Combined Heart and Liver Transplantation

Anil Grover and Balvir S Tomar

ABSTRACT

Background: With first liver transplantation in 1963 and first heart transplant in 1967, the first combined liver and heart transplantation (CHLT) took another 21 years to occur. Since then these remain rare events. During last 12 years, this set of procedures has been used more frequently as therapeutic modality. This study was taken to critically review the various aspects of this clinical condition. With the technical innovation to undertake liver transplantation during transient heart failure has made CHLT possible.

Methods/Results: We performed a thorough research of Pubmed/Medline, gathering data regarding situations where CHLT have been performed over last 25 years. This data were discussed to build to better understanding and build consensus about indications for this procedure in this era of organ scarcity.

Conclusions: Combined heart liver transplantation is a viable therapy for patients with end stage heart and liver failure. This is specially so in patients with end stage liver disease who are unable to tolerate orthotopic liver transplant (OLT) post operatively due to cardiac dysfunction. Answer to the question that can giving two organs to a single individual in CHLT is justified? As evident from literature among all who received one thoracic one abdominal organ simultaneously, only CHLT recipients have shown greater survival benefits. CHLT is a safe and effective procedure, with combined graft survival rates similar to isolated heart and isolated liver transplantation. National organ donation registry of a country should formulate its own individual criteria for wait listing and prioritization; as technical expertise and resources vary from one nation to other; so do the organ availability and the statutes of law.

Key words: Combined heart and liver transplantation, end stage liver disease, end stage heart disease

INTRODUCTION

Nearly half a century ago, on December 3, 1967, In Groote Schuur hospital Cape Town, South Africa, Dr Christian Bernard performed world’s first human heart transplantation on 53 year old Lewis Washkansky. Three months ago, for the first time in developing world and first in Asian continent combined heart and liver transplant was done in Apollo Hospitals Chennai, India on 30 year old man. Only a few countries such extraordinary surgeries are possible in end stage liver disease (ESLD) can be complicated later with cardiac arrhythmia, coronary artery occlusions and congestive heart failure. Kasahara has published in this issue of the journal Japanese experience of liver transplant and suggested improvement in its technique for small babies. Therefore, a time has come to critically review this subject.

Schaffer et al have two years ago raised an interesting question- Do waitlisted patients require exception status? This was when writing about talking about combined heart-liver transplantation.

Since the original report of Starzi and Shaw, CHLT has been a rare phenomenon. Greater part of the published data in English medical literature come from single center case reports from the US. Single center experience usually remain limited as maximum number reported from one center in the US was 15 patients. Te et al reported then current status of CHLT combined number 47 in the year 2008. With such reports the
feasibility of this technically demanding procedure was established.14,15 This also led Porret et al16 to conclude that patients waiting for CHLT form a small minority of those who are on organ waiting list. However, with liver and heart both in end stage disease make these patients critical. Most common cause of simultaneous heart and liver disease is systemic illness such as Amyloidosis (Figure 1).

Cannon RM et al17 after review of the US experience with CHLT concluded which are summarized in Table I.

Table 1: Graft survival in patients with amyloidosis going for combined heart and liver transplantation

<table>
<thead>
<tr>
<th>Graft total n = 97 (1987-2010)</th>
<th>1 year (%)</th>
<th>5 Year(%)</th>
<th>10 Year(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liver in cohort = 26 (26.8%)</td>
<td>83.4</td>
<td>72.8</td>
<td>71</td>
</tr>
<tr>
<td>Heart in cohort = 27 (27.8%)</td>
<td>83.5</td>
<td>73.2</td>
<td>71</td>
</tr>
<tr>
<td>Liver alone</td>
<td>79.4</td>
<td>71</td>
<td>65.1</td>
</tr>
<tr>
<td>Heart alone</td>
<td>82.6</td>
<td>71.9</td>
<td>63.2</td>
</tr>
</tbody>
</table>

Liver only graft survival similar in CHLT (p=0.839); Heart only graft survival similar in CHLT (p=0.341)

2. End stage cardiac and liver disease because of unrelated causes
3. End stage heart disease with liver transplantation performed to correct an underlying disorder

Evaluation of patients for liver transplantation represents team efforts including hepatologists, transplant surgeons, social workers and consultants. It is described in Figure 2 and Table II

Table II18: Model for end stage liver disease (MELD) used and is described:

<table>
<thead>
<tr>
<th>MELD Score</th>
<th>Predicts mortality while waiting for liver transplant</th>
<th>3.8 x loge (bilirubin mg %) +11.2 x Loge (INR) + 9.6 x loge (creatinine mg %) + 6.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>PELD Score (for Pediatrics, Growth is factored in)</td>
<td>Adapted for pediatric patients</td>
<td>4.8 x loge (bilirubin mg%) +18.6 x Loge (INR)+6.9 x Loge (albumin gm%)+4.4(&lt;1 Yr age) +6.7(Z score &lt;2SD)</td>
</tr>
</tbody>
</table>

