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GUEST EDITORIAL

HepatoBiliary and Pancreatic Surgery is a relatively new speciality, which has made great strides since inception. The complex nature of this surgery, the presence of comorbidities, and the lack of awareness of these options leading to delayed referrals are some of the problems faced by the specialists in this field.

The department of HPB and Pancreatic Surgery have made rapid strides in a short span of time, and have performed pioneering surgeries in this area.

The Newsletter will showcase their work to General Surgeons, Gastroenterologists, Oncosurgeons, and hopefully will stimulate academic discussions.

I wish the effort all success.

Dr. B.S. Ajai Kumar,
Chairman, HCG

ABOUT THE NEWSLETTER

HPB and Liver Transplantation newsletter is an effort to highlight the progress in the field and to share the experience, knowledge and way forward. This field has seen many achievements over decades in this area, which with sustained research can only improve.

Advances in diagnostic modalities, understanding of the pathophysiology of liver, pancreas and biliary conditions, multimodal team approach have resulted in better outcomes.

This newsletter will showcase the efforts of the HPB and Liver Transplantation Department of HCG. Feedback on this Newsletter will be welcome at (basant02@gmail.com)
ASSOCIATING LIVER PARTITION WITH PORTAL VEIN LIGATION FOR STAGED HEPATECTOMY

ALPPS (Associating Liver Partition with Portal vein ligation for Staged hepatectomy) is a relatively new procedure in the surgical field.

The safe removal of extensive tumor load in the liver has been one of the main focuses of laboratory and clinical research for hepatobiliary surgeons over the past 3 decades. The first breakthrough is credited to Masatoshi Makuuchi, who in 1980s, introduced the concept of the portal vein embolization (PVE) of the right portal branch to induce hypertrophy of the left side of the liver, enabling a safer removal of large or multiple tumors, mostly located in the right hemi-liver and segment IV.

What was the need for a new procedure? The only chance to obtain long-term survival in patients with hepatic tumor or metastasis from other primary cancers is complete tumor resection in the liver. However, in some patients with large tumors, or even with small tumors located close to central structures, the functional liver volume that would remain after radical resection might be too small to maintain liver function. A review of PVE procedures using various methods of embolization may increase the volume of the Future Liver Remnant (FLR) by 10 to 46% after 2 to 8 weeks. Portal Vein Ligation was no better than PVE and offered no significant advantage in terms of increasing FLR or the rate of hypertrophy. It was therefore speculated that the formation of intrahepatic collaterals after PVL/PVE was the reason for the impairment of Liver regeneration after these procedures.

The In-Situ Split of the Liver Parenchyma was therefore devised to prevent the formation of intrahepatic collaterals and thus induce a more rapid and greater amount of FLR regeneration. This staged surgical procedure combined with multimodal treatment options have extended the indications of the procedure.

So how much of benefit can be expected from this procedure? Is it really worth the effort to put a patient through two surgeries with all its risks and cost? These questions were laid to rest by various studies and the efforts of HPB surgeons the world over. Schnitzbauer et al reported a 74% volume increase of the remnant liver in a mean of 9 days! Others have similarly reported a hypertrophy of 40-80% in an average of 6-9 days.

Physiology Involved

- Apoptosis of the hepatocytes on the diseased side.
- Increased markers of hepatocyte proliferation on the FLR side.
- Absence of cross circulation between the two parts of the liver.

Exact cause for this phenomenal response remains an enigma till date.

ALPPS is performed at very dedicated HPB (HepatoPancreatoBiliary) centers across the world. ALPPS registry is maintained through a common portal based in Zurich, Switzerland (www.alpps.net). We are part of the registry.

As of this day, it is a standard procedure performed in the Department of HPB and Liver Transplantation, HCG Bangalore.
Application, How is it performed?

APPLICATIONS

Patients with massive primary Hepatocellular carcinoma (HCC), Cholangiocarcinoma (CCC), Colorectal liver metastases (CRLM), and Neuroendocrine tumor metastases to the liver (NET Mets) are the common candidates for ALPPS.

