Année 2017/2018 N°

# Thèse

Pour le

## DOCTORAT EN MEDECINE

Diplôme d'État

par


## Lise COURTOT

Née le 03/08/1988 à Nantes (44)


---

**TITRE**

Facteurs de risque d'iléus post-opératoire après colectomies droites coelioscopiques réglées. Etude multicentrique rétrospective.

---

Présentée et soutenue publiquement le **24 Avril 2018** devant un jury composé de :

Président du Jury : Professeur Ephrem SALAME, Chirurgie Digestive, Faculté de Médecine – Tours

Membres du Jury : Professeur Guillaume MEURETTE, Chirurgie Digestive, Faculté de Médecine – Nantes
Docteur Raphael DENHAUT, Anesthésiologie - Réanimation, PH, CHU – Tours

Directeur de thèse : Professeur Mehdi OUAISSI, Chirurgie Digestive, Faculté de Médecine – Tours

Année 2017/2018 N°

# Thèse

Pour le

## DOCTORAT EN MEDECINE

Diplôme d'État

par


## Lise COURTOT

Née le 03/08/1988 à Nantes (44)


---

**TITRE**

Facteurs de risque d'iléus post-opératoire après colectomies droites coelioscopiques réglées. Etude multicentrique rétrospective.

---

Présentée et soutenue publiquement le **24 Avril 2018** devant un jury composé de :

Président du Jury : Professeur Ephrem SALAME, Chirurgie Digestive, Faculté de Médecine – Tours

Membres du Jury : Professeur Guillaume MEURETTE, Chirurgie Digestive, Faculté de Médecine – Nantes
Docteur Raphael DENHAUT, Anesthésiologie - Réanimation, PH, CHU – Tours

Directeur de thèse : Professeur Mehdi OUAISSI, Chirurgie Digestive, Faculté de Médecine – Tours

FACULTÉ DE MÉDECINE
TOURS

UNIVERSITE FRANCOIS RABELAIS
**FACULTE DE MEDECINE DE TOURS**

## DOYEN
**Pr. Patrice DIOT**

## VICE-DOYEN
Pr. Henri MARRET

## ASSESSEURS
Pr. Denis ANGOULVANT, *Pédagogie*
Pr. Mathias BUCHLER, *Relations internationales*
Pr. Hubert LARDY, *Moyens – relations avec l'Université*
Pr. Anne-Marie LEHR-DRYLEWICZ, *Médecine générale*
Pr. François MAILLOT, *Formation Médicale Continue*
Pr. Patrick VOURC'H, *Recherche*

## SECRETAIRE GENERALE
Mme Fanny BOBLETER

********

## DOYENS HONORAIRES
Pr. Emile ARON (†) – *1962-1966*
*Directeur de l'Ecole de Médecine - 1947-1962*
Pr. Georges DESBUQUOIS (†) - *1966-1972*
Pr. André GOUAZE - *1972-1994*
Pr. Jean-Claude ROLLAND – *1994-2004*
Pr. Dominique PERROTIN – *2004-2014*

## PROFESSEURS EMERITES
Pr. Daniel ALISON
Pr. Catherine BARTHELEMY
Pr. Philippe BOUGNOUX
Pr. Pierre COSNAY
Pr. Etienne DANQUECHIN-DORVAL
Pr. Loïc DE LA LANDE DE CALAN
Pr. Noël HUTEN
Pr. Olivier LE FLOCH
Pr. Yvon LEBRANCHU
Pr. Elisabeth LECA
Pr. Gérard LORETTE
Pr. Roland QUENTIN
Pr. Alain ROBIER
Pr. Elie SALIBA

## PROFESSEURS HONORAIRES
P. ANTHONIOZ – A. AUDURIER – A. AUTRET – P. BAGROS – G. BALLON – P.BARDOS – J.L. BAULIEU – C. BERGER – JC. BESNARD – P. BEUTTER – P. BONNET – M. BROCHIER – P. BURDIN – L. CASTELLANI – B. CHARBONNIER – P. CHOUTET – T. CONSTANS – C. COUET - J.P. FAUCHIER – F. FETISSOF – J. FUSCIARDI – P. GAILLARD – G. GINIES – A. GOUAZE – J.L. GUILMOT – M. JAN – J.P. LAMAGNERE – F. LAMISSE – Y. LANSON – J. LAUGIER – P. LECOMTE – G. LELORD – E. LEMARIE – G. LEROY – Y. LHUINTRE – M. MARCHAND – C. MAURAGE – C. MERCIER – J. MOLINE – C. MORAINE – J.P. MUH – J. MURAT – H. NIVET – L. POURCELOT – P. RAYNAUD – D. RICHARD-LENOBLE – M. ROBERT – J.C. ROLLAND – D. ROYERE - A. SAINDELLE – J.J. SANTINI – D. SAUVAGE – B. TOUMIEUX – J. WEILL

**PROFESSEURS DES UNIVERSITES - PRATICIENS HOSPITALIERS**

ANDRES Christian .....Biochimie et biologie moléculaire
ANGOULVANT Denis .....Cardiologie
ARBEILLE Philippe .....Biophysique et médecine nucléaire
AUPART Michel .....Chirurgie thoracique et cardiovasculaire
BABUTY Dominique.....Cardiologie
BALLON Nicolas .....Psychiatrie ; addictologie
BARILLOT Isabelle .....Cancérologie ; radiothérapie
BARON Christophe .....Immunologie
BEJAN-ANGOULVANT Théodora .....Pharmacologie clinique
BERNARD Anne .....Cardiologie
BERNARD Louis .....Maladies infectieuses et maladies tropicales
BODY Gilles .....Gynécologie et obstétrique
BONNARD Christian .....Chirurgie infantile
BONNET-BRILHAULT Frédérique.....Physiologie
BRILHAULT Jean.....Chirurgie orthopédique et traumatologique
BRUNEREAU Laurent .....Radiologie et imagerie médicale
BRUYERE Franck.....Urologie
BUCHLER Matthias .....Néphrologie
CALAIS Gilles .....Cancérologie, radiothérapie
CAMUS Vincent .....Psychiatrie d'adultes
CHANDENIER Jacques.....Parasitologie, mycologie
CHANTEPIE Alain.....Pédiatrie
COLOMBAT Philippe .....Hématologie, transfusion
CORCIA Philippe .....Neurologie
COTTIER Jean-Philippe.....Radiologie et imagerie médicale
DE TOFFOL Bertrand .....Neurologie
DEQUIN Pierre-François.....Thérapeutique
DESTRIEUX Christophe .....Anatomie
DIOT Patrice .....Pneumologie
DU BOUEXIC de PINIEUX Gonzague.....Anatomie & cytologie pathologiques
DUCLUZEAU Pierre-Henri.....Endocrinologie, diabétologie, et nutrition
DUMONT Pascal.....Chirurgie thoracique et cardiovasculaire
EL HAGE Wissam.....Psychiatrie adultes
EHRMANN Stephan.....Réanimation
FAUCHIER Laurent.....Cardiologie
FAVARD Luc.....Chirurgie orthopédique et traumatologique
FOUQUET Bernard.....Médecine physique et de réadaptation
FRANCOIS Patrick.....Neurochirurgie
FROMONT-HANKARD Gaëlle.....Anatomie & cytologie pathologiques
GOGA Dominique .....Chirurgie maxillo-faciale et stomatologie
GOUDEAU Alain .....Bactériologie-virologie, hygiène hospitalière
GOUPILLE Philippe .....Rhumatologie
GRUEL Yves.....Hématologie, transfusion
GUERIF Fabrice.....Biologie et médecine du développement et de la reproduction
GUYETANT Serge .....Anatomie et cytologie pathologiques
GYAN Emmanuel.....Hématologie, transfusion
HAILLOT Olivier .....Urologie
HALIMI Jean-Michel.....Thérapeutique
HANKARD Régis .....Pédiatrie
HERAULT Olivier .....Hématologie, transfusion
HERBRETEAU Denis .....Radiologie et imagerie médicale
HOURIOUX Christophe .....Biologie cellulaire
LABARTHE François .....Pédiatrie
LAFFON Marc.....Anesthésiologie et réanimation chirurgicale, médecine d'urgence
LARDY Hubert .....Chirurgie infantile
LARIBI Saïd .....Médecine d'urgence
LARTIGUE Marie-Frédérique.....Bactériologie-virologie
LAURE Boris .....Chirurgie maxillo-faciale et stomatologie
LECOMTE Thierry.....Gastroentérologie, hépatologie
LESCANNE Emmanuel.....Oto-rhino-laryngologie
LINASSIER Claude .....Cancérologie, radiothérapie
MACHET Laurent.....Dermato-vénéréologie
MAILLOT François.....Médecine interne
MARCHAND-ADAM Sylvain .....Pneumologie
MARRET Henri .....Gynécologie-obstétrique
MARUANI Annabel .....Dermatologie-vénéréologie
MEREGHETTI Laurent .....Bactériologie-virologie ; hygiène hospitalière
MORINIERE Sylvain .....Oto-rhino-laryngologie

