# Appendices

# APPENDIX A. SEARCH STRATEGY *(CHAPTER 3)*

Appendix A

| | |
|---|---|
| Embase (1950–April 6, 2018) | ((((synop* OR template* OR structured* OR structural* OR structuriz* OR structuris* OR standardi* OR checklist) NEAR/3 (report* OR operati*-note* OR operati*-documentation* OR surg*-note* OR surg*-documentation*)) OR (quality NEAR/3 (operati* OR surg*) NEAR/3 reporting)):ab,ti) AND ('surgery'/exp OR 'surgeon'/exp OR 'operating room'/de OR (surger* OR surgical* OR surgeon* OR ((operati*) NEAR/3 (room* OR theat* OR note* OR documentation* OR report*))):ab,ti) NOT ([Conference Abstract]/lim OR [Letter]/lim OR [Note]/lim OR [Editorial]/lim) AND [english]/lim |
| Ovid MEDLINE (1950–April 6, 2018) | ((((synop* OR template* OR structured* OR structural* OR structuriz* OR structuris* OR standardi* OR checklist) ADJ3 (report* OR operati*-note* OR operati*-documentation* OR surg*-note* OR surg*-documentation*)) OR (quality ADJ3 (operati* OR surg*) ADJ3 reporting)).ab, ti.) AND (exp Surgical Procedures, Operative/ OR exp surgeons/ OR exp Operating Rooms/ OR (surger* OR surgical* OR surgeon* OR ((operati*) ADJ3 (room* OR theat* OR note* OR documentation* OR report*))).ab, ti.) NOT (letter* OR news OR comment* OR editorial* OR congres* OR abstract* OR book* OR chapter* OR dissertation abstract*).pt. AND english.la. |
| Web of Science (1988–April 6, 2018) | TS=(((((synop* OR template* OR structured* OR structural* OR structuriz* OR structuris* OR standardi* OR checklist) NEAR/2 (report* OR operati*-note* OR operati*-documentation* OR surg*-note* OR surg*-documentation*)) OR (quality NEAR/2 (operati* OR surg*) NEAR/2 reporting))) AND ((surger* OR surgical* OR surgeon* OR ((operati*) NEAR/2 (room* OR theat* OR note* OR documentation* OR report*)))))) AND DT=(article) AND LA=(english) |
| Cochrane Central (1998–April 6, 2018) | ((((synop* OR template* OR structured* OR structural* OR structuriz* OR structuris* OR standardi* OR checklist) NEAR/3 (report* OR operati*-note* OR operati*-documentation* OR surg*-note* OR surg*-documentation*)) OR (quality NEAR/3 (operati* OR surg*) NEAR/3 reporting)):ab,ti) AND ((surger* OR surgical* OR surgeon* OR ((operati*) NEAR/3 (room* OR theat* OR note* OR documentation* OR report*))):ab,ti) |
| Google Scholar (1991–April 6, 2018) | "synoptic\|structured\|structural\|structurized\|structurised report\|reporting"\|"synoptic\|structured\|structural\|structurised\|standardized operative\|operation\|surgical note\|documentation" surgery\|surgical\|surgeon\|"operative\|operating room\|theater" |

## APPENDIX B. SURVEY (TRANSLATED FROM DUTCH) *(CHAPTER 4)*

### Demographic data

**Question 1.** *What is your current function?*

- o Surgeon
- o Gynecologist
- o Urologist
- o Resident in training
- o Retired specialist
- o Other (specify)

**Question 2A.** *(if surgeon) What is your subspecialization? (Multiple answers possible)*

- o Surgical Oncology
- o Gastrointestinal Surgery
- o Hepatopancreaticobiliary Surgery
- o Pediatric Surgery
- o Pulmonary Surgery
- o Trauma Surgery
- o Vascular Surgery
- o Not applicable

**Question 2B.** *(if gynecologist) What is your subspecialization? (Multiple answers possible)*

- o General Gynecology
- o Maternal-Fetal Medicine
- o Reproductive Endocrinology and Infertility
- o Urogynecology
- o Gynecological Oncology
- o Not applicable

**Question 2C.** *(if urologist) What is your subspecialization? (Multiple answers possible)*

- o General Urology
- o Andrological Urology
- o Endourology and Stone Disease
- o Functional and Reconstructive Urology
- o Pediatric Urology
- o Not applicable

**Question 2D.** *(if resident in training) For what specialty are you in training?*

- o Surgery

- o Gynecology
- o Urology

**Question 3A.** *(If surgeon, gynecologist or urologist) How many years are you practicing surgery?*

- o <5 years
- o 5 to 10 years
- o 10 to 15 years
- o 15 to 20 years
- o >20 years

**Question 3B.** *(If resident) What year of the training are you currently in?*

- o Year 1
- o Year 2
- o Year 3
- o Year 4
- o Year 5
- o Year 6

**Question 4.** *What is your workplace?*

- o University hospital
- o General teaching hospital
- o General non-teaching hospital
- o Other (specify)

**Current use of operative reporting**

**Question 5.** *Do you think that the currently used narrative operative report – without video and/or sound – is sufficient for future quality requirements?*

- o Yes
- o No

**Question 6.** *As far as you are aware, which techniques are currently used to document surgical procedures in your department? (Multiple answers possible)*

- o Endoscopic camera
- o External camera recording the surroundings of the operating room
- o External camera recording the surgical field (e.g. camera in the OR light)
- o Surgical Black Box
- o Mobile phone (picture/video/sound)
- o Audio recording (microphone)

o Other (specify)
o None of the above

**Question 7.** *Is routine video recording during conventional ('open') surgical procedures currently taking place in your department?*
o Yes
o No
o Don't know

**Question 8.** *Is routine video recording during endoscopic surgical procedures currently taking place in your department?*
o Yes
o No
o Don't know

**Question 9.** *If surgical procedures are recorded on video in your institution, what is the retention period of these recordings?*
o <30 days
o 30 to 90 days
o 90 days to 1 year
o >1 year
o Don't know

**Current use of multimedia in the operating room**

**Question 10.** *Please indicate of the following actions in what frequency you apply them.*

| | Never | Rarely | Sometimes | Regularly | Always |
|---|---|---|---|---|---|
| In current practice, do you make video recordings of endoscopic surgical procedures | ○ | ○ | ○ | ○ | ○ |
| In current practice, do you make video recordings of conventional ('open') surgical procedures | ○ | ○ | ○ | ○ | ○ |

**Question 11.** *If you record your surgical procedures on video, for what purposes? (Multiple answers are possible)*
o Addition to patient file
o For quality control purposes
o For educational purposes

- o In the context of proctoring
- o To provide information for patients, patients' family and/or colleagues
- o Other

**Question 12.** *Please indicate for the following statements to what extent you agree.*

| | Very unlikely | Unlikely | Neutral | Likely | Very likely |
|---|---|---|---|---|---|
| I would ***behave*** differently in the operating room when video recording is taking place | ○ | ○ | ○ | ○ | ○ |
| I would ***perform surgery*** differently in the operating room when video recording is taking place | ○ | ○ | ○ | ○ | ○ |
| I would ***behave*** differently in the operating room when video ***and*** audio recording is taking place | ○ | ○ | ○ | ○ | ○ |
| I would ***perform surgery*** differently in the operating room when video ***and*** audio recording is taking place | ○ | ○ | ○ | ○ | ○ |

**Question 13.** *Please indicate for the following situations, in the context of intraoperative video recording, to what extent you find it objectionable.*

| | Not at all objectionable | Not objectionable | Neutral | Objectionable | Very objectionable |
|---|---|---|---|---|---|
| Recognizability of my or my colleague's identity on the video recordings | ○ | ○ | ○ | ○ | ○ |
| Potential for medical liability | ○ | ○ | ○ | ○ | ○ |
| Harmful for the quality of surgical care | ○ | ○ | ○ | ○ | ○ |

**Question 14.** *Please indicate for the following situations to what extent intraoperative* ***video recording*** *might be of added value.*

| | Very unlikely | Unlikely | Neutral | Likely | Very likely |
|---|---|---|---|---|---|
| Documenting the operative phase as an addition to the patient file | ○ | ○ | ○ | ○ | ○ |
| For educational purposes | ○ | ○ | ○ | ○ | ○ |
| To provide information for patients, family and/or colleagues | ○ | ○ | ○ | ○ | ○ |
| For quality control purposes | ○ | ○ | ○ | ○ | ○ |
| In the context of proctoring | ○ | ○ | ○ | ○ | ○ |
| Supportive evidence in medicolegal proceedings | ○ | ○ | ○ | ○ | ○ |

**Question 15.** *Please indicate for the following situations to what extent intraoperative* ***video and audio recording*** *might be of added value.*

| | Very unlikely | Unlikely | Neutral | Likely | Very likely |
|---|---|---|---|---|---|
| Documenting the operative phase as an addition to the patient file | ○ | ○ | ○ | ○ | ○ |
| For educational purposes | ○ | ○ | ○ | ○ | ○ |
| To provide information for patients, family and/or colleagues | ○ | ○ | ○ | ○ | ○ |
| For quality control purposes | ○ | ○ | ○ | ○ | ○ |
| In the context of proctoring | ○ | ○ | ○ | ○ | ○ |
| Supportive evidence in medicolegal proceedings | ○ | ○ | ○ | ○ | ○ |

**Question 16.** *Regarding documentation of surgical procedures, which of the following scenarios would you prefer?*

- o Video recordings of the entire surgical procedure
- o Video recordings of only the essential steps of the surgical procedure
- o Video and audio recordings of the entire surgical procedure
- o Video and audio recordings of only the essential steps of the surgical procedure
- o No video and audio recordings

## APPENDIX C. CASE REPORT FORMS *(CHAPTER 6 AND 7)*

### LAPAROSCOPIC RIGHT HEMICOLECTOMY

PATIENT IDENTIFICATION NUMBER ..... DATE . . / . . / . . . .

INDICATION .....

SURGICAL PROCEDURE(S) PERFORMED .....

SURGEON (INITIALS, LAST NAME) .....

