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## **LIVER TRANSPLANT PROGRAM IN THE DEPARTMENT OF GENERAL, TRANSPLANT AND LIVER SURGERY, MEDICAL UNIVERSITY OF WARSAW**

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Трансплантация печени является одним из самых сложных оперативных вмешательств, которые требуют не только высокого мастерства хирургов, но и тщательно организованной системы подготовки пациентов, надежной координации действий различных служб, наличия высокотехнологичного оборудования и системы послеоперационного наблюдения. В настоящей статье освещены вопросы истории становления службы трансплантации печени в Польше, современные потребности и возможности этой службы.

Описанные в статье подходы к определению показаний и выбору тактики оперативных вмешательств основываются на опыте выполнения 805 трансплантаций печени за более чем двадцатилетний период. Такой большой опыт позволил не только определить частоту возникающих осложнений, но и представить результаты по выживаемости пациентов с различной патологией.

*Ключевые слова: ортотопическая трансплантация печени, программа по трансплантации печени, показания, осложнения, цирроз печени, первично склерозирующий холангит, печеночно-клеточный рак*

Liver transplantation is one of the most complicated surgical interventions demanding not only high skills of surgeons but also a thoroughly organized system of patients' preparing as well as a reliable coordination of actions of various services, high-tech equipment and the system of postoperative observation. In the given article the questions the foundation history of the service of liver transplantation in Poland are illustrated as well as modern demands and possibilities of this service.

The described approaches to the determining indications and tactics choice of surgical interventions are based on 805 liver transplantations for more than a 20-year period. Such a wide experience permits not only to determine the complications frequency but also to present the results of patients' survival with various pathologies.

*Keywords: orthotopic liver transplantation, liver transplantation program, indications, complications, liver cirrhosis, primarily sclerosing cholangitis, liver-cellular cancer*

In 1967, three years after the first unsuccessful transplantation occurred, Thomas Starzl achieved the first success in performing orthotopic liver transplantation (OLTx). However, the intervention operation remained experimental and it took 16 more years to recognize it as a fully legal therapeutic procedure. Advances in immunosuppressive therapies such as the introduction of cyclosporine and its wide-spread use in patients after liver and kidney transplantation since 1983 have considerably improved transplantation success rates.

There are 125 liver transplant centers in the USA and 138 centers in Europe in 26 countries. Every 30 minutes one of parenchymal organs such as liver, pancreas, kidneys, lungs or heart is transplanted all over the world.

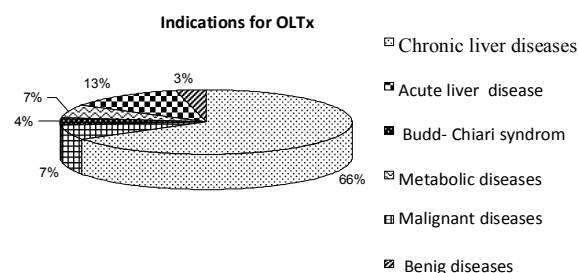
In Poland the first unsuccessful attempts at orthotopic liver transplantation were made in 1987 by prof. Stanislaw Zielinski and his team from the Department of Surgery, Pomeranian Medical University in Szczecin (patient died 2 weeks after OLTx). The first successful procedure was performed in a child, in 1990, in The Children's

Memorial Health Institute in Warsaw. 1994 was the real turning point for Polish liver transplantology. In the Department of General, Transplant and Liver Surgery, Medical University of Warsaw the first successful orthotopic liver transplantation was performed in a female patient with PBC. She is Polish longest-surviving patient (16 years now) with a good chance of many more years to live. In the following years a team of surgeons, anesthesiologists and pathologists were trained in France in two leading transplant centers – one run by prof. Henry Bismuth in Villejouis near Paris and the other in L'Hopital Cochin in Paris run by prof. Didier Houssin.

However, it was not until 1999 when the liver transplant program was well developed. Until June 2010 we performed 805 OLTx and 50 reOLTx. The best results, regarding the number of transplantations, were obtained in 2008. The total of 106 patients received OLTx that year which made our Department one of the six first liver transplant centers in Europe.