MOUSSATA Driffa .....Gastro-entérologie
MULLEMAN Denis .....Rhumatologie
ODENT Thierry .....Chirurgie infantile
OUAISSI Mehdi .....Chirurgie digestive
OULDAMER Lobna .....Gynécologie-obstétrique
PAGES Jean-Christophe .....Biochimie et biologie moléculaire
PAINTAUD Gilles .....Pharmacologie fondamentale, pharmacologie clinique
PATAT Frédéric .....Biophysique et médecine nucléaire
PERROTIN Dominique .....Réanimation médicale, médecine d'urgence
PERROTIN Franck .....Gynécologie-obstétrique
PISELLA Pierre-Jean .....Ophtalmologie
PLANTIER Laurent .....Physiologie
QUENTIN Roland .....Bactériologie-virologie, hygiène hospitalière
REMERAND Francis .....Anesthésiologie et réanimation, médecine d'urgence
ROINGEARD Philippe .....Biologie cellulaire
ROSSET Philippe .....Chirurgie orthopédique et traumatologique
RUSCH Emmanuel .....Epidémiologie, économie de la santé et prévention
SAINT-MARTIN Pauline .....Médecine légale et droit de la santé
SALAME Ephrem .....Chirurgie digestive
SAMIMI Mahtab .....Dermatologie-vénéréologie
SANTIAGO-RIBEIRO Maria .....Biophysique et médecine nucléaire
SIRINELLI Dominique .....Radiologie et imagerie médicale
THOMAS-CASTELNAU Pierre .....Pédiatrie
TOUTAIN Annick .....Génétique
VAILLANT Loïc .....Dermato-vénéréologie
VELUT Stéphane .....Anatomie
VOURC'H Patrick .....Biochimie et biologie moléculaire
WATIER Hervé .....Immunologie

**PROFESSEUR DES UNIVERSITES DE MEDECINE GENERALE**

LEBEAU Jean-Pierre
LEHR-DRYLEWICZ Anne-Marie

**PROFESSEURS ASSOCIES**

MALLET Donatien .....Soins palliatifs
POTIER Alain .....Médecine Générale
ROBERT Jean .....Médecine Générale

**MAITRES DE CONFERENCES DES UNIVERSITES - PRATICIENS HOSPITALIERS**

BAKHOS David .....Physiologie
BARBIER Louise .....Chirurgie digestive
BERHOUET Julien .....Chirurgie orthopédique et traumatologique
BERTRAND Philippe .....Biostatistiques, informatique médical et technologies de communication
BLANCHARD-LAUMONNIER Emmanuelle .....Biologie cellulaire
BLASCO Hélène .....Biochimie et biologie moléculaire
BRUNAULT Paul .....Psychiatrie d'adultes, addictologie
CAILLE Agnès .....Biostatistiques, informatique médical et technologies de communication
CLEMENTY Nicolas .....Cardiologie
DESOUBEAUX Guillaume .....Parasitologie et mycologie
DOMELIER Anne-Sophie .....Bactériologie-virologie, hygiène hospitalière
DUFOUR Diane .....Biophysique et médecine nucléaire
FOUQUET-BERGEMER Anne-Marie .....Anatomie et cytologie pathologiques
GATAULT Philippe .....Néphrologie
GAUDY-GRAFFIN Catherine .....Bactériologie-virologie, hygiène hospitalière
GOUILLEUX Valérie .....Immunologie
GUILLON Antoine .....Réanimation
GUILLON-GRAMMATICO Leslie .....Epidémiologie, économie de la santé et prévention
HOARAU Cyrille .....Immunologie
IVANES Fabrice .....Physiologie
LE GUELLEC Chantal .....Pharmacologie fondamentale, pharmacologie clinique
MACHET Marie-Christine .....Anatomie et cytologie pathologiques
PIVER Éric .....Biochimie et biologie moléculaire
REROLLE Camille .....Médecine légale
ROUMY Jérôme .....Biophysique et médecine nucléaire
TERNANT David .....Pharmacologie fondamentale, pharmacologie clinique

ZEMMOURA Ilyess .....Neurochirurgie

**MAITRES DE CONFERENCES DES UNIVERSITES**

AGUILLON-HERNANDEZ Nadia .....Neurosciences
BOREL Stéphanie .....Orthophonie
DIBAO-DINA Clarisse .....Médecine Générale
LEMOINE Maël .....Philosophie
MONJAUZE Cécile .....Sciences du langage - orthophonie
PATIENT Romuald .....Biologie cellulaire
RENOUX-JACQUET Cécile.....Médecine Générale

**CHERCHEURS INSERM - CNRS - INRA**

BOUAKAZ Ayache .....Directeur de Recherche INSERM – UMR INSERM 930
CHALON Sylvie.....Directeur de Recherche INSERM – UMR INSERM 930
COURTY Yves .....Chargé de Recherche CNRS – UMR INSERM 1100
DE ROCQUIGNY Hugues.....Chargé de Recherche INSERM – UMR INSERM 966
ESCOFFRE Jean-Michel .....Chargé de Recherche INSERM – UMR INSERM 930
GILOT Philippe.....Chargé de Recherche INRA – UMR INRA 1282
GOUILLEUX Fabrice.....Directeur de Recherche CNRS – UMR CNRS 7292
GOMOT Marie.....Chargée de Recherche INSERM – UMR INSERM 930
HEUZE-VOURCH Nathalie .....Chargée de Recherche INSERM – UMR INSERM 1100
KORKMAZ Brice .....Chargé de Recherche INSERM – UMR INSERM 1100
LAUMONNIER Frédéric.....Chargé de Recherche INSERM - UMR INSERM 930
LE PAPE Alain .....Directeur de Recherche CNRS – UMR INSERM 1100
MAZURIER Frédéric .....Directeur de Recherche INSERM – UMR CNRS 7292
MEUNIER Jean-Christophe .....Chargé de Recherche INSERM – UMR INSERM 966
PAGET Christophe.....Chargé de Recherche INSERM – UMR INSERM 1100
RAOUL William .....Chargé de Recherche INSERM – UMR CNRS 7292
SI TAHAR Mustapha.....Directeur de Recherche INSERM – UMR INSERM 1100
WARDAK Claire.....Chargée de Recherche INSERM – UMR INSERM 930

**CHARGES D'ENSEIGNEMENT**

***Pour l'Ecole d'Orthophonie***
DELORE Claire .....Orthophoniste
GOUIN Jean-Marie .....Praticien Hospitalier
PERRIER Danièle .....Orthophoniste

***Pour l'Ecole d'Orthoptie***
LALA Emmanuelle .....Praticien Hospitalier
MAJZOUB Samuel.....Praticien Hospitalier

***Pour l'Ethique Médicale***
BIRMELE Béatrice .....Praticien Hospitalier

**Résumé :**

L'iléus post-opératoire (IPO) est source de complications médico-chirurgicales et représente un coût hospitalier important. L'objectif est d'identifier les facteurs favorisant l'IPO après colectomie droite coelioscopique.

Entre 2004 et 2016, 637 colectomies ont été réalisées et étudiées de façon rétrospective à partir de la base de données CLIMHET. Les facteurs favorisants potentiels ont été analysés par régression logistique.

Les patients avec IPO (n=113, 17,7%) étaient comparés à ceux sans iléus post-opératoire (SIPO) (n=524, 82.3%). Dans le groupe IPO, il y avait plus d'hommes (62%vs49% p=0.012), plus d'anesthésies péridurales (19%vs9% p=0.004), de transfusions peropératoires (7%vs3% p=0.020) et un remplissage vasculaire plus important (2000mL vs 1750mL, p<0.001). La section vasculaire extracorporelle et l'extraction de la pièce par une incision transverse étaient plus fréquentes dans le groupe IPO (20%vs12%, p=0.049 et 34%vs23% p=0.044). Les complications chirurgicales étaient plus fréquentes dans le groupe IPO (31.9%vs12.0% p<0.0001). En analyse multivariée les facteurs de risques indépendant d'IPO étaient : sexe masculin (HR=2.316, 1.102–4.866), anesthésie péridurale (HR=2.958, 1.250–6.988) et transfusion peropératoire (HR=6.994, 1.550–31.560).

Cette étude est l'une des premières à exploiter la base données CLIMHET et la première à s'intéresser aux facteurs de risque d'IPO. Les facteurs de risque d'IPO modifiables sont : anesthésie péridurale et transfusion peropératoire ; celles-ci doivent être utilisées avec précaution afin de diminuer le taux d'IPO.

**Mots clés :** Iléus post-opératoire – facteurs de risque – colectomie droite – cœlioscopie

**Abstract:**

Postoperative ileus (POI) is associated with an elevated risk of other complications and increases the economic impact on healthcare services. The aim of this study was to identify pre-, intra- and post-operative risk factors associated with the development of POI following elective laparoscopic right colectomy.

Between 2004 and 2016, 637 laparoscopic right colectomies were performed. Data were analysed retrospectively thanks to the CLIHMET database. Potential contributing factors were analysed by logistic regression.

