Surgical complications after pediatric liver transplantation

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Aims and objectives

Liver transplant is the treatment option for the end stage liver diseases in children. Pediatric transplant differs from that of an adult's in various aspects, mainly due to the fact that patient size and hemodynamic characteristics vary with age, creating a need for the use of partial or reduced-sized grafts in this age group (1,2). Surgical complications of the hepatic transplant may be classified into venous, arterial and biliary (2).

Therefore, the purpose of this study was to analyse the pediatric liver transplantation complications in our centre and describe the differences in surgical complications between transplant types, patient age and basal disease.

Methods and materials

Patient population: All pediatric patients who received a liver transplantation in our centre between 1/1/2012 and 28/11/2016, were included.

Complications: Surgical complications were reviewed during the first 6 months after the transplantation. We took into account arterial complications (stenosis and thrombosis) (Fig. 1-2), venous complications (stenosis and thrombosis) (Fig. 3) and biliary complications (stenosis and bilomas) (Fig. 4).

Imaging techniques: The follow-up of the pediatric liver transplant in our centre includes Doppler ultrasound in the immediate postoperative moment of the intervention, every 24 hours for three days, once or twice a week during the hospital stay and then every 6 months or every year. Different operators performed the explorations. The UCI ultrasound controls were performed with a Siemens Acuson Sequoia 512 (Germany) apparatus and the ambulatory controls were performed with a Philips iU22 device (The Netherlands). Different probes were used based on the characteristics of the patients and the needs of the operator.

In some cases the Doppler ultrasound was not sufficient for the diagnosis of the complications and the realization of AngioTC (Siemens Somatom Definition AS+) and MRI (Siemens Magnetom Avanto) were necessary.

Statistical analysis: The rates of complications depending on transplant type, patient's age and basal disease of the patients were assessed.

Images for this section:

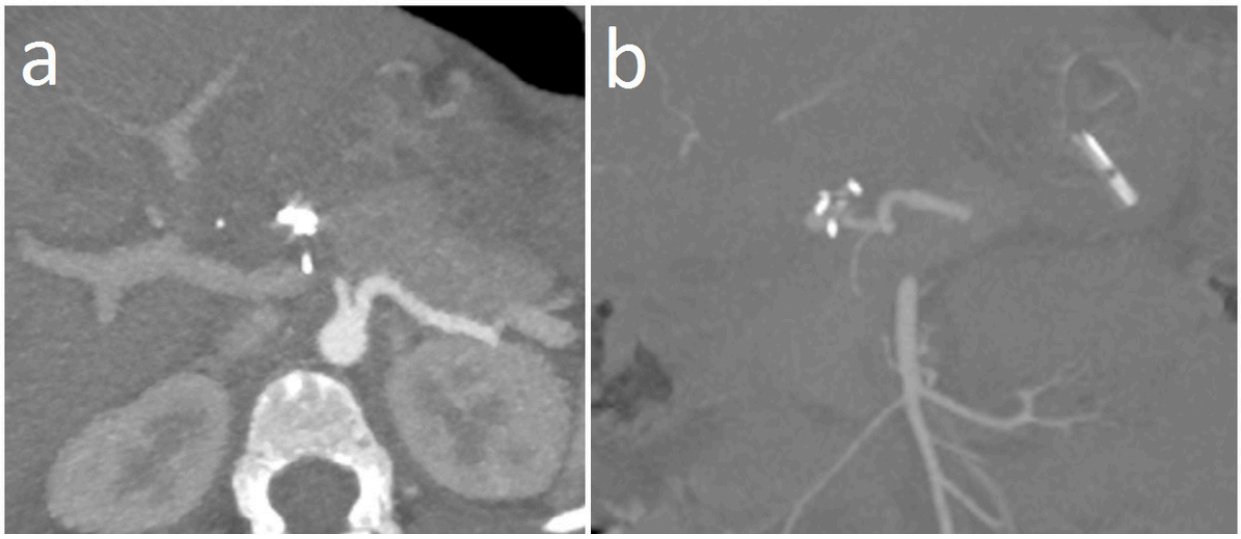

Fig. 2: Arterial complications: Thromboses and Pseudoaneurysm. a) Axial CT with Maximum Intensity Projection that shows an independent origin of the liver artery with proximal amputation caused by a thrombosis; b) Coronal CT with maximum intensity projection showing a pseudoaneurysm (arrow) of the liver artery at the site of anastomosis.

