

# **Predictive Factors of Difficulty of Laparoscopic Management of Cancer Rectum**

Thesis

*Submitted for Partial Fulfillment of Master Degree In  
General Surgery*

By

**Michael Wagdy Wadie Farag Gerges**  
*M.B.B.Ch*

Under Supervision of

**Prof. Dr. Hanna Habib Hanna**

*Professor of General Surgery  
Faculty of Medicine - Ain Shams University*

**Dr. Mohamed Ibrahim Mohamed**

*Lecturer of General Surgery  
Faculty of Medicine - Ain Shams University*

Faculty of Medicine  
Ain Shams University

**2018**

## Acknowledgment

*First and foremost, I feel always indebted to **God**, the Most Kind and Most Merciful.*

*I'd like to express my respectful thanks and profound gratitude to **Prof. Dr. Hanna Habib Hanna**, Professor of General Surgery, Faculty of Medicine- Ain Shams University for his keen guidance, kind supervision, valuable advice and continuous encouragement, which made possible the completion of this work.*

*I am also delighted to express my deepest gratitude and thanks to **Dr. Mohamed Ibrahim Mohamed**, Lecturer of General Surgery, Faculty of Medicine, Ain Shams University, for his kind care, continuous supervision, valuable instructions, constant help and great assistance throughout this work.*

*I would like to express my hearty thanks to all **my family** for their support till this work was completed.*

*Last but not least my sincere thanks and appreciation to all patients participated in this study.*

**Michael Wagdy**

# *List of Contents*

Title	Page No.
List of Tables .....	4
List of Figures .....	6
List of Abbreviations .....	8
Introduction .....	1
Aim of the Work.....	4
Review of Literature	
📖 Anatomy of Rectum.....	5
📖 Pathophysiology of Cancer Rectum.....	17
📖 Diagnosis of Cancer Rectum .....	27
📖 Management of Cancer Rectum.....	33
Patients and Methods .....	57
Results .....	65
Discussion .....	84
Summary and Conclusion .....	90
References .....	93
Arabic Summary	

## *List of Tables*

Table No.	Title	Page No.
<b>Table (1):</b>	Anterior relationships of the prectum in male and female .....	10
<b>Table (2):</b>	Cheng et al. classification of TNM .....	24
<b>Table (3):</b>	Zinkin classification of TNM .....	25
<b>Table (4):</b>	Stage grouping.....	25
<b>Table (5):</b>	Operative time, conversion rates and its causes.....	67
<b>Table (6):</b>	Postoperative complications and mortality.....	68
<b>Table (7):</b>	TNM staging.....	70
<b>Table (8):</b>	Factors determining difficulty of laparoscopic anterior resection .....	71
<b>Table (9):</b>	Relation between age and conversion, postoperative complications, mortality and operative time .....	72
<b>Table (10):</b>	Relation between gender and conversion, postoperative complication, mortality and operative time .....	73
<b>Table (11):</b>	Relation between body mass index and conversion, postoperative complications, mortality and operative time.....	74
<b>Table (12):</b>	Relation between surgical history and coverision, postoperative complications, mortality and operative time.....	77
<b>Table (13):</b>	Relation between tumour distance from anal verge and conversion, postoperative complications, mortality and operative time .....	78

## *List of Tables (cont...)*

Table No.	Title	Page No.
<b>Table (14):</b>	Relation between preoperative chemoradiotherapy and conversion, postoperative complications, mortality and operative time .....	80
<b>Table (15):</b>	Relation between intraoperative blood loss and conversion, mortality and operative time.....	81
<b>Table (16):</b>	Relation between TNM staging groups and conversion, postoperative complications, mortality and operative time.....	82

## *List of Figures*

Fig. No.	Title	Page No.
<b>Figure (1):</b>	Parts of colon .....	5
<b>Figure (2):</b>	Anatomy of pelvis .....	6
<b>Figure (3):</b>	Flexures of rectum .....	7
<b>Figure (4):</b>	Anteroposterior curvature of rectum .....	8
<b>Figure (5):</b>	Peritoneal Relations of the Rectum .....	9
<b>Figure (6):</b>	Posterior relationships of rectum .....	11
<b>Figure (7):</b>	Arterial supply of rectum .....	12
<b>Figure (8):</b>	Venous Drainage of rectum.....	13
<b>Figure (9):</b>	Lymphatic Drainage of rectum .....	15
<b>Figure (10):</b>	Cheng et al. classification of TNM. ....	24
<b>Figure (11):</b>	Stage and prognosis .....	26
<b>Figure (12):</b>	Prognostic factors .....	28
<b>Figure (13):</b>	Clinical Presentations .....	29
<b>Figure (14):</b>	Digital rectal examination .....	30
<b>Figure (15):</b>	Mucinous adenocarcinoma of the rectum. ....	31
<b>Figure (16):</b>	Mucinous adenocarcinoma of the rectum .....	32
<b>Figure (17):</b>	Exposure and division of the inferior mesenteric vessels flush with the aorta (high tie) in the course of an abdominoperineal excision of the rectum.....	43
<b>Figure (18):</b>	Low anterior resection by the double stapling method. ....	43
<b>Figure (19):</b>	Abdominotransanal-coloanal anastomosis .....	44
<b>Figure (20):</b>	Plane of dissection for total mesorectal excision .....	46