Patients with POI (n=113, 17.7%) were compared to those without postoperative ileus (WPOI) (n=524, 82.3%). In the POI group, there were more men (62% vs 49%; p=0.012), more use of epidural anaesthesia (19% vs. 9%; p=0.004), more intraoperative blood transfusion requirements (7% vs. 3%; p=0.018) and greater perioperative intravenous fluid administration (2000mL vs. 1750mL; p<0.001). POIs were more frequent when extracorporeal vascular section (20% vs 12%; p=0.049) and transversal incision for extraction site (34% vs 23%; p=0.044) were performed. Overall surgical complications in the POI group were significantly greater than in the control group WPOI (31.9% vs 12.0%; p<0.0001). Multivariate analysis found the following independent POI risk factors: male gender (HR=2.316, 1.102 – 4.866), epidural anaesthesia (HR=2.958, 1.250 – 6.988) and postoperative blood transfusion requirement (HR=6.994, 1.550 – 31.560).

This study is one of the first to explore the CLIHMET database and the first to use it for investigating risk factors for POI development. Modifiable risk factors such as epidural anaesthesia and intraoperative blood transfusion should be used with caution in order to decrease POI rates.

**Key Words:** postoperative ileus - risk factor - right colectomy – laparoscopy

**Remerciements :**

Merci au Professeur Salamé d'avoir accepté de présider ce jury de thèse. Merci pour votre soutien tout au long de ma formation, merci pour votre enseignement et votre détermination exemplaire.

Un grand merci au Professeur Ouaïssi d'avoir dirigé ce travail. Merci pour votre engagement inconditionnel et votre disponibilité. Vos connaissances et votre exigence m'ont beaucoup apporté.

Merci au Professeur Meurette, d'avoir accepté d'être membre du jury. Merci pour ce semestre passé à vos côtés qui m'a permis de redécouvrir avec plaisir la CCDE de Nantes. Votre savoir et votre envie de le transmettre m'ont été très bénéfique.

Merci au Docteur Raphaël Denhaut, d'avoir accepté d'être membre du jury et d'apporter votre expertise à ce travail.

Un grand merci à toute l'équipe de chirurgie digestive du CHU de Tours :

- aux PH qui ont eu l'envie de nous former, Docteur Bourlier, Louise, Céline et Pétru.
- à mes différents chefs de Clinique Baudouin, Zeynal, Giovanni, David, Nico, Fred et Fabien, pour la patience dont ils ont fait preuve et leur pédagogie. Désolé pour vos surrénales et vos coronaires.
- aux infirmières, aides-soignantes et secrétaires qui nous ont aidés et supportés au quotidien, avec une attention particulière à Pauline, Karine , Faustine, Laure, Valérie, Sarah.
- aux coordinatrices pour leurs doux appels nocturnes même si elles ont toujours refusé ma demande d'hélico
- aux cadres qui ont dû faire face à nos besoins impérieux. Avec un merci particulier à Dodo pour nos longues conversations.
- aux anesthésistes, car même si un champ nous sépare, nous travaillons ensemble avec plaisir. Merci notamment à Jean-Louis et au Dr Lepage.

Merci au service de la CCDE de Nantes, pour ces 6 premiers mois d'exil :

- au professeur Mirallié pour son talent et son piquant éternel.
- à tous les PH et chefs qui nous ont accueillis, formés et fait confiance rapidement.
- à une grande partie des infirmières pour leur accueil.

Merci au service d'urologie, au professeur Bruyère et aux PH pour leur accueil et leur enseignement. A Colas, Mélanie, FX, et Alex pour leur confiance et leur pédagogie.
Avec une pensée particulière pour M. Boutin.

Merci à l'équipe de la chirurgie digestive du CHRO, au Dr Piquard pour son enseignement et son humanité, Dr Saint-Marc pour son talent et sa bonne parole, au Dr AbouMrad grâce à qui je sais filmer les mariages ®boobies et au Dr Bellouard franc carabin qui m'a appris le ski nautique. Aux infirmières, AS, panseuses (Sarah, Sophie, Fred, Bruno, Phillipe) et à Denis (qui a succédé à ma chère Gueguette)

Merci à ma famille, mes parents pour leur soutien lors de ses longues années d'études, notamment à ma mère pour les petits plats et le repassage à Nantes. Bien consciente que tout cela ne soit pas toujours facile à appréhender d'un œil extérieur (je rappelle juste qu'une garde dure 24h).

Merci à mes ami(e)s de l'externat grâce à qui ses années ont été plus douces.
Gillian, Lucile, Hoël, Hélène, Marie, Camille Claire et Amandine

Merci au VHO, refuge pour internes en détresse où j'ai rencontré des copines devenue des amies. Margaux (un rayon de soleil), Camille (ton côté maternel) et lolo, Alice (mon acolyte), Axelle (je suis ravie d'être du bon côté et merci pour tes défilés quotidiens), Marion (pour notre humour connecté et tes photos pas spontanées) et Julie (une personne sur qui on peut compter)

Merci à mes différents co-internes rencontrés lors de ses stages : Perrine, Nico (merci du fond du cœur pour ton investissement dans ce travail), Julien, Théo, Remi
Aurélie, Pierre, Greg, Lucas, Louise, Marina, Luc. Un remerciement particulier à Benjam' pour son compagnonnage en uro et bon entendeur.

A mon mari qui me soutient au quotidien, qui a dû écouter pendant des heures mes divagations sur les urgentistes, participer à mes astreintes téléphoniques et qui m'a aidé pour ce travail. Merci pour ta bienveillance.

Merci aux pilotes d'avions

Merci à la région Centre, plus qu'une région, une chance.

Je ne remercierai pas : Vinci, ceux qui n'allument pas la lumière de la piste d'atterrissage et l'interdiction du port de vernis à ongles.

## Table des matières

# I) Lettre de soumission



Gmail Lise Courtot <lise.courtot@gmail.com>

## International Journal of Colorectal Disease - Submission Notification to co-author

1 message

**Editorial Office** <em@editorialmanager.com> 9 mars 2018 à 14:46
Répondre à : Editorial Office <b.hotz@ijcd.de>
À : Lise Courtot <lise.courtot@gmail.com>

Re: "Risk factors for postoperative ileus following elective right laparoscopic colectomy: A retrospective Multicentric study."
Full author list: Lise Courtot, M.D; Bertrand Le Roy, M.D; Ricardo Memeo, M.D; Thibault Voron; Nicolas De Angelis, M.D, Ph.D; Nicolas Tabchouri, M.D; Francesco Brunetti, M.D; Anne Berger, M.D, PhD; Didier Mutter; Ephrem Salame, M.D, PhD; Denis Pezet; Mehdi ouaissi, M.D, Ph.D

Dear Dr Lise Courtot,

We have received the submission entitled: "Risk factors for postoperative ileus following elective right laparoscopic colectomy: A retrospective Multicentric study." for possible publication in International Journal of Colorectal Disease, and you are listed as one of the co-authors.

The manuscript has been submitted to the journal by Dr. Pr Mehdi ouaissi who will be able to track the status of the paper through his/her login.

If you have any objections, please contact the editorial office as soon as possible. If we do not hear back from you, we will assume you agree with your co-authorship.

Thank you very much.

With kind regards,

Springer Journals Editorial Office
International Journal of Colorectal Disease

## II) Article

# Risk factors for postoperative ileus following elective laparoscopic right colectomy:

# A retrospective multicentric study.

Lise Courtot, M.D.[1], Bertrand Leroy M.D.[2], Ricardo Memeo M.D.[3], Thibault Voron M.D.[4], Nicolas de Angelis M.D.[5], Nicolas Tabchouri M.D.[1], Francesco Brunetti M.D.[5], Anne Berger M.D., Ph.D. [4], Didier Mutter M.D., Ph.D. [3], Johan Gagniere, MD, PhD[2], Ephrem Salamé, M.D., Ph.D. [1], Denis Pezet M.D., Ph.D. [2], Mehdi Ouaïssi M.D., Ph.D.[1]

[1]Department of Digestive, Oncological, Endocrine, and Hepatic Surgery, and Hepatic Transplantation. Trousseau Hospital, Tours, France
[2]Department of Digestive Surgery, Estaing University Hospital, Clermont-Ferrand, France
[3]Hepato-Biliary and Pancreatic Surgical Unit, IRCAD-IHU, University of Strasbourg, Strasbourg, France
[4]Department of Digestive Surgery. George Pompidou European Hospital, Paris, France
[5]Department of Digestive Surgery, Hepato-Pancreato-Biliary Surgery, and Liver Transplantation, Henri-Mondor Hospital, AP-HP, Créteil, France

**Running title: Predictive factors for ileus following elective laparoscopic right colectomy**

**Corresponding author**
Mehdi Ouaïssi, M.D., Ph.D.
Department of Digestive, Oncological, Endocrine, and Hepatic Surgery, and Hepatic Transplantation. Trousseau Hospital. Colorectal Unit.
Centre Hospitalier Universitaire (CHU) Tours, avenue de la République, 37170 Chambray-les-Tours, France.
Fax: Tel.: E-mail: m.ouaissi@chu-tours.fr

**Source of financial support:** None

## a. Introduction

Postoperative ileus (POI) following open or laparoscopic colorectal surgery is one of the most common complications, with an incidence of 10 to 17%[1]. POI contributes to prolonged hospital stays, is associated with an increased risk of other complications, nosocomial infections and higher postoperative mortality. Consequently, POI has a major economic impact on healthcare services [2, 3]. A recent study with a large database (N=29,201) highlighted that POI occurred more frequently following right colectomy compared with left colectomy [4]. Because it reduces overall postoperative morbidity (mainly ileus, length of hospital stay and time to oral intake), the laparoscopic approach is considered to be the gold standard in colorectal surgery[5–7]. Despite significantly reduced rate of POI with the laparoscopic approach, recent studies have shown that the rate of POI after laparoscopic right colectomy is 10.6% [8] and explain that POI could raise public health issues. A better understanding of the factors associated with POI could lead to better prevention at each stage of care, avoiding the operative factors implicated and monitoring, and providing early care to high-risk patients. No large study has analysed POI risk factors following elective laparoscopic right colectomy, based on a homogenous definition of POI. The purpose of our study was to characterise preoperative, intraoperative and postoperative POI risk factors in patients undergoing elective laparoscopic right colectomy.