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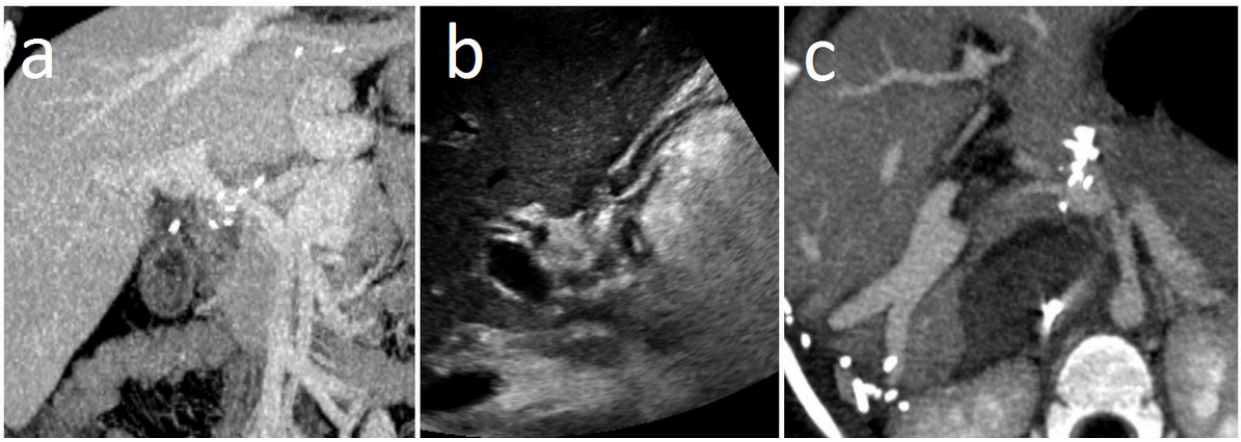

Fig. 3: Venous complications. a) Coronal CT with maximum intensity projection showing a portal stenosis in the place of the anastomosis, note the radiologic correlation with the b) ultrasonography; c) Axial CT with Maximuml Intensity Projection showing portal thromboses (arrow) next to the anastomosis in a PLT.

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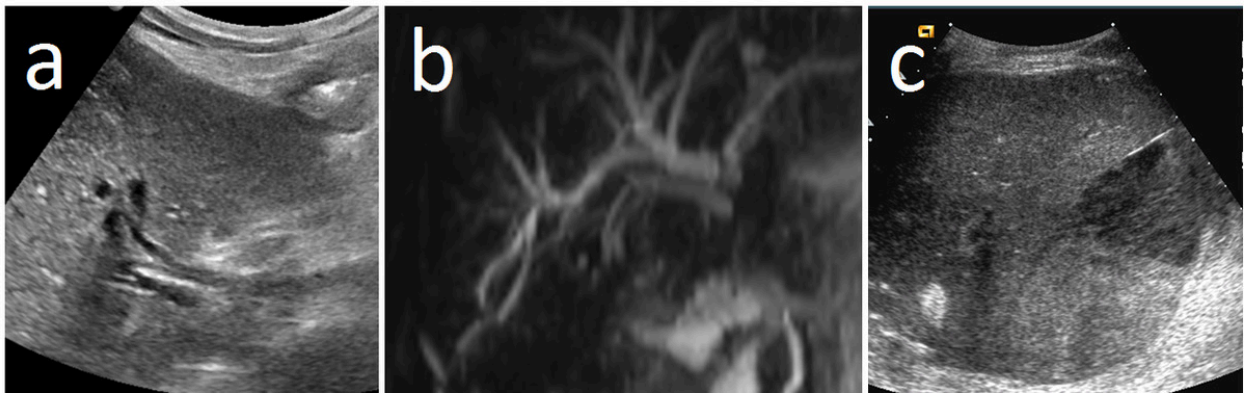

Fig. 4: Biliary complications. a) Echography showing a dilatated biliary tree in the hepatic helium in a patient with a biliar stenosis; b) CholangioMRI of the same patient with the dilatation of the biliary tree and the stenosis (arrow) in the anastomosis; c) Ultrasonography showing a subhepathic collection with an echogenic level, conresponding to a biliary leak.

