RESECTION IN DIFFICULT SEGMENT
LAPAROSCOPIC LIVER RESECTION

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Seoul National University Bundang Hospital
Contents

• What is difficult locations now?
• Anatomic liver resection.
• Video clips.
Indications of Laparoscopic Resection

• Contraindication
  – Large tumor, deeply seated, or posteriorly located in the right lobe
  – Tumor close to the portal bifurcation or suprahepatic junction.

• Indication
  – Small, superficial, or peripheral
  – Segment 2, 3, 4b, 5, 6

Most of the reported cases have had peripheral lesions located in the anterolateral segments (segments 2, 3, 4b, 5, 6).
We, All, have Tried to Overcome Previous Limitation on Location.
Case Report

Total Laparoscopic Right Posterior Sectionectomy for Hepatocellular Carcinoma

YOO-SEOK YOON, MD, HO-SEONG HAN, MD, PhD, YOO SHIN CHOI, MD, JIN-YOUNG JANG, MD, KYUNG-SUK SUH, MD, SUN-WHE KIM, MD, KUHN UK LEE, MD, and YONG-HYUN PARK, MD
Outcomes of laparoscopic right posterior sectionectomy in patients with hepatocellular carcinoma in the era of laparoscopic surgery

Jai Young Cho, MD, PhD, Ho-Seong Han, MD, PhD, Yoo-Seok Yoon, MD, PhD, YoungRok Choi, MD, and Woohyung Lee, MD, Seoul, Republic of Korea
Comparison between Laparoscopic & Open Liver Resection after RPS in HCC

Cho JY, Han HS et al. Surgery 2015
Feasibility of laparoscopic liver resection for tumors located in the posterosuperior segments of the liver, with a special reference to overcoming current limitations on tumor location

Jai Young Cho, MD, PhD, Ho-Seong Han, MD, PhD, Yoo-Seok Yoon, MD, PhD, and Sang-Hyun Shin, MD, Seoul, Korea

*Surgery 2008;144:32-8.*

- **Outcomes of laparoscopic liver resection for tumors located in PS is comparable as tumors located in AL.**
Comparison of laparoscopic liver resection for hepatocellular carcinoma located in the posterolateral and anterolateral segments: A case-matched analysis

Woohyung Lee, MD, Ho-Seong Han, MD, PhD, Yoo-Seok Yoon, MD, PhD, Jai Young Cho, MD, PhD, YoungRok Choi, MD, Hong Kyung Shin, MD, Jae Yool Jang, MD, Hanlim Choi, MD, Jae Seong Jang, MD, and Seong Uk Kwon, MD, Seongnam, Republic of Korea
**Post Sup vs. Anterolateral**

**Overall survival**

**Disease free survival**

Lee WH, Han HS et al. *Surgery, 2016*
Role of intercostal trocars on laparoscopic liver resection for tumors in segments 7 and 8

Woohyung Lee · Ho-Seong Han · Yoo-Seok Yoon · Jai Young Cho · Young Rok Choi · Hong Kyung Shin

Fig. 1 Trocar placement at the 7th or 9th intercostal space (White arrow, 7th intercostal trocar; black arrow, 9th intercostal trocars)
Laparoscopic liver resection for centrally located tumors close to the hilum, major hepatic veins, or inferior vena cava

Yoo-Seok Yoon, MD, PhD, Ho-Seong Han, MD, PhD, Jai Young Cho, MD, PhD, Ji Hoon Kim, MD, and Yujin Kwon, MD, Seoul, Korea

Yoon YS, Han HS et al. Surgery, 2013
Comparison between Open & Laparoscopy

Overall Survival

Ds-free Survival

Yoon YS, Han HS et al. *Surgery, 2013*
Fate of Contraindication on LLS
Contents

• What is difficult locations now?
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Anatomic Liver Resection

Anatomic resection including bi & mono-segmentectomy

HCC is usually associated with poor liver function. Volume preserving as possible. Resection of only the involved segment.
Anatomical Resection
Beneficial in Oncology

HCC invades Portal Vein
HCC intrahepatic metastasis
HCC becomes a source of tumor thrombus

Remnant Liver Ischemia could be more detrimental.
# Multivariate Analysis of Prognosis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Overall Survival</th>
<th>Disease-Free Survival</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR (95% CI)</td>
<td>P Value</td>
</tr>
<tr>
<td>Male sex</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>ICGR at 15 min &gt;10%</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Stage T3 or T4</td>
<td>1.66 (0.88-3.13)</td>
<td>.12</td>
</tr>
<tr>
<td>Previous TACE</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Child-Pugh classification B or C</td>
<td>1.36 (0.77-2.42)</td>
<td>.29</td>
</tr>
<tr>
<td>Severe remnant liver ischemia</td>
<td>6.98 (4.27-11.43)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Open surgery</td>
<td>1.76 (1.10-2.82)</td>
<td>.02</td>
</tr>
<tr>
<td>Intraoperative transfusion</td>
<td>0.98 (0.61-1.58)</td>
<td>.95</td>
</tr>
<tr>
<td>Nonanatomical resection</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Presence of a satellite nodule</td>
<td>1.17 (0.63-2.19)</td>
<td>.62</td>
</tr>
<tr>
<td>Microscopic vascular invasion</td>
<td>1.16 (0.50-1.42)</td>
<td>.51</td>
</tr>
<tr>
<td>Multinodular confluent or infiltrative gross tumor type</td>
<td>2.76 (1.13-6.71)</td>
<td>.03</td>
</tr>
<tr>
<td>Histologically confirmed cirrhosis</td>
<td>1.23 (0.74-2.04)</td>
<td>.43</td>
</tr>
</tbody>
</table>