## b. Materials and methods

*Patients*

A retrospective study was conducted using the CLIHMET Study Group Database. 637 consecutive elective laparoscopic right colectomies were reviewed from January 2005 to December 2015, at five University Hospital centres in France (the CHU in Clermont-Ferrand, Hôpital Civil in Strasbourg – IRCAD, Hôpital Henri-Mondor in Créteil, Hôpital Européen Georges Pompidou in Paris and the CHU in Tours). The CLIHMET database included adult patients (over 18 years of age) scheduled for elective laparoscopic right colectomy for malignant or benign colonic diseases. All patients were treated with a curative intent for their right colonic disease. Patients with metastatic disease, locally advanced cancer requiring multi-visceral resection or undergoing emergency surgery were excluded.

*Data collection*

According to Chapuis [9], POI was defined as the presence of abdominal distension with a lack of bowel sounds in a patient who has experienced nausea or vomiting and has failed to pass flatus or stool for more than 3 days postoperatively, in the absence of mechanical bowel obstruction. The study population was therefore divided into two groups: 113 patients in the POI group and 524 in the control group without postoperative ileus (WPOI). Patients' characteristics and operative data were retrospectively collected to identify risk factors associated with POI. Patient background factors were age, gender, BMI score, American Society of Anesthesiologists (ASA) score, comorbidities (smoking, diabetes, cardio vascular disease and previous open or laparoscopic surgery), type and site of the colonic disease, tumour stage and neoadjuvant chemotherapy.

*Preoperative and intraoperative workup*

Patients with colorectal cancer and colonic polyps or adenoma underwent the following: preoperative colonoscopy, tumour biopsy and an abdominal computed tomography (CT) scan. In patients with inflammatory bowel disease (IBD), preoperative colonoscopy and magnetic resonance imaging (MRI) were performed. Bowel preparation was not conducted before surgery. A single dose of prophylactic antibiotics was routinely given (750 mg of cefuroxime) at induction of general anaesthesia and was repeated intraoperatively if surgery lasted for >2 hours. Prophylaxis for deep-vein thrombosis was given, i.e. low molecular-weight heparin (50 IU/kg per day) was given to all patients and was continued postoperatively for 30 days in patients with colon cancer and 7 days in patients with benign disease. Operative features recorded for all patients were epidural analgesia, perioperative blood transfusion, perioperative intravenous fluids, duration of operation, conversion rate, nasogastric tube insertion and drain insertion.

*Surgery*

All surgical teams were experts in both laparoscopic and open colorectal surgery (around 400 colorectal surgical procedures were performed each year in all five departments). Laparoscopic right colectomies were performed as previously reported using a medial-to-lateral approach for radical operations [10, 11] for cancer and lateral to medial for benign diseases. The type of ileocolic anastomosis performed was left to the surgeon's discretion: intracorporeally or extracorporeally [12], mechanical or manual, peristaltic or anti-peristaltic. Anastomosis techniques could be performed as follows: side-to-side, end-to-end, side-to-end or end-to-side. Surgeons performed middle, transverse or suprapubic incision to extract the specimen. Conversion was defined as the completion of the right colectomy procedure through either an enlarged incision or an abdominal incision measuring ≥6cm.

*Postoperative outcomes*

Postoperative morbidity and mortality were defined as events occurring during hospital stay or within 30 and 90 postoperative days. Postoperative complications were classified according to Dindo-Clavien, their management (medical, radiological, surgical) and their severity [13]. Postoperative complications included POI, anastomotic leakage, anastomotic haemorrhage, wound infection, intra-abdominal abscess, bleeding and evisceration. Non-surgical complications were cardiac, vascular and pulmonary. Postoperative outcomes also included the following: reoperation rate, time to resumption of a regular diet, time before ambulation, time to flatus, time to first stool and time before perfusion removal, length of in-hospital stay and mortality.

*Postoperative follow-up*

Patients were systematically clinically examined at 4 to 6 weeks after discharge from hospital. The length of hospitalisation was measured from the time of surgery to the date of discharge from hospital. Regarding colorectal cancer, postoperative follow-up visits included clinical, biochemical and radiological assessments every 3 months during the first three postoperative years and then every 6 months up to 5 postoperative years [14]. Surviving patients were assessed for disease recurrence and, if so, the site of recurrence. Follow-up information was obtained from medical records, direct consultation with patients and/or telephone interview. At the end of the follow-up, the statuses of all patients were assessed, i.e. mortality, recurrence and lost to follow-up. The endpoint of data collection was April 2017. Patient follow-up was carried out from the time of surgery to this endpoint, until death if occurring prior to this date, or until the date of last contact. Loss to follow-up was defined as a follow-up inferior to 3 months, in the absence of death. Overall, 165 patients (25.9%) were lost to follow-up. Median follow-up was 27 months.

*Statistical Analysis*

Statistical analyses were performed using IBM SPSS Statistics version 20 (IBM SPSS Inc., Chicago, IL, USA). Continuous variables are expressed as their means ± standard deviations (SD), or as their medians and ranges (min, max). Categorical variables are reported as numbers and percentages. Mean values between the two groups were compared using Student's t-test or the Mann–Whitney U test, when necessary. Comparisons between percentages were made using the $\chi^2$ test or Fisher's exact test, as appropriate, for the qualitative variables. Factors included in the multivariate analyses were significant in the univariate analyses at a *p*-value of <0.10. Univariate and multivariate Cox's proportional hazard regression models were used to estimate the hazard ratio (HR). The HRs were expressed with their 95% confidence intervals. All tests were two-sided. Overall survival (OS) and disease-free survival (DFS) rates were computed using the Kaplan-Meier method and compared between groups using the log rank (Mantel–Cox) test. Statistical significance was defined as a *p*-value of <0.05

### c. Results

Patients were allocated into 2 groups: 113 patients with POI and 524 patients WPOI. As the mortality rate before the fourth postoperative day was null, all 637 patients were able to be included for statistical analyses.

*General characteristics and demographics (table 1)*

Median age was 71 years (range 21-98). Median body mass index (BMI) was 25.0 kg/m$^2$ (range 15-47). The male/female gender ratio was 1.05 for the whole series. Thirty percent of patients were considered at high risk (ASA 3 and 4). There were significantly more male individuals in the POI group compared to the control group (61.9% vs 49.0%; p=0.012). There was no significant association between ileus and age, comorbidities (smoking, diabetes, vascular, coronary disease or previous surgery) and ASA scores. Colorectal disease (colorectal cancer, IBD, benign tumour) and location did not differ between the two groups.

*Operative procedure (table 2)*

Median preoperative fasting was 11 hours (range 2-96). Anastomosis was performed extracorporeally and mechanically in 76.3% and 56.2% of cases respectively. Overall conversion rate was 6.3%. Median operative time was 180 minutes (range 60-695). There were statistically significant associations between prolonged ileus and operative features. Concerning perioperative anaesthetic procedures, POI was more frequent in patients undergoing epidural anaesthesia (18.6% and 9.0%, respectively, p=0.004), in patients requiring blood transfusion (7.1% and 2.7%, respectively, p=0.018) and in patients receiving more perioperative intravenous fluid (2000 mL and 1500mL p <0.0001). Concerning surgical techniques, extracorporeal vascular section (19.5% and 12.2%, respectively, p=0.049) and transverse periumbilical extraction incision (33.6% and 23.1%, respectively, p=0.044) were performed more in the POI group than in the control group.

*Short- and long-term outcomes (table 3)*

Overall 30- and 90-day mortality rates were 1.7% and 2.2%. Thirty and 90-day mortality rates were significantly higher in the POI group than in the WPOI group (6.2% vs 0.8%; 8.0% vs 1.0%; p<0.0001, respectively).

According to Clavien-Dindo's classification [13], the postoperative complication (stage III and IV) rate was higher in the POI group than in the WPOI group (16.9% vs 4.8%, respectively, p <0.0001). POI excluded, overall surgical complications in the POI group were significantly higher than in the control group WPOI (31.9% vs 12.0%; p<0.0001), respectively. Concerning surgical complications, surgical revision and anastomotic leakage in the POI group were significantly greater than in the control group WPOI (15.9% vs 2.9%; 13.3% and 2.5%; p<0.0001), respectively. However, there were no statistical differences regarding other surgical complications (endoscopic or radiologic drain, wound abscess, intra-abdominal haemorrhage, intraluminal haemorrhage and evisceration) between the two groups. Cardiac and pulmonary complication rates in the POI group were significantly higher than in the control group WPOI (9.7% vs 3.4% and 11.5% vs 2.7%, respectively, p=0.009, p<0.0001). Median of length of hospital stay was significantly higher in the POI group than in the control group WPOI (13 vs 7 days, respectively, p <0.0001). More patients were admitted to the intensive care unit or reanimation unit in the POI group than in the control group (23% vs 8.2%, respectively, p<0.0001).