VIDEO DOCUMENTATION TECHNIQUE ☐ GOPRO CAMERA

☐ OTHER CAMERA: .....

| VIDEO DOCUMENTATION (PLEASE CHECK BOX OF EVERY RECORDED STEP OR WRITE N/A IF THIS STEP IS NOT APPLICABLE FOR YOUR PROCEDURE) | | | |
|---|---|---|---|
| STEP 1 | | | |
| **1** | Introduction of trocars under vision | 10sec | ☐ |
| STEP 2: EXPLORATION | | | |
| **2A** | Liver: right and left lobe | 10sec | ☐ |
| **2B** | Parietal peritoneum: including falciform and teres ligament | 10sec | ☐ |
| **2C** | Tumor: including ink | 10sec | ☐ |
| STEP 3: VASCULAR CONTROL | | | |
| **3A** | Ligation level of ileocolic artery and vein | 10sec | ☐ |
| **3B** | Ligation of right colic artery and vein (if present) and/or right branches of middle colic artery and vein | 10sec | ☐ |
| **3C** | In case of extended right hemicolectomy: ligation of middle colic artery and vein | 10sec | ☐ |
| STEP 4: MOBILIZATION AND RESECTION | | | |
| **4A** | Transection of distal ileum (within 10cm from ileocecal valve; intracorporeal or extracorporeal) | 10sec | ☐ |
| **4B** | Specimen (with unfolded mesentery) | 10sec | ☐ |
| STEP 5: ANASTOMOSIS | | | |
| **5A** | Anastomosis | 10sec | ☐ |
| **5B** | Laparoscopic check of rotation of ascending (ileal) loop | 10sec | ☐ |
| STEP 6: CLOSURE | | | |
| **6** | Intraperitoneal trocar sites after removal of trocars | 10sec | ☐ |
| UNEXPECTED FINDINGS | | | |
| ..... | | | ☐ |

# LAPAROSCOPIC TRANSVERSE COLECTOMY

PATIENT IDENTIFICATION NUMBER ..... DATE . . / . . / . . . .

INDICATION .....

SURGICAL PROCEDURE(S) PERFORMED .....

SURGEON (INITIALS, LAST NAME) .....

VIDEO DOCUMENTATION TECHNIQUE ☐ GOPRO CAMERA

☐ OTHER CAMERA: .....

| VIDEO DOCUMENTATION (PLEASE CHECK BOX OF EVERY RECORDED STEP OR WRITE N/A IF THIS STEP IS NOT APPLICABLE FOR YOUR PROCEDURE) | | | |
|---|---|---|---|
| STEP 1 | | | |
| **1** | Introduction of trocars under vision | 10sec | ☐ |
| STEP 2: EXPLORATION | | | |
| **2A** | Liver: right and left lobe | 10sec | ☐ |
| **2B** | Parietal peritoneum: including falciform and teres ligament | 10sec | ☐ |
| **2C** | Tumor: including ink | 10sec | ☐ |
| STEP 3: VASCULAR CONTROL | | | |
| **3** | Proximal ligation of middle colic artery and vein | 10sec | ☐ |
| STEP 4: MOBILIZATION AND RESECTION | | | |
| **4A** | Mobilization of splenic flexure (imaging of spleen) | 10sec | ☐ |
| **4B** | Specimen (with unfolded mesentery) | 10sec | ☐ |
| STEP 5 | | | |
| **5** | Anastomosis | 10sec | ☐ |
| STEP 6: CLOSURE | | | |
| **6** | Intraperitoneal trocar sites after removal of trocars | 10sec | ☐ |
| UNEXPECTED FINDINGS | | | |
| ..... | | | ☐ |

# LAPAROSCOPIC LEFT HEMICOLECTOMY

PATIENT IDENTIFICATION NUMBER ..... DATE . . / . . / . . . .

INDICATION .....

SURGICAL PROCEDURE(S) PERFORMED .....

SURGEON (INITIALS, LAST NAME) .....

VIDEO DOCUMENTATION TECHNIQUE ☐ GOPRO CAMERA

☐ OTHER CAMERA: .....

| VIDEO DOCUMENTATION (PLEASE CHECK BOX OF EVERY RECORDED STEP OR WRITE N/A IF THIS STEP IS NOT APPLICABLE FOR YOUR PROCEDURE) | | | |
|---|---|---|---|
| STEP 1 | | | |
| **1** | Introduction of trocars under vision | 10sec | ☐ |
| STEP 2: EXPLORATION | | | |
| **2A** | Liver: right and left lobe | 10sec | ☐ |
| **2B** | Parietal peritoneum: including falciform and teres ligament | 10sec | ☐ |
| **2C** | Tumor: including ink | 10sec | ☐ |
| STEP 3: VASCULAR CONTROL | | | |
| **3A** | Ligation level of left colic artery and vein at level of origin from inferior mesenteric artery, sigmoid arteries and vein | 10sec | ☐ |
| **3B** | Ligation of left branches of middle colic artery and vein | 10sec | ☐ |
| **3C** | In case of extended left hemicolectomy: ligation of middle colic artery and vein | 10sec | ☐ |
| STEP 4: MOBILIZATION AND RESECTION | | | |
| **4A** | Mobilization of splenic flexure (imaging of spleen) | 10sec | ☐ |
| **4B** | Identification of left ureter (manipulation) | 10sec | ☐ |
| **4C** | Specimen (with unfolded mesentery) | 10sec | ☐ |
| STEP 5 | | | |
| **5** | Anastomosis | 10sec | ☐ |
| STEP 6: CLOSURE | | | |
| **6** | Intraperitoneal trocar sites after removal of trocars | 10sec | ☐ |
| UNEXPECTED FINDINGS | | | |
| ..... | | | ☐ |

# LAPAROSCOPIC SIGMOIDECTOMY

PATIENT IDENTIFICATION NUMBER ..... DATE . . / . . / . . . .

INDICATION .....

SURGICAL PROCEDURE(S) PERFORMED .....

SURGEON (INITIALS, LAST NAME) .....

VIDEO DOCUMENTATION TECHNIQUE ☐ GOPRO CAMERA

☐ OTHER CAMERA: .....

| VIDEO DOCUMENTATION (PLEASE CHECK BOX OF EVERY RECORDED STEP OR WRITE N/A IF THIS STEP IS NOT APPLICABLE FOR YOUR PROCEDURE) | | | |
|---|---|---|---|
| STEP 1 | | | |
| **1** | Introduction of trocars under vision | 10sec | ☐ |
| STEP 2: EXPLORATION | | | |
| **2A** | Liver: right and left lobe | 10sec | ☐ |
| **2B** | Parietal peritoneum: including falciform and teres ligament | 10sec | ☐ |
| **2C** | Tumor: including ink | 10sec | ☐ |
| STEP 3: VASCULAR CONTROL | | | |
| **3** | Ligation of arteries and veins | 10sec | ☐ |
| STEP 4: MOBILIZATION AND RESECTION | | | |
| **4A** | Identification of left ureter (manipulation) | 10sec | ☐ |
| **4B** | Specimen (with unfolded mesentery) | 10sec | ☐ |
| STEP 5: ANASTOMOSIS | | | |
| **5A** | Perforation of stapler pin through or near (<1cm) stapler line | 10sec | ☐ |
| **5B** | Donuts | 10sec | ☐ |
| **5C** | Anastomosis | 10sec | ☐ |
| **5D** | Anastomotic (air) leak test | 10sec | ☐ |
| STEP 6: CLOSURE | | | |
| **6** | Intraperitoneal trocar sites after removal of trocars | 10sec | ☐ |
| UNEXPECTED FINDINGS | | | |
| ..... | | | ☐ |

## LAPAROSCOPIC (LOW) ANTERIOR AND ABDOMINOPERINEAL RESECTION

PATIENT IDENTIFICATION NUMBER ..... DATE . . / . . / . . . .

INDICATION .....

SURGICAL PROCEDURE(S) PERFORMED .....

SURGEON (INITIALS, LAST NAME) .....

VIDEO DOCUMENTATION TECHNIQUE ☐ GOPRO CAMERA

☐ OTHER CAMERA: .....

| VIDEO DOCUMENTATION (PLEASE CHECK BOX OF EVERY RECORDED STEP OR WRITE N/A IF THIS STEP IS NOT APPLICABLE FOR YOUR PROCEDURE) | | | |
|---|---|---|---|
| **STEP 1** | | | |
| **1** | Introduction of trocars under vision | 10sec | ☐ |
| **STEP 2: EXPLORATION** | | | |
| **2A** | Liver: right and left lobe | 10sec | ☐ |
| **2B** | Parietal peritoneum: including falciform and teres ligament | 10sec | ☐ |
| **2C** | Tumor: including ink | 10sec | ☐ |
| **STEP 3: VASCULAR CONTROL** | | | |
| **3A** | Low tie (ligation of upper rectal artery at bifurcation of inferior mesenteric and left colic arteries) or high tie | 10sec | ☐ |
| **STEP 4: MOBILIZATION AND RESECTION** | | | |
| **4A** | Identification of left ureter (manipulation) | 10sec | ☐ |
| **4B** | Specimen (with unfolded mesentery) | 10sec | ☐ |
| **4C** | Identification of hypogastric nerves (“wishbone”) | 10sec | ☐ |
| **STEP 5: ANASTOMOSIS** | | | |
| **5A** | Perforation of stapler pin through or near (<1cm) stapler line | 10sec | ☐ |
| **5B** | Donuts | 10sec | ☐ |
| **5C** | Anastomosis | 10sec | ☐ |
| **5D** | Air leak test of anastomosis | 10sec | ☐ |
| **STEP 6: CLOSURE** | | | |
| **6** | Intraperitoneal trocar sites after removal of trocars | 10sec | ☐ |
| **UNEXPECTED FINDINGS** | | | |
| ..... | | | ☐ |

## APPENDIX D. REQUIREMENTS FOR ADEQUATE RECORDING AND REPORTING *(CHAPTER 6 AND 7)*

**Requirements for an adequate recording**

**Step 1**: Introduction of trocars under vision:
- Complete visualization of the introduction of all trocars.

**Step 2**: Exploration
- Complete visualization of right and left liver lobe, both anterior and posterior planes.
- Complete visualization of the tumor and its surrounding tissue before dissection, including ink marker if present.
- Complete visualization of the parietal peritoneum of the abdomen.

