Re LDLT – 3 (1,01%)
Re DDLT – 2 (0,67%)

Graft type in ALDLT

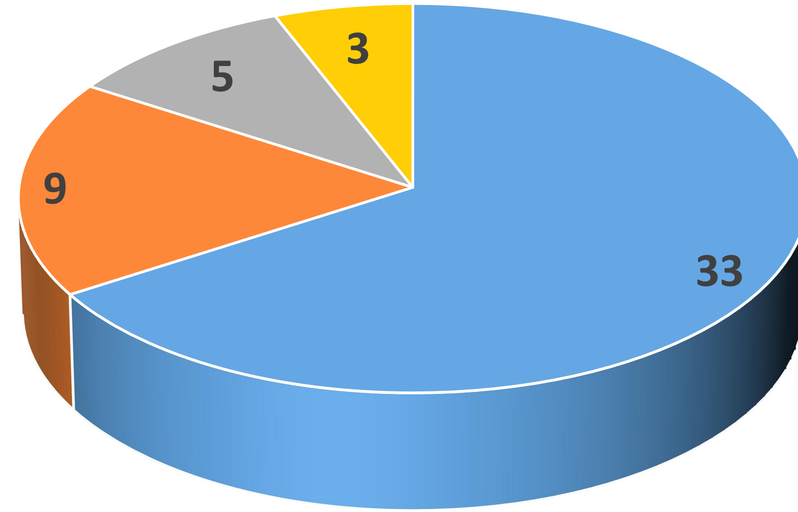
	2011 - 2015	2016 - 2022
Right lobe	32	161
Ex Left lobe	6	16

PLDLT
03/2016 – 09/2024
(n=50)

Indications for liver transplantation



Graft lobe



Own innovations in liver transplantation from a living donor

- **The method developed by us for the reconstruction of hepatic veins V,VIII- Sg and portal vein using modified great saphenous vein**

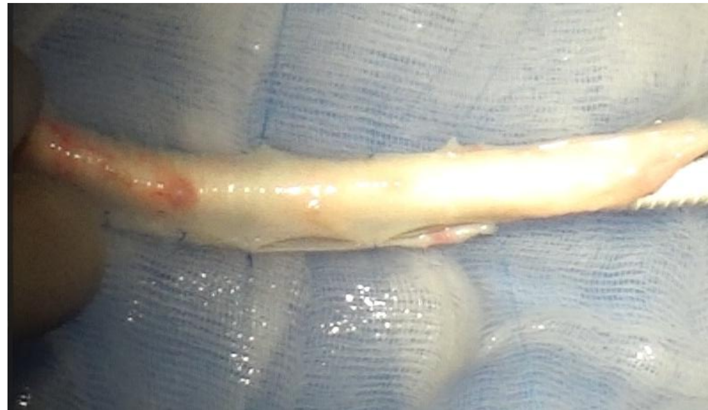
- **Complex arterial anastomoses (Multiple graft arteries, Arterial dissection, arterial diameter < 2 mm)**

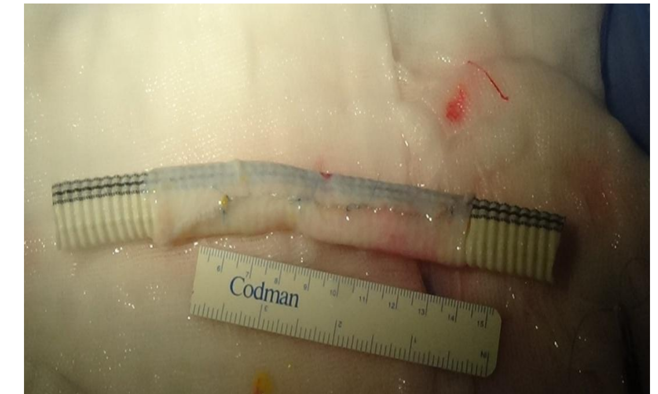
- **Extraanatomic arterial reconstruction (jump graft)**