*Pathological findings*

According to the TNM classification [15] for colorectal cancer, the tumour stage did not differ significantly between the POI group and the control group WPOI. The median number of lymph nodes resected did not differ between the two groups, at 19.

*Overall and disease-free survival (figure 1 and 2)*

Overall Survival (OS) and Desease-Free Survival (DFS) are displayed in Figures 1 and 2. Only 479 patients with colorectal cancer were analysed, 82 in the POI group and 397 in the control group WPOI. OS of the POI group was significantly lower than for the control group WPOI (89.0% vs 98.5% at 1 year, 87.8% vs 96% at 3 years, 86.6% vs 95.5% at 5 years, respectively, p <0.0001). DFS rates were comparable in the 2 groups, with 97.6% at 1 year, 95.1% at 3 years, 95.1% at 5 years in the POI group vs. 97.2% at 1 year, 93.7% at 3 years, 92.9% at 5 years in the control group WPOI, respectively (p=0.671).

*Multivariate analysis (table 4)*

Factors that were independently associated with an increased risk of POI were male gender (HR=2.316, 95% CI, 1.102 – 4.866), epidural anaesthesia (HR=2.958, 1.250 – 6.988) and perioperative blood transfusion requirement (HR=6.994, 1.550 – 31.560). Extracorporeal vascular section and extraction sites were not risk factors for POI.

### d. Discussion

This large series of 637 patients focused on risk factors associated with POI specifically following laparoscopic right colectomy. A 17.7% POI rate was observed, which was associated with non-modifiable risk factors such as male gender, but also with modifiable factors such as the type of anaesthesia, perioperative intravenous fluid volume, blood transfusion requirements and technical surgical points, such as extra-vascular section of the vessels and extraction modalities. Furthermore, POI was found to be correlated with other operative complications, both surgical and medical, and was associated with increased postoperative mortality.

This study contrasts with previous reports through patient homogeneity (only elective laparoscopic right colectomies were included) and its large sample size. Patients had standardised follow-up by expert teams. Thanks to previous studies, clinical and biological POI risk factors have been identified, but few studies have shown any interest as to the precise surgical technique performed. The fact that this study was multicentric, with surgical habits specific to each department, made it possible to analyse the different surgical techniques used. Indeed, as described in Venara et al. [16], the clinical criteria and the number of days defining ileus vary widely between studies (3 to 7 days) [9, 17]. This explains the great heterogeneity in the onset of ileus. Livingston described small intestine motility recovery as occurring within 12-24 hours and colonic motility within 3-5 days [18]. Nowadays, our understanding of POI management has reduced median recuperation of transit to 24-48 hours [19]. POI was therefore defined as the absence of transit resumption for more than 3 days postoperatively in the absence of a mechanical obstacle [9].

In the current series, male gender was a POI risk factor, which is consistent with the large series focusing on colorectal surgery previously published by Chapuis, Murphy and Vather [9, 20, 21]. Contrary to previous studies [17, 20], however, we did not demonstrate that

age and ASA scores greater than 3 were associated with POI occurrence.

Concerning perioperative management, our study suggests that excess fluid administration during surgery is associated with increased POI. This is corroborated by the recommendations of learned societies of anaesthesiology [22], which do not recommend excess fluid administration. Indeed, meta-analyses found that restricting fluid administration decreases the rate of postoperative complications [23]. Fluid administration induces tissue oedema, which hinders the recovery of intestinal motility. Intraoperative blood transfusion requirement was identified as a risk factor for POI, which is consistent with previous studies [9, 21, 24]. Analysis of our data suggests that epidural anaesthesia was significantly associated with POI. A recent study identified epidural anaesthesia as a risk factor for the reinsertion of a nasogastric tube [25]. These results differ, however, from previous studies that showed that in colorectal surgery, epidural anaesthesia decreased the number of POI [26, 27]. Nevertheless, according to the French guidelines for enhanced recovery after elective laparoscopic colorectal surgery, thoracic epidural analgesia should probably not be recommended by means of multimodal analgesia. It is difficult to isolate the role of the analgesic technique in terms of hospital stay or re-admission rate [22].

Regarding surgical techniques, extracorporeal vessel section was a POI risk factor in the univariate analysis. This could be ascribed to the reduced manipulation of the abdominal organs and also to the related traction on the transverse colon and mesocolon (sometimes necessary to exteriorize a large, heavy specimen through a small laparotomy incision). We could not, however, pinpoint any difference between the two groups as to performing extra-corporal anastomosis. This is consistent with the meta-analysis by Wu et al., which did not find any difference between the intra and extra-corporal anastomosis groups regarding the occurrence of POI [28]. Concerning the specimen extraction site, the transverse periumbilical

incision seemed to be more frequently associated with POI occurrence, without its being significant. This trend is interesting and will need to be confirmed by further studies. Previous studies have shown that intracorporeal anastomosis was associated with a transverse supra-pubic incision (Pfannenstiel), while extracorporeal anastomosis involved a periumbilical incision (mainly transverse incisions) [12].

Patients with POI had an increased overall postoperative complication rate compared with those without POI, and an increased reoperation rate. Anastomotic leakage was more frequent in the POI group, in agreement with the results of Moghadamyeghaneh et al., who identified anastomotic leakage as a risk factor for POI [17]. In the same way, the severe postoperative complication rate was higher in the POI group, suggesting that POI should be considered as a warning signal. When POI occurs, it is necessary to look for other postoperative complications.

According to our results, patients treated for right colon cancer with POI had a lower overall survival rate than patients without POI. It is important to emphasise this result because few recent studies have shown that POI onset following laparoscopic right colectomy for cancer has a negative impact on the overall prognosis. This can probably be explained by the fact that, as we said earlier, the occurrence of POI is correlated with that of other postoperative complications, in particular anastomotic leakage. Previous studies have shown that patients with anastomosis leakage had worse overall survival [29, 30]. POI is therefore a harbinger of other postoperative complications that deserve attention, especially in patients who have had cancer, due to poorer overall survival.

The present study's limitations are inherent to its retrospective nature. It can hardly produce cause and effect links and cannot dismiss all confounding factors. Data in this study were extracted from the discharge data and coding errors could potentially have occurred.

CLIHMET did not collect some important information such as opioid dosage administration, use of prokinetic agents, chronic preoperative use of narcotics and colic preparation, which may impact the risk of prolonged ileus [1, 2]. Despite these limitations, this study provides a large sample size reporting POI risk factors following laparoscopic right colectomy.

### e. Conclusion

This study is one of the first to explore the CLIHMET database and the first to use it for investigating risk factors for developing POI. We used univariate and multivariate analyses to identify independent risk factors for POI (gender, epidural anaesthesia and perioperative blood transfusion). A better understanding of these risk factors may lead to targeted preoperative teaching, heightened postoperative surveillance and more rapid treatment of POI. Lower POI rates would improve patient comfort and reduce hospital stays and costs.

**Conflict of Interest:**

The authors declare that they have no conflicts of interest.

## f. References


1. Kronberg U, Kiran RP, Soliman MSM, et al (2011) A characterization of factors determining postoperative ileus after laparoscopic colectomy enables the generation of a novel predictive score. Ann Surg 253:78–81. doi: 10.1097/SLA.0b013e3181fcb83e

2. Kehlet H, Holte K (2001) Review of postoperative ileus. Am J Surg 182:3S–10S

3. Iyer S, Saunders WB, Stemkowski S (2009) Economic burden of postoperative ileus associated with colectomy in the United States. J Manag Care Pharm JMCP 15:485–494. doi: 10.18553/jmcp.2009.15.6.485

4. Asgeirsson T, El-Badawi KI, Mahmood A, et al (2010) Postoperative ileus: it costs more than you expect. J Am Coll Surg 210:228–231. doi: 10.1016/j.jamcollsurg.2009.09.028

5. COLOR Study Group (2000) COLOR: a randomized clinical trial comparing laparoscopic and open resection for colon cancer. Dig Surg 17:617–622. doi: 10.1159/000051971

6. Colon Cancer Laparoscopic or Open Resection Study Group, Buunen M, Veldkamp R, et al (2009) Survival after laparoscopic surgery versus open surgery for colon cancer: long-term outcome of a randomised clinical trial. Lancet Oncol 10:44–52. doi: 10.1016/S1470-2045(08)70310-3

7. Braga M, Vignali A, Gianotti L, et al (2002) Laparoscopic versus open colorectal surgery: a randomized trial on short-term outcome. Ann Surg 236:759–766; disscussion 767. doi: 10.1097/01.SLA.0000036269.60340.AE

8. Campana JP, Pellegrini PA, Rossi GL, et al (2017) Right versus left laparoscopic colectomy for colon cancer: does side make any difference? Int J Colorectal Dis 32:907–912. doi: 10.1007/s00384-017-2776-x

9. Chapuis PH, Bokey L, Keshava A, et al (2013) Risk factors for prolonged ileus after resection of colorectal cancer: an observational study of 2400 consecutive patients. Ann Surg 257:909–915. doi: 10.1097/SLA.0b013e318268a693