**Step 3**: Vascular control
- Ligation of identified artery and vein.
- If vascular structures are spared, these should be identifiable on the recording.

**Step 4**: Mobilization and Resection
- In **right hemicolectomy**: The terminal ileum should be transected within 10cm of the ileocecal valve. The amount of terminal ileum resected must be visualized during resection or identified in the specimen
- In **transverse colectomy** or **left hemicolectomy**: after mobilization of the splenic flexure of the colon, an intact spleen should be visible or, if damaged, after hemostasis.
- In **left hemicolectomy**, **sigmoidectomy** or **low anterior resection/abdominoperineal resection**: The left ureter should be identified.
- The resected specimen should be recorded extracorporeal, identifying all of the following elements: tumor (including ink, if present), vessels and unfolded mesentery.

**Step 5**: Anastomosis
- The anastomosis should be recorded laparoscopic or extra-corporeal, containing the following aspects: tension, interposition and vascularization.
- In sigmoidectomy or low anterior resection/abdominoperineal resection: If the anastomosis is created using the transanal circular stapler:
  - Perforation of the distal part of the anastomosis by the transanal stapler pin.
  - After removal, donuts should be recorded demonstrating structural integrity.

**Step 6**: Closure
- The removal of all trocars should be recorded, showing the intraperitoneal trocar sites after removal.

**Requirements for an adequate <u>reporting</u>**

**Step 1**: Introduction of trocars under vision:

- Mentioning of trocars introduced under vision

**Step 2**: Exploration

- Mentioning of visualization of liver with observation.
- Mentioning of tumor visualization and its surrounding tissue, including ink marker (if present).
- Mentioning of visualization of the parietal peritoneum of the abdomen.

**Step 3**: Vascular control

- Mentioning of identification and ligation of artery and vein.

**Step 4**: Mobilization and Resection

- In **right hemicolectomy**: The terminal ileum should be transected within 10cm of the ileocecal valve, approximate length should be mentioned.
- In **transverse colectomy** or **left hemicolectomy**: Mobilization of the splenic flexure of the colon should be mentioned, including observation of intact spleen or possible damage followed by intervention
- In **left hemicolectomy**, **sigmoidectomy** or **low anterior resection/abdominoperineal resection**: mentioning of identification of the left ureter.
- Mentioning of investigation of the resected specimen post resection.

**Step 5**: Anastomosis

- Mentioning of the quality of the anastomosis, including the following aspects: tension, interposition and vascularization (color).
- In sigmoidectomy or low anterior resection/abdominoperineal resection: If the anastomosis is created using the transanal circular stapler:

o Description of the process of creating the anastomosis, including: perforation of the distal part of the anastomosis by the transanal stapler pin and the quality of the donuts

**Step 6**: Closure

- Mentioning of the removal of trocars under vision.

## APPENDIX E. SEARCH STRATEGY *(CHAPTER 8)*

Appendix E

| | |
|---|---|
| Embase | ('cholecystectomy'/exp OR 'cholecystitis'/de OR (cholecystectom* OR cholecystit* OR (gallbladder NEAR/3 (resect*))):ab,ti) AND ('laparoscopy'/exp OR 'laparoscope'/de OR 'endoscope'/de OR endoscopy/de OR 'endoscopic surgery'/de OR 'minimally invasive procedure'/exp OR (laparoscop* OR celioscop* OR endoscop* OR Laparoendoscop* OR (minmal* NEAR/3 invasiv*)):ab,ti) AND ('peroperative cholangiography'/de OR 'fluorescence imaging'/de OR 'fluorescence imaging system'/de OR 'near infrared imaging system'/ de OR (('bile duct injury'/de OR 'bile leakage'/de ) AND (prevention/de OR prevention:lnk OR 'protection'/de OR 'risk reduction'/de OR 'education'/de)) OR ((Peroperati* NEAR/3 (echogra* OR ultraso*)) OR ((prevent* OR protect* OR reduc* OR avoid* OR technique* OR training OR teaching OR educat*) NEAR/6 ( bile-duct* )) OR (safet* NEAR/3 critical-view) OR (gallbladder* NEAR/3 antegrade NEAR/3 dissect*) OR (fundus NEAR/3 first NEAR/3 dissect*) OR infundibul*):ab,ti) NOT ([Conference Abstract]/lim OR [Letter]/lim OR [Note]/lim OR [Editorial]/ lim) AND [english]/lim |
| Ovid MEDLINE | (exp "cholecystectomy"/ OR "cholecystitis"/ OR (cholecystectom* OR cholecystit* OR (gallbladder ADJ3 (resect*))).ab,ti,kf.) AND (exp "Laparoscopy"/ OR "Laparoscopes"/ OR "endoscopes"/ OR endoscopy/ OR "Natural Orifice Endoscopic Surgery"/ OR "Minimally Invasive Surgical Procedures"/ OR (laparoscop* OR celioscop* OR endoscop* OR Laparoendoscop* OR (minmal* ADJ3 invasiv*)).ab,ti,kf.) AND (("Cholangiography"/ AND "Intraoperative Care"/) OR (("Bile Ducts"/in ) AND ("prevention and control".xs. OR "education"/)) OR ((Peroperati* ADJ3 (echogra* OR ultraso*)) OR ((prevent* OR protect* OR reduc* OR avoid* OR technique* OR training OR teaching OR educat*) ADJ6 ( bile-duct* )) OR (safet* ADJ3 critical-view) OR (gallbladder* ADJ3 antegrade ADJ3 dissect*) OR (fundus ADJ3 first ADJ3 dissect*) OR infundibul*).ab,ti,kf.) NOT ((letter OR news OR comment OR editorial OR congresses OR abstracts).pt.) AND english.la. |
| Cochrane Central | ((cholecystectom* OR cholecystit* OR (gallbladder NEAR/3 (resect*))):ab,ti) AND ((laparoscop* OR celioscop* OR endoscop* OR Laparoendoscop* OR (minmal* NEAR/3 invasiv*)):ab,ti) AND (((Peroperati* NEAR/3 (echogra* OR ultraso*)) OR ((prevent* OR protect* OR reduc* OR avoid* OR technique* OR training OR teaching OR educat*) NEAR/6 ( bile-duct* )) OR (safet* NEAR/3 critical-view) OR (gallbladder* NEAR/3 antegrade NEAR/3 dissect*) OR (fundus NEAR/3 first NEAR/3 dissect*) OR infundibul*):ab,ti) |
| Web of Science | TS=(((cholecystectom* OR cholecystit* OR (gallbladder NEAR/2 (resect*)))) AND ((laparoscop* OR celioscop* OR endoscop* OR Laparoendoscop* OR (minmal* NEAR/2 invasiv*))) AND (((Peroperati* NEAR/2 (echogra* OR ultraso*)) OR ((prevent* OR protect* OR reduc* OR avoid* OR technique* OR training OR teaching OR educat*) NEAR/5 ( bile-duct* )) OR (safet* NEAR/2 critical-view) OR (gallbladder* NEAR/2 antegrade NEAR/2 dissect*) OR (fundus NEAR/2 first NEAR/2 dissect*) OR infundibul*)) ) AND DT=(article) AND LA=(english) |
| Google Scholar | cholecystectomy\|"gallbladder resection" laparoscopy\|laparoscopic\|endoscopic\|Laparoendoscopic\|"minmally invasivive" prevention\|protection\|reduction "bile duct" |

## APPENDIX F. SUPPLEMENTAL TABLES *(CHAPTER 8)*

**Table 1.** Dedicated surgical approaches.

| Author (year published) | Study period | Study type | LOE | Focus of study | Cases N | BDI N (%) | Additional outcomes | Author's conclusion | In favour of technique |
|---|---|---|---|---|---|---|---|---|---|
| **Critical view of safety** | | | | | | | | | |
| Avgerinos et al. (2009) | 2002-2007 | Retrospective study | 3 | CVS | 1046 | 0 | CVS was achieved in 998 (95.4%), 5 bile leaks (0.48%), conversion in 27 (2.6%) | CVS clarifies the relations of the anatomic structures that should be divided and should be routinely applied because of its highly protective role against BDI | + |
| Kaya et al. (2017) | 2015-2016 | Prospective study | 4 | CVS combined with hydrodissection | 120 | 0 | CVS was achieved in all cases (100%), no bile leaks, no conversion occurred in this series. | CVS and hydrodissection techniques minimize BDI during LC | + |
| Rawlings et al. (2010) | 2008-2009 | Technique | 4 | CVS in SILC | 54 | 0 | CVS was achieved in all cases (100%), IOC was attempted in all cases and successful in 50 (93%), no bile leaks, no conversion occurred in this series. | CVS can be routinely accomplished with SILC | +/- |
| Sanjay et al. (2010) | 2004-2007 | Retrospective study | 4 | CVS with selective IOC | 447 | 0 | CVS was achieved in 388 (87%), IOC performed in 57 (12.8%), no bile leaks, conversion in 47 (10.5%) | CVS is a feasible and safe alternative to routine IOC in patients presenting with acute biliary pathology | + |
| Tsalis et al. (2015) | 2000-2012 | Retrospective study | 3 | CVS | 929 | 0 | CVS was achieved in 873 of 911 (95.82%), Conversion in 38 (4.1%), no bile leaks | Using the CVS technique for the identification of the CD is the safest way to perform and teach LC. | + |
| Vettoretto et al. (2011) | 2009-2010 | Retrospective study | 4 | CVS vs. IT | 90 CVS 84 IT | 0 | 1 bile leak, conversions were excluded from analysis, no difference in terms of morbidity and outcome | The CVS technique is suggested as the gold standard for resident teaching, because it has a similar rate of biliary and haemorrhagic complications but has a shorter operative time | + |
| Yegiyants et al. (2008) | 2002-2006 | Retrospective study | 3 | CVS as dominant technique in institution | 3042 | 1 (0.03) | BDI occurred in difficult procedure before CVS was established | CVS can reduce BDI and should be incorporated in the surgical curriculum | + |