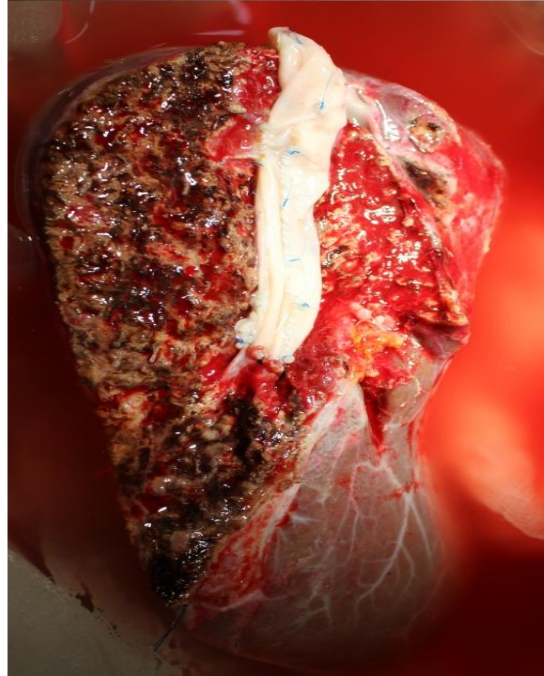
- **Magnetic compression anastomosis in strictures of biliary anastomoses**

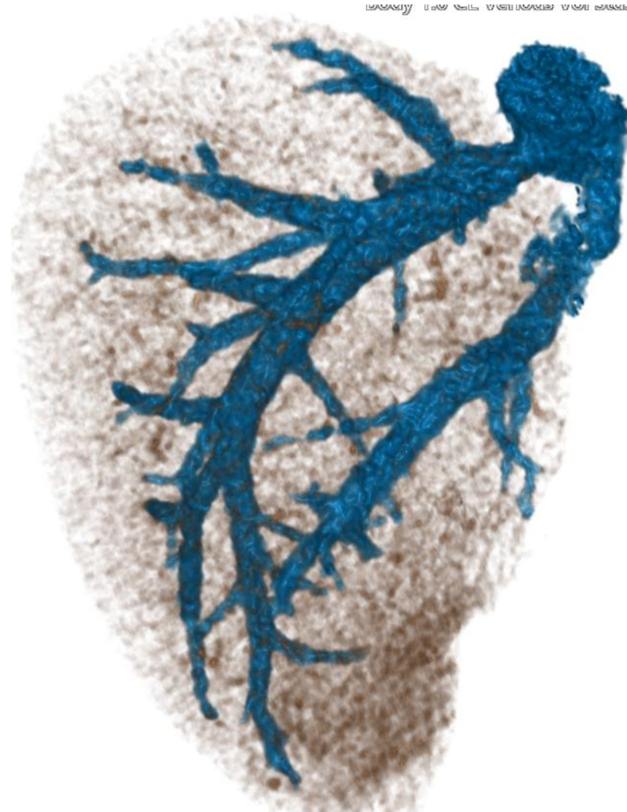
The method we developed for the reconstruction of the portal vein and hepatic veins V,VIII- Sg using the great saphenous vein