## *List of Figures (cont...)*

Fig. No.	Title	Page No.
<b>Figure (21):</b>	Radical pelvic exenteration, indicating the extent of the dissection and the viscera removed .....	48
<b>Figure (22):</b>	Cancer-specific survival rates following surgery for rectal cancer according to Dukes' stages .....	50
<b>Figure (23):</b>	TEM resection of a neoplastic lesion (T1N0) located 20cm from the anal verge .....	54
<b>Figure (24):</b>	Total mesorectal excision including blood and lymphatic vessels .....	62
<b>Figure (25):</b>	Complete posterior dissection with identification of the autonomic nerves .....	62
<b>Figure (26):</b>	Sex distribution in our study.....	65
<b>Figure (27):</b>	Medical history of selected patients.....	66
<b>Figure (28):</b>	Surgical history of selected patients.....	66
<b>Figure (29):</b>	Causes of conversion. ....	67
<b>Figure (30):</b>	Types of postoperative complications. ....	68
<b>Figure (31):</b>	Histopathological types of cancer rectum.....	69
<b>Figure (32):</b>	Body mass index and conversion rates. ....	75
<b>Figure (33):</b>	Body mass index and operative time.....	75
<b>Figure (34):</b>	Relation between tumour distance and postoperative complications.....	79
<b>Figure (35):</b>	Relation between TNM staging groups and conversion rates.....	83

## *List of Abbreviations*

<i>Abb.</i>	<i>Full term</i>
<i>5FU-CI</i> .....	<i>5-Fluorouracil Continuous Infusion</i>
<i>BMI</i> .....	<i>Body Mass Index</i>
<i>CRM</i> .....	<i>Circumferential Resection Margin</i>
<i>DWI</i> .....	<i>Diffusion-Weighted Imaging</i>
<i>EGFR</i> .....	<i>Epidermal Growth Factor Receptor</i>
<i>EMVI</i> .....	<i>Extra Mural Vascular Invasion</i>
<i>EUS</i> .....	<i>Endoscopic Ultrasonography</i>
<i>GDP</i> .....	<i>Guanosine Diphosphate</i>
<i>GTP</i> .....	<i>Guanosine Triphosphate</i>
<i>HNPCC</i> .....	<i>Hereditary Nonpolyposis Colon Cancer</i>
<i>LN</i> .....	<i>Lymph Nodes</i>
<i>MRF</i> .....	<i>Mesorectal Fascia</i>
<i>MRI</i> .....	<i>Magnetic Resonance Imaging</i>
<i>pCR</i> .....	<i>Pathologic Complete Response</i>
<i>SPSS</i> .....	<i>Statistical Package for Social Science</i>
<i>TME</i> .....	<i>Total Mesorectal Excision</i>

# **ABSTRACT**

Laparoscopy has a lot of surgical advantages in the treatment of rectal diseases and with the publication of several multi- institutional prospective randomized trials, it became clear that laparoscopic anterior resection is equivalent to open intervention. However, many other prospective studies were done that showed that the previously mentioned factors may predict the difficulty of Laparoscopic anterior resection and that may aid to take precise decisions in cases with cancer rectum and that may decrease the rate of conversion from laparoscopic to open surgeries and postoperative complications and mortality rate.

In conclusion, laparoscopic resection for rectal cancers is a feasible technique and with proper training it can be performed safely with acceptable rates of overall morbidity and by taking into consideration the above mentioned factors that may predict the difficulty of laparoscopic intervention in order to have the best outcome from the decision of laparoscopic anterior resection for patients with cancer rectum. The limitations of this study include the relatively small sample size and the relatively short follow-up time, particularly for maintenance of oncologic issues. Planned randomised controlled trials addressing this issue with a larger sample size and long-term follow-up should be performed.