**Table 1.** Dedicated surgical approaches. (continued)

| Author (year published) | Study period | Study type | LOE | Focus of study | Cases N | BDI N (%) | Additional outcomes | Author's conclusion | In favour of technique |
|---|---|---|---|---|---|---|---|---|---|
| **Fundus first laparoscopic cholecystectomy** | | | | | | | | | |
| Cui et al. (2012) | 2009 | Technique | 4 | FFLC in SILC | 16 | 0 | No complications were observed | SILC using a modified dome-down approach is technically feasible and safe | + |
| Mahmud et al. (2002) | 1993-2000 | Retrospective study | 3 | FFLC | 710 | 0 | FFLC was performed in 35 (5%) and successful in 31 (89%), 1 bile leak in the FFLC group (2.9%), conversion in 9 (1.2%). | FFLC is a feasible and safe option when dealing with a difficult LC. The conversion rate is significantly reduced | + |
| Martin et al. (1995) | 1990-1993 | Retrospective study | 4 | FFLC | 333 | 0 | FFLC was performed in 53 (16%) and successful in 52 (98%). In the FFLC group: No BDI, 1 bile leak (2%), conversion in 1 (2%). | Data too preliminary to conclude that FFLC will significantly improve the outcome of LC. Potential benefits are present. | +/- |
| Raj et al. (2001) | 2001 | Technique | 4 | FFLC | 50 | 0 | No complications, no unusual technical difficulties | The fundus-down technique of LC may lower the incidence of common bile duct injury | +/- |
| Rosenberg et al. (2004) | 2004 | Prospective study | 4 | FFLC | 20 | 0 | No complications | The laparoscopic dome down technique for laparoscopic cholecystectomy seems promising especially in cases of acute inflammation and in fibrosis or contraction of triangle of Calot. | + |
| Tuveri et al. (2008) | 1994-2005 | Retrospective study | 3 | FFLC | 1965 | 2 (0.1) | FFLC was performed in 29 (1.5%), and successful in 23 (80%), 2 bile leaks (0.1%), conversion in 6 (0.3%) | FFLC remains a safe option when dealing with patients with difficult anatomy at the Calot's triangle | + |

**Table 1.** Dedicated surgical approaches. (continued)

| Author (year published) | Study period | Study type | LOE | Focus of study | Cases N | BDI N (%) | Additional outcomes | Author's conclusion | In favour of technique |
|---|---|---|---|---|---|---|---|---|---|
| **Laparoscopic subtotal cholecystectomy** | | | | | | | | | |
| Beldi et al. (2003) | 1995-2000 | Retrospective study | 3 | LSC | 345 | 1 (0.29) | LSC was performed in 46 (13.3%) and successful in 37 (80.4%), 33 bile leaks (9.6%), conversion occurred in 13 (3.8%) of which 9 in the LSC group (19.6%) | LSC offers a feasible and safe way to prevent BDI and lower the conversion rate in technically difficult, severely acute, and chronic cholecystitis | + |
| Hubert et al. (2010) | 2004-2007 | Retrospective study | 4 | Endovesicular LSC with IOC | 500 | 0 | Endovesicular LSC was performed in 39 (7.8%) and successful in all (100%), IOC was attempted in all 39 cases and successful in 31 (79.5%), no bile leaks, conversion in 10 (2%) | the endovesicular approach to the gallbladder followed by LSC is an effective and safe technical alternative to the classic external Calot's triangle dissection during LC when there is severe inflammation or difficult local conditions. | + |
| Kuwabara et al. (2014) | 2005-2008 | Retrospective study | 4 | LSC vs. Conventional LC | 246 | 0 | LSC was performed in 26 (10.6%), no bile leaks, no conversion occurred | Performing LSC for acute cholecystitis is safe and particularly effective in patients unable to undergo early surgery. | + |
| Nakajima et al. (2009) | 1992-2008 | Retrospective study | 3 | LSC | 1226 | 12 (1.0) | Before introduction of LSC (n=643): BDI occurred in 10 (1.6%), conversion in 16 (2.5%); After introduction of LSC (n=583): LSC was performed in 60 (10.3%), BDI occurred in 2 (0.3%), no bile leaks, Conversion in 2 (0.3%) | LSC is safe and effective for preventing BDI and lowering the conversion rate in patients with technically difficult severe cholecystitis. | + |
| Philips et al. (2008) | 2001-2004 | Retrospective study | 4 | LSC | 1917 | NR | LSC was performed in 26 (1.4%), 4 bile leaks in the LSC group (15.4%) | When conventional LC is not possible, LSC is a viable and acceptable alternative to conversion to OC. It avoids the risk of major BDI. | + |
| Tian et al. (2009) | 2004-2007 | Retrospective study | 4 | LSC | 1558 | NR | LSC was performed in 48 (3.1%) in which 4 bile leaks (6.3%) occurred. No conversion or BDI occurred in the LSC group | LSC is a safe and feasible alternative to conversion to open surgery during difficult LC for patients with complicated cholecystitis. | + |

**Table 1.** Dedicated surgical approaches. (continued)

| Author (year published) | Study period | Study type | LOE | Focus of study | Cases N | BDI N (%) | Additional outcomes | Author's conclusion | In favour of technique |
|---|---|---|---|---|---|---|---|---|---|
| Yoon et al. (2016) | 2012-2014 | Retrospective Study | 4 | LSC with routine IOC | 404 | 1 (0.25) | LSC was performed in 23 (5.7%), 7 bile leaks (1.7) of which 5 in the LSC group (22%), conversion in 8 (2%). No BDI occurred in the LSC group | LSC is a viable alternative to conversion in cases of difficult laparoscopic cholecystectomy | + |

*BDI b*ile duct injury, *CBD* common bile duct, *CD* cystic duct, *CHD* common hepatic duct, *CVS* Critical view of safety, *FFLC* Fundus first laparoscopic cholecystectomy, *IOC* intraoperative cholangiography, *IOUS* intraoperative ultrasonography, *IT* Infundibular technique *LC* laparoscopic cholecystectomy, *LSC* laparoscopic subtotal cholecystectomy, *NR* Not reported, *OC* Open cholecystectomy, *SILC* Single incision laparoscopic cholecystectomy.

**Table 2.** IOC

| Author (year published) | Study period | Study type | LOE | Focus of study | Cases N | BDI N (%) | | Additional outcomes | Author's conclusion | In favor of IOC |
|---|---|---|---|---|---|---|---|---|---|---|
| **Intraoperative radiologic cholangiography in general** | | | | | | | | | | |
| Akolekar et al. (2009) | 2000-2003 | Retrospective study | 3 | IOC | 1651 | 2 | (0.12) | IOC attempted in 745 (45.1%) and successful in (88.6%). | Possible role of IOC in BDI prevention, interpretation can be difficult | +/- |
| Caratozzolo et al. (2004) | 1993-2001 | Retrospective study | 3 | IOC | 1074 | 1 | (0.08) | IOC attempted in 993 (83%) and successful in 802 (80.7%). 6 Bile leaks (0.56%) | IOC and timely conversion may help to significantly reduce major BDI | + |
| Ding et al. (2015) | 2012-2014 | Randomized Controlled Trial | 2 | Routine LC vs. LC + IOC | 404 | 2 | (0.54) | BDI rate and conversion rate similar between the two groups; BDI: 1 in 185 (0.54%) vs. 1 in 186 (0.54%), Conversion in 3 of 185 (1.6%) vs 4 in 186 (2.1%). Bile leak 1 in 185 (0.54%) vs 0 in 186 | No statistically significant advantage for the use of IOC during LC for the improvement of BDI rates | - |
| Fletcher et al. (1999) | 1988-1994 | Retrospective study | 3 | Incidence of BDI in a population based study with relation to IOC | 7675 | 25 | (0.32) | Per period; 1988-1990 (n=15): 1 BDI (6.66%), 0 bile leaks. 1991-1992 (n=2593): 9 BDI (0.35%), 7 Bile leaks (0.27%). 1993-1994 (n=5067): 15 BDI (0.30%), 26 bile leaks (0.51%). OR for all injuries and leaks using IOC = 0.5 | One third of all cases of BDI might be prevented by the routine use of IOC | + |
| Flum et al. (2001) | 1991-1998 | Retrospective study | 2 | IOC and surgeon's experience in relation to CBD injury | 30630 | 76 | (0.25) | Incidence BDI significantly lower with IOC use: 2.0 vs. 3.3 per 1000) | Increased use of IOC should be considered | + |
| **Routine intraoperative radiologic cholangiography** | | | | | | | | | | |
| Alvarez et al. (2014) | 1991-2012 | Retrospective study | 3 | IOC; routine | 11423 | 20 | (0.17) | IOC successful in 10932 (95.7%). 5 bile leaks (0.04%). Sensitivity and specificity for detection of BDI using IOC (respectively): 79% and 100% | IOC is suitable for BDI prevention | + |
| Carroll et al. (1996) | 1989-1995 | Retrospective study | 4 | IOC; routine | 3242 | 12 | (0.37) | 11 of 12 (92%) BDIs were detected peroperatively and successfuly repaired | Routine IOC increases the early identification of BDI. Early recognition reduces the severity, cost, and consequences of BDI | + |
| Cox et al. (1994) | 1991-1992 | Retrospective study | 4 | IOC; routine + gallbladder-down dissection technique | 410 | 1 | (0.24) | IOC successful in 356 (87%). Conversion in 54 (13%). 7 bile leaks (1.7%) | The gallbladder-down dissection technique for LC is a safe method that avoids injury to the CBD. The routine use of IOC prevents clip application across a tented bile duct and may detect any BDI | + |

