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Obtaining haemostasis in Laparoscopic Surgery

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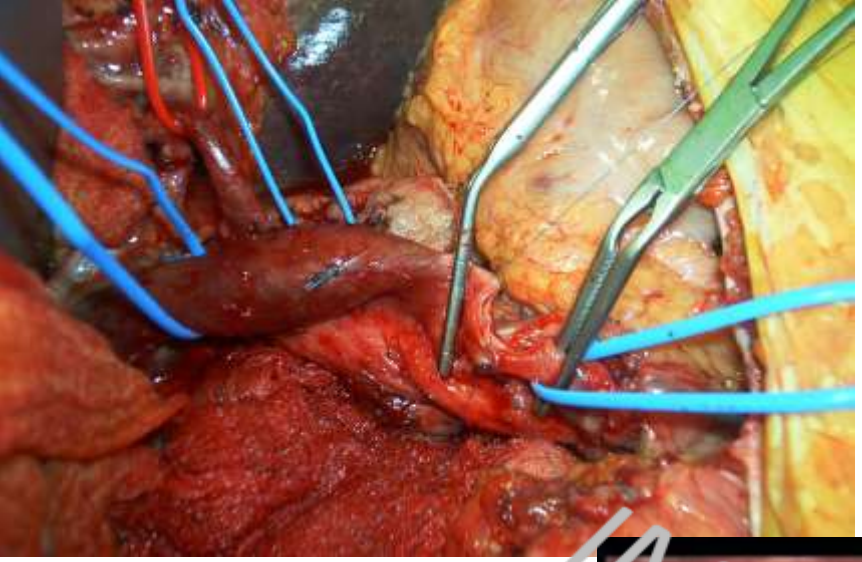
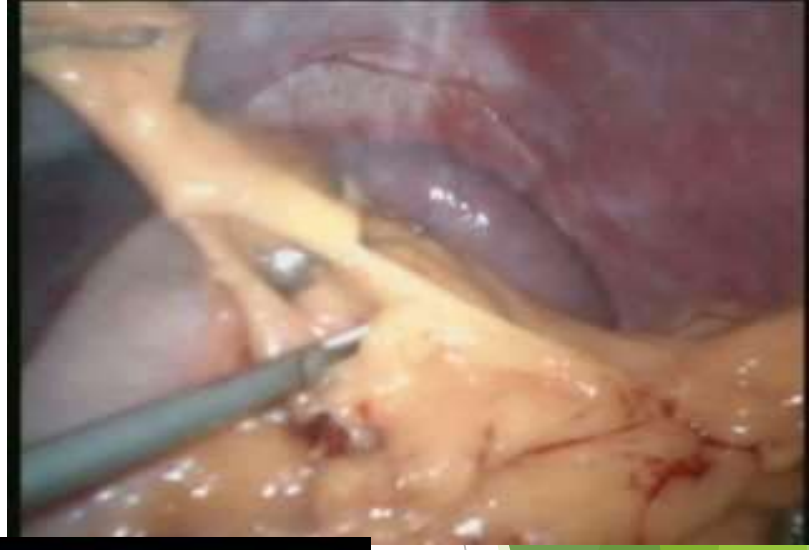
Nablus 10/09/2011



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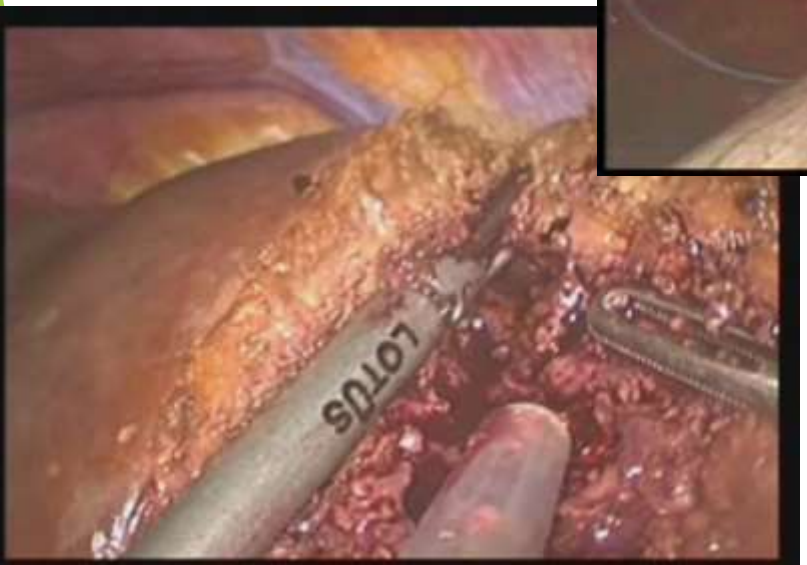
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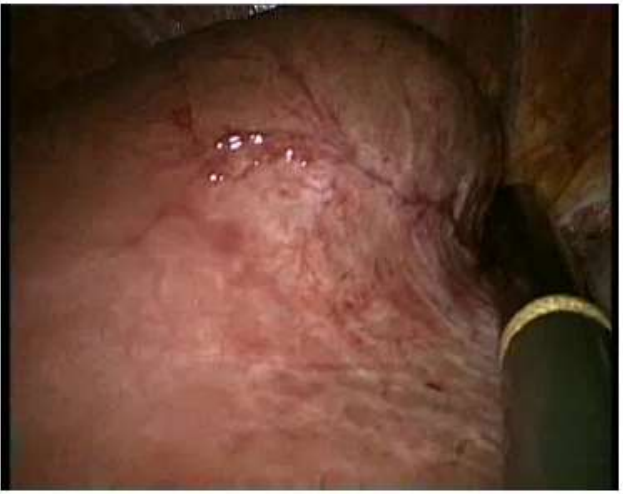
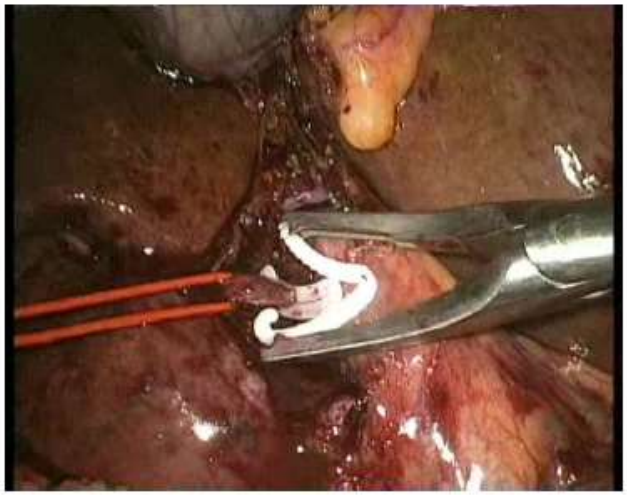
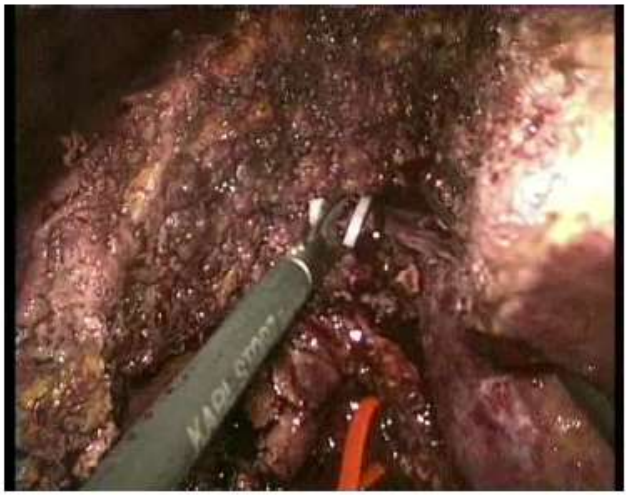
A.L.L.P.S.