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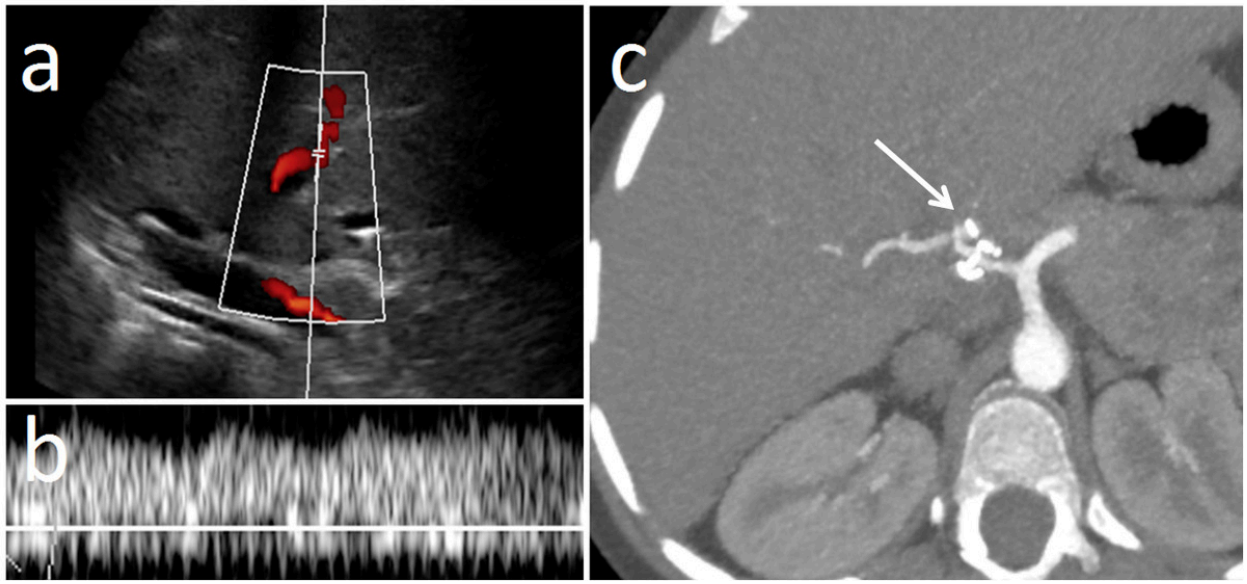

Fig. 1: Arterial complications: Stenosis. a) Colour Doppler sonography showing the portal inflow and the Spectral Doppler box on the Hepatic Artery; b) Spectral Doppler of the arterial wave with a parvus tardus waveform; c) Axial CT with Maximuml Intensity Projection showing celiac trunk and main hepatic artery, the arrow points the stenosis of the left hepatic artery.

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Results

On that 5-year period 60 pediatric liver transplants were performed in our centre. The average age at the transplant was 4,7±4,4 years (between 0,08-15,9 years).

The number of pediatric hepatic transplants in our centre has been increasing annually during the studied period (Fig. 5).

The main transplantation indication was Biliary Atresia (BA) (14 patients), followed by metabolopathies (10 patients), there were other indications such as cholestatic diseases, cirrhosis and other diseases that represent a lower percentage of transplants. Indications of pediatric liver transplantation varies in the different age groups (Fig. 6).

From all patients, 33 received a Partial Liver Transplant (PLT) and 27 received Total Liver Transplant (TLT) (Fig. 7). From partial transplants 13 patients received Partial Cadaveric Transplant (PCT) the 39% and 20 patients received Partial Live Donor Transplants (PLDT) the 61%. PLT represent the 55% of all pediatric liver transplants (Fig. 8).

The complications, 29 in total, occurred in 25 patients, 42% of patients receiving a liver transplant suffered complications from the surgery.

Of the patients who experienced complications, the majority were in patients who had received partial hepatic transplants, 72,4% of the complications were in this group, although it did not show a statistical significance (p=0,871). 14 complications appeared in PLDT (48%), 7 in PCT (24%) and 8 in TLT (27,6%).

Children under 2 years of age received 23 transplants and 10 developed complications (43,5%), 40% of all patients who developed complications, not statistically different from other age groups (p = 0,86).

The patients transplanted by a metabolopathy were 11, 6 of them developed a surgical complication (55%) which represents a significantly higher proportion than other indications (p=0,011). Of the other indications, the patients transplanted by cholestasis and tumour diseases also showed significantly more complications with respect to the other indications, with a p value of 0,002 and <0,001 respectively.