**Table 2.** IOC (continued)

| Author (year published) | Study period | Study type | LOE | Focus of study | Cases N | BDI N (%) | Additional outcomes | Author's conclusion | In favor of IOC |
|---|---|---|---|---|---|---|---|---|---|
| Ido et al. (1996) | 1990-1993 | Retrospective study | 4 | Combination of technique combined with routine IOC | 802 | 0 | Conversion in 3 (0.4%) | IOC can facilitate in the confirmation of a safety zone for BDI prevention in LC | + |
| Jones et al. (1995) | 1992-1994 | Prospective study | 4 | IOC; routine | 356 | 0 | IOC successful in 328 (95%). Conversion in 11 (3%). 1 bile leak (0.3%) | IOC is accurate, safe, permits rapid evaluation of the biliary tree, and facilitates management of CBD stones | + |
| Kullman et al. (1996) | 1991-1994 | Prospective study | 4 | IOC; routine | 630 | 3 (0.5) | IOC successful in 591 (98%). 4 bile leaks (0.6%) | These results show that routine IOC is feasible and provides valuable information about the anatomy of the biliary tract, thereby improving the safety of laparoscopic cholecystectomy | + |
| Kumar et al. (2015) | 2013-2014 | Prospective study | 4 | IOC; routine | 100 | 0 | IOC successful in 92 (92%) | IOC was successful and safe. Operating time was significantly longer. Very little useful clinical information compared to the selective use of IOC | +/- |
| Nassar et al. (2016) | 1992-2014 | Retrospective study | 4 | IOC; routine | 4088 | 2 (0.05) | IOC attempted in 3691 (90.2%) and successful in 3635 (98.4%). Conversion 26 (0.7%). 14 bile leaks (0.34%). Both BDI occurred before IOC was performed | IOC can be routinely and safely performed in LC and should be considered for routine use | + |
| Noji et al. (2011) | 2000-2010 | Retrospective study | 4 | IOC; routine | 1835 | NR | ENBD was used in 38 (2.1%). 1 BDI occurred in the ENBD group (2.6%). Conversion in 1 (2.6%) of the ENBD group vs 106 (5.9%) in the standard LC group | ENBD tube placement prior to LC may have successfuly decreased the incidence of complications | + |
| Panton et al. (1995) | 1991-1993 | Retrospective study | 4 | IOC; routine | 236 | 0 | IOC attempted in 224 (94%) and successful in 198 (89%). Conversion in 10 (4%). bile leaks in 4 (2%) | Data supports that LC is safe and that IOC has a rol in identifying anomalies and the prevention of BDI | + |
| Photi et al. (2017) | 2013-2015 | Retrospective study | 4 | IOC; routine | 1005 | 0 | IOC successful in 997 (99.2%). Conversion in 6 (0.4%). 3 bile leaks (0.3%) | high-volume routine IOC is associated with a low risk of BDI and can be performed safely in emergency and elective cases | + |
| Stuart et al. (1998) | 1995-1996 | Retrospective study | 4 | IOC; routine | 669 | 0 | IOC attempted in 606 (90.5%) and successful in 566 (93%). Conversion in 63 (9%) | IOC is safe, quick, detects unsuspected choledocholithiasis, and can prevent common bile duct transection. It should be routine. | + |

**Table 2.** IOC (continued)

| Author (year published) | Study period | Study type | LOE | Focus of study | Cases N | BDI N (%) | | Additional outcomes | Author's conclusion | In favor of IOC |
|---|---|---|---|---|---|---|---|---|---|---|
| Tornqvist et al. (2015) | 2005-2010 | Retrospective study | 2 | IOC; routine | 51041 | 747 | (1.4) | LC performed in 44241 (89.8%). IOC attempted in 44401 (87.7%) and successful in 42346 (95.4%). Conversion in 3965 (9.0%) | Any proposed protective effect of IOC was restricted to patients with (or a history of) acute cholecystitis. | +/- |
| Van Campenhout et al. (1993) | 1990-1991 | Retrospective study | 4 | IOC; routine | 107 | 0 | | IOC attempted in 105 (98%) and successful in 75 (71%) | Our results show that IOC is feasible and useful in patients undergoing LC | + |
| Vezakis et al. (2000) | 1990-1998 | Retrospective study | 4 | IOC; routine | 950 | 3 | (0.3) | IOC attempted in 896 (94.3%) and successful in 734 (82%). 13 bile leaks (1.4%). In 2 cases, the CBD was cannulated instead of the CD | Findings show that IOC is a safe technique. Its routine use during LC may not prevent BDI, but it minimizes the extent of the injury so that it can be repaired easily without any consequences for the patient. The prevention of a major BDI makes IOC cost effective. | + |
| **Selective intraoperative radiologic cholangiography** | | | | | | | | | | |
| Giger et al. (2011) | 1995-2005 | Retrospective study | 2 | IOC; selective | 31838 | 101 | (0.3) | IOC performed in 11642 (36.6%). No difference in BDI rate between IOC and no-IOC groups. | the incidence of BDI missed during surgery was similar with or without the use of IOC. Selective use of IOC may be worthwhile. | +/- |
| Hawasli (1993)[55] | 1989-1992 | Retrospective study | 4 | IOC; selective | 1000 | 3 | (0.3) | IOC attempted in 102 (10%) and successful in 96 (94%) | Routine use of IOC through the CD does not decrease the number of injuries to the CBD but actually may increase this number. IOC should be used for diagnosis or management of CBD stones. To avoid mishaps, a cholecystocholangiogram should be done first in every case where the anatomy is obscure. | +/- |
| Robinson et al. (1995) | 1990-1991 | Retrospective study | 4 | IOC; selective | 542 | 0 | | IOC was performed in 161 (32.5%) and adequate in 121 (75%) IOC imaging was adequate. Conversion in 28 (5.2%) 1 bile leak (0.18%) | Selective IOC during LC is a safe practice when the ductal anatomy is clearly defined and there is no laboratory or clinical evidence of CBD abnormalities. | + |
| Verma et al. (2016) | 2013-2014 | Retrospective study | 4 | IOC; selective | 75 | 0 | | IOC attempted in 38 (50.7%) and successful in 29 (76.3%) | Routine IOC can be considered in patients undergoing LC to detect and remove CBD stones, confirm biliary tree anatomy and prevent BDI. . | + |

**Table 2.** IOC (continued)

| Author (year published) | Study period | Study type | LOE | Focus of study | Cases N | BDI N (%) | | Additional outcomes | Author's conclusion | In favor of IOC |
|---|---|---|---|---|---|---|---|---|---|---|
| Buddingh et al. (2011) | 2004-2009 | Retrospective study | 3 | IOC; routine vs selective | 835 | 26 | (3.1) | IOC was attempted in 260 of 435 (59.8%) routine IOC cases and successful in 226 (86.8%). IOC was attempted in 25 of 421 (5.9%) selective IOC cases and successful in 23 (91.7%). 11 BDI in routine IOC group (2.5%) and 15 BDI in selective IOC group (3.6%). Rate of major BDI significantly lower in routine IOC group (1.9% vs. 0%) | Marked reduction in major BDI after implementation of routine IOC | routine IOC |
| Carlson et al. (1993) | 1993 | Retrospective study | 4 | IOC; routine vs selective | 319 | 1 | | IOC performed in 127 of 164 (77.4%) routine IOC cases and successful in 90 (70.9%). IOC was performed in 21 of 155 (13.5%) selective IOC cases. 1 BDI in routine IOC group (0.61%), 0 BDI in selective IOC group | Selective IOC does not result in a high incidence of common bile duct injury | Neutral |
| **No use of intraoperative radiologic cholangiography** | | | | | | | | | | |
| Barkun et al. (1993) | 1990-1992 | Retrospective study | 3 | No IOC | 1300 | 5 | (0.38) | 12 bile leaks (0.9%) | LC can be performed safely without routine IOC. | - |
| Lepner et al. (2005) | 2000-2001 | Prospective study | 4 | No IOC | 413 | 0 | | Conversion in 8 (1.9%) | IOC can be safely omitted in LC without BDI | - |
| Lorimer et al. (1995) | 1991-1993 | Retrospective study | 4 | No IOC | 525 | 0 | | Conversion in 25 (4.8%). No bile leaks | IOC is not essential to prevent BDI during LC. In case of uncertain anatomy, further careful dissection should be carried out until any uncertainty has been resolved | - |
| McFarlane et al. (2005) | 1997-2003 | Prospective study | 4 | No IOC in selected patients | 159 | 1 | (0.62) | Conversion in 12 (6.1%) | IOC is not necessary for patients undergoing LC who have no history of gallstone pancreatitis or jaundice, normal liver functions tests and a CBD diameter less than 10 mm. | +/- |
| Mir et al. (2007) | 2001-2007 | Prospective study | 3 | No IOC | 1267 | 1 | (0.08) | Conversion in 23 (1.8%). 4 bile leaks (0.32%) | IOC is not essential to prevent biliary tract injuries or missed CBD stones | - |
| Morris et al. (1993) | 1990-1991 | Retrospective study | 4 | No IOC | 82 | 0 | (0) | 1 bile leak (1.2%) | LC can be performed safely without IOC. | - |