The 11th course in Advanced Laparoscopic Liver and Pancreatic Surgery (ALLPS) - Southampton

26th & 27th May 2011

Aims

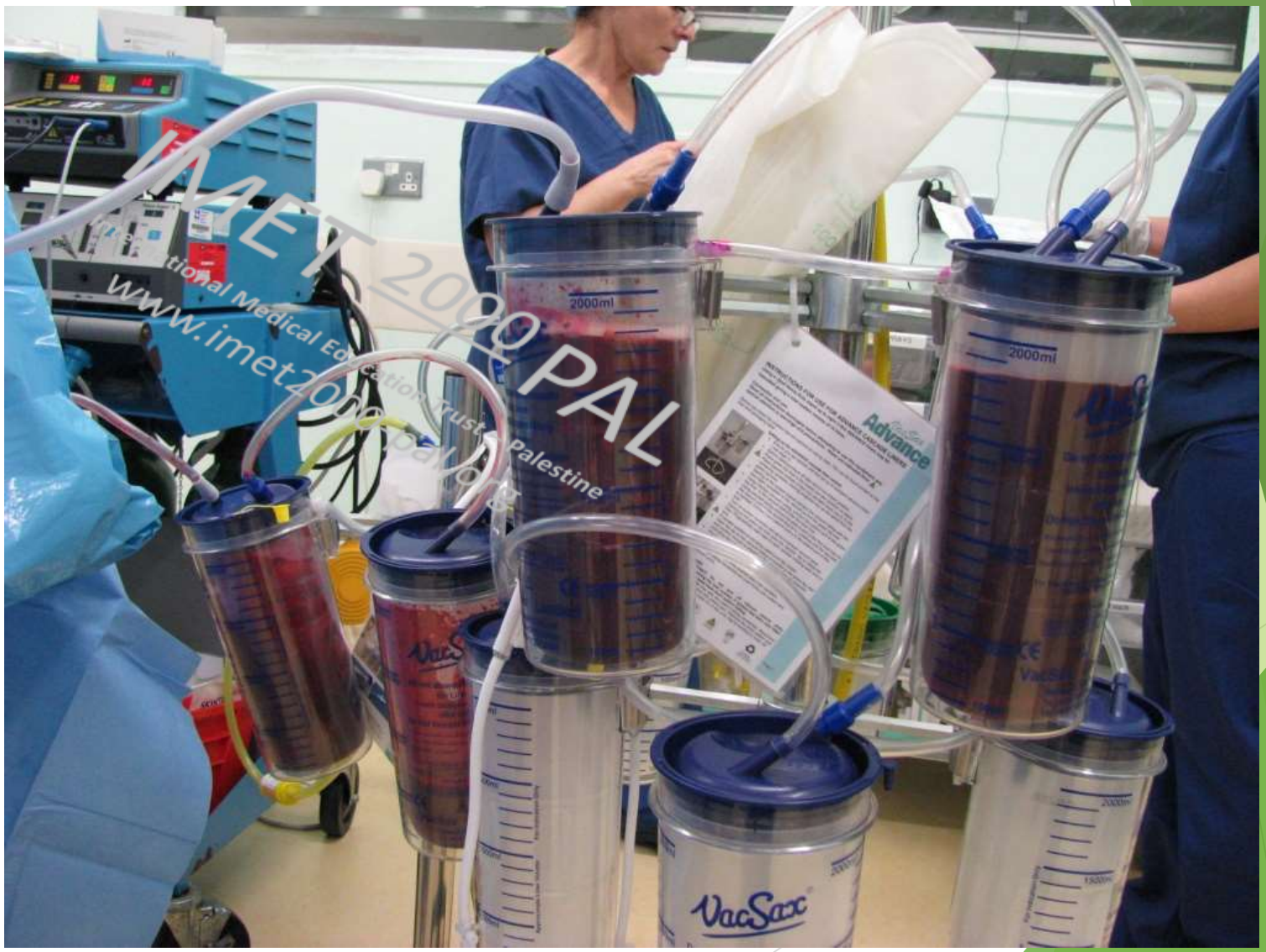
- Review the importance of haemostasis
- Share our experience in laparoscopic liver and pancreatic surgery
- Demonstrate haemostatic techniques

Haemostasis

- Traced back to the primitive's man realization that unchecked bleeding means death
- Early Greeks and Romans used vegetables and minerals dressing
- Early surgeon avoided vessels in their incisions
- Herophilus described bleeding from veins and arteries

For years, the standard method of haemostasis was to plunge the amputation stump into boiling oil

Bleeding is still a reality for all surgeons



Bleeding

- How can we prevent it ?
- How can we treat it ?

Basic Principles of Haemorrhage Control

Pre-Emptive

- Planning
- Anaesthetic
- Haemodynamic
- Clotting
- Equipment
- Exposure
- Mobilisation
- Vascular Control

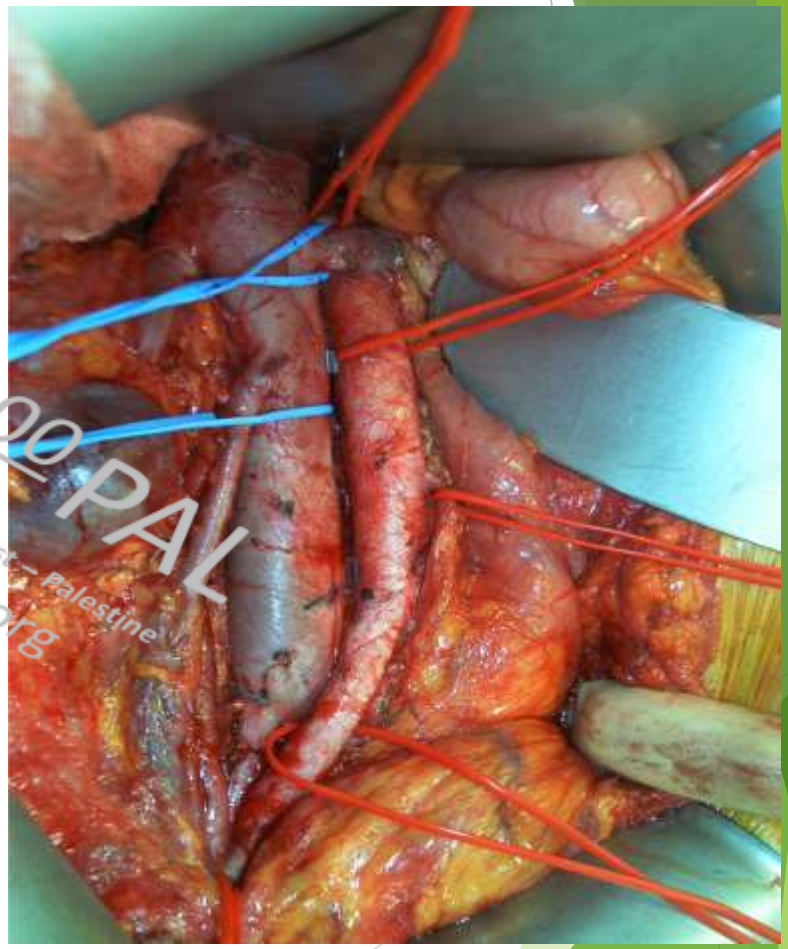
Reactive

- Pressure (digital / packing)
- Elevation
- Vascular clamping
- Clear the field (suction)
- Diathermy
- Sutures, clips, staplers

- Topical Haemostats

Time..... Time.....Time.....Time.....Time

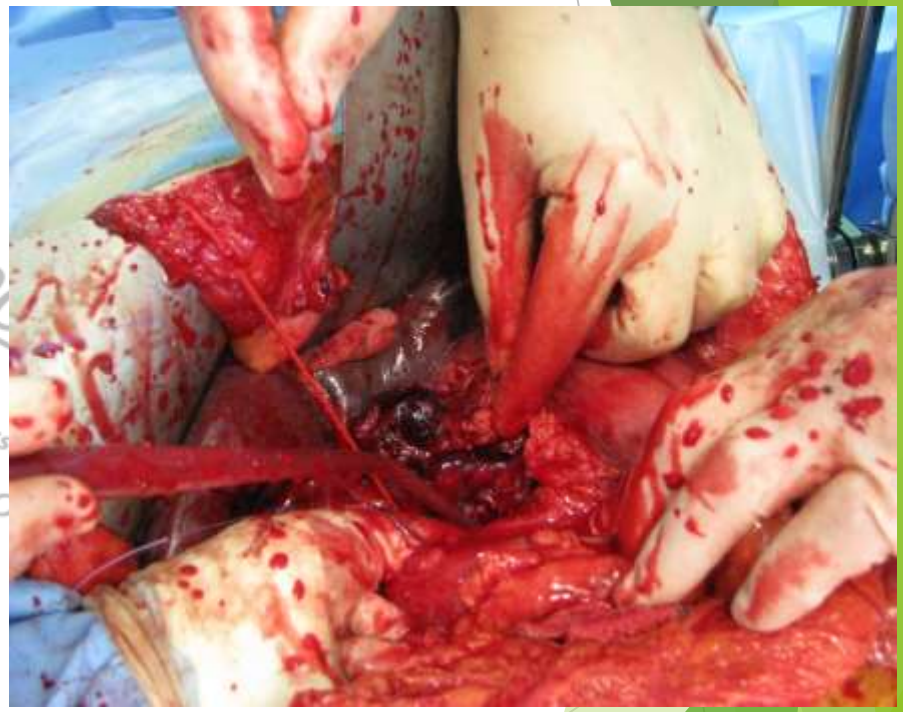
Access, Exposure, Anatomic Dissection, Control