Cho JY, Han HS et al. *JAMA Surg*, 2017
Association of Remnant Liver Ischemia With Early Recurrence and Poor Survival After Liver Resection in Patients With Hepatocellular Carcinoma

Jai Young Cho, MD, PhD; Ho-Seong Han, MD, PhD; YoungRok Choi, MD; Yoo-Seok Yoon, MD, PhD; Sungho Kim, MD; Jang Kyu Choi, MD; Jae Seong Jang, MD; Seong Uk Kwon, MD; Haeryoung Kim, MD, PhD

Figure 2. Comparison of Overall Survival and Disease-Free Survival

Cho JY, Han HS et al. JAMA Surg, 2017
### Our Reports on Anatomic LLR

<table>
<thead>
<tr>
<th>Type of resection</th>
<th>Year</th>
<th>Journal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left lateral sectionectomy</td>
<td>2006</td>
<td>J Pediatr Surg</td>
</tr>
<tr>
<td>Right posterior sectionectomy</td>
<td>2006</td>
<td>J Laparoendosc Adv Surg Tech A</td>
</tr>
<tr>
<td>Central bisectionectomy</td>
<td>2009</td>
<td>J Laparoendosc Adv Surg Tech A</td>
</tr>
<tr>
<td>Right hepatectomy</td>
<td>2010</td>
<td>Ann Surg Oncol</td>
</tr>
<tr>
<td>S5 segmentectomy</td>
<td>2011</td>
<td>J Laparoendosc Adv Surg Tech A</td>
</tr>
<tr>
<td>S4 segmentectomy</td>
<td>2011</td>
<td>Surg Laparosc Endosc Percutan Tech</td>
</tr>
<tr>
<td>Right anterior sectionectomy</td>
<td>2012</td>
<td>J Laparoendosc Adv Surg Tech A</td>
</tr>
<tr>
<td>Extended RPS</td>
<td>2015</td>
<td>Surgery</td>
</tr>
<tr>
<td>Living donor right hepatectomy</td>
<td>2015</td>
<td>Surgical Endoscopy</td>
</tr>
<tr>
<td>S4a, S4b, ext-S4</td>
<td>2015</td>
<td>J Laparoendosc Adv Surg Tech A,</td>
</tr>
<tr>
<td>S3 and S4 Bisegmentectomy</td>
<td>2016</td>
<td>J Laparoendosc Adv Surg Tech A</td>
</tr>
<tr>
<td>S2 segmentectomy</td>
<td>2016</td>
<td>J Laparoendosc Adv Surg Tech A</td>
</tr>
<tr>
<td>Total caudate lobectomy</td>
<td>2016</td>
<td>J Laparoendosc Adv Surg Tech A</td>
</tr>
<tr>
<td>S8 segmentectomy</td>
<td>2017</td>
<td>Ann Surg Oncol</td>
</tr>
<tr>
<td>S6 segmentectomy</td>
<td>2017</td>
<td>Surg Laparosc Endosc Percutan Tech</td>
</tr>
</tbody>
</table>

1000 cases of laparoscopic liver resection.   Han HS, Yoon YS, Cho JY, Choi YR et al.
Anatomic Liver Resection on Difficult Part
Total Anatomical Laparoscopic Liver Resection of Segment 4 (S4), Extended S4, and Subsegments S4a and S4b for Hepatocellular Carcinoma

Young Ki Kim, MD, Ho-Seong Han, MD, PhD, Yoo-Seok Yoon, MD, PhD, Jai Young Cho, MD, PhD, and Woo hyung Lee, MD
Laparoscopic Total Caudate Lobectomy for Hepatocellular Carcinoma

Kit-Man Ho, MBBS, FRCS (Edin),¹,² Ho-Seong Han, MD, PhD,¹ Yoo-Seok Yoon, MD, PhD,¹ Jai Young Cho, MD, PhD,¹ Young Rok Choi, MD,¹ Jae Seong Jang, MD,¹ Seong Uk Kwon, MD,¹ Sungho Kim, MD,¹ and Jang Kyu Choi, MD¹
Three-Dimensional Laparoscopic Anatomical Segment 8 Liver Resection with Glissonian Approach

Jae Yool Jang, MD¹, Ho-Seong Han, MD, PhD², Yoo Seok Yoon, MD, PhD², Jai Young Cho, MD, PhD², YoungRok Choi, MD², Woohyung Lee, MD³, Hong Kyung Shin, MD⁴, and Han Lim Choi, MD⁵

¹Department of Surgery, Gyeongsang National University Hospital, Jinju, Korea; ²Department of Surgery, Seoul National University Bundang Hospital, Seoul National University College of Medicine, Seoul, Korea; ³Department of Surgery, Gyeongsang National University School of Medicine, Jinju, Korea; ⁴Department of Surgery, The Armed Forces Medical Command, Seongnam-si, Korea; ⁵Department of Surgery, Chungbuk National University Hospital, Cheongju, Korea
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Anatomical S8 segmentectomy for HCC with diaphragm resection

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Laparoscopic total Caudate Lobectomy

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Greatness is not in where we stand, but in what direction we are moving. We must sail sometimes with the wind and sometimes against it.

- Oliver Wendell Holmes