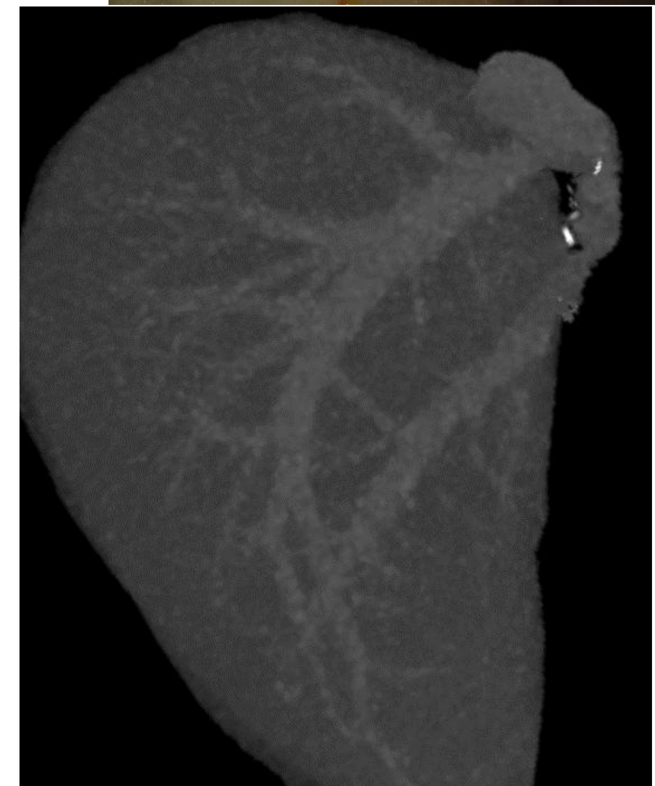
Used since 2022.