At the moment in Poland there are 4 centers





**Fig. 1. Indications for OLTx in Department of General, Transplant and Liver Surgery, Warsaw Medical University**

for adult liver transplant and 1 for children. They are:

1. Department of General, Transplant and Liver Surgery, Warsaw Medical University, Banacha, 1a str., 02-097 Warsaw

2. Department of General and Transplant Surgery, Warsaw Medical University, Institute of Transplantation, Nowogrodzka 59 str, 02-006 Warsaw

3. Department of General and Transplant Surgery SPSK im. A. Mieleckiego, Silesian Medical University, Francuska 20-24 str, 40-027 Katowice

4. Department of General and Transplant Surgery, Division of Liver, Pancreas and Biliary Surgery, Regional Hospital, Arkonska 4 str., 71-455 Szczecin

5. Department of Pediatric Surgery and Organ Transplantation The Children's Memorial Health Institute, Al. Dzieci Polskich 20, 04-730 Warsaw

The Department of General, Transplant & Liver Surgery is recognized for its extensive influence in

hepatic surgery and transplantology in Poland. 250 liver resections and nearly 100ts OLTx are performed there annually. In 1999 the first successful orthotopic liver transplantation from a related donor (LDLT) took place. The procedure was developed by surgical team from our Department supervised by prof. Marek Krawczyk. Two left segments were harvested and the implantation was performed in the Children's Memorial Health Institute in Warsaw under the supervision of prof. Piotr Kalicinski. This is the only program of such kind in Poland. As Poltransplant data show it covers 50% of pediatric demand for transplantation. Annually 20 organs from a living-related donor are harvested for children and up till now 147 procedures of this type have been performed. This year we are celebrating the 10<sup>th</sup> anniversary of LDLT introduction.

Unfortunately, despite the growing number of OLTx, the waiting list continues to expand on a yearly basis. This proves the demand for transplantation is constantly increasing. (Fig. 1) At the end of 2009, 183 people were registered on the liver transplant waiting list while 224 transplantations were performed. In comparison, in 2007, 178 OLTx were performed and the number of patients awaiting transplantations equaled 182. (Tab.1)

### 1. Indications for OLTx

Generally, indications for OLTx include:

- chronic, advanced and incurable liver diseases;
- acute liver failure;

Table 1

**National Transplant Waiting List (2009)  
Poltransplant Information Buletin 1(18)[March 2010]**

	Waiting for <b>kidney</b> transplantation	Waiting for <b>kidney and pancreas</b> transplantation	Waiting for <b>pancreas</b> transplantation	Waiting for <b>kidney and liver</b> transplantation	Waiting for <b>liver</b> transplantation	Waiting for <b>heart</b> transplantation	Waiting for <b>lung</b> transplantation	Waiting for <b>heart and lung</b> transplantation	<b>All together</b>
January**	1501	14	1		<b>123</b>	215	31	18	<b>1903</b>
February**	1512	11	1		<b>125</b>	207	35	18	<b>1909</b>
March**	1532	11	1		<b>147</b>	195	33	18	<b>1937</b>
April**	1544	14	1		<b>139</b>	201	34	18	<b>1951</b>
May**	1553	15	1		<b>144</b>	198	34	18	<b>1963</b>
June**	1574	19	2		<b>156</b>	211	35	18	<b>2015</b>
July**	1577	17	2		<b>164</b>	206	34	19	<b>2019</b>
August**	1604	19	2		<b>167</b>	200	35	19	<b>2046</b>
September**	1636	22	2		<b>176</b>	228	37	20	<b>2121</b>
October**	1711	24	3		<b>181</b>	237	36	20	<b>2212</b>
November**	1731	24	4		<b>178</b>	245	36	19	<b>2237</b>
December**	1768	26	3	2	<b>183</b>	253	37	19	<b>2291</b>



- metabolic diseases;
- malignant neoplasms;
- combined liver and other organ transplantation;
- retransplantations.

Covering the period from 1989 (the first OLTx) to 2009, it is clearly visible that hepatitis C has gradually become one of the leading indications for liver transplantation, reaching up to 1/3 of the cases in the recent years.

## 2. Techniques of orthotopic liver transplantation

At present, two techniques of liver transplantation exist. The conventional Starzl technique with the removal of retrohepatic vena cava and administration of extracorporeal venovenous by-pass and a piggy-back technique with preservation of the inferior vena cava and side-to-side anastomosis between the recipient vena cava and the retrohepatic vena cava of the graft.

Initially, all patients in the Department were operated on with the Starzl technique. Nowadays we typically use the piggy-back technique and it is principally only for the very selected patients that we employ the conventional technique. We use the latter method in case of:

- a) patients without collateral circulation developed (e.g. acute toxic liver failure, hepatitis fulminans);
- b) difficult hepatectomies in patients with very well developed collateral circulation, after abdominal and hepatic operations (where the risk of substantial blood loss is very high);
- c) liver retransplantation;
- d) patients with HCC, with a tumor situated very near the inferior vena cava which forces its removal.