**Table 2.** IOC (continued)

| Author (year published) | Study period | Study type | LOE | Focus of study | Cases N | BDI N (%) | | Additional outcomes | Author's conclusion | In favor of IOC |
|---|---|---|---|---|---|---|---|---|---|---|
| Pesce et al. (2012) | 2003-2011 | Retrospective study | 4 | No IOC | 1100 | 2 | (0.18) | Conversion in 33 (3%). 3 bile leaks (0.27%) | LC can be performed safely without the use of IOC and with acceptable low rates of biliary complications. | - |
| Taylor et al. (1997) | 1990-1995 | Retrospective study | 3 | No IOC | 2038 | NR | | Conversion 64 (3.1%). minor duct injury and bile leaks in 22 (1.1%) | Omission of IOC is equally safe as published results using routine IOC | - |
| Wright et al. (1998) | 1990-1996 | Retrospective study | 4 | No IOC | 1200 | 7 | (0.58) | | IOC is not a prerequisite for the safe performance of LC and cannot be relied upon to prevent all BDI | - |
| Zacharakis et al. (2007) | 1992-2005 | Retrospective study | 3 | No IOC | 1851 | 7 | (0.37) | Conversion in 99 (5.3%) | Performing an LC procedure without IOC is recommended | - |
| **Other uses of intraoperative cholangiography** | | | | | | | | | | |
| Duff (2006) | 2003-2005 | Prospective study | 4 | Use of cystic duct marking technique in conjunction with percutaneous cholecystocholangiography | 204 | 0 | | CD was successfully identified in 191 (94%). In 3 patients (1.5%) the CBD was marked and correctly identified, avoiding injury. 2 bile leaks (1.0%) | IOC through the gallbladder combined with the CD marking technique proves to be useful in avoiding BDI | + |
| Fox et al. (1996) | 1996 | Retrospective study | 4 | IOC; trough gallbladder (cholecystocholangiography) | 113 | NR | | IOC successful in 92 (81.4%). Conversion in 12 (10.6%) | IOC trough the gallbladder is a safe, simple, and an effective procedure that can be used as an alternative to IOC trough the CD to identify biliary anatomy and diagnose CBD calculi prior to laparoscopic dissection. | + |
| Kuster et al. (1995) | 1989-1994 | Retrospective study | 4 | IOC; routine trans gallbladder vs routine trough CD vs no IOC | 677 | 2 | (0.3) | IOC successful in 271 (94%) cholecystocholangiograms and in 133 (82%) CD cholangiograms. 6 bile leaks (0.89%) | IOC performed through the gallbladder before any dissection was initiated significantly facilitated the operation and helped decrease the incidence of technical complications | + |
| Liyanage et al. (2009) | 1996-2007 | Retrospective study | 4 | IOC; ENBD | 508 | 2 | (0.39) | Conversion in 9 (1.8%). 4 bile leaks (0.8%) IOC trough ENBD was used in 26 (5.2%) | IOC trough ENBD is a safe and effective technique and should be done without hesitation, especially if the patient is to undergo ERCP | + |

BDI bile duct injury, CBD common bile duct, CD cystic duct, CHD common hepatic duct, ENBD endonasobiliary drainage tube ICG-NIR indocyanine green near infrared imaging, IOC intraoperative cholangiography, IOUS intraoperative ultrasonography, LC laparoscopic cholecystectomy, LHD Left hepatic duct, NR not reported, RHD right hepatic duct.

**Table 3.** IOUS

| Author (year published) | Study period | Study type | LOE | Focus of study | Cases N | BDI N (%) | Additional outcomes | Author's conclusion | In favor of IOUS |
|---|---|---|---|---|---|---|---|---|---|
| **Intraoperative ultrasonography** | | | | | | | | | |
| Biffl et al. (2001) | 1995-2000 | Retrospective study | 4 | IOUS (with selective IOC) | 842 | 5 (0.6) | 6 bile leaks (1%). Conversion in 84 (14%) of Non-US group and 30 (12%) in US group (not significant). All BDI occurred in the non-US group (incidence 0.8%) | LC with IOUS is associated with fewer bile duct complications | + |
| Hakamada et al. (2008) | 1991-2006 | Retrospective study | 4 | IOUS; selective vs routine | 644 | 4 (1.1) | BDI occurred in 4 of 368 (1.1%), all before introduction of routine IOUS use. Identification rates: CD 96.8%, confluence CD-CHD 93.7%, CHD 95.4%, | IOUS during LC is feasible, which provided accurate, real-time information about the biliary structures. | + |
| Machi et al. (2007) | 2004-2005 | Retrospective study | 4 | IOUS; routine | 200 | 0 | IOUS was successful in 193 of 200 (96.5%) patients. IOC was not needed in these 193 patients, and was used in the remaining 7 (3.5%) | Routine IOUS accurately identified biliary anatomy and significantly reduced the need for selective IOC without adversely affecting the outcome of the LC or increasing the overall cost. | + |
| Machi et al. (2009) | 2007-2008 | Retrospective study | 3 | IOUS; routine | 1381 | 0 | IOUS was successful in 1352 of 1381 (98.0%) | IOUS can be performed successfully to delineate biliary anatomy and improves the safety of LC by clarifying anatomy and decreasing BDI. | + |
| Tomonaga et al. (1999) | 1995-1997 | Retrospective study | 4 | Routine predissection IOUS | 43 | NR | Visualization of biliary structures using IOUS (before dissection): CHD 95%, confluence CD-CHD 98%, CBD 98%. Cystic duct length accuracy was 87.1% | CD length and biliary structures were determined by IOUS with a high level of accuracy | + |
| **Intraoperative ultrasonography vs. intraoperative cholangiography** | | | | | | | | | |
| Ohtani et al. (1997) | 1993-1994 | Prospective study | 4 | IOC vs. IOUS | 65 | 0 | IOC attempted in 58 (89.2%), successful 54 (93%). Identification rates: CHD + confluence 46 (85%), CHD 48 (89%), CBD 54 (100%)<br>IOUS attempted by 65 (100%). Identification rates: CHD + confluence 63 (97%), CHD 65 (100%), CBD 63 (97%), CD and confluence 61 (94%). Conversion in 2 (2.9%). No bile leaks occurred | IOUS compares favourably with IOC in the exploration for bile duct stones and demonstrating hepatobiliary anatomy | + |

**Table 3.** IOUS (continued)

| Author (year published) | Study period | Study type | LOE | Focus of study | Cases N | BDI N (%) | Additional outcomes | Author's conclusion | In favor of IOUS |
|---|---|---|---|---|---|---|---|---|---|
| Rijna et al. (1999) | 1997 | Prospective study | 3 | IOC vs. IOUS | 50 | NR | IOC successful in 38 (76%). Complete imaging of biliary tract in 34 (89%). IOUS: Complete visualization of CBD 45 (92%) | IOUS has comparable results to IOC in regard of identification of CBD anatomy and the assessment of CBD stones, but with almost no technical failures, no use of contrast and no complications | +/- |
| Tranter et al. (2003) | 2001 | Prospective study | 3 | IOC vs. IOUS | 135 | NR | IOC successful in 121 (89%), IOUS successful in 131 (97%) | IOUS examination of the bile duct is superior to IOC and could replace it. | + |

*BDI b*ile duct injury, *CBD* common bile duct, *CD* cystic duct, *CHD* common hepatic duct, *IOC* intraoperative cholangiography, *IOUS* intraoperative ultrasonography, *LC* laparoscopic cholecystectomy, *LHD* Left hepatic duct, *NR* not reported, *RHD* right hepatic duct.

**Table 4.** Fluorescence imaging

| Author (year published) | Study period | Study type | LOE | Focus of study | Cases N | Detection rates (%) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | CHD | CD-CHD | CD | CBD |
| **ICG-NIR fluorescence imaging** | | | | | | | | | |
| Ankersmit et al. (2017) | 2015 | Prospective study | 4 | ICG-NIR | 18 | NR | NR | NR | NR |
| Boni et al. (2015) | 2013-2014 | Prospective study | 4 | ICG-NIR | 52 | NR | 100 | 100 | 100 |
| Daskalaki et al. (2014) | 2011-2013 | Retrospective study | 4 | ICG-NIR | 184 | 94 | 83.6 | 97.8 | 96.1 |
| Dip et al. (2013) | 2011 | Prospective study | 4 | ICG-NIR | 65 | NR | NR | 100 | 100 |
| Dip et al. (2015) | 2013 | Prospective study | 4 | ICG-NIR | 45 | 60 | NR | 97.8 | 80 |
| Dip et al. (2016) | 2014 | Prospective study | 4 | ICG-NIR | 71 | 70.4 | NR | 100 | 87.3 |
| Igami et al. (2016) | 2013-2014 | Prospective study | 4 | ICG-NIR during SILC | 21 | 81 | 71.4 | 47.6* | NR |
| Ishizawa et al. (2010) | 2008-2009 | Prospective study | 4 | ICG-NIR | 52 | 100 | 100 | 100 | NR |
| Kono et al. (2015) | 2008-2012 | Prospective study | 4 | ICG-NIR | 108 | 93 | 92 | 95 | NR |
| Prevot et al. (2014) | 2012 | Prospective study | 4 | ICG-NIR | 23 | 48 | 74 | 100 | 87 |

| | Additional outcomes | Author's conclusion |
|---|---|---|
| | In 6 (33,3%) earlier CD visualization using ICG-NIR, additional CBD identification in 7 (38,9%) | Early visualization of the CD or additional identification of the CBD using ICG-NIR imaging can be helpful in preventing CBD injury |
| | Biliary anatomy is identified in all cases, irrespectively of normal or inflamed tissue | ICG-NIR imaging can be applied during LC to clarify anatomy within Calot's triangle |
| | All 4 structures (CD, CHD, CBD, and confluence) were visualized in 153 (83.1%). An anatomical variation of the biliary tree was identified using the ICG in 5 patients (2.7%) | ICG-NIR fluorescent cholangiography during robotic cholecystectomy is a safe and effective procedure that helps real-time visualization of the biliary duct anatomy. |
| | For detection of the CD and CBD smooth resection was necessary in 15 (23.1%) and 15 (23.1%) respectively. | Preliminary data demonstrates that ICG-NIR imaging is a feasible method of identifying biliary structures as an adjunct to conventional LC technique |
| | ICG-NIR was attempted and successful in all cases | ICG-NIR imaging appears to be a feasible, low-cost and effective imaging modality when performing LC. It is safe, easy to perform and interpret, and does not require a learning curve or X-ray |
| | Detection rates in obese cases (BMI ≥30 N=38): CD 38 (100%), HD 23 (60.5%), CBD 31 (81.6%), Accessory duct 2 (5.3%) | ICG-NIR fluorescent cholangiography is safe for utilization in the obese population. |
| | Significant lower detectability in patients with BMI >25 | fluorescent cholangiography can prevent biliary injury during SILC and facilitate SILC. Obesity is the major factor that could prevent identification of biliary structures under fluorescent cholangiography. |
| | Accessory hepatic ducts (n=8) were detected in 2 (25%) before dissection and 8 (100%) after dissection. Comparison with IOC (drip infusion, n = 46): CD 17 (37%); CHD 36 (78%); CD-CHD junction 17 (37%); Right and left hepatic duct junction 28 (61%); accessory hepatic duct 6 (75%) | Fluorescent cholangiography enables real-time identification of biliary anatomy during dissection of Calot's triangle. This simple technique may become standard practice for avoiding bile duct injury during laparoscopic cholecystectomy, replacing radiographic cholangiography. |
| | Accessory hepatic ducts detected in 9 of 10 cases (90%) | ICG-NIR is a simple navigation tool that is easy to use during LC. It can provide a road map of the extrahepatic bile ducts to reach the "critical view of safety" without any interventions involving the biliary tracts or exposure to radiation. |
| | Standard vision: sensitivity 33%, specificity 75%, accuracy 48%; ICG-NIR (before dissection): sensitivity 53%, specificity 50%, accuracy 52%; ICG-NIR (after dissection): sensitivity 87%, specificity 50%, accuracy 74%. No BDI occurred, no conversion occurred | ICG-NIR appears to be feasible and safe for assessing the extrahepatic bile duct anatomy before and during dissection. |