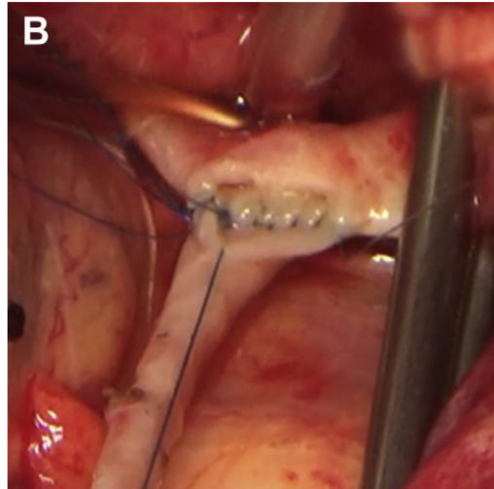


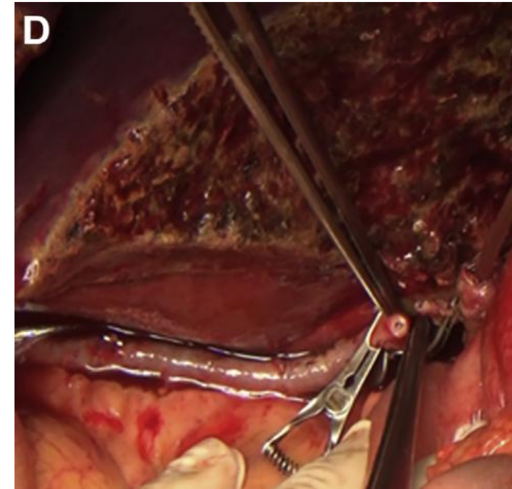


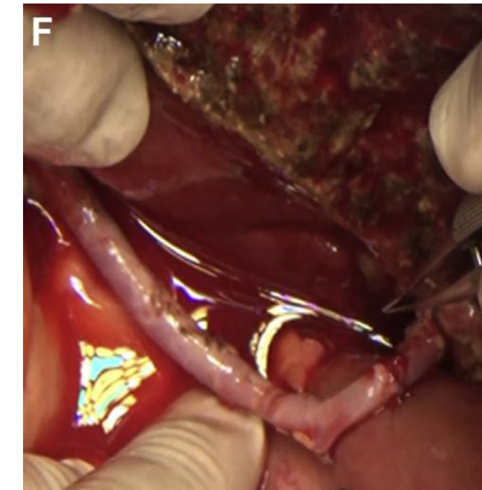


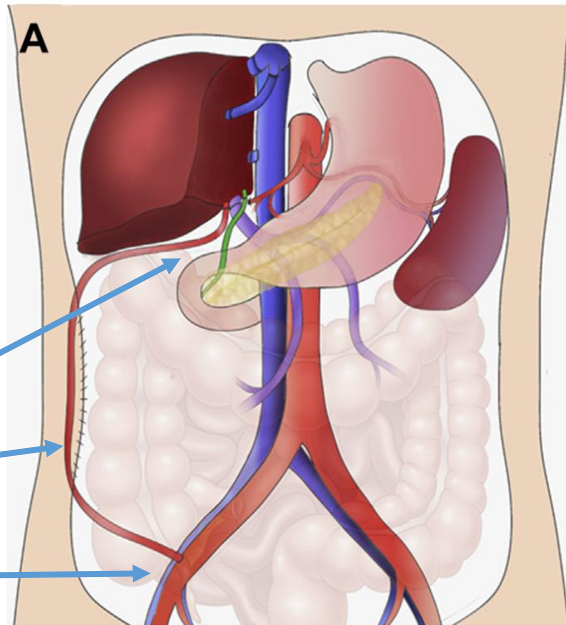


A case of dissection of the intima of an artery that reached the celiac trunk









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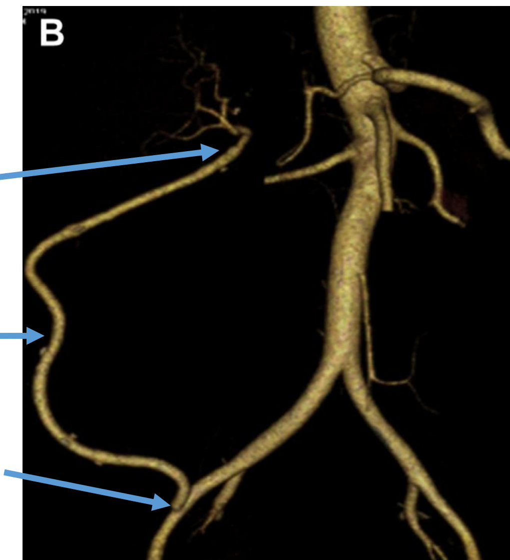
CT scan of the abdominal cavity 2 weeks after LT



Graft's RHA / Iliac artery recipient using the recipient's great saphenous vein (GSV)