Arterial bleeding

- Exposure
- Retraction
- Suction
- Vascular slings
- Sutured repair

= Control



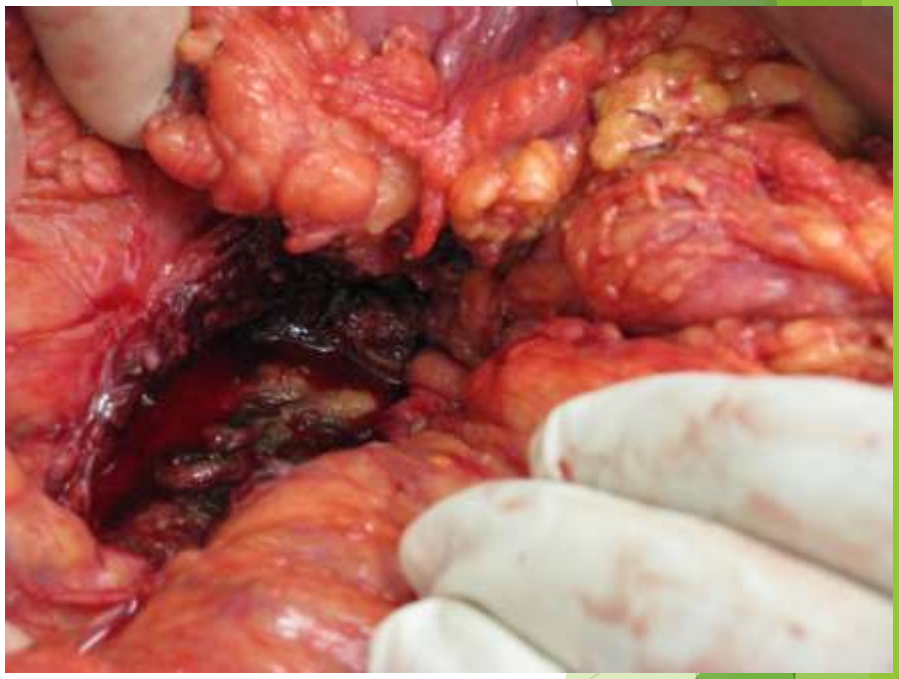
Venous bleeding

- Digital pressure
- Elevation
- In flow and out flow control
- Reduce CVP
- Pack

- Suture
- Topical haemostats
- Time

Pancreatic Necrosectomy

- Venous bleeding
- Inaccessible bleeding
- Broad area ooze
- Coagulopathy



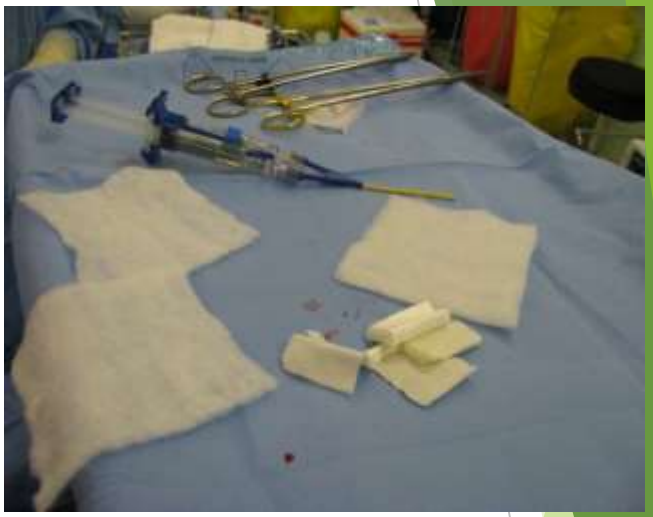
A haemostatic product !!!

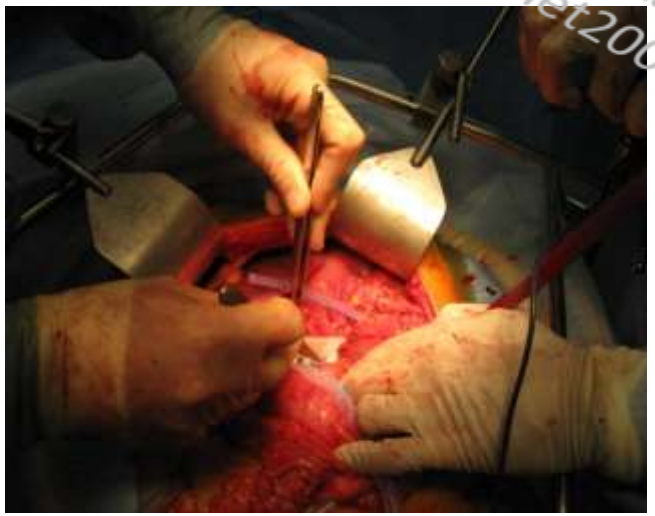
"You clumsy ape! I ask for a hemostat and you hand me a banana. Where'd you go to med school, the Bronx Zoo?"

Topical Fibrin Sealants

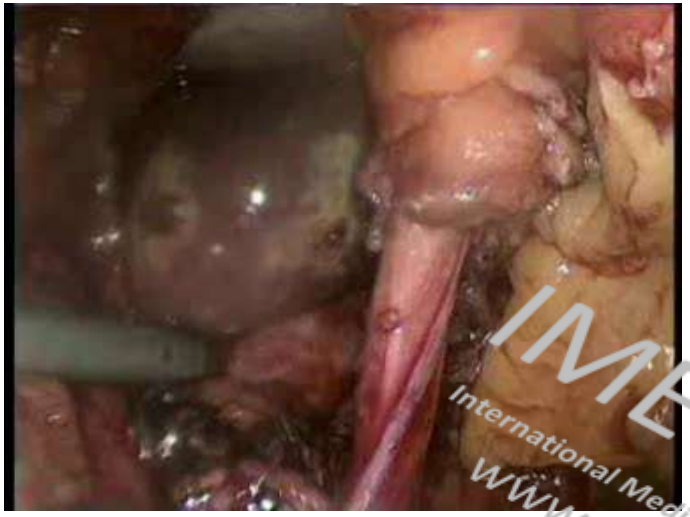
Human derived fibrinogin & thrombin = Biological action