10. Clinical Outcomes of Surgical Therapy Study Group, Nelson H, Sargent DJ, et al (2004) A comparison of laparoscopically assisted and open colectomy for colon cancer. N Engl J Med 350:2050–2059. doi: 10.1056/NEJMoa032651

11. Deo SV, Puntambekar SP (2012) Laparoscopic right radical hemicolectomy. J Minimal Access Surg 8:21–24. doi: 10.4103/0972-9941.91779

12. Shapiro R, Keler U, Segev L, et al (2016) Laparoscopic right hemicolectomy with intracorporeal anastomosis: short- and long-term benefits in comparison with extracorporeal anastomosis. Surg Endosc 30:3823–3829. doi: 10.1007/s00464-015-4684-x

13. Dindo D, Demartines N, Clavien P-A (2004) Classification of surgical complications: a new proposal with evaluation in a cohort of 6336 patients and results of a survey. Ann Surg 240:205–213

14. T Lecomte, T André, Y Panis, P Laurent-Puig, F Bibeau, J Taieb. «Cancer du côlon». Thésaurus National de Cancérologie Digestive, 11-2016

15. Edge SB, Compton CC (2010) The American Joint Committee on Cancer: the 7th edition of the AJCC cancer staging manual and the future of TNM. Ann Surg Oncol 17:1471–1474. doi: 10.1245/s10434-010-0985-4

16. Venara A, Neunlist M, Slim K, et al (2016) Postoperative ileus: Pathophysiology, incidence, and prevention. J Visc Surg 153:439–446. doi: 10.1016/j.jviscsurg.2016.08.010

17. Moghadamyeghaneh Z, Hwang GS, Hanna MH, et al (2016) Risk factors for prolonged ileus following colon surgery. Surg Endosc 30:603–609. doi: 10.1007/s00464-015-4247-1

18. Livingston EH, Passaro EP (1990) Postoperative ileus. Dig Dis Sci 35:121–132

19. van Bree SHW, Bemelman WA, Hollmann MW, et al (2014) Identification of clinical outcome measures for recovery of gastrointestinal motility in postoperative ileus. Ann Surg 259:708–714. doi: 10.1097/SLA.0b013e318293ee55

20. Murphy MM, Tevis SE, Kennedy GD (2016) Independent risk factors for prolonged postoperative ileus development. J Surg Res 201:279–285. doi: 10.1016/j.jss.2015.10.047

21. Vather R, Josephson R, Jaung R, et al (2015) Development of a risk stratification system for the occurrence of prolonged postoperative ileus after colorectal surgery: a prospective risk factor analysis. Surgery 157:764–773. doi: 10.1016/j.surg.2014.12.005

22. Alfonsi P, Slim K, Chauvin M, et al (2014) French guidelines for enhanced recovery after elective colorectal surgery. J Visc Surg 151:65–79. doi: 10.1016/j.jviscsurg.2013.10.006

23. Rahbari NN, Zimmermann JB, Schmidt T, et al (2009) Meta-analysis of standard, restrictive and supplemental fluid administration in colorectal surgery. Br J Surg 96:331–341. doi: 10.1002/bjs.6552

24. Artinyan A, Nunoo-Mensah JW, Balasubramaniam S, et al (2008) Prolonged postoperative ileus-definition, risk factors, and predictors after surgery. World J Surg 32:1495–1500. doi: 10.1007/s00268-008-9491-2

25. Kummer A, Slieker J, Grass F, et al (2016) Enhanced Recovery Pathway for Right and Left Colectomy: Comparison of Functional Recovery. World J Surg 40:2519–2527. doi: 10.1007/s00268-016-3563-5

26. Halabi WJ, Kang CY, Nguyen VQ, et al (2014) Epidural analgesia in laparoscopic colorectal surgery: a nationwide analysis of use and outcomes. JAMA Surg 149:130–136. doi: 10.1001/jamasurg.2013.3186

27. Gendall KA, Kennedy RR, Watson AJM, Frizelle FA (2007) The effect of epidural analgesia on postoperative outcome after colorectal surgery. Colorectal Dis Off J Assoc Coloproctology G B Irel 9:584-598; discussion 598-600. doi: 10.1111/j.1463-1318.2007.1274.x

28. Wu Q, Jin C, Hu T, et al (2017) Intracorporeal Versus Extracorporeal Anastomosis in Laparoscopic Right Colectomy: A Systematic Review and Meta-Analysis. J Laparoendosc Adv Surg Tech A 27:348–357. doi: 10.1089/lap.2016.0485

29. Wang S, Liu J, Wang S, et al (2017) Adverse Effects of Anastomotic Leakage on Local Recurrence and Survival After Curative Anterior Resection for Rectal Cancer: A Systematic Review and Meta-analysis. World J Surg 41:277–284. doi: 10.1007/s00268-016-3761-1

30. Bakker IS, Grossmann I, Henneman D, et al (2014) Risk factors for anastomotic leakage and leak-related mortality after colonic cancer surgery in a nationwide audit. Br J Surg 101:424–432; discussion 432. doi: 10.1002/bjs.9395

## II) Annexes

### a. Table 1

Table 1: General characteristics and demographics of patients undergoing elective laparoscopic right colectomy

| | WPOI (*n*=524) | POI (*n*=113) | Total (*n*=637) | *p* value |
|---|---|---|---|---|
| Age, years, median (range) | 71 (21-98) | 73 (23-96) | 71 (21-98) | 0.771 |
| Male gender, *n* (%) | 257 (49.0%) | 70 (61.9%) | 327 (51.3%) | 0.012 |
| BMI, kg/m$^2$, median (range) | 24.7 (15-47) | 25.3 (15.6-41) | 25(15-47) | 0.688 |
| ASA, *n* (%) | | | | |
| • 1 | 134 (25.5%) | 29 (25.6%) | 163 (25.5%) | 0.761 |
| • 2 | 229 (43.7%) | 53 (46.9%) | 282 (44.2%) | |
| • 3 | 159 (30.3%) | 30 (26.5%) | 189 (29.6%) | |
| • 4 | 2 (0.3%) | 1 (0.9%) | 3 (0.5%) | |
| Comorbidity, *n* (%) | | | | |
| • Smoking | 64 (12.2%) | 13 (11.5%) | 77 (12.1%) | 1.000 |
| • Diabetes | 86 (16.4%) | 16 (14.2%) | 102 (16.0%) | 0.671 |
| • Arteriopathy | 159 (30.3%) | 31 (27.4%) | 190 (29.8%) | 0.581 |
| • Coronary disease | 91 (17.4%) | 26 (23.0%) | 117 (18.4%) | 0.649 |
| • Previous laparotomy | 157 (30.0%) | 33 (29.2%) | 190 (29.8%) | 0.178 |
| • Previous laparoscopy | 83 (15.8%) | 21 (18.6%) | 104 (16.3%) | 1.000 |
| Colorectal Pathology, *n* (%) | | | | |
| • Colorectal cancer | 397 (75.8%) | 82 (72.6%) | 479 (75.2%) | 0.774 |
| • IBD | 44 (8.4%) | 14 (12.4%) | 58 (9.1%) | |
| • Benign tumour | 83 (15.8%) | 17 (15%) | 100 (15.7%) | |
| Location of pathology, *n* (%) | | | | |
| • Caecum | 218 (41.6%) | 41 (36.3%) | 259 (40.7%) | 0.216 |
| • Ascending colon | 135 (25.8%) | 30 (26.5%) | 165 (25.9%) | |
| • Hepatic flexure | 56 (10.7%) | 19 (16.8%) | 75 (11.8%) | |
| • Transverse colon | 36 (6.9%) | 6 (5.3%) | 42 (6.6%) | |
| • Ileocecal valve | 79 (15.1%) | 17 (15.0%) | 96 (15.1%) | |

*WPOI:* Without Post-Operative Ileus, *POI:* Post-Operative Ileus, *BMI:* Body mass index, *ASA:* American Society of Anesthesiologists classification, *IBD:* Inflammatory Bowel Disease