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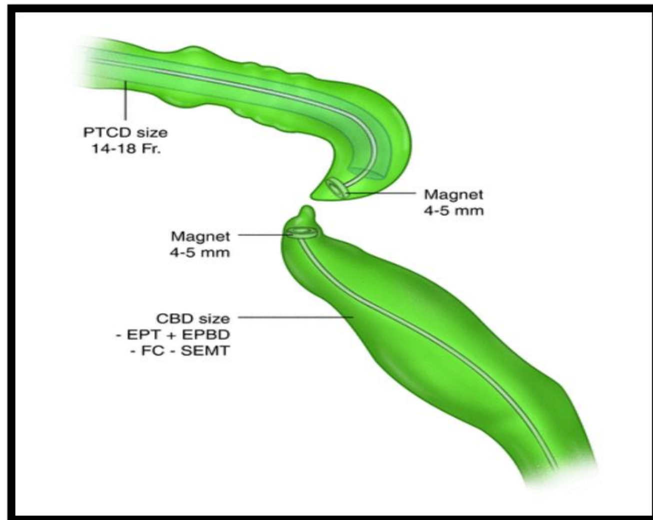
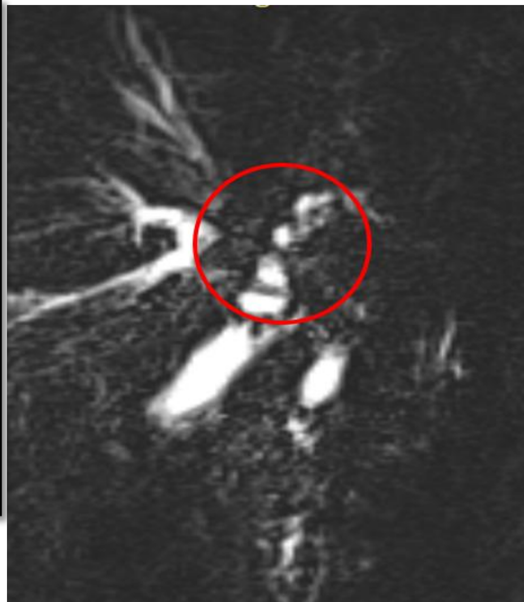
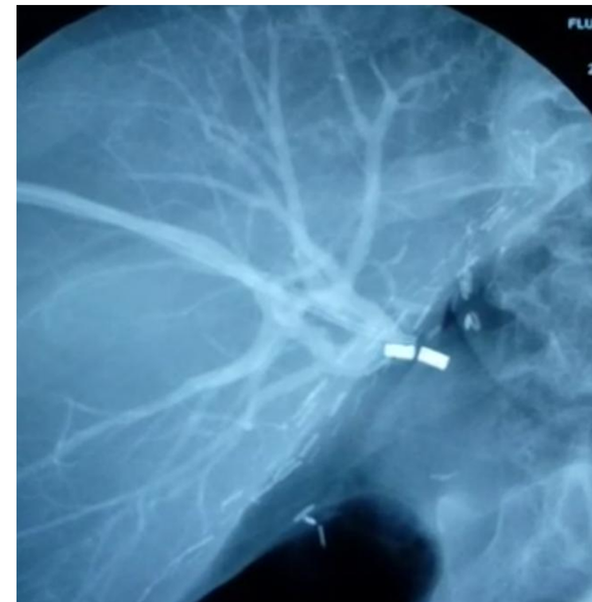
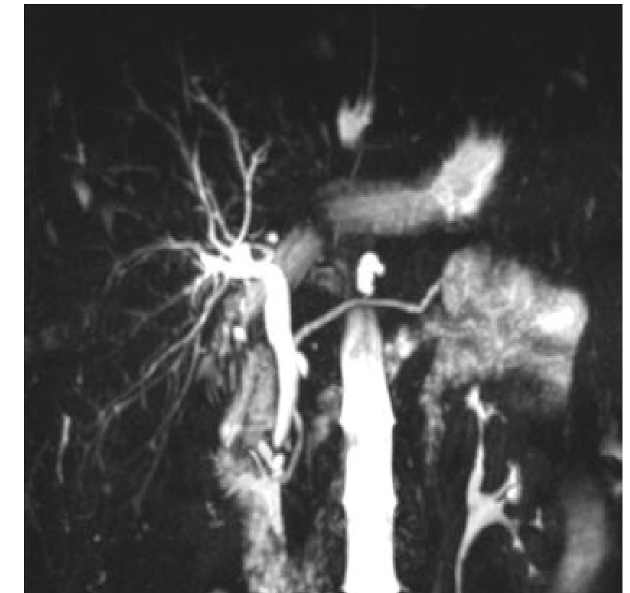
Magnetic compression anastomosis in strictures of biliary anastomoses

Efficiency up to 80%, average recanalization time is 8 days (+-4 days)









DOI: 10.1016/j.transproceed.2012.01.021 · Corpus ID: 205473067

Magnetic compression anastomosis for bile duct stenosis after donor left hepatectomy: a case report.

H. Oya, Y. Sato, +8 authors K. Hatakeyama · Published 2012 · Medicine · Transplantation proceedings

Magnetic compression anastomosis (MCA) provides a minimally invasive treatment creating a nonsurgical, sutureless enteric anastomosis in conjunction with an interventional radiologic technique by using 2 high-power magnets. Recently, the MCA technique has been applied to bile duct strictures after living donor liver transplantation or major hepatectomy. Herein we described use of MCA for bile duct stenosis 5 months after donor left hepatectomy in a 24-year-old man who presented with a stricture... CONTINUE READING