The “Sandwich” Technique





Fibrillar = Mechanical & **evicel** Biological action



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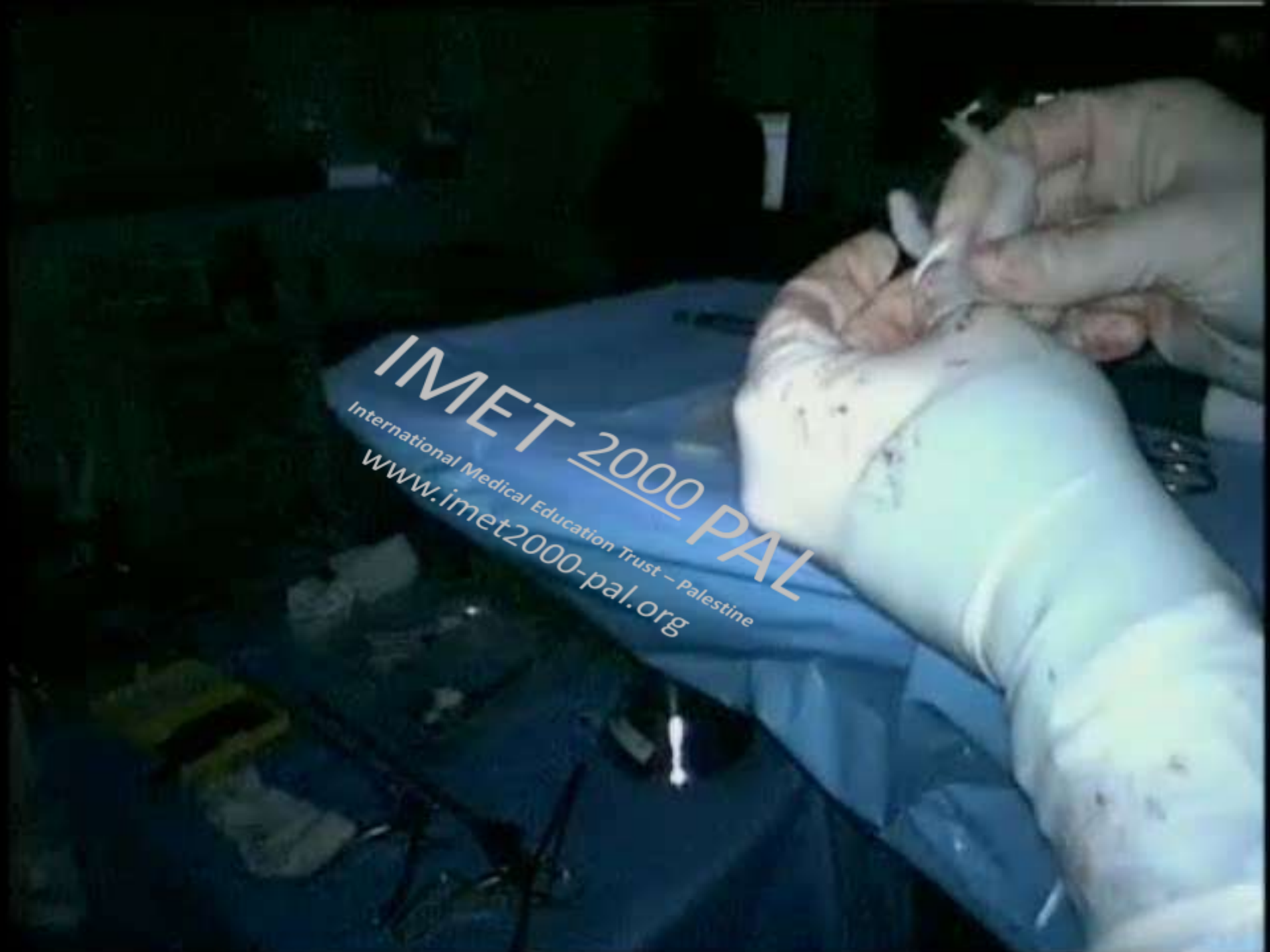
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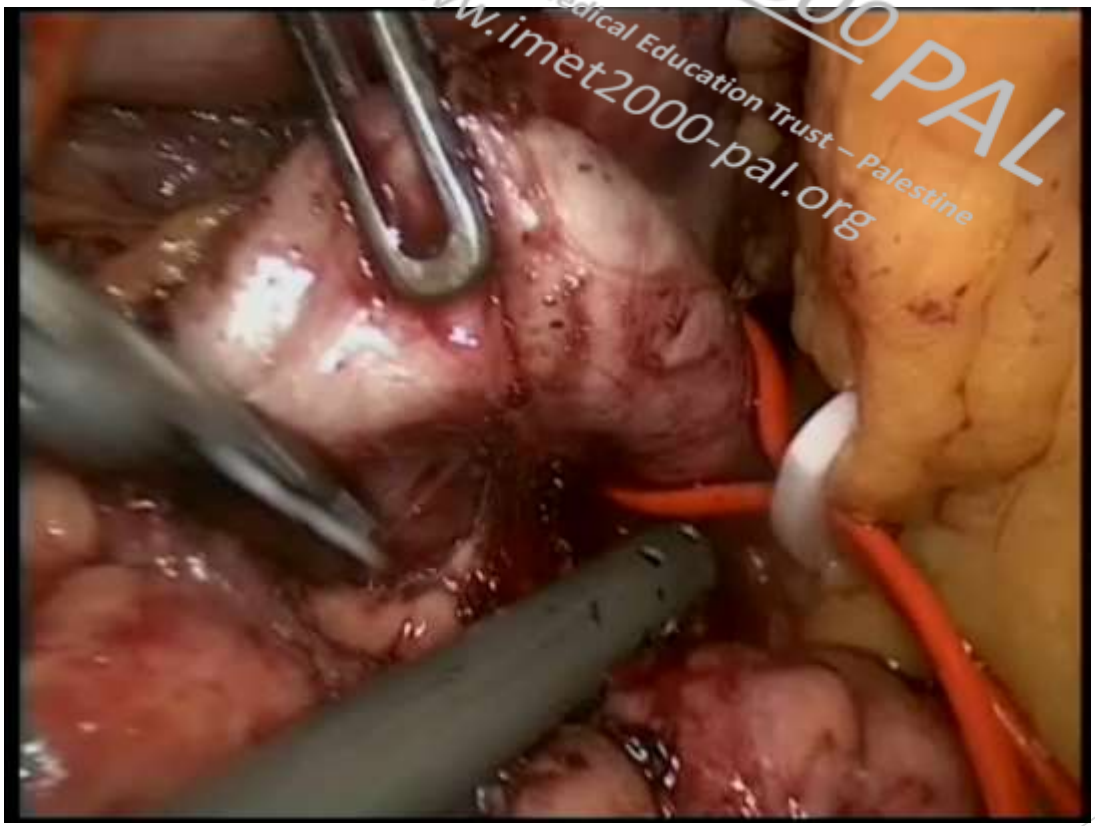
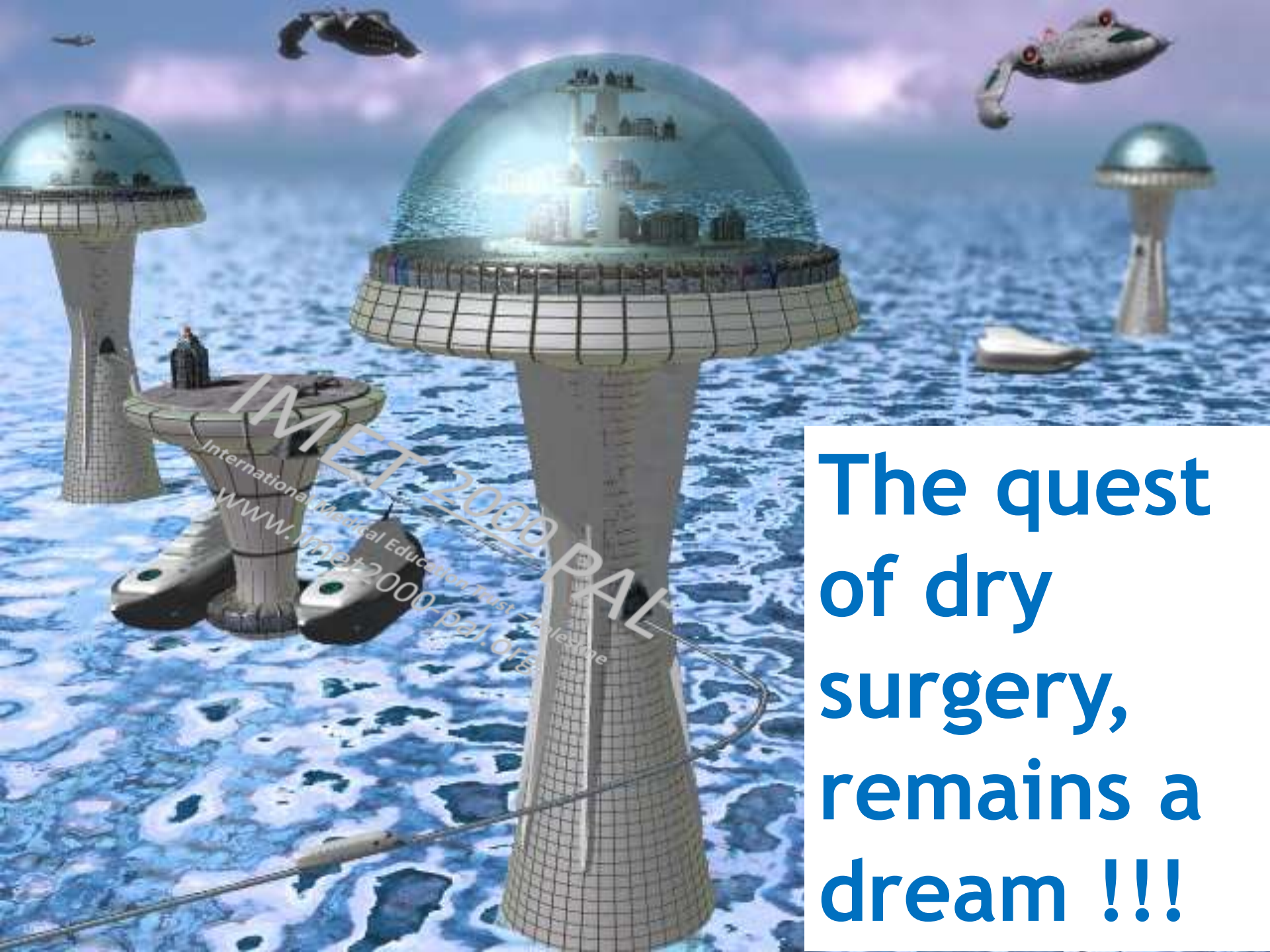




The quest of dry surgery, remains a dream !!!