This is relevant in patients with:

1. Large tumors confined to a single lobe with poor functional liver remnant
2. Multiple liver tumors with a single large on one side and finite on the other side
3. Large tumor with fatty changes in the liver

HOW IS IT PERFORMED?

The ALPPS procedure is performed in two stages. Usually performed for right lobe lesions.

The first Stage involves the following salient steps:

- Laparotomy
- Make sure no peritoneal metastases is noted
- Mobilize the whole liver
- Intraoperative ultrasonogram
- Dissection of the hilum of the liver
- Division of the right portal vein and if lesions are in segment IV, then division of segmental portal veins to segment IV are also performed
- Isolate and tag the right hepatic artery
- Isolate and tag the right hepatic vein
- Division of the liver with a clear margin from the tumor, middle hepatic vein is divided
- Identify and mark the hepatic duct and the plate
- Resection of any left lobe tumors
- Radiofrequency ablation of deep seated lesions if any in the left lobe using ultrasonogram
- Separate the two lobes using a plastic prosthesis (Now we use an absorbable hemostatic agent which prevents adhesion of the two lobes)
- Drain placement
- Complete closure of the abdomen

CT scan is performed (Plain CT) on day 4 and then as required to assess hypertrophy. Second stage is performed once good hypertrophy is noted (Usually 7-14 days, can vary)

- Re-exploration through same wound
- Assess hypertrophy
- Ligation of the right hepatic artery
- Division of the right hepatic vein
- Division of the right hepatic duct and the plate
- Thorough wash out
- Fixation of the left lobe
- Drain placement
- Complete closure of the abdomen

Stages of development of ALPPS procedure
Advantages and Disadvantages: Acceptance

Advantages:

- Applicable for large and or multiple otherwise unresectable tumors
- Waiting period to assess hypertrophy is short
- Scope of tumor progression in the opposite lobe and making it inoperable during the waiting period is minimal
- Tumors in the opposite lobe can be treated in the first stage and hence prevent growth during the waiting period
- Clear assessment of metastases during the first stage
- Minimal or no incidence of post hepatectomy liver failure
- Extension of indication in patients with bilateral liver disease
- Patient recovery in 15-21 days including waiting period
- Possibility of cure in extensive disease
- Can be associated with other Gastrointestinal resections during first stage

Disadvantages:

- Two surgeries
- Morbidity from staged procedure
- Bile leaks, infection, delayed second stage
- Relatively expensive
- Inflammatory response due to use of prosthetic material (plastic sheet): At our center we do not use this anymore
- Increased length of stay in the hospital
- Not curative in all cases
- Nutritional deprivation due to two procedures

Acceptance:

Initial reluctance is a general rule among patients counseled for ALPPS. Due to lack of an alternative, this procedure is accepted among most. Complete information to the patient and the family is key to the success of the procedure. Patients need to continue on adjuvant forms of treatment after the procedure.

Communication regarding the prolonged stay in the hospital, morbidity, financial incurrences, possibility of a cure or prolonged survival, usually ascertain the patients about the positiveness.

Patients do get confidence after going through our series which is among the largest in India with this procedure.
Our series