There were 11 arterial and biliary complications (18% of the patients) respectively and 7 of venous (12% of the patients). Of the arterial 5 were stenosis, 5 thrombosis and 2 pseudoaneurisms. Of the venous complications 5 were stenosis and 2 were thromboses. And biliary 9 were stenosis and 2 bile extravasation.

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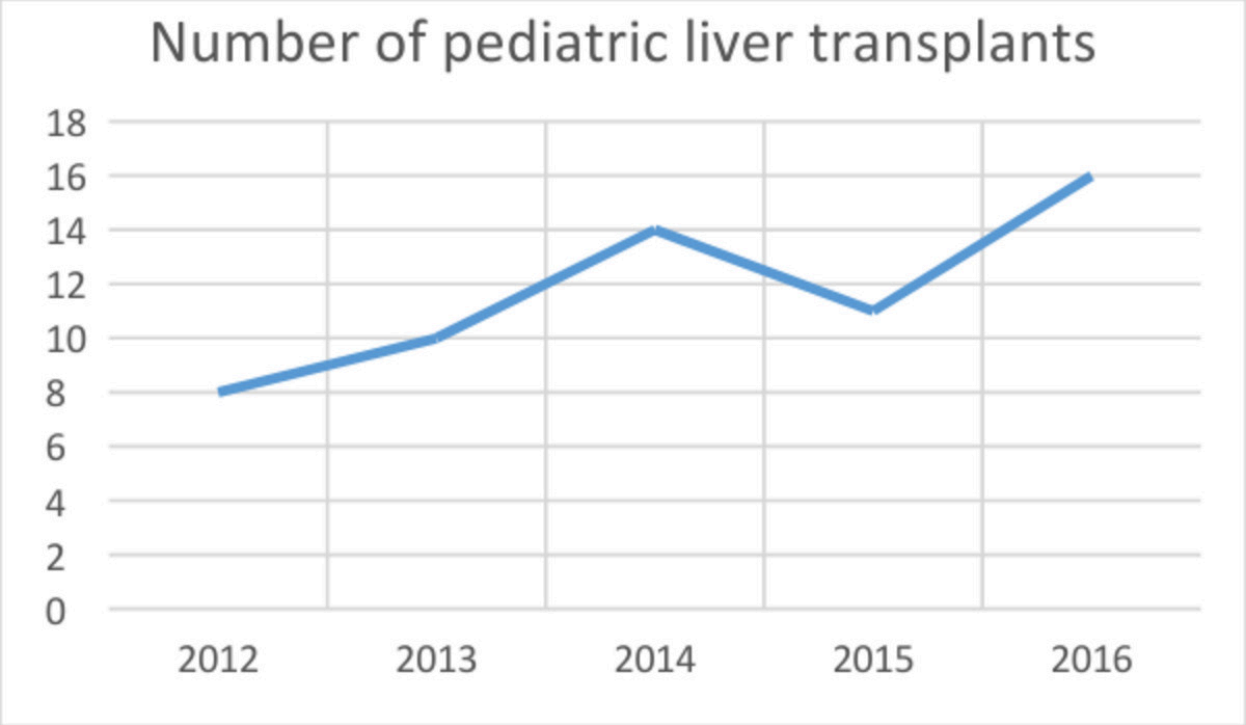

Fig. 5: Graphic representing the evolution of the number of pediatric liver transplantations in our centre between 2012 and 2016.