Haemostasis in laparoscopic liver surgery

- The major factor to delay the expansion of open liver surgery(Yamamoto et al 1994 & Tsao et al 1994)

In laparoscopic liver surgery

-loss of manual compression

-need of advanced skills for quick efficient suturing

- the risk of gas embolism

Importance of haemostasis in laparoscopic liver surgery

- Improves patient's outcome (Kooby et al. 2003)
- Reduces the need for transfusion (Melendez et al. 1998)
- Reduces rate of open conversion
  - 80% is due to bleeding (Jean-François et al. 2002)

- Reduces light absorption

better views

Easier identification of important structures

Surg Endosc (2010) 24:572–577
DOI 10.1007/s00464-009-0597-x

Bleeding and hemostasis in laparoscopic liver surgery

Mohammad Abu Hilal · Tim Underwood · Matthew G. Taylor · Khaled Hamdan · Hassan Elberm · Neil W. Pearce

Received: 19 January 2009 / Accepted: 11 June 2009 / Published online: 16 July 2009

Abstract

Background Minimally invasive liver resection is gaining acceptance worldwide. However, the laparoscopic approach often is reserved for small segmental resections due to the fear of significant blood loss. The expansion of laparoscopic liver surgery will depend on the ability of expert surgeons and technological advances to address the management of bleeding and hemostasis with any new approach. The 4½- year experience of a single center performing totally laparoscopic liver resections is presented, with special reference to the techniques the authors have developed to limit blood loss.

Methods Between 2003 and 2007, 80 patients underwent laparoscopic liver surgery for benign and malignant conditions including colorectal cancer metastases ($n = 31$), hepatocellular carcinoma ($n = 6$), neuroendocrine tumor

blood loss for right-sided transections than for the left liver surgery (821 vs 147 ml; $p = 0.012$). Four (57%) of seven resections converted to open procedures because of bleeding. No deaths occurred, and only two patients required intraoperative blood transfusions. There were eight complications and one bile leak. The median length of hospital stay was 3 days.

Conclusions The authors' experience with 80 totally laparoscopic liver resections over a 4½-year period demonstrates that laparoscopic liver surgery is safe and effective in experienced hands for major resections. An intimate knowledge of the technology and techniques available for preventing and managing significant hemorrhage during laparoscopic liver resection is required for all surgeons performing laparoscopic liver surgery.

Haemostasis in laparoscopic liver surgery

- Pre-operative management.
- Liver mobilization
- Control of the inflow
- Parenchymal dissection
- Control of the outflow
- Treatment of the resection margins

Pre-operative management

- LOW VENOUS PRESSURE SURGERY:

With a positive intra-abdominal pressure we get away with higher CVP

- 5-7mmHg to reduce the risk of venous air embolism.

Liver mobilization

- Liver ligaments are divided by a combination of scissors diathermy and dissection with ultrasonic coagulating shears
- Special attention to retrocaval hepatic space

Control of the inflow

- PRINGLE MANOEUVRE
- The pneumo peritoneum is a natural Pringle's
- We always prepare it to use if needed
- If not possible lateral dissection to permit the use of a

laparoscopic
endovascular Debaky
Tangential Occlusion
Clamp if needed

Extra parenchymal vascular control

- In major hemihepatectomies
- Technically difficult, hence requires good access to the portal structures.
- Good dissection of the vessel, complete view and efficient control are essential.