The remaining anastomoses in both techniques are created in a much similar way. After vena cava is anastomosed in an end-to-end fashion, we reperfuse the liver. Following on that, we perform arterial anastomosis and reperfusion. End-to-end bile duct anastomosis is finally performed without any drain.

It is common practice in patients transplanted for PSC, Caroli syndrome and SBC (secondary biliary cirrhosis) to form a Roux-en-Y jejunal loop. After necessary hemostasis, 3 Redon drains are usually placed to allow active suction. Drains are removed, if possible, in the second or third day after the operation.

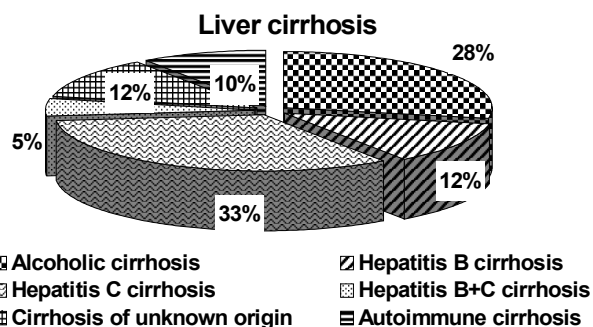


Fig. 2. Indications for OLTx due to liver cirrhosis in the Department of General, Transplant and Liver Surgery, Medical University of Warsaw

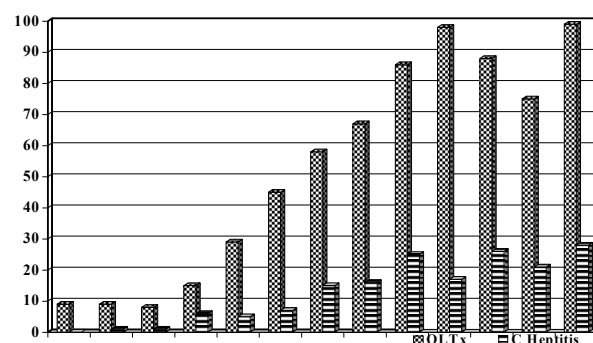


Fig. 3. OLTx in patients with C hepatitis

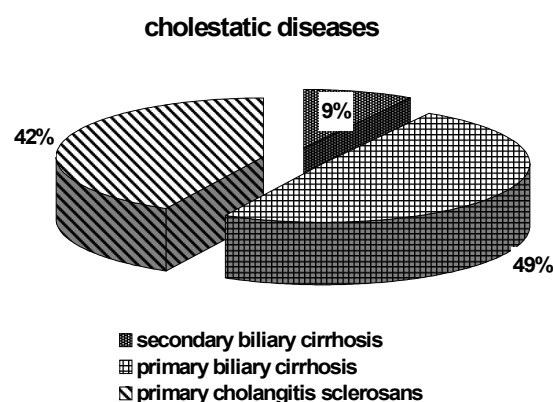


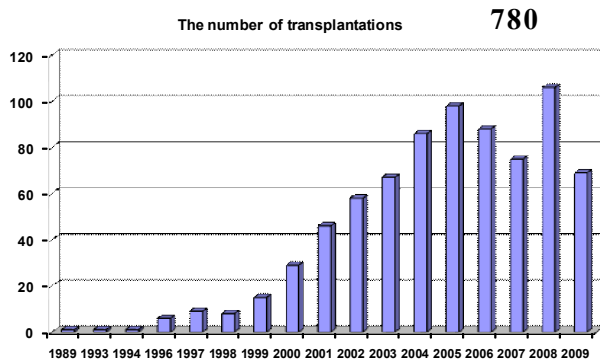
Fig. 4. Indications for OLTx due to cholestatic diseases in the Department of General, Transplant and Liver Surgery, Medical University of Warsaw

## 3. Postoperative care

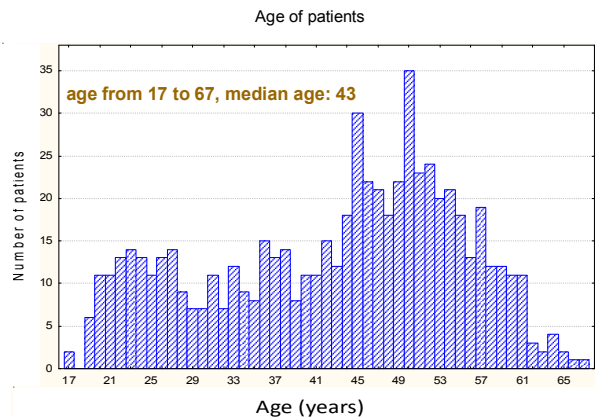
After the transplantation a patient is transported to the surgical intensive care unit. Depending on their general condition and efficacy of breathing, they are either extubated or stay on mechanical ventilation. In case of uncomplicated transplantation, patients are closely monitored for 3 or 4 days and then they are transferred to so called clean surgical unit.