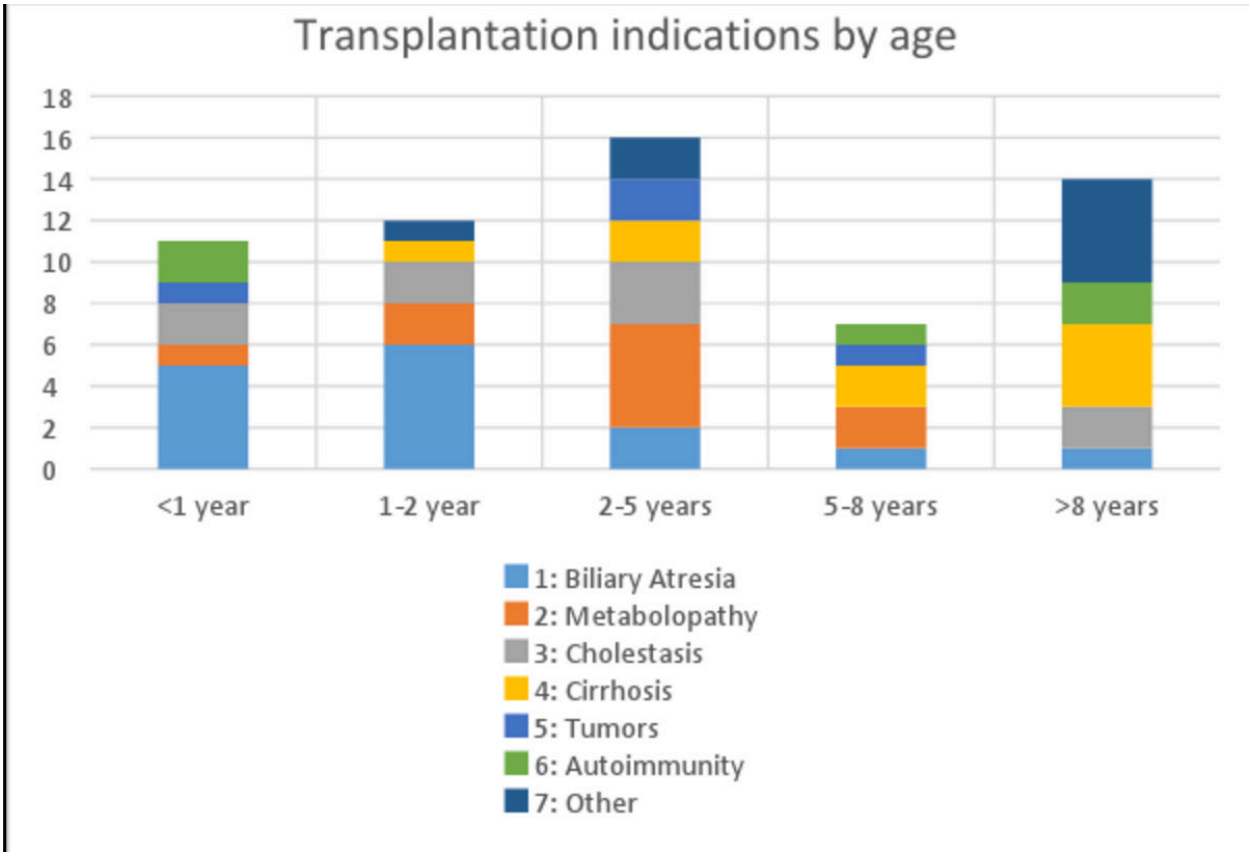

Fig. 6: Main indications to perform liver transplantation in children changes with age. This graphic represents the indications distributed by age groups.

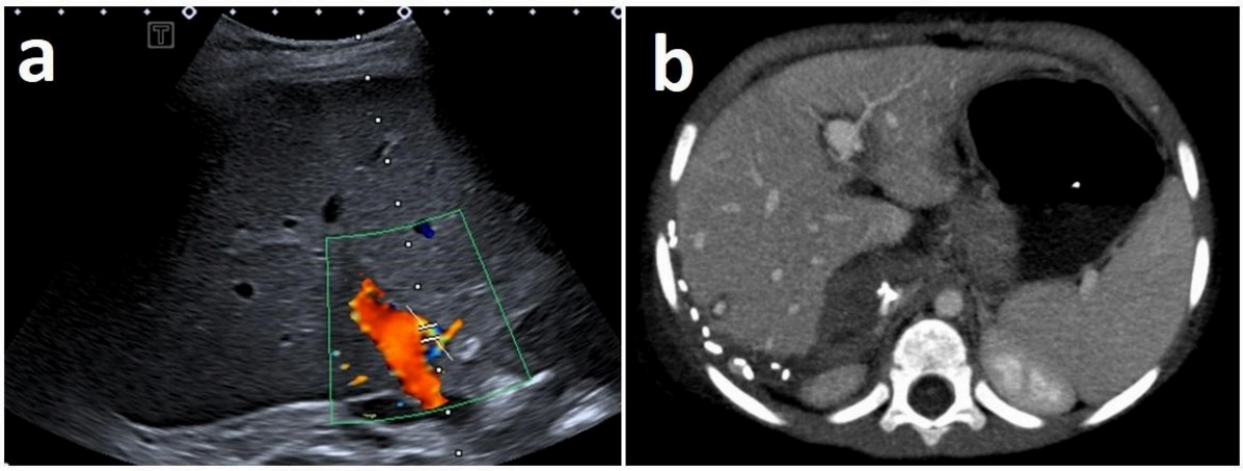

Fig. 7: Types of transplants: a) Total Liver Transplant seen by ultrasonography from a transverse right upper quadrant vision; b) Partial Liver Transplant seen in a CT axial reformation, notice the multiple surgical staples in the hepatic graft edge.