**Table 4.** Fluorescence imaging (continued)

| Author (year published) | Study period | Study type | LOE | Focus of study | Cases N | Detection rates (%) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | CHD | CD-CHD | CD | CBD |
| Schols et al. (2013) | 2011-2012 | Prospective study | 4 | ICG-NIR | 15 | NR | NR | 100 | 100 |
| Schols et al. (2013) | 2011-2012 | Prospective study | 4 | ICG-NIR + Arterial phase | 30 | NR | NR | 97 | 83 |
| Spinoglio et al. (2013) | 2011-2012 | Prospective study | 4 | ICG-NIR during single site robotic cholecystectomy | 45 | 97 | 97 | 97 | 97 |
| Zroback et al. (2016) | 2016 | Retrospective study | 4 | ICG-NIR | 12 | 50 | NR | 100 | 83 |
| **ICG-NIR fluorescence imaging vs. radiologic IOC** | | | | | | | | | |
| Osayi et al. (2015) | 2013-2014 | Prospective study | 4 | ICG-NIR vs IOC | 82 | 69.4 | 79 | 98.4 | 82.3 |
| **Other fluorescence imaging modalities** | | | | | | | | | |
| Mohsen et al. (2015) | 2015 | Prospective study | 4 | UV-A/Fluorescein | 40 | NR | NR | NR | NR |

**Detection of entire running course of CD, not only identification of the CD.*
*BDI* bile duct injury, *CBD* common bile duct, *CD* cystic duct, *CHD* common hepatic duct, *CD-CHD* confluence of cystic duct and common hepatic duct, *ICG-NIR* indocyanine green near infrared imaging, *IOC* intraoperative cholangiography, *LC* laparoscopic cholecystectomy, *LHD* Left hepatic duct, *NR* not reported, *RHD* right hepatic duct, *UV-A* ultraviolet-A..

| | Additional outcomes | Author's conclusion |
|---|---|---|
| | Successful identification of the CBD and CD was achieved in 15 of 15 (100%) patients before dissection. | Intermittent ICG-NIR fluorescence imaging seems a useful aid in accelerating visualization of the extrahepatic bile ducts during LC. |
| | Conventional light identification rates: CBD 22 (73.3%), CD 29 (96.7%) patients. Conversion in 1 (3.3%) | Both biliary and vascular ICG-NIR fluorescence imaging in laparoscopic cholecystectomy are easily applicable, can be helpful for earlier identification of the extrahepatic bile ducts, and are useful for the confirmation of the arterial anatomy. |
| | Successful identification before dissection: CD 42 of 45 (93% ), CHD of 40 of 45 (88%), CD-CHD junction 40 of 45 (88%), CBD 41 of 45 (91%) | Real-time high-resolution ICG-NIR fluorescent imaging to identify the biliary tree anatomy during robot assisted LC was safe and effective |
| | Positive subjective surgeon's experience | ICG-NIR imaging allows non-invasive real-time visualization of the extrahepatic biliary tree. |
| | | |
| | IOC detection rates: CHD 98.4%, CH-CHD confluence 95.2%, CD 95.2%, CBD 100% | ICG-NIR imaging is safe, feasible, and a non-invasive alternative to IOC for imaging extrahepatic biliary structures during LC |
| | | |
| | Adequate bile duct visualization in 33 of 40 (82.5%). True negative for other tissues in 40 of 40 (100%) | The developing ultraviolet/fluorescein technique is helpful in early localization of bile ducts at LC |

**Table 5.** Comparison of techniques and other preventive measures

| Author (year published) | Study period | Study type | LOE | Focus of study | Cases N | BDI N (%) |
|---|---|---|---|---|---|---|
| **Comparison of BDI prevention techniques** | | | | | | |
| Ohtani et al. (1997) | 1993-1994 | Prospective study | 4 | IOC vs. IOUS | 65 | 0 |
| Rijna et al. (1999) | 1997 | Prospective study | 3 | IOC vs. IOUS | 50 | NR |
| Tranter et al. (2003) | 2001 | Prospective study | 3 | IOC vs. IOUS | 135 | NR |
| Osayi et al. (2015) | 2013-2014 | Prospective study | 4 | ICG-NIR vs. routine IOC | 82 | NR |
| **Other methods of BDI prevention** | | | | | | |
| Cai et al. (2015) | 2003-2015 | Retrospective study | 3 | Blunt dissection of Calot's triangle by irrigation and aspiration | 21497 | 20 (0.09) |
| Li et al. (2014) | 2009-2010 | Retrospective study | 4 | Use of a rating scale assessing unfavourable factors during surgery. | 780 | 5 (0.64) |
| Sari et al. (2005) | 2003-2004 | Prospective study | 4 | Methylene blue cholangiography | 46 | 0 |
| Wang et al. (2010) | 2007-2008 | Technique | 4 | Light cholangiography | 16 | 0 |
| Xu et al. (2004) | 2001-2003 | Technique | 4 | Light cholangiography vs. Methylene blue cholangiography | 36 | |

*BDI* bile duct injury, *CBD* common bile duct, *CD* cystic duct, *CHD* common hepatic duct, *CVS* Critical view of safety, *FFLC* Fundus first laparoscopic cholecystectomy, *GTIUF* graded treatment of Intraoperative unfavourable factors, *LC* laparoscopic cholecystectomy, *NR* Not reported, *SILC* Single incision laparoscopic cholecystectomy.

| | Additional outcomes | Author's conclusion |
|---|---|---|
| | | |
| | IOC attempted in 58 (89.2%), successful 54 (93%).<br>Identification rates: HD + confluence 46 (85%), CHD 48 (89%), CBD 54 (100%)<br>IOUS attempted and tolerated by 65 (100%).<br>Identification rates: HD + confluence 63 (97%), CHD 65 (100%), CBD 63 (97%), CD and confluence 61 (94%).<br>Conversion in 2 (2.9%). No bile leaks occurred | IOUS compares favorably with IOC in the exploration for bile duct stones and demonstrating hepatobiliary anatomy |
| | IOC successful in 38 (76%). Complete imaging of biliary tract in 34 (89%). IOUS: Complete visualization of CBD 45 (92%) | IOUS has comparable results to IOC in regard of identification of CBD anatomy and the assessment of CBD stones, but with almost no technical failures, no use of contrast and no complications |
| | IOC successful in 121 (89%), IOUS succesful in 131 (97%) | IOUS examination of the bile duct is superior to IOC and could replace it. |
| | Identification of biliary anatomy:<br>ICG-NIR: RHD 1.6%, LHD 4.8%, CHD 69.4%, CH-CHD confluence 79.0%, CD 98.4%, CBD 82.3%,<br>IOC: RHD 85.5%, LHD 85.5%, CHD 98.4%, CH-CHD confluence 95.2%, CD 95.2%, CBD 100% | ICG-NIR imaging is safe, feasible, and a noninvasive alternative to IOC for imaging extrahepatic biliary structures during LC |
| | | |
| | Incidence of BDI is 0.093% Conversion in 239 (1.1%) | Blunt dissection by flushing and aspiration to expose Calot's triangle proved to be a valuable method to avoid BDI. |
| | LC without GTIUF (n=384): conversion in 6 (1.6%), 5 BDI (1.3%)<br>LC with GTIUF (n = 396): conversion in 15 (5.4%), 0 BDI | GTIUF is an effective method of preventing BDI during LC in that it helps identify the course of the extrahepatic bile duct and prevents intraoperative errors, especially for inexperienced operators. |
| | 43 of 46 cases had successful painting of gallbladder, CD and CBD (93.5%), no conversion occurred | The incidence of BDI related to anatomic misidentification can be decreased by intraoperative injection of methylene blue and visualization of the gall bladder, CD and CBD |
| | Successful placement of optical fibre in 15 (93.8%)<br>No conversion occurred | this modality can reduce unnecessary biliary duct exploration and reduce retaining of CBD stones, it contributes to the identification of normal and variation of the biliary duct anatomy |
| | Light cholangiography (n=16): successful in 13 (81.3%), CBD and CHD were identified in all cases. CD was identified in 4 (30.8%)<br>Methylene blue (n=20): successful in 18 (90%) with identification of the extra hepatic ducts due to blue coloration | LCP is currently the most effective way to directly observe the extrahepatic ductal system during LC and may play a useful role in clarifying uncertain anatomy in selected cases |

## APPENDIX G. SURVEY (TRANSLATED FROM DUTCH) *(CHAPTER 9)*

**Demographic data**

**Question 1.** *What is your current function?*

- o Surgeon
- o Resident in surgical training
- o Retired surgeon
- o Other (specify)

**Question 2.** *What is your subspecialization?*

*(Multiple answers possible. In case of resident in surgical training en not yet differentiated towards a subspecialization, please select* ***not applicable****)*

- o Surgical Oncology
- o Gastrointestinal Surgery
- o Hepatopancreaticobiliary Surgery
- o Pediatric Surgery
- o Pulmonary Surgery
- o Trauma Surgery
- o Vascular Surgery
- o Not applicable