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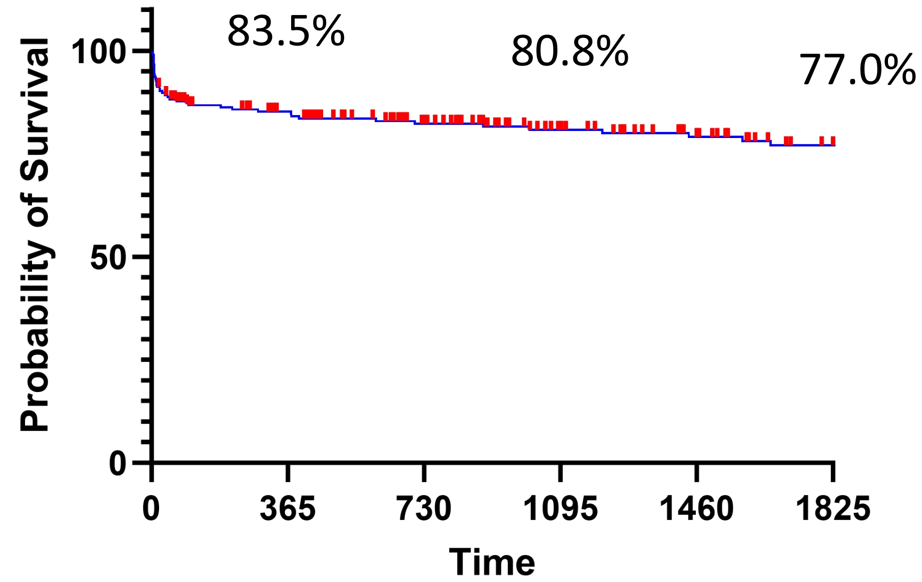
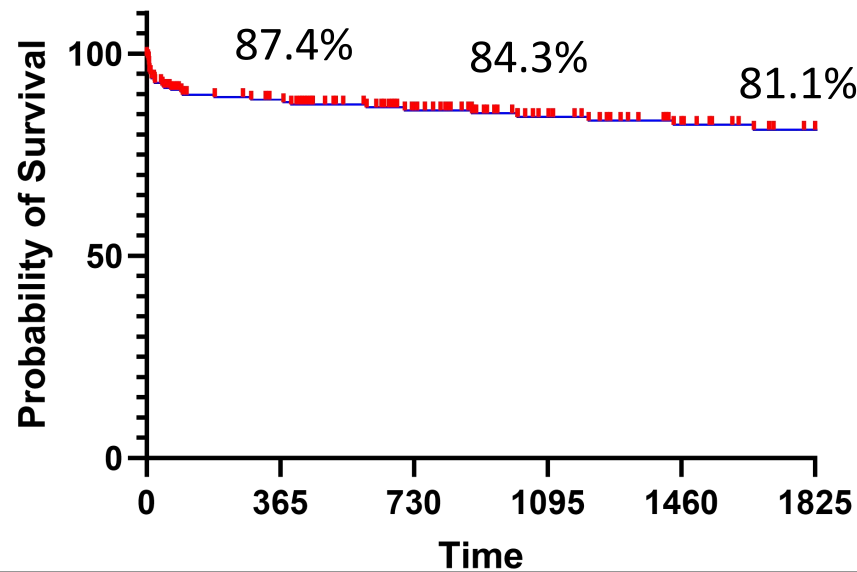
Survival in NSCS - LDLT