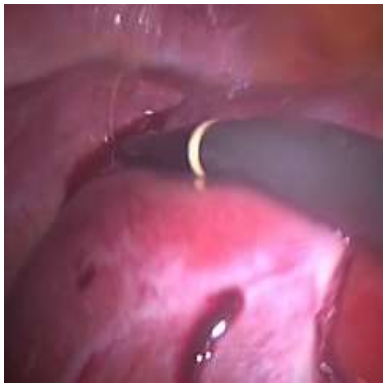
Extra parenchymal vascular control

Judicious use of clips

Clips may affect your endovascular staples

Use the self-locking polymer clips To minimise clip slippage

Parenchymal dissection



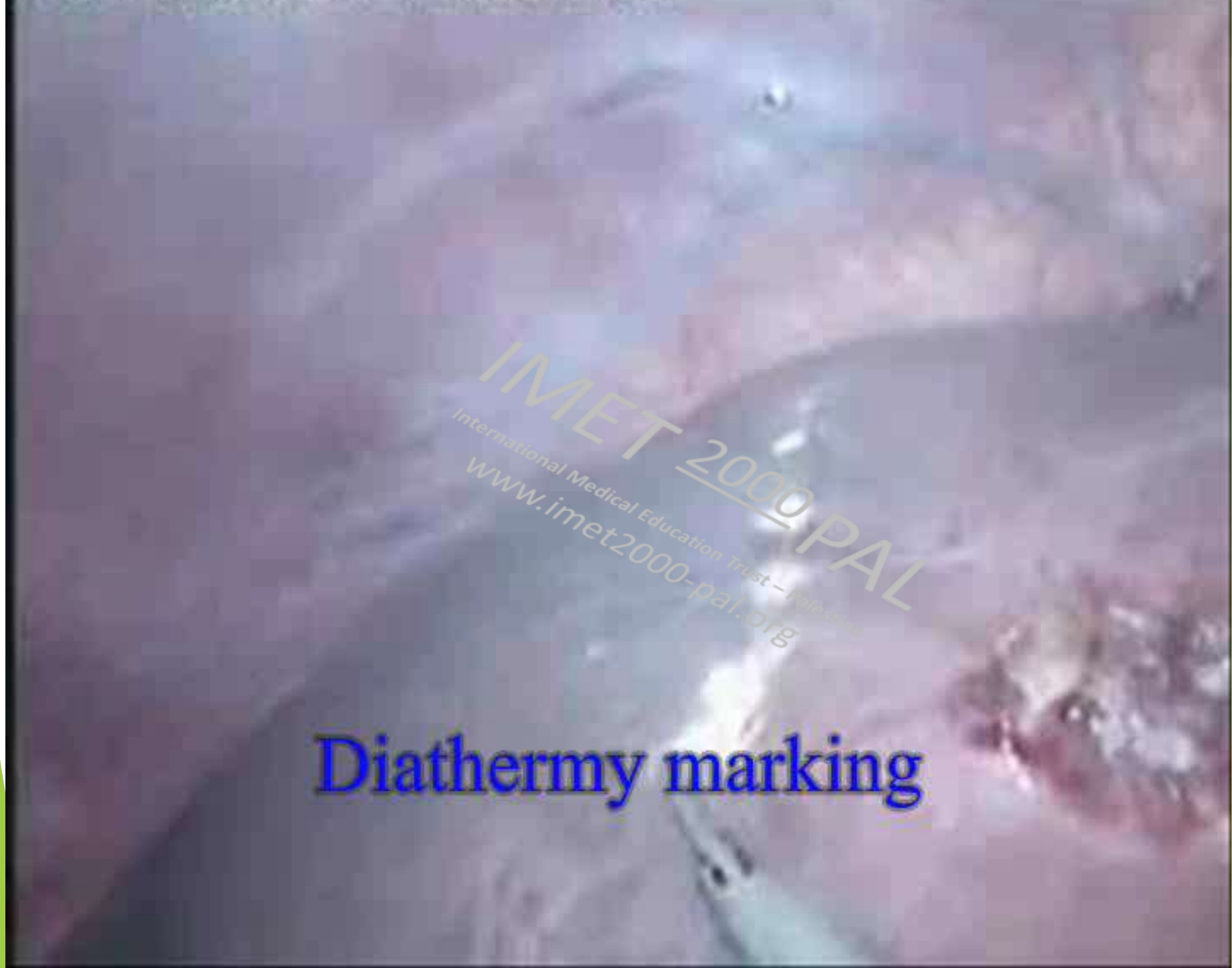
Get a good assistant

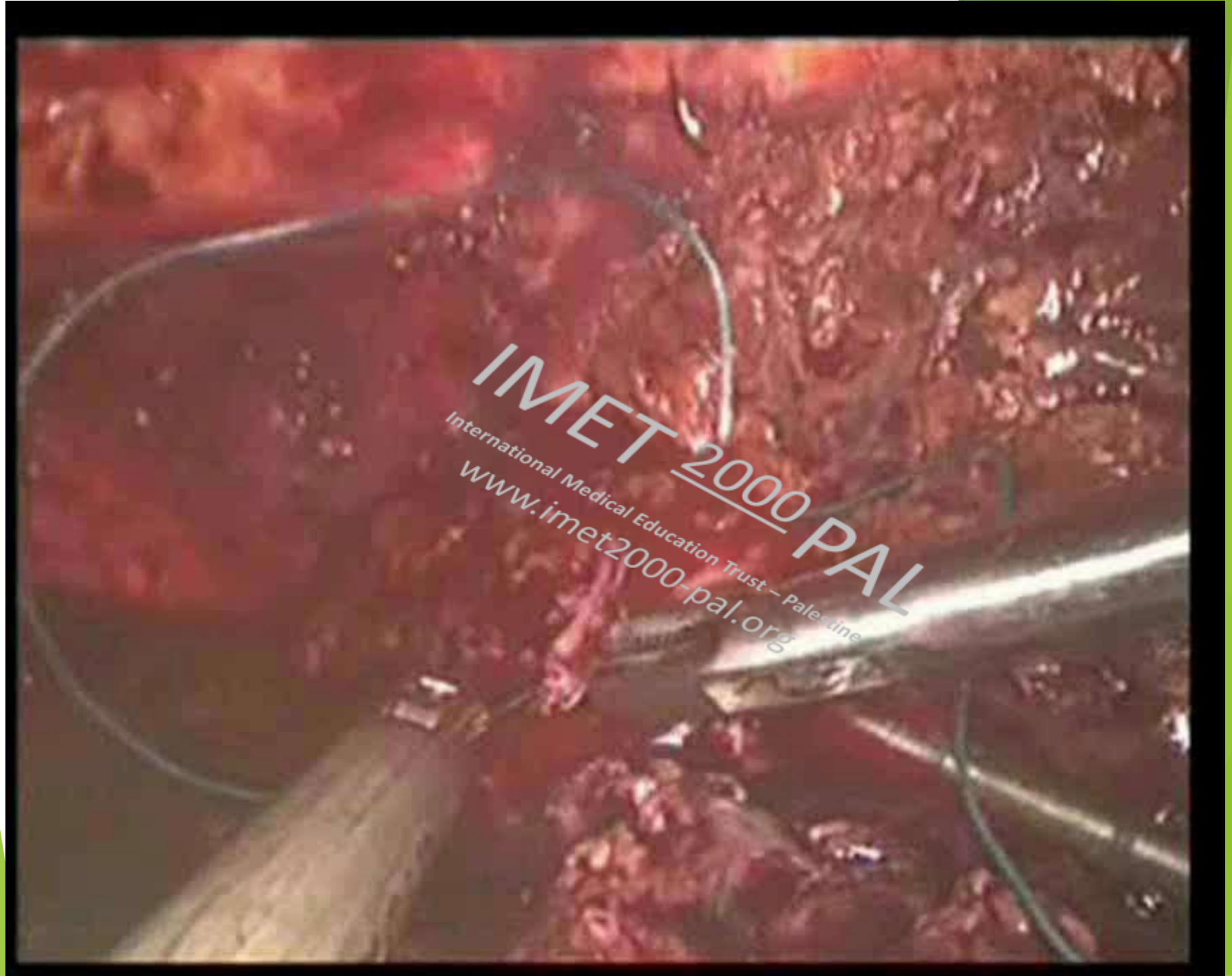
IO USS

Mark your transection line
Camera and Instrument in line with the transection line

From front to the back 2-3 mm layers and don't create halls

Take your time , Know your instruments

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Digestive Surgery

Dig Surg 2008;25:305–308
DOI: 10.1159/000155222

Published online: September 11, 2

Laparoscopic Left Lateral Liver Sectionectomy: A Safe, Efficient, Reproducible Technique

M. Abu Hilal N.W. Pearce

Hepatobiliary-Pancreatic and Laparoscopic Surgical Unit, Southampton University Hospital, Southampton, UK

Key Words

Laparoscopic liver surgery · Left lateral sectionectomy, surgical technique · Laparoscopic left lateral sectionectomy · Laparoscopic liver resection

Introduction

Thanks to recent excellent results in terms of safe
feasibility and efficiency reported by a handful of enth
siastic skilled surgeons [1–3], in the next few years lap

World Journal of Gastrointestinal Surgery

Online Submissions: http://www.wjgnet.com/1948-9366office
wjgs@wjgnet.com
doi:10.4240/wjgs.v3.i7.101

World J Gastrointest Surg 2011 July 27; 3(7): 101-105
ISSN 1948-9366 (online)

BRIEF ARTICLE

Laparoscopic liver resection for hepatocellular adenoma

Mohammed Abu Hilal, Francesco Di Fabio, Robert David Wiltshire, Mohammed Hamdan, David M Layfield, Neil William Pearce

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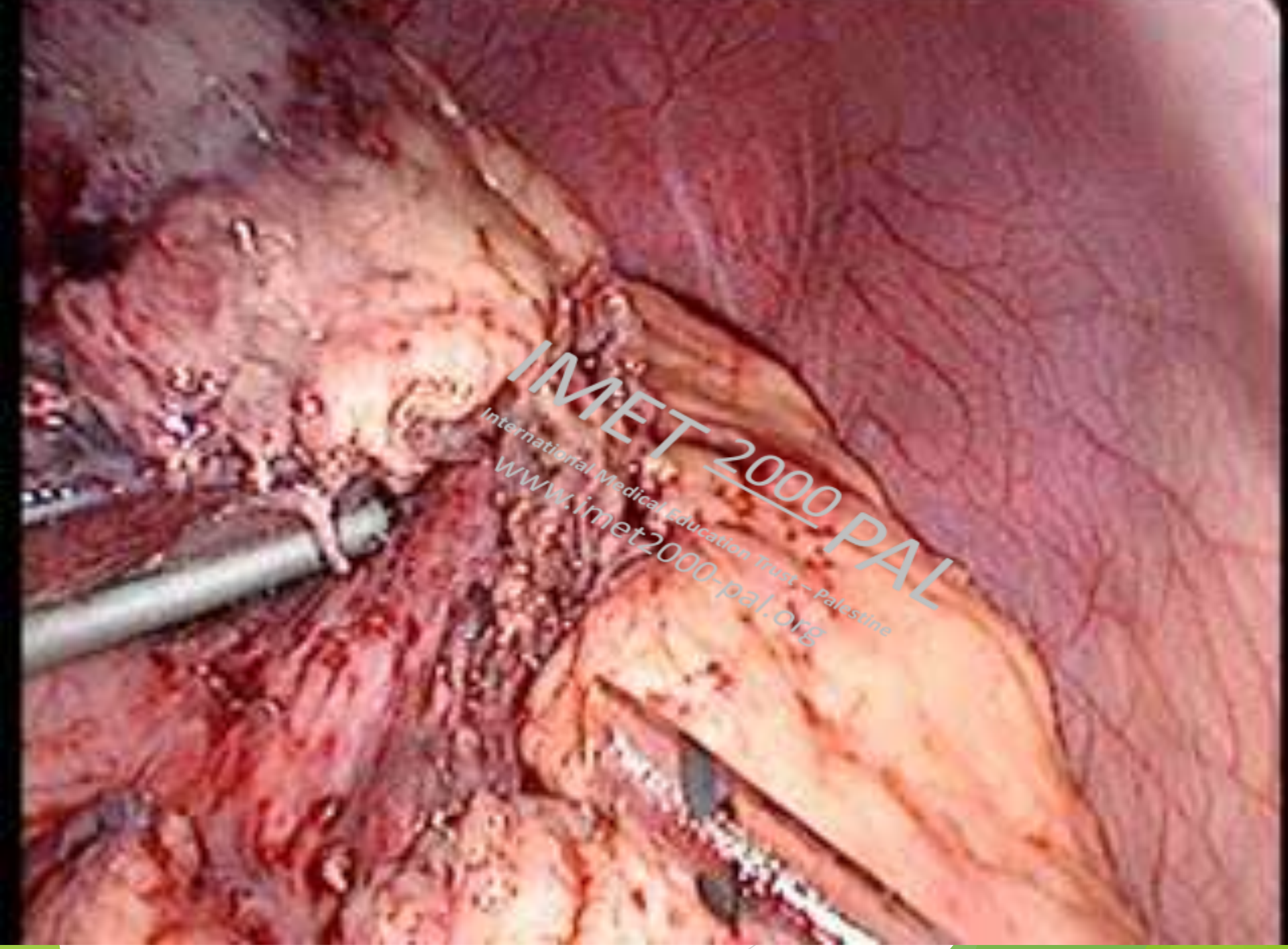
Author contributions: Abu Hilal M and Di Fabio F contributed equally to this work; Abu Hilal M, Di Fabio F, Wiltshire RD, Hamdan M, Layfield DM and Pearce NW designed the research; Abu Hilal M, Di Fabio F, Wiltshire RD, Hamdan M and Pearce NW performed the research; Abu Hilal M and Di Fabio F analyzed the data; Abu Hilal M and Di Fabio F wrote the paper.