Figure 1: Pathological specimen of heart with amyloidosis
Falk RH. Diagnosis and management of cardiac amyloidosis. Circulation 2005; 112: 2047-2060
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**COMBINED HEART AND LIVER TRANSPLANTATION**

It is uncommonly performed and potentially lifesaving procedure. Indications can be summarized as:

1. End stage cardiac and liver disease because of related causes

![Figure 3](image-url)
Table III: Indications for Combined heart and liver transplantation from actually done patients from literature

<table>
<thead>
<tr>
<th>LANDMARK</th>
<th>On Whom</th>
<th>Where / Who Did?</th>
<th>When?</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Human Heart Transplant</td>
<td>Lewis Kumar</td>
<td>Washkansky</td>
<td>December 1967</td>
</tr>
<tr>
<td>WORLD</td>
<td></td>
<td>Dr Chris, Bernard, South Africa</td>
<td></td>
</tr>
<tr>
<td>First Human Heart Transplant</td>
<td>Not Disclosed</td>
<td>Dr P Venugopal, New Delhi</td>
<td>August 1994</td>
</tr>
<tr>
<td>INDIA</td>
<td></td>
<td>Dr Thomas E Stazy</td>
<td>November 1963</td>
</tr>
<tr>
<td>First successful Liver Transplant</td>
<td>Not Disclosed</td>
<td>Apollo Hospitals, Delhi</td>
<td>November 1998</td>
</tr>
<tr>
<td>WORLD</td>
<td></td>
<td>Dr Starzy, Dr Bahnson, Pittsburgh, PA</td>
<td>December 1989</td>
</tr>
<tr>
<td>First Combined Transplant</td>
<td>26 Yr Woman</td>
<td>Apollo Hospitals, Chennai</td>
<td>November 2015</td>
</tr>
<tr>
<td>WORLD</td>
<td></td>
<td>Dr Thomas E Stazy</td>
<td>November 1998</td>
</tr>
<tr>
<td>First Combined Transplant</td>
<td>30 Yr Man</td>
<td>Apollo Hospitals, Chennai</td>
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<td>December 1989</td>
</tr>
</tbody>
</table>

- Familial Amyloidosis Polyneuropathy
- Cardiac Cirrhosis (as a result of congenital or acquired heart disease)
- Hepatitis C associated Cirrhosis
- Alcoholic Liver Disease
- Iron Storage Disorders
- Primary Biliary Cirrhosis
- Alpha 1 antitrypsin deficiency

Technical Competency, ethical and legal aspects

As a representative of developing country which has achieved a degree of medical technical excellence we have chosen India for this part of the article. First transplant (Kidney) was done in 1970s and over these 4 and half decades we have reached the stage of CHLT. Table (III) illustrates where India stands among the rest of the world. Progress is being made towards bridging the digital gap. That surely is going to make the national registry of recipients. Economic disparity had seen exploitative transplants in 1980s. Pressure on the Government saw the passing of THO.20 Then for next decade there was increase in cadaveric donation of organs. Live related donor liver transplant and Heart transplant from brain dead patient also marked the beginning. Three months ago CHLT done in Apollo Hospitals is another landmark.

There are ethical aspects. Especially in developing countries where there is illiteracy, poverty and resource crunch, organ transplantation purely as a commercial activity cannot be eliminated without health education of masses and stringent laws which are followed. The competence and technical proficiency of Indian medical professionals has never been doubt. It is ethical aspect which regulatory bodies have to take care of.

Another aspect which concerns multi organ transplantation(MOT) in the setting of scarcity. It is a universal problem not confined to India. Reese et al in a recent article stated that ethics of MOT deserves new examination. MOT offers substantial benefit to some recipients but also deprives some waiting for single organ transplant. Thus there are problems of fairness or equity. Ethically, inequalities in allocation are allowable if such imbalances would benefit the least advantaged. Challenge of judging ‘least advantaged’ in the waiting list is assessing many factors like mortality risk, morbidities, length of time waiting for organs, sensitization etc. Such things are decided by professionals of high integrity and assessed by astute medico-social workers with judicious approach. All of us have to travel a long distance in this pursuit.

CONCLUSION

Can CHLT be justified in the sense of giving two organs to one individual? Recently lower survival on the waiting list has been reported after transplant of simultaneous thoracic and abdominal organ transplantation. However, Wolf et al22 found that post transplant survival was worse than the reference group of abdominal transplant in all combinations except CHLT. Here the survival was akin to ‘heart transplant only’ recipients.

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