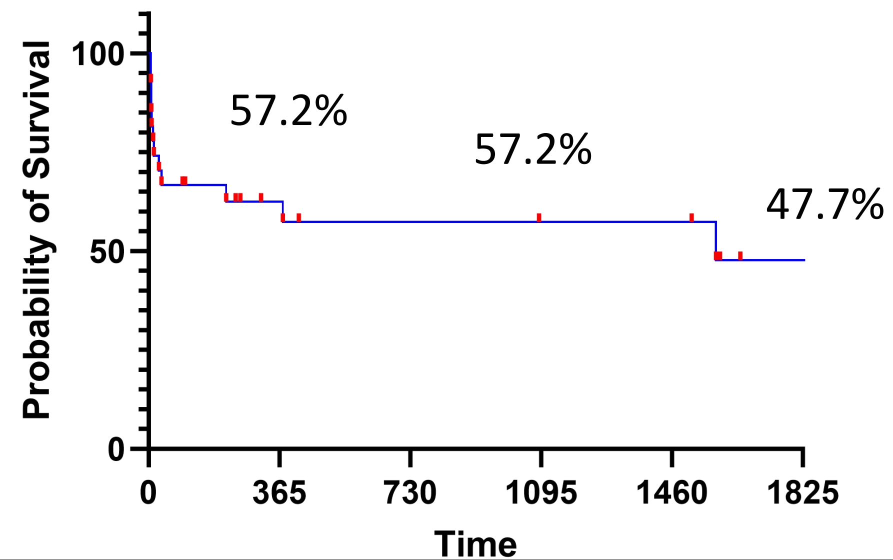
Overall survival



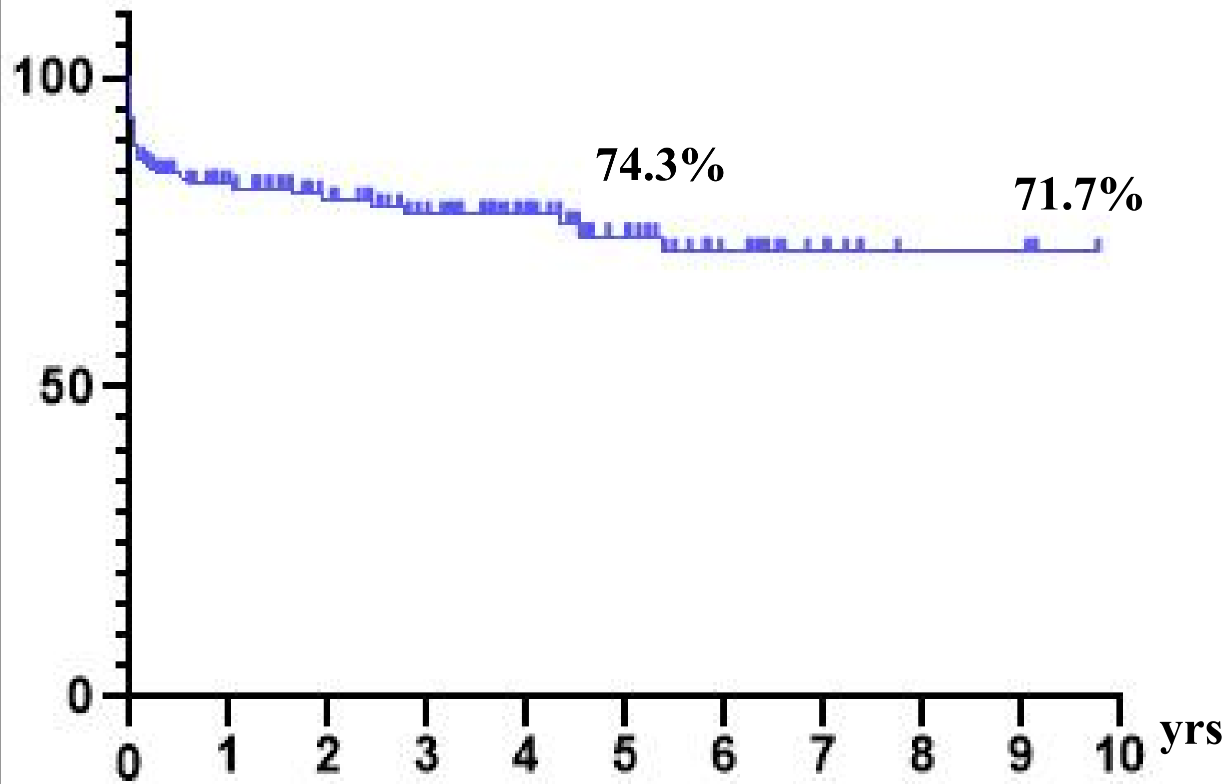
Survival RL

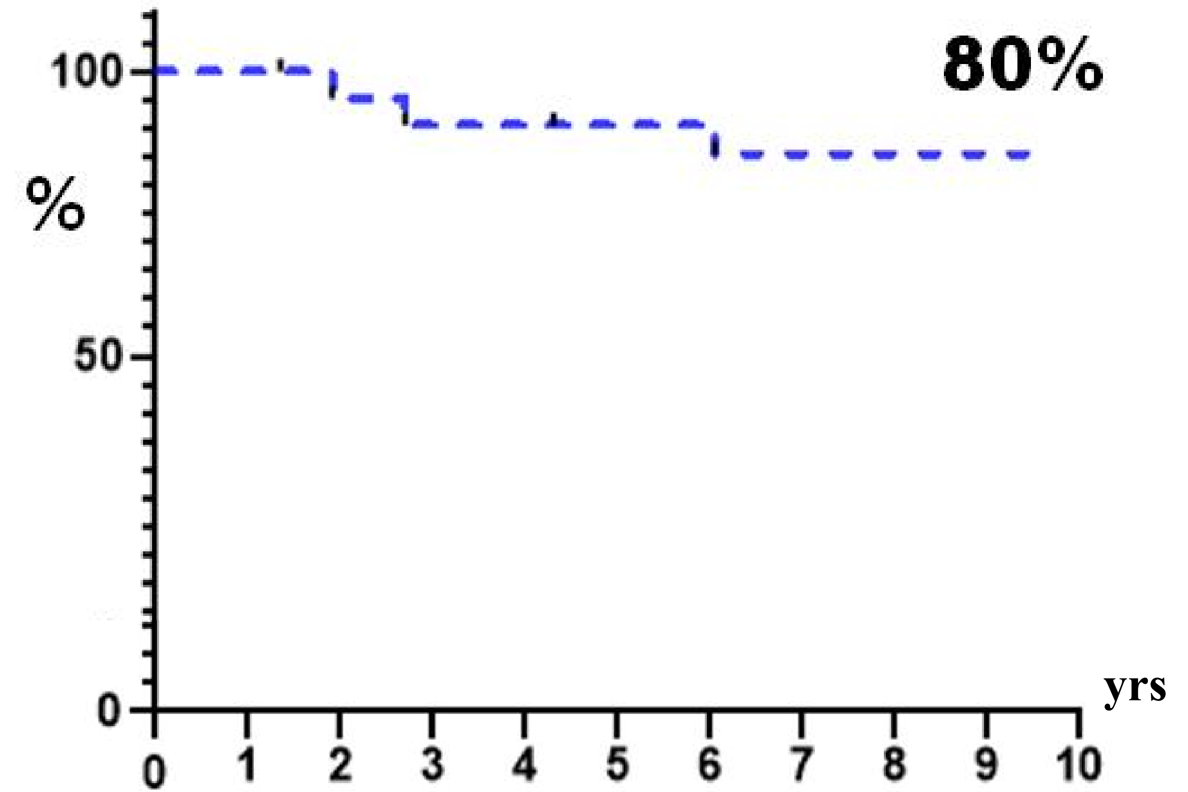


Survival LL



Syzganov's NSCS





Summary

❖Over the past 10 years, the Republic of Kazakhstan has developed a liver transplantation program from living donor that is progressing successfully.

❖Due to the fact that we have not developed cadaveric transplantation, up to 90% is performed from a living donor.

❖For successful development of the transplant program from deceased donor are necessary to change the law.

❖There should be a careful selection of a donor for liver transplantation. It is necessary to avoid a fatal outcome.

❖The formation of a multidisciplinary team is essential for successful liver transplantation from living donor.