sion and treatment with selective arterial embolization. Laparoscopic liver resection was then semi-electively performed. Eight patients (62%) required major hepatectomy [right hepatectomy (n = 5), left hepatectomy (n = 3)]. No conversion to open surgery occurred. The median operative time for pure laparoscopic procedures was 270 min (range 135-360 min). The median size of the excised lesions was 85 mm (range 25-180 mm). One patient with adenomatosis developed postoperative bleeding requiring embolization. Mortality was nil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EJSO xx (2008) 1–4
www.ejso.com

Laparoscopic versus open left lateral hepatic sectionectomy: A comparative study

M. Abu Hilal*, M.J.W. McPhail, B. Zeidan, S. Zeidan, M.J. Hallam, T. Armstrong, J.N. Primrose, N.W. Pearce

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Accepted 18 January 2008

Abstract

Background: Laparoscopic liver surgery has been difficult to popularize. High volume liver centres have identified left lateral sectionectomy (LLS) as a procedure with potential for transformation into a primarily laparoscopic procedure where surgeons can safely gain proficiency.
Methods: Forty-four patients underwent either laparoscopic (LLLS) or open (OLLS) left lateral sectionectomy (of segments II/III) for focal lesions at Southampton General Hospital.
Results: OLLS and LLLS groups were matched for age, sex and tumour types resected. Median operative time in the LLLS group was 180 (40–340) min and 155 (110–330) min in the OLLS group ($p = 0.885$) with median intra-operative blood loss in the LLLS group 80 (25–800) ml versus a larger 470 (100–3000) ml; $p = 0.002$ for patients receiving OLLS. Post-operative stay was also shorter in the LLLS group (3.5 (1–6) days) compared to the OLLS group (7 (3–12) days; $p < 0.001$). Resection margin was not different in the two groups (11 (1.5–30) mm (LLLS) versus 12 (4–40) mm (OLLS); $p = 1$) and neither was the complication rate (13% for LLLS versus 25% for OLLS; $p = 0.541$). There were no conversions to open in the LLLS group and no deaths in either group at 90 days. Between the first and second 12 LLLS the median operative time fell from 240 (70–340) min to 120 (40–120) min; $p = 0.005$ as well as median post-operative hospital stay from 4.5 (2–6) days to 2 (1–4) days, $p = 0.001$.
Conclusion: LLLS is a viable alternative to OLLS with potential improvements in intra-operative blood loss and shorter hospital stay without adversely affecting successful resection or complication rates. Larger prospective studies are required to explore this new avenue in laparoscopic liver surgery.

Results

	LLLR	OLLR	Significance
Median operative time - minutes	180 (40-340)	155 (110-330)	P=0.885
Median blood loss- mls	80 (25-800)	470 (100-2000)	P=0.002
Post operative stay- Days	3.5 (1-6)	7 (3-12)	P=0.001
Median resection margin- mm	11 (1.5-30)	12 (4-40)	P=1
Complication rate	13%	25%	P=0.541

Learning curve

	LLLS First 13 cases	LLLS Last 14 cases	Significance
Median operative time- minutes	240 (70-340)	120 (40-120)	P= 0.005
Median post operative stay - days	4.5 (2-6)	2 (1-4)	P= 0.001

Laparoscopic right hepatectomy: a challenging, but feasible, safe and efficient procedure

Neil William Pearce, D.M., F.R.C.S., Francesco Di Fabio, M.D., Mabel Joey Teng, BMedSci, M.B.B.S., Shareef Syed, MB.Ch.B., John Neil Primrose, M.D., F.R.C.S., Mohammed Abu Hilal, M.D., F.R.C.S.*

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KEYWORDS:
Laparoscopy;
Major hepatectomy;
Right hepatectomy;
Surgical technique

Abstract

BACKGROUND: Few centers are undertaking major laparoscopic liver resections, because of the well-recognized technical difficulties and lack of training opportunities.

METHODS: The authors describe their technique for laparoscopic right hepatectomy, highlighting relevant details for accomplishing a safe and efficient procedure. Patients were chronologically divided into 2 groups to evaluate the impact of increasing experience on the surgical outcomes.

RESULTS: Group I included 17 patients and group II 18 patients. The conversion rate to open or hybrid techniques significantly decreased from 36% in group I to 6% in group II ($P = .03$). The hospital stay decreased from a median of 6 days in group I to a median of 4 days in group II ($P = .05$). Complications occurred in 4 patients (11%), of whom 3 were in group I. The mortality was zero.

CONCLUSIONS: Laparoscopic right hepatectomy is a safe and efficient procedure when performed at specialized centers with extensive experience in hepatic surgery. Long-term training is necessary to acquire adequate expertise.

Despite the delay in gaining popularity, laparoscopic liver surgery (LLS) is now rapidly expanding in use.[1] This achievement has been possible because of the encouraging results of earlier pioneering studies[2–6] and recent advances in imaging, anesthetic care, and laparoscopic devices.[1]

There is increasing evidence to suggest that the minimally invasive liver surgery offers significant advantages in terms of less pain and analgesic drug consumption, shorter hospital stay, fewer transfusion requirements, faster recovery, and improved cosmetic results compared with open surgery.[1] Furthermore, several studies have now demonstrated the feasibility, safety, and efficiency of LLS when appropriate criteria are applied to patient selection.[1,7–17] However, even at enthusiastic centers, this surgical approach is limited to segmental or small anatomic resections.[1] Because of the well-recognized technical difficulties, few centers with advanced laparoscopic expertise are undertaking major laparoscopic liver resections. In a recent multicenter study, 210 major liver resections were performed at 6 different laparoscopic liver centers during 11 years. Of these, only 91 were pure laparoscopic resections, and this included right and left hepatectomy.[15]

There is general agreement that surgeons need significant experience in open liver surgery and adequate proficiency with laparoscopic liver resection before embarking in per-

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Manuscript received April 8, 2010; revised manuscript August 11, 2010

Table 1 Indications for surgery in the study groups

Indication	All Patients (n = 35)	Group I (n = 17)	Group II (n = 18)
Colorectal cancer metastasis	20	9	11
Hepatocellular carcinoma	4	1	3
Neuroendocrine tumor	3	1	2
Adenoma	3	1	2
Indeterminate lesion	2	2	0
Gastrointestinal stromal tumor	1	1	0
Oriental cholangiopathy	1	1	0
Breast cancer metastasis	1	1	0