**Keywords:** Laparoscopic Management - Cancer Rectum - Lymph Nodes

## INTRODUCTION

Rectal cancers compromise approximately 25% of all primary colorectal cancers and follow a different natural disease course compared to colonic tumours, also it is well established that surgical approach, local recurrence rates and associated complications of rectal tumours are distinct from colonic ones (*American Cancer Society, 2010*).

Laparoscopic management for rectal tumours is widely used as being more advantageous than the open approach. Its benefits include less intraoperative blood loss, less postoperative pain, shorter hospital stay, faster return to work and fewer adhesions without compromising oncologic clearance (*Van Gijn et al., 2010*).

Also it needs acquisition of advanced skills and taking into consideration the potential effects of the technique on tumour dissemination at the time of surgical procedure as well as rates of recurrence and overall survival (*Milsom et al., 2008*).

A lot of studies were done in a retrospective way to build models to predict difficulty of laparoscopic anterior resection, some of them showed that prior abdominal surgery, preoperative chemoradiotherapy, tumour distance to anal verge, interspinous distance and Body Mass Index were predictors for the standardized operative times, gender and tumour maximum diameter were related to the standardized blood loss (*Champagne and Delaney, 2007*).

Also we have to take into consideration that surgeon's advanced laparoscopic skills are one of the most important factors for operative success. Existence of learning curves suggests that surgeons develop laparoscopic skills through continuous repetition of surgical procedures (*Laurent et al., 2007*).

Operative time as a standardized end point also influences the decision of conversion from Lap to open surgery. Many authors clearly emphasize that timely conversion wherever indicated is of almost importance in containing harm and shouldn't be perceived as failure, it also reflects surgical maturity. The mean operative time reported in previous studies varies from 153 to over 300 minutes related to the factors previously mentioned (*Akiyoshi et al., 2009; Wang et al., 2014*).

Laparoscopic surgery for rectal cancer is performed within the pelvic cavity which limits vision, access and space. The anatomical parameters such as prominence of sacral promontory, degree of sacral curves and size of the pelvis are associated with operative difficulty (*Ogiso et al., 2011*).

Also studies showed that Body Mass Index affect operative time, BMI doesn't consistently reflect body adipose tissue distribution. It has been observed that obese males have more visceral fat, where as obese females have more subcutaneous fat. However we have found that BMI is an easily obtainable and useful parameter in predicting operative difficulty (*Denost et al., 2013*).

Preoperative chemoradiotherapy has been shown to reduce local recurrence and improve survival for rectal cancer patients. It considerably reduces tumour size and improves exposure of the surgical field thus helping obtain a safe resection margin. However it causes tissue oedema, fibrosis and may increase both operative time and blood loss during surgery (*Denost et al., 2012*).

Similarly, prior abdominal surgery causes formation of adhesions and tissue fibrosis and conceivably increases the difficulty of laparoscopic resection (*Franko et al., 2006*).

Also patients' comorbidities (Hypertension and/or Diabetes Mellitus) may slightly affect operative difficulty, patients with mild or moderate hypertension, drugs used in chronic treatment may increase the need for active management of hypertensive episodes, also some studies reported that Diabetes is a significant risk factor for incisional hernias (*Targarona et al., 2015*).

Also one of the main factors of difficulty of laparoscopic management of cancer rectum is technical difficulties that can face the surgeon as assistant dependant unstable two dimensional view, inability to perform high precision suturing, poor ergonomics, all of these remain the most common technical challenges that may oppose the surgeon through prolongation of the operative time (*Akagi et al., 2012*).

So the purpose of our study is to screen clinical, anatomical and pathological factors that contribute to the difficulty of Laparoscopic management of rectal cancer.