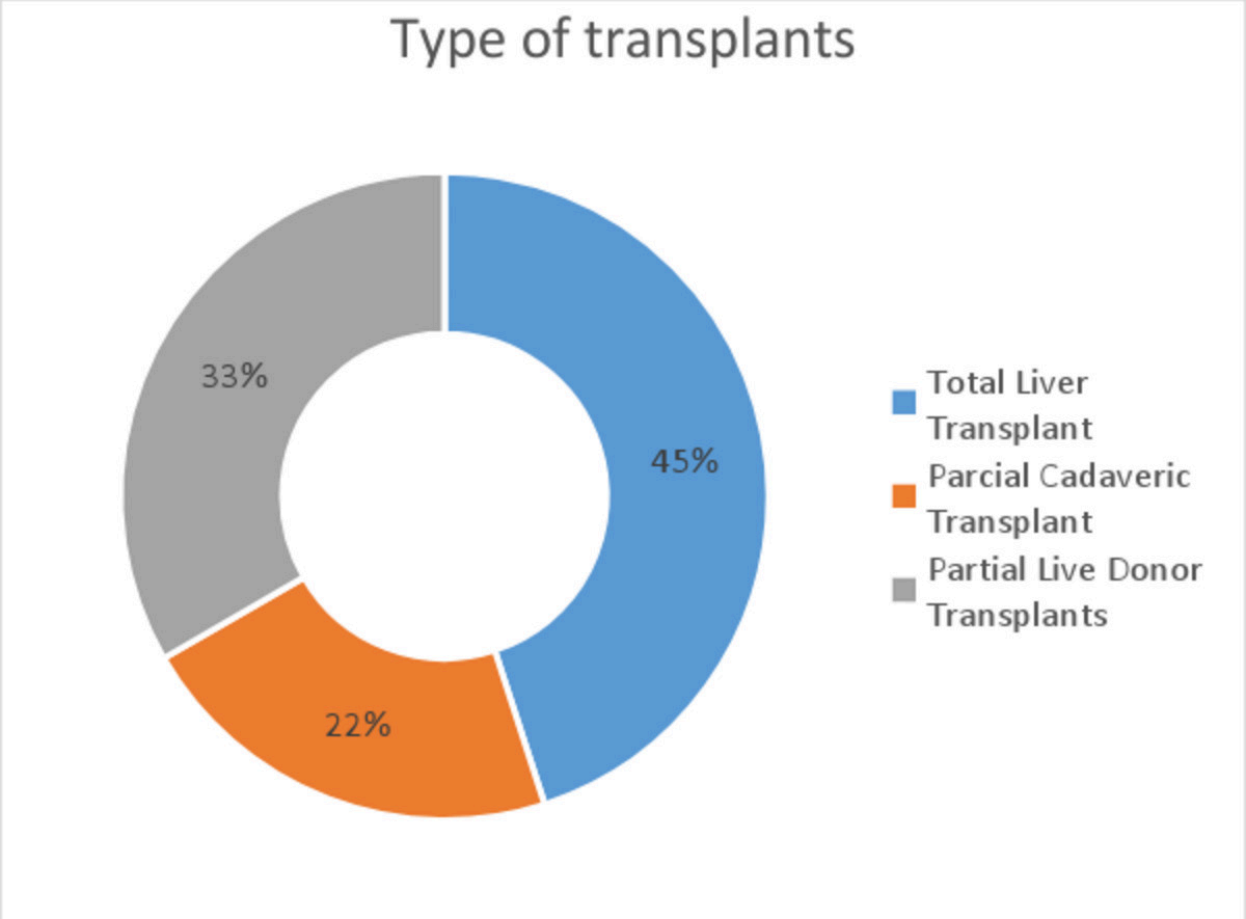

Fig. 8: Percentages of the types of transplants: Total Liver Transplant (TLT), Partial Cadaveric Transplant (PLT) and Partial Live Donor Transplants (PLDT).

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Conclusion

The highest rates of complications in pediatric liver transplants in our centre occurred in patients who received PT (72,4%) and in patients less than 2 years old (34,4% of all complications). Basal disease plays an important role in the development of complications after a liver transplantation as it affects younger patients who may have subjacent arterial disease and who require partial liver transplants.

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