b. Table 2

Table 2: Operative procedure for elective laparoscopic right colectomy

| | WPOI (*n*=524) | POI (*n*=113) | Total (*n*=637) | *p* value |
|---|---|---|---|---|
| Prior fasting, hours, median (range) | 12 (2-50) | 10 (2-96) | 11(2-96) | 0.444 |
| Type of anaesthesia, *n* (%) | | | | |
| • General anaesthesia | 472 (90.1%) | 92 (81.4%) | 564 (88.5%) | 0.004 |
| • General anaesthesia and epidural anaesthesia | 47 (9.0%) | 21 (18.6%) | 68 (10.7%) | |
| • General anaesthesia and spinal anaesthesia | 5 (1.0%) | 0 (0.0%) | 5 (0.8%) | |
| Perioperative blood transfusion, *n* (%) | 14 (2.7%) | 8 (7.1%) | 22 (3.5%) | 0.018 |
| Perioperative intravenous fluids, mL, median (range) | 1500 (500-4500) | 2000 (500-5500) | 1500 (500-5500) | <0.0001 |
| Vascular section, *n* (%) | | | | |
| • Intracorporeal | 460 (87.8%) | 91 (80.5%) | 551 (86.5%) | 0.049 |
| • Extracorporeal | 64 (12.2%) | 22 (19.5%) | 86 (13.5%) | |
| Laparotomy conversion, *n* (%) | 32 (6.1%) | 8 (7.1%) | 40 (6.3%) | 0.641 |
| Location of tumour specimen extraction, *n* (%) | | | | |
| • Median incision | 329 (62.8%) | 63 (55.8%) | 392 (61.5%) | 0.044 |
| • Pfannenstiel incision | 74 (14.1%) | 12 (10.6%) | 86 (13.5%) | |
| • Transversal incision | 121 (23.1%) | 38 (33.6%) | 159 (25.0%) | |
| Type of anastomosis, *n* (%) | | | | |
| • Side-to-side | 475 (90.6%) | 101 (89.4%) | 576 (90.4%) | 0.723 |
| • End-to-end | 9 (1.7%) | 3 (2.7%) | 12 (1.9%) | |
| • Side-to-end | 2 (0.4%) | 0 (0.0%) | 2 (0.3%) | |
| • End-to-side | 38 (7.3%) | 9 (8.0%) | 47 (7.4%) | |
| Anastomotic procedure, *n* (%) | | | | |
| • Mechanical | 303 (57.8%) | 55 (48.7%) | 358 (56.2%) | 0.094 |
| • Manual | 221 (42.2%) | 58 (51.3%) | 279 (43.8%) | |
| Anastomotic site, *n* (%) | | | | |
| • Intracorporeal | 125 (23.9%) | 26 (23.0%) | 151 (23.7%) | 0.903 |
| • Extracorporeal | 399 (76.1%) | 87 (77.0%) | 486 (76.3%) | |
| Drain, *n* (%) | 48 (9.2%) | 12 (10.6%) | 60 (9.4%) | 0.588 |
| Operative time, minutes, median (range) | 185 (75-695) | 161 (60-380) | 180 (60-695) | 0.264 |

*WPOI:* Without Post-Operative Ileus, *POI:* Post-Operative Ileus

c. Table 3

Table 3: Short- and long-term outcomes after elective laparoscopic right colectomy

| | WPOI (*n*=524) | POI (*n*=113) | Total (*n*=637) | *p* value |
|---|---|---|---|---|
| Number of surgical complications, *n* (%) | | | | |
| • Overall surgical complications without POI | 63 (12.0%) | 36 (31.9%) | 99 (15.5%) | <0.0001 |
| • Repeat surgery | 15 (2.9%) | 18 (15.9%) | 33 (5.2%) | <0.0001 |
| • Endoscopic or radiologic drain | 7 (1.3%) | 3 (2.7%) | 10 (1.6%) | 0.789 |
| • Ileus only | 0 (0.0%) | 77 (68.1%) | 77 (12.1%) | <0.0001 |
| • Anastomotic leakage | 13 (2.5%) | 15 (13.3%) | 28 (4.4%) | <0.0001 |
| • Wound abscess | 22 (4.2%) | 6 (5.3%) | 28 (4.4%) | 0.627 |
| • Intra-abdominal collection | 6 (1.1%) | 4 (3.5%) | 10 (1.6%) | 0.829 |
| • Intra-abdominal haemorrhage | 5 (1.0%) | 2 (1.8%) | 7 (1.1%) | 0.360 |
| • Intraluminal haemorrhage | 10 (1.9%) | 2 (1.8%) | 12 (1.9%) | 1.000 |
| • Evisceration | 2 (0.4%) | 2 (1.8%) | 4 (0.6%) | 0.150 |
| Clavien, *n* (%) | | | | |
| • I-II | 189 (36.1%) | 73 (64.6%) | 262 (41.1%) | <0.0001 |
| • III-IV | 25 (4.8%) | 19 (16.9%) | 44 (6.9%) | <0.0001 |
| Medical complications, *n* (%) | | | | |
| • Overall medical complication | 83 (15.8%) | 35 (31.0%) | 118 (18.5%) | <0.0001 |
| • Cardiac | 18 (3.4%) | 11 (9.7%) | 29 (4.6%) | 0.009 |
| • Vascular | 5 (1.0%) | 3 (2.7%) | 8 (1.3%) | 0.154 |
| • Pulmonary | 14 (2.7%) | 13 (11.5%) | 27 (4.2%) | <0.0001 |
| Length of hospital stay, days, median (range) | 7 (2-35) | 13 (6-56) | 8 (2-56) | <0.0001 |
| Pathological finding, *n* (%) | | | | |
| • Stage 0 | 42 (10.6%) | 2 (2.4%) | 44 (9.2%) | 0.066 |
| • Stage I | 91 (22.9%) | 24 (29.3%) | 115 (24.1%) | |
| • Stage II | 154 (38.9%) | 37 (45.1%) | 191 (40.0 %) | |
| • Stage III | 109 (27.5%) | 19 (23.2%) | 128(26.8%) | |
| Lymph nodes resected, median (range) | 19 (0-77) | 19 (0-52) | 19 (0-77) | 0.118 |
| Length of hospital stay, days, median (range) | 7 (2-35) | 13 (6-36) | 8 (2-36) | <0.0001 |
| Length of reanimation /intensive care stay, days, median (range) | 0 (0-16) | 0 (0-26) | 0 (0-26) | 1.0000 |
| Number of reanimations / intensive care stays, *n* (%) | 43 (8.2%) | 26 (23.0%) | 69 (10.8%) | <0.0001 |
| 30-day mortality, *n* (%) | 4 (0.8%) | 7 (6.2%) | 11 (1.7%) | 0.008 |
| 90-day mortality, *n* (%) | 5(1.0%) | 9 (8.0%) | 14 (2.2%) | <0.0001 |
| Follow-up, months, median (range) | 27.3 (0.2-139.2) | 19.1 (0.3-130.5) | 26.9 (0.2-139.2) | |
| Overall survival for colorectal cancer only, *n* (%) | | | | |
| • Overall survival at 1 year | 391 (98.5%) | 73 (89.0%) | 621 (97.5%) | <0.0001 |
| • Overall survival at 3 years | 381 (96.0%) | 72 (87.8%) | 611 (95.9%) | <0.0001 |
| • Overall survival at 5 years | 379 (95.5%) | 71 (86.6%) | 607(95.3%) | <0.0001 |

d. Table 4

Table 4: Risk factors for postoperative ileus following elective laparoscopic right colectomy: multivariate analysis

| | WPOI (*n*=524) | POI (*n*=113) | Total (*n*=637) | *p* value | Adjusted Odds ratio (95% CI) | *p* value |
|---|---|---|---|---|---|---|
| Male gender, *n* (%) | 257 (49.0%) | 70 (61.9%) | 327 (51.3%) | 0.012 | 2.316 (1.102-4.866) | 0.027 |
| Type of anaesthesia, *n* (%) | | | | | | |
| • General anaesthesia | 472 (90.1%) | 92 (81.4%) | 564 (88.5%) | 0.004 | 2.958 (1.250-6.998) | 0.014 |
| • General anaesthesia and epidural anaesthesia | 47 (9.0%) | 21 (18.6%) | 68 (10.7%) | | | |
| • General anaesthesia and spinal anaesthesia | 5 (1.0%) | 0 (0.0%) | 5 (0.8%) | | | |
| Perioperative blood transfusion, *n* (%) | 14 (2.7%) | 8 (7.1%) | 22 (3.5%) | 0.018 | 6.994 (1.550-31.560) | 0.011 |
| Perioperative intravenous fluids, mL, median (range) | 1500 (500-4500) | 2000 (500-5500) | 1500 (500-5500) | <0.0001 | 1.000 (1.000-1.001) | 0.234 |
| Vascular section, *n* (%) | | | | | | |
| • Intracorporeal | 460 (87.8%) | 91 (80.5%) | 551 (86.5%) | 0.049 | 1.354 (0.407-4.507) | 0.621 |
| • Extracorporeal | 64 (12.2%) | 22 (19.5%) | 86 (13.5%) | | | |
| Location of tumour specimen extraction, *n* (%) | | | | | | |
| • Median incision | 329 (62.8%) | 63 (55.8%) | 392 (61.5%) | 0.044 | 0.770 (0.512-1.642) | 0.683 |
| • Pfannenstiel incision | 74 (14.1%) | 12 (10.6%) | 86 (13.5%) | | | |
| • Transversal incision | 121 (23.1%) | 38 (33.6%) | 159 (25.0%) | | | |
| | | | | | | |
| Number of surgical complications, *n* (%) | | | | | | |
| • Overall surgical complications without POI | 63 (12.0%) | 36 (31.9%) | 99 (15.5%) | <0.0001 | 1.310 (1.083-1583) | 0.005 |
| • Repeat surgery | 15 (2.9%) | 18 (15.9%) | 33 (5.2%) | <0.0001 | 2.451 (0.550-10.927) | 0.240 |
| Clavien, *n* (%) | | | | | | |
| • III-IV | 25 (4.8%) | 19 (16.9%) | 44 (6.9%) | <0.0001 | 4.150 (1.062-16.213) | 0.041 |
| Medical complications, *n* (%) | | | | | | |
| • Overall medical complications | 83 (15.8%) | 35 (31.0%) | 118 (18.5%) | <0.0001 | 1.738 (0.798-3.783) | 0.164 |