Learning Curve for Right Hepatectomy

Table 2 Demographics and operative and postoperative courses in the study groups

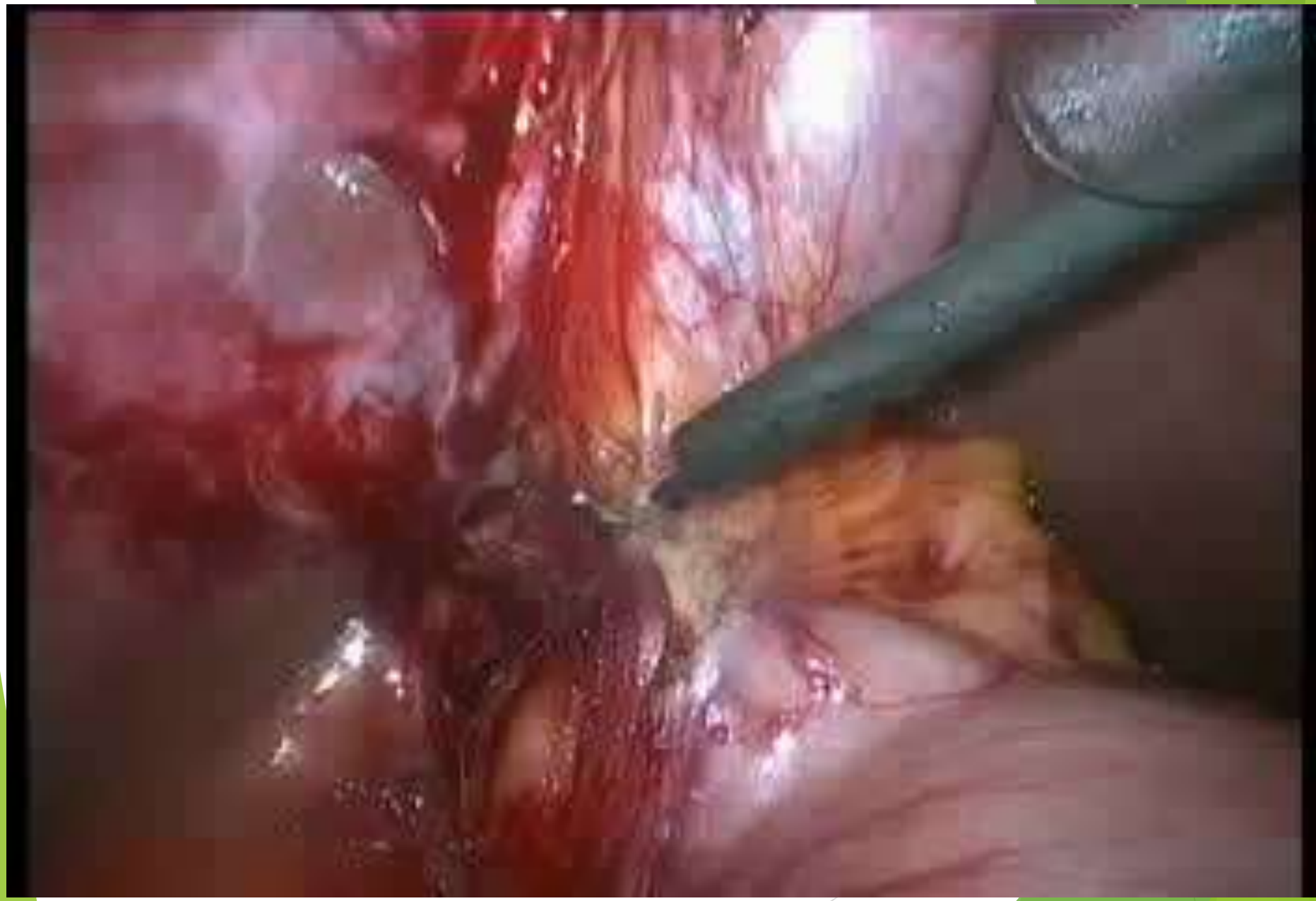
Variable	All Patients (n = 35)	Group I (n = 17)	Group II (n = 18)	*P*
Women/men	19/16	10/7	9/9	.74*
Age at operation (y)	62 (26–82)	62 (29–82)	62.5 (26–78)	.82†
Operation time (min)	295 (180–465)	289 (240–465)	297 (180–460)	.32†
Blood loss (mL)	650 (75–3,000)	650 (200–3,000)	600 (75–3,000)	.25†
High-dependency unit stay (d)	2 (0–8)	2 (0–8)	2 (1–4)	.97†
Postoperative length of stay (d)	5 (3–21)	6 (3–20)	4 (3–11)	.05†
Resection margins (mm)	20 (4–50)	20 (10–50)	20 (4–50)	.58†
Complications	4 (11.4%)	3 (17.6%)	1 (5.5%)	.60*
Conversions‡				.03*
Laparoscopic-assisted technique	4 (11%)	4 (24%)	0	
Open conversion	3 (8.6%)	2 (12%)	1 (6%)	

Data are expressed as number (percentage) or as median (range).

*Fisher's exact test.

†Mann-Whitney *U* test.

‡Laparoscopic-assisted and open conversions were considered as a single group for statistical analysis.



ORIGINAL ARTICLE

Single-Centre Comparative Study of Laparoscopic Versus Open Right Hepatectomy

Mohammed Abu Hilal · Francesco Di Fabio · Mabel Joey Teng · Pavlos Lykoudis · John Neil Primrose · Neil William Pearce

Received: 13 November 2010 / Accepted: 8 February 2011 / Published online: 5 March 2011

Abstract

Background Expansion of laparoscopic major hepatectomy is still limited mainly due to the well-recognised technical difficulties compared to open surgery, and doubts regarding the oncological efficiency when major resections are required.

Methods Patients undergoing open right hepatectomy (ORH) were matched with patients undergoing laparoscopic right hepatectomy (LRH) and compared for perioperative outcomes.

Results Seventy patients were included: 36 patients underwent LRH and 34 ORH. Operative time was significantly longer for LRH (median, 300 min vs. 180 min for ORH; $p<0.0001$). Intensive care unit (median, 2 days for LRH vs. 4 days for ORH; $p<0.0001$) and postoperative length of stay (5 days for LRH vs. 9 days for ORH; $p<0.0001$) were significantly shorter for LRH. Four laparoscopic cases were converted to open surgery. No significant difference in postoperative complications and mortality was observed between LRH and ORH. Among patients with colorectal carcinoma liver metastases, R0 resection was obtained in 20/21 (95%) cases after LRH, and in 20/25 (80%) after ORH ($p=0.198$). Mid-term overall survival did not significantly differ between the laparoscopic and the open group.

Conclusions LRH can be a safe, effective, and oncologically efficient alternative to open resection in selected cases. Extensive experience in hepatic and laparoscopic surgery is required.

Keywords Right hepatectomy · Laparoscopy · Case–control study · Outcome · Survival

Introduction

Laparoscopic liver resection is progressively gaining popularity. For minor liver resections, the minimally invasive approach has been shown to be feasible, safe and efficient when appropriate criteria are applied to patient selection.[1–12] In contrast, expansion of laparoscopic major

Results

Indication for surgery	LRH (n=36)	ORH (n=34)
Colorectal carcinoma metastases	21 (58%)	26 (76%)
HCC	4 (11%)	4 (12%)
Non-colorectal carcinoma metastases	5 (14%)	2 (6%)
Adenoma	3 (8%)	1 (3%)
Oriental cholangiopathy	1 (3%)	0
Uncertain preoperative diagnosis	2 (6%)	1 (3%)

Results

Variables	LRH (n=36)	ORH (n=34)	p values
Demographics			
Female: male	18:18	16:18	0.806**
Age at operation, years, median (range)	64 (26-82)	63 (25-84)	0.431*
Surgical results			
Conversions:			
Laparoscopic-assisted	4 (11%)	-	-
Open	4 (11%)		
No. portal triad clamping	20 (56%)	13 (38%)	0.147**
Estimated blood loss, ml, median (range)	700 (75-3000)	500 (50-5200)	0.156*
Received transfusion	8 (22%)	7 (21%)	0.868**
Operation time, min, median (range)	**300 (180-465)**	**180 (90-360)**	**<0.0001***
Benign/malignant lesions	7/29	2/32	0.152***
Seeding/ port site metastasis	o		
R0 resections	**20/21**	**20/25**	**0.198***

* Mann-Whitney test; ** Chi-squared test; *** Fisher's exact test; § colorectal liver metastases; LRH: laparoscopic right hepatectomy; ORH: open right hepatectomy

Results

Variables	LRH (n=36)	ORH (n=34)	p values
Postoperative course			
High dependency unit/Intensive care unit stay, days, median (range)	2 (0-8)	4 (2-48)	<0.0001*
Postoperative length of stay, days, median (range)	5 (3-20)	9 (4-48)	<0.0001*
Patients with postoperative complications	5 (14%)	5 (15%)	0.922**
Mortality	0	1 (3%)	0.2***

* Mann-Whitney test; ** Chi-squared test; *** Fisher's exact test; § colorectal liver metastases; LRH: laparoscopic right hepatectomy; ORH: open right hepatectomy

Conclusion

The quest for a bloodless laparoscopic liver resection is ongoing.

A wide selection of methods and tools are available.

Surgeons should be familiar with the use, advantages and shortcomings of each method

Prevention and meticulous surgical technique are essential tools for a dry surgery.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Thank you