**Question 3A.** *(If surgeon) How many years are you practicing surgery?*

- o <5 years
- o 5 to 10 years
- o 10 to 15 years
- o >15 years

**Question 3B.** *(If resident) What year of the education are you currently in?*

- o Year 1
- o Year 2
- o Year 3
- o Year 4
- o Year 5
- o Year 6

**Question 4A.** *(If surgeon) How many laparoscopic cholecystectomy procedures did you perform or supervise in your carrieer up to now?*

o <100
o 300
o 301 to 500
o >500

**Question 4B.** *(If resident) How many laparoscopic cholecystectomy procedures did you perform or have you assisted in your carrieer up to now?*

o <50
o 50 to 100
o 101 to 200
o >200

**Question 5A.** *(If surgeon) How many laparoscopic cholecystectomy procedures did you perform or supervise in the past 12 months?*

o <10
o 10 to 25
o 26 to 50
o >50

**Question 5B.** *(If resident) How many laparoscopic cholecystectomy procedures did you perform or have you assisted in the past 12 months?*

o <10
o 10 to 25
o 26 to 50
o >50

**Question 6.** *What is your workplace?*

o University hospital
o General teaching hospital
o General non-teaching hospital
o Other (specify)

**Current use of the Critical View of Safety technique**

**Question 7.** *Do you know the critical view of safety technique?*

o Yes
o No

**Question 8.** *Do you use the Critical View of Safety (CVS) technique?*

o Yes
o No

**Question 9A.** *(If answer was 'Yes' at Question 8) Why do you use this technique?*

o Because i was trained this way
o this is the most trustworthy method of preventing BDI
o Other (specify)

**Question 9B.** *(If answer was 'No' at Question 8) Why do you **not** use this technique?*

o This method is cumbersome.
o I use a different method i deem more trustworthy
o Other (specify)

**Question 10A.** *(If answer was 'Yes' at Question 8) Use of the Critical View of Safety technique in de daily practice.*

| | Never | Rarely | Sometimes | Regularly | Always |
|---|---|---|---|---|---|
| How often do you use the CVS technique | ○ | ○ | ○ | ○ | ○ |

**Question 10B.** *(If answer was 'No' at Question 8) What technique do you use to remove a gallbladder?*
*Please provide a short description of your method.*

## Current practice of laparoscopic cholecystectomy

**Question 11.** *Please indicate of the following actions in what frequency you apply them.*

| | Never | Rarely | Sometimes | Regularly | Always |
|---|---|---|---|---|---|
| Identification of Rouvière's sulcus | ○ | ○ | ○ | ○ | ○ |
| Opening of the peritoneal envelope as far as possible from the liver hilum | ○ | ○ | ○ | ○ | ○ |
| Full clearance of Calot's hepatobiliary triangle (cystic duct – common hepatic duct – liver) from fat and fibrous tissue | ○ | ○ | ○ | ○ | ○ |
| Circumferential overview of the cystic duct – gallbladder junction after dissection | ○ | ○ | ○ | ○ | ○ |
| Circumferential overview of the cystic artery – gallbladder junction after dissection | ○ | ○ | ○ | ○ | ○ |
| Complete freeing of the gallbladder infundibulum from the liver bed before transection of the cystic duct and the cystic artery | ○ | ○ | ○ | ○ | ○ |
| The cystic artery is transected before the cystic duct | ○ | ○ | ○ | ○ | ○ |
| The cystic duct is transected before the cystic artery | ○ | ○ | ○ | ○ | ○ |
| The gallbladder is dissected fundus first from the liver bed | ○ | ○ | ○ | ○ | ○ |

## Aspects of the Critical View of Safety technique

**Question 12.** *In case you employ the Critical View of Safety technique, what are, according to you, the essential steps of this technique?*

*(Multiple answers are possible)*

- o Identification of the cystic duct – common hepatic duct junction
- o The cystic duct is transected after the funnel-shaped junction between the infundibulum and the cystic duct is recognized
- o To identify corresponding structures, Calot's hepatobiliary triangle (cystic duct – common hepatic duct – liver) has to be cleared entirely from fat and fibrous tissue
- o Dissection of the entry point of the *cystic duct* into the gallbladder until circumferential overview is achieved
- o Dissection of the entry point of the *cystic artery* into the gallbladder until circumferential overview is achieved
- o Dissection of the infundibulum free from the liver bed for approximately one third.

### Conversion to open cholecystectomy

**Question 13.** *In which of the following cases would you convert to an open procedure? (Multiple answers are possible)*

- o In case of shrunken gallbladder
- o When the Critical View of Safety is not achieved
- o Extensive adhesions involving the surrounding structures and organs
- o Bile leakage (with an intact gallbladder)
- o Spillage of bile due to gallbladder damage
- o Spillage of gallstones due to gallbladder damage
- o In case of severe bleeding
- o Other (specify)

### Other techniques

**Question 14.** *In what frequency do you employ the following techniques?*

| | Never | Rarely | Sometimes | Regularly | Always |
|---|---|---|---|---|---|
| Intraoperative radiological cholangiography | ○ | ○ | ○ | ○ | ○ |
| Intraoperative fluorescence (ICG) cholangiography | ○ | ○ | ○ | ○ | ○ |
| Intraoperative ultrasonography | ○ | ○ | ○ | ○ | ○ |
| Partial cholecystectomy | ○ | ○ | ○ | ○ | ○ |
| Leave the gallbladder in situ | ○ | ○ | ○ | ○ | ○ |

## APPENDIX H. REQUIREMENTS FOR AN ADEQUATE VIDEO RECORDING, AUDIO RECORDING, AND OPERATIVE NOTE *(CHAPTER 10 AND 11)*

### Requirements for an adequate video recording, audio recording, and operative note

Based on an evidence-based Dutch guideline: Diagnosis and treatment of cholelithiasis. Association of Surgeons of the Netherlands (NVvH); 2016. [Available from: https://heelkunde.nl/sites/heelkunde.nl/files/richtlijnen-definitief/Richtlijn_Galsteenlijden_09032016.pdf].

**Step 1**: Introduction and positioning of trocars under vision
a) Introduction of the first accessory trocar under vision
b) Introduction of the second accessory trocar under vision
c) Introduction of the third accessory trocar under vision

**Step 2**: Inspection of surgery site
a) Inspection and description of the gallbladder condition
b) Inspection and description of the liver condition

**Step 3**: Circumferential dissection of the cystic duct and the cystic artery

**Step 4**: Transection of the cystic artery (by clipping or sealing)

**Step 5**: Transection of the cystic duct (by clipping or sealing)

**Step 6**: Removal of the gallbladder from the liver bed

**Step 7**: Inspection of liver hemostasis

**Step 8**: Presence of bile or stone spill

**Step 9**: Use of saline irrigation (if used)

**Step 10**: Placement of drain (if present)

**Step 11**: Removal of trocars under vision and check for port side bleeding (intraperitoneal trocar sites)
a) Removal of the first accessory trocar under vision
b) Removal of the second accessory trocar under vision
c) Removal of the third accessory trocar under vision

# APPENDIX I. INDEPENDENT REVIEWER FORM (CHAPTER 10 AND 11)

LAPAROSCOPIC CHOLECYSTECTOMY INDEPENDENT REVIEWER FORM (SONAR-TRIAL)

ANONYMIZED CASE IDENTIFICATION CODE

REVIEW DATE D D M M Y Y Y Y

REVIEWER (INITIALS, LAST NAME)

STEPS RECORDED

| | | VIDEO | | NOTE | | AUDIO | | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| **1a** | Introduction of the first accessory trocar | Ye ☐ | No ☐ | Ye ☐ | No ☐ | Ye ☐ | No ☐ | |
| **1b** | Introduction of the second accessory trocar | Ye ☐ | No ☐ | Ye ☐ | No ☐ | Ye ☐ | No ☐ | |
| **1c** | Introduction of the third accessory trocar | Ye ☐ | No ☐ | Ye ☐ | No ☐ | Ye ☐ | No ☐ | |
| **2a** | Inspection of the gallbladder | Ye ☐ | No ☐ | Ye ☐ | No ☐ | Ye ☐ | No ☐ | |
| **2b** | Inspection of the liver condition | Ye ☐ | No ☐ | Ye ☐ | No ☐ | Ye ☐ | No ☐ | |
| **3** | Circumferential dissection of the cystic duct and the cystic artery | Ye ☐ | No ☐ | Ye ☐ | No ☐ | Ye ☐ | No ☐ | |
| **4** | Transection of the cystic artery | Ye ☐ | No ☐ | Ye ☐ | No ☐ | Ye ☐ | No ☐ | |
| **5** | Transection of the cystic duct | Ye ☐ | No ☐ | Ye ☐ | No ☐ | Ye ☐ | No ☐ | |
| **6** | Removal of the gallbladder from the liver bed | Ye ☐ | No ☐ | Ye ☐ | No ☐ | Ye ☐ | No ☐ | |
| **7** | Inspection of liver hemostasis | Ye ☐ | No ☐ | Ye ☐ | No ☐ | Ye ☐ | No ☐ | |
| **8** | Presence of spill (clear or purulent bile, stones) | Ye ☐ | No ☐ | Ye ☐ | No ☐ | Ye ☐ | No ☐ | |
| **9** | Saline irrigation (if used) | Ye ☐ | No ☐ | Ye ☐ | No ☐ | Ye ☐ | No ☐ | |
| **10** | Drain placement (if present) | Ye ☐ | No ☐ | Ye ☐ | No ☐ | Ye ☐ | No ☐ | |
| **11a** | Removal of the first accessory trocar | Ye ☐ | No ☐ | Ye ☐ | No ☐ | Ye ☐ | No ☐ | |
| **11b** | Removal of the second accessory trocar | Ye ☐ | No ☐ | Ye ☐ | No ☐ | Ye ☐ | No ☐ | |
| **11c** | Removal of the third accessory trocar | Ye ☐ | No ☐ | Ye ☐ | No ☐ | Ye ☐ | No ☐ | |