*WPOI* Without Post-Operative Ileus, *POI* Post-Operative Ileus

e. Figure 1

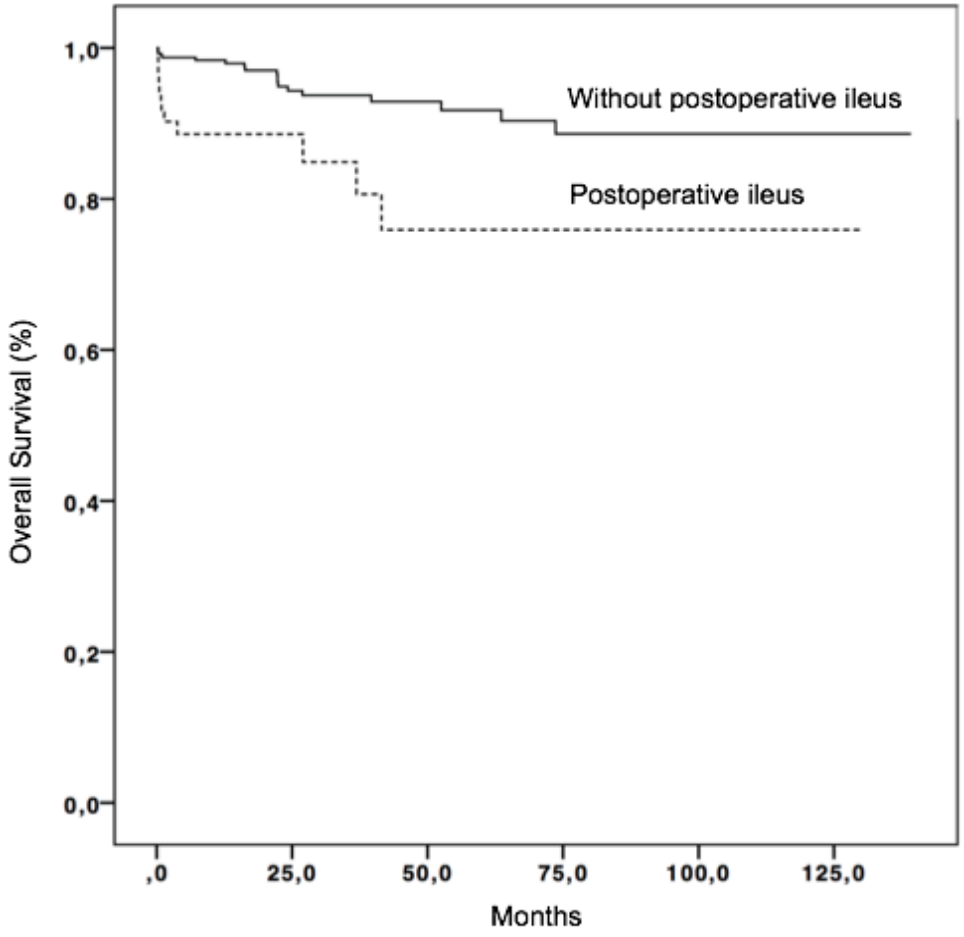


Figure 1: Overall survival amongst patients with colon cancer after laparoscopic right colectomy

f. Figure 2

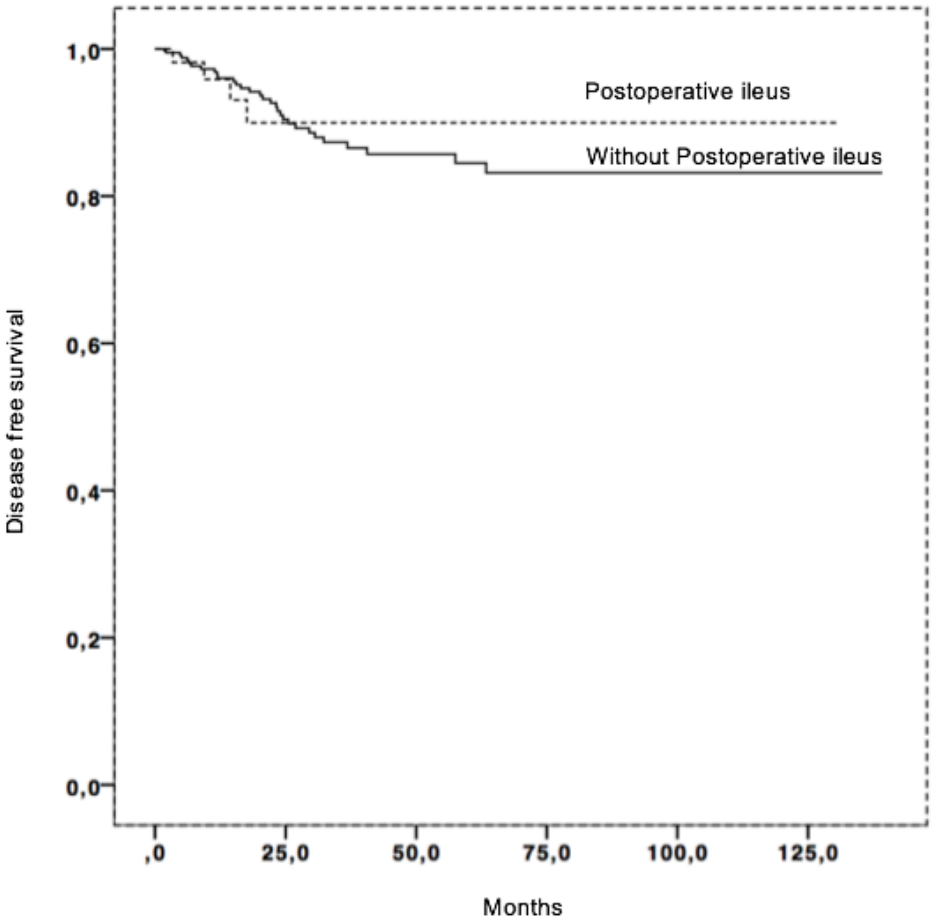


Figure 2: Disease-free survival amongst patients with colon cancer after laparoscopic right colectomy

# SERMENT D'HIPPOCRATE

En présence des Maîtres de cette Faculté,
de mes chers condisciples
et selon la tradition d'Hippocrate,
je promets et je jure d'être fidèle aux lois de l'honneur
et de la probité dans l'exercice de la Médecine.

Je donnerai mes soins gratuits à l'indigent,
et n'exigerai jamais un salaire au-dessus de mon travail.

Admis dans l'intérieur des maisons, mes yeux
ne verront pas ce qui s'y passe, ma langue taira
les secrets qui me seront confiés et mon état ne servira pas
à corrompre les mœurs ni à favoriser le crime.

Respectueux et reconnaissant envers mes Maîtres,
je rendrai à leurs enfants
l'instruction que j'ai reçue de leurs pères.

Que les hommes m'accordent leur estime
si je suis fidèle à mes promesses.
Que je sois couvert d'opprobre
et méprisé de mes confrères
si j'y manque.

Vu, le Directeur de Thèse

Vu, le Doyen
De la Faculté de Médecine de Tours
Tours, le

académie d'Orléans-Tours

université de TOURS | Faculté de médecine

**COURTOT Lise**

38 pages – 4 tableaux – 2 figures

**Résumé :**

L'iléus post-opératoire (IPO) est source de complications médico-chirurgicales et représente un coût hospitalier important. L'objectif est d'identifier les facteurs favorisant l'IPO après colectomie droite coelioscopique.

Entre 2004 et 2016, 637 colectomies ont été réalisées et étudiées de façon rétrospective à partir de la base de données CLIMHET. Les facteurs favorisants potentiels ont été analysés par régression logistique.

Les patients avec IPO (n=113, 17,7%) étaient comparés à ceux sans iléus post-opératoire (SIPO) (n=524, 82.3%). Dans le groupe IPO, il y avait plus d'hommes (62%vs49% p=0.012), plus d'anesthésies péridurales (19%vs9% p=0.004), de transfusions peropératoires (7%vs.3% p=0.020) et un remplissage vasculaire plus important (2000mL vs 1750mL, p<0.001). La section vasculaire extracorporelle et l'extraction de la pièce par une incision transverse étaient plus fréquentes dans le groupe IPO (20%vs12%, p=0.049 et 34%vs23% p=0.044). Les complications chirurgicales étaient plus fréquentes dans le groupe IPO (31.9%vs12.0% p<0.0001). En analyse multivariée les facteurs de risques indépendant d'IPO étaient : sexe masculin (HR=2.316, 1.102–4.866), anesthésie péridurale (HR=2.958, 1.250–6.988) et transfusion peropératoire (HR=6.994, 1.550–31.560).

Cette étude est l'une des premières à exploiter la base données CLIMHET et la première à s'intéresser aux facteurs de risque d'IPO. Les facteurs de risque d'IPO modifiables sont : anesthésie péridurale et transfusion peropératoire ; celles-ci doivent être utilisées avec précaution afin de diminuer le taux d'IPO.

**Mots clés : Iléus post-opératoire – facteurs de risque – colectomie droite - cœlioscopie**

**Jury :**

Président du Jury : Professeur Ephrem SALAME
Directeur de thèse : Professeur Mehdi OUAISSI
Membres du Jury : Professeur Guillaume MEURETTE
Docteur Raphael DENHAUT

Date de soutenance : 24/04/2018