Doppler ultrasound is used to assess hepatic artery flow in the first postoperative day. In case of





**Fig. 5. The number of cadaver transplantations – the Department of General, Transplant and Liver Surgery, Medical University of Warsaw, SPCSK Banacha (1989-2009).**



**Fig. 6. Patients aged 17 to 67**

doubts concerning arterial patency, patients undergo an urgent contrasted CT with hepatic vessels visualization. If the complication is confirmed, a patient is enlisted for identically blood-group matched retransplantation. If a patient's condition deteriorates, which naturally is visible in their biochemical results, they need to be enlisted for AB0-incompatible retransplantation.

For prevention of general infection a patient after an operation receives a broad-spectrum antibiotic called Meronem (AstraZeneca) and immunosuppressive treatment.

At the moment the procedure and immunosuppression are of the highest standards and the majority of patients have a very good possibility of living a long life.

#### 4. Results

A total of 805 liver transplantations were performed in the Department between 1989 until end of July 2010.

Technical difficulties occurring in the early posttransplant period

1. large haematomas 10–15%;
2. hepatic artery thrombosis 2–8%;
3. biliary complications 10–20% of patients out of which 80% in the 1<sup>st</sup> 3-6 months;
4. portal vein thrombosis 1–3%;

5. hepatic veins thrombosis/ stenosis 0,5–1,7%.

At the moment the results in our Department meet the standards of other centers in Poland and in the world. (Tab. 2, 3). Perioperative mortality rate doesn't exceed 10%, but it is necessary to mention that the results include urgent cases when patients are operated on due to hepatitis fulminans, fungus poisoning or chemical poisoning of different type. While waiting for OLTx, they are treated with albumin dialysis performed with "Prometheus" equipment. In this group perioperative mortality rate rises up to 50%, the result similar to retransplantations.

The most crucial problem of liver transplant centers have to deal with is recurrence of the original disease and the necessity of retransplantation. There have been retransplantations performed in the Department which included patients operated upon urgently for perioperative indications such as hepatic artery thrombosis and recurrence of the previous liver failure in the later period.

42–90% of recipients suffer from HCV (hepatitis C virus) reinfection within 5 years following liver transplantation, 50,0–70,0% present with inflammation of the graft, 15,0–30,0% develop cirrhosis within 5–7 years.

Survival: 1 year= 80,0-94.8% of patients, 3 years

Table 2

Results of cadaver transplantations – all centers in Poland [2]					
Survival	The number of recipients observed*	Recipient survival	% Recipient survival	Graft survival	% graft survival
3 months	1262	1124	89	1101	87
12 months	1185	1024	86	1000	84
36 months	790	648	82	618	78
60 months	414	320	77	296	71

\* from 1998



Table 3

**Results of cadaver transplantations – the Department of General, Transplant and Liver Surgery, Medical University of Warsaw, SPCSK Banacha [2]**

Survival	The number of recipients observed*	Recipient survival	% Recipient survival	Graft survival	% graft survival
3 months	475	428	90	420	88
12 months	461	404	88	395	86
36 months	283	232	82	222	78
60 months	96	71	74	67	70

\* from 1998

= 76,0–84,1% of patients and 5 years = 62,2–75,0% of patients. The necessity for retransplantation has been reported in about 10% of patients within 15 years after OLTx.

PBC (primary biliary cirrhosis) reappears in 25,0–50,0% of patients 10 years after transplantation, 10,0–24,0% of cases require retransplantation.

PSC (primary sclerosing cholangitis) recurrence = 20,0%

HCC (hepatocellular carcinoma) patients constitute a separate group. In our Department we use Milan criteria as the selection for liver transplantation. In this group 1-year survival rate fluctuates from 91,0% to 82,0%, 5-year from 79,0% to 61,0% and 10-year come to 44%. HCC recurs in 5,3% - 20,0% within 5 years from OLTx.

### Conclusions

The success of our liver transplant program

determines substantial progress which has been made in preservation of health in Poland in the recent years. The Department of General, Transplant and Liver Surgery of Medical University of Warsaw plays one of the most important roles in this program in both cadaver and living-related donor transplantation.

### REFERENCES

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2. Poltransplant Information Buletin. - 2010. - Vol.18, N1.
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