List of ALPPS procedures performed at HCG, Bangalore

<table>
<thead>
<tr>
<th>No</th>
<th>Diagnosis</th>
<th>Age/Gender</th>
<th>Left lateral Pre %</th>
<th>Left lateral Post %</th>
<th>Day of 2nd procedure</th>
<th>Months of survival</th>
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<tbody>
<tr>
<td>1</td>
<td>HCC</td>
<td>66/M</td>
<td>23</td>
<td>28</td>
<td>14</td>
<td>25</td>
</tr>
<tr>
<td>2</td>
<td>HCC</td>
<td>52/M</td>
<td>20</td>
<td>29</td>
<td>12</td>
<td>29+</td>
</tr>
<tr>
<td>3</td>
<td>CRC Mets</td>
<td>42/M</td>
<td>16</td>
<td>26</td>
<td>11</td>
<td>29+</td>
</tr>
<tr>
<td>4</td>
<td>CCC</td>
<td>57/M</td>
<td>17</td>
<td>27</td>
<td>10</td>
<td>19</td>
</tr>
<tr>
<td>5</td>
<td>CRC Mets</td>
<td>72/M</td>
<td>21</td>
<td>27</td>
<td>7</td>
<td>25+</td>
</tr>
<tr>
<td>6</td>
<td>HCC</td>
<td>31/M</td>
<td>22</td>
<td>28</td>
<td>12</td>
<td>22+</td>
</tr>
<tr>
<td>7</td>
<td>NET CRC Mets</td>
<td>65/M</td>
<td>16</td>
<td>25</td>
<td>10</td>
<td>2 (Pulmonary embolism)</td>
</tr>
<tr>
<td>8</td>
<td>CCC</td>
<td>53/M</td>
<td>18</td>
<td>28</td>
<td>9</td>
<td>20+</td>
</tr>
<tr>
<td>9</td>
<td>HCC</td>
<td>60/M</td>
<td>22</td>
<td>29</td>
<td>14</td>
<td>15+</td>
</tr>
<tr>
<td>10</td>
<td>CRC Mets</td>
<td>43/M</td>
<td>16</td>
<td>24</td>
<td>8</td>
<td>14+</td>
</tr>
<tr>
<td>11</td>
<td>CCC</td>
<td>67/M</td>
<td>19</td>
<td>27</td>
<td>4</td>
<td>6+</td>
</tr>
<tr>
<td>12</td>
<td>NET PNET Mets</td>
<td>55/F</td>
<td>25 (Multiple liver resections + RFA)</td>
<td>28</td>
<td>10</td>
<td>+</td>
</tr>
</tbody>
</table>

HCC: Hepatocellular Carcinoma
CCC: Cholangiocarcinoma
CRC: Colorectal cancer
PNET: Pancreatic Neuroendocrine tumor
RFA: Radiofrequency ablation
Procedure In Pictures

Pre Op Image:  
First Stage:  

Pre Op Image (Prior to stage II):

Second Stage:  

References:


Objective: To evaluate a new 2-step technique for obtaining adequate but short-term parenchymal hypertrophy in oncologic patients requiring extended right hepatic resection with limited functional reserve. Background: Patients presenting with primary or metastatic liver tumors often face the dilemma that the remaining liver tissue may not be sufficient. Preoperative portal vein embolization has thus far been established as the standard procedure for achieving resectability. Methods: Two-staged hepatectomy was performed in patients who preoperatively appeared to be marginally resectable but had a tumor-free left lateral lobe. Marginal respectability was defined as a left lateral lobe to body weight ratio of less than 0.5. In the first step, surgical exploration, right portal vein ligation (PVL), and in situ splitting (ISS) of the liver parenchyma along the falciform ligament were performed. Computed tomographic volumetry was performed before ISS and before completion surgery.

Conclusions: Two-step hepatic resection performing surgical exploration, PVL, and ISS results in a marked and rapid hypertrophy of functional liver tissue and enables curative resection of marginally resectable liver tumors or metastases in patients that might otherwise be regarded as palliative.

Editorial Comments: This was the landmark paper that studied ALPPS as an independent HPB procedure first. This paper paved the way for other authors to investigate and improve upon the procedure. They were the first group to describe the technique of resection in ALPPS as a standard and the current method that is followed is all in reference to the methods described in this article.
Highlights of Volume 2: Bloodless Liver Transplantations highlights

At HCG, we perform both living donor and deceased (cadaver) donor liver transplantations.

We have achieved great results at our center with patients doing well after the procedure and living longer and healthier.

The following volume concentrates on the management aspects of liver transplantation and the procedure per se. We also want to emphasize that we have performed 5 transplantations without any blood or blood product transfusions.

Your feedback will be helpful to us:

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Artist
Rama Suresh

Title
Untitled

Media
Mixed Media on canvas

Size
72 x 36 inches

Year
2009

Courtesy
Swasti Art Gallery, HCG K.R. Road

Proceeds of the sale of this painting will be used for assisting poor patients.

For more information contact:
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