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Letter

SARS-CoV-2 Infection and Pediatric Liver Transplantation: Does It Work?

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1. Background

SARS-CoV-2 infection is an urgent health problem in the world (1). The infection has involved more than 200 countries, and the World Health Organization has declared it a pandemic.

Coronavirus Disease 2019 (COVID-19) is asymptomatic in most children, making its timely and correct diagnosis difficult in pediatric patients (2). Thus, children are a major source of spreading SARS-CoV-2.

Liver transplantation is a life-saving procedure, especially in children. However, the effects of SARS-CoV-2 infection are not completely clear on liver transplantation.

- What are the clear indications of immediate liver transplantation in children during the COVID-19 epi-demic?

- What should we do for recipients and donors before liver transplantation during the COVID-19 epidemic?

These are now the most challenging issues in the field of transplantation during the COVID-19 epidemic.

Our hospital is the second major center of pediatric liver transplantation in Iran. Recently, two boys were excluded from our organ transplantation list because of COVID-19. The first one was a six-year-old boy who was a candidate for liver transplantation due to decompensated cirrhotic Wilson disease. His father was evaluated as a donor, but the chest CT scan was positive for COVID-19. When we examined the recipient, he had no symptoms or signs of COVID-19, but the result of his SARS-COV-2 RNA PCR test was positive.

The second case was a 14-year-old boy with idiopathic acute liver failure, who had no findings suggestive of COVID-19. However, his chest CT scan revealed the typical symptoms of COVID-19, and consequently, his SARS-CoV-2 RNA PCR test was positive.

2. Discussion

There are no clear data about liver transplantation and SARS-CoV-2 infection in children. The findings are limited to a few adult studies. Children are potentially a major source of SARS-CoV-2 infection, especially because they are often asymptomatic (2). Moreover, resources are allocated to COVID-19 patients during the epidemic, and prioritizing resources and personnel is a challenging issue (3). The effect of SARS-CoV-2 infection on recipients is another unresolved mystery, which requires more caution until further studies are conducted in this regard. Living donors are good candidates for pediatric liver transplantation, but concomitantly, every person may be a case of COVID-19. Therefore, we should exclude infectious cases before proceeding to transplantation (2).

We reviewed studies on transplantation, including liver transplantation, during SARS-CoV-2 infection. The data about pediatric liver transplantation are sparse, as they mostly concern adults.

Thus, we have to make inferences based on adult studies until sufficient data are gathered.

A summary of the studies is presented in Table 1.

The findings of the surveyed studies are applicable for liver transplantation, such as pediatric liver transplantation during the SARS-CoV-2 infection epidemic.

1- Immediate liver transplantation

This should only be considered for acute liver failure, a high MELD score (> 22), or severe complications such as

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| Table 1. A Summary of the Studies | | | | |
|--|---|--|---|--------------------------|
| Pediatric Recipient | Recipient | Donor | General | Study (Reference Number) |
| Limit living-related transplantation only to pediatric acute liver failure | -Immediate liver transplantation: (1) HCC; (2) Severe disease and high MELD scores. | -Develop a local policy | -Avoid unnecessary admission for suspected patients to a transplant unit | (3) |
| | | -Consider the recipient's age, comorbidities, and resources | | |
| | -Test the recipients for COVID-19 shortly before transplantation, if possible. | -Screen donors for the probability of COVID-19 | -Consider COVID-19 for patients with liver disease and new-onset encephalopathy | |
| | | -Test recipients and donors for COVID-19 before transplantation | | |
| | -Follow local health department guidelines | -Tiered suspension of deceased donor transplants | -Appropriate assessment of donors and recipients for COVID-19 and obtaining informed consent | (4) |
| | -Isolate suspected recipients until infection with COVID-19 is ruled out | -Temporary suspending of living-related kidney and liver transplantation | | |
| | | -Evaluation of donors for the history of contact < 14 days, symptoms, and SARS-CoV-2 PCR | | |
| | -Private transportation and fixed accompanying relative | -Accompany donors by only one immediate relative. | | (5) |
| | | -ICU admission | | |
| | | -Screen all in-contact personnel | | |
| | -In epidemic areas, do liver transplantation only for: status 1 patients; labMELD > 20; risk for drop-out HCC | -Nasopharyngeal swab/bronchoalveolar lavage - SARS-CoV-2 RNA PCR for all donors in epidemic areas | | |
| | -Check for symptoms/history of contact/swab PCR | | | (6) |
| | -BAL during transplantation (if positive, the patient should be isolated and routine protection for in-contact personnel is mandatory) | | | |

recurrent gastrointestinal bleeding, hepatic encephalopathy, and recurrent cholangitis. In children, these indications should be limited to status 1 patients:

- Acute liver failure with encephalopathy, ventilator dependence, dialysis or continuous venovenous hemoperfusion or INR > 2

- Acute decompensated Wilson disease

- Primary non-functioning of the transplanted liver within the first seven days after transplantation

- Hepatic artery thrombosis within the first 14 days after transplantation

- A MELD/PELD score > 25, life-threatening conditions such as respiratory failure, severe gastrointestinal bleeding, renal insufficiency/renal failure, and a Glasgow coma score > 10 in the last 48 hours (encephalopathy)

- Hepatocellular carcinoma (7, 8)

2- Deceased donors

- An infectious disease consult and history of close con-

tact or respiratory symptoms should be considered in all deceased donors.

- All suspected/confirmed cases or those with a positive history of contact during the last 14 days should be excluded from the list and other transplant centers should also be informed.

- In cases of close contacts more than 14 days ago, the donor should be considered as marginal.

In these situations, SARS-CoV-2 RNA PCR may be helpful, making marginal cases as potential donors for immediate liver transplantation.

3- Living donors

In urgent pediatric cases, this may be a good option. All living donors should be evaluated by an infectious disease specialist before proceeding to transplantation. History of contact and respiratory symptoms or fever is important. Chest CT scan and SARS-CoV-2 RNA PCR should be performed for all donors.

4-Recipients

Infectious disease consult and informed consent are necessary for all recipients. In children, thorough history taking and specific attention to close contacts in the last 14 days are mandatory. One should notice that the most asymptomatic cases of COVID-19 may be found in pediatric recipients, and there are vague data about the effects of COVID-19 on liver transplanted children. However, a chest CT scan is now recommended for all pediatric recipients irrespective of symptoms. In suspected cases, SARS-CoV-2 RNA PCR can be helpful for confirmation or exclusion.

5- All transplanted cases with a positive history of contact during the last 14 days should be monitored closely, and any new symptom should be considered seriously.

All elective surgeries and procedures should be postponed, and outpatient visits and hospital admissions should be limited. Internet-based visits and instructions may be considered a good option.

In pediatrics, parents, and especially teenagers, one should be informed of the importance of protection and the presence of new symptoms, especially fever and respiratory symptoms.

6- Affected personnel should not have any contact with transplanted cases. Only first-degree relatives without any suggestive symptoms of COVID-19 or recent history of contact can visit transplanted patients.

7- Developing a policy is recommended for all transplant centers.

In conclusion, liver transplantation should be limited to life-threatening cases during the COVID-19 epidemic, and special consideration is mandatory to rule out SARS-CoV-2 infection in both donors and recipients.

Footnotes

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