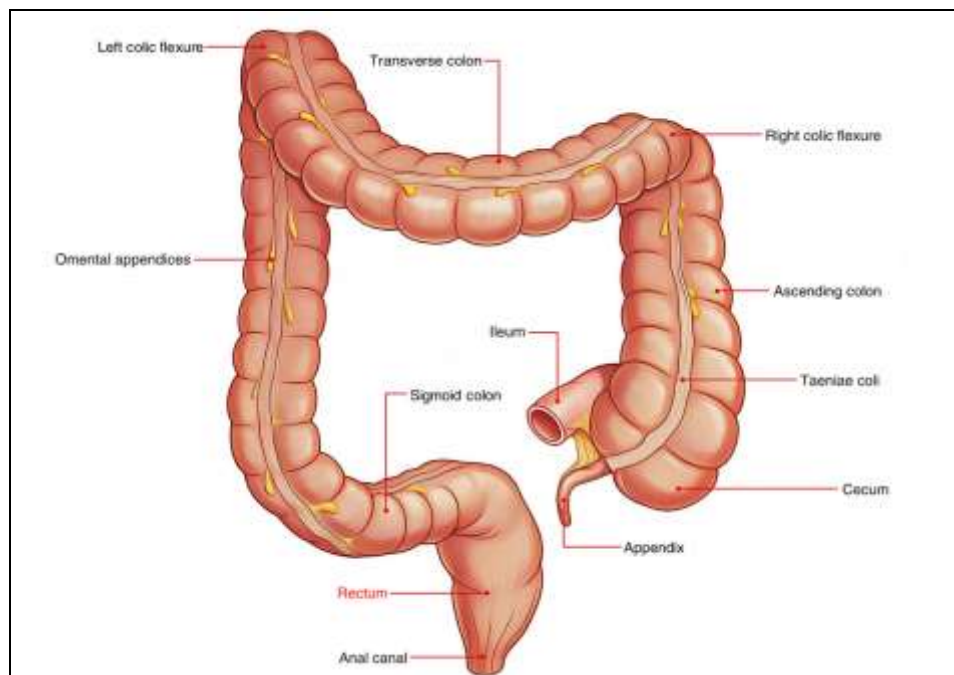
## **AIM OF THE WORK**

**T**he aim of this study is to use the previously mentioned factors that can influence the difficulty of performing laparoscopic anterior resection. And by using standardized operative time as an end point to build reliable study models thys predicting operative difficulty for clinical use.

## **Chapter 1**

# **ANATOMY OF RECTUM**

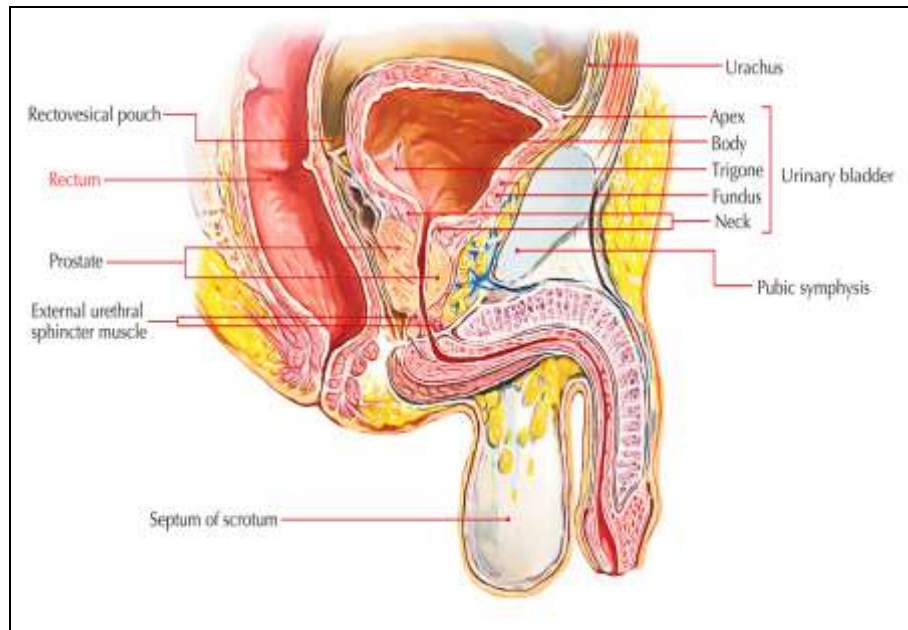
**T**he Rectum is the distal part of the **large intestine** between the sigmoid **colon** and the **anal canal**. In Latin, the word “rectum” means straight; but the rectum is straight in quadrupeds and not in men. In spite of the fact that the rectum is a part of the **large intestine**, it's devoid of taenia coli, sacculations and appendices epiploicae- the cardinal features of the large intestine (*Skawina, 2016*).



**Figure (1):** Parts of colon (*Skawina, 2016*).

## Location

Rectum is situated in the posterior part of the lesser pelvis in front of the lower 3 sections of the **sacrum** and the **coccyx** and behind the **urinary bladder** in the male and **uterus** in the female (*Clemente, 2007*).



**Figure (2):** Anatomy of pelvis (*Clemente, 2007*).

## Measurements

The rectum is 5 inches (12 cm) long. The diameter of the rectum isn't uniform throughout. In the upper part, the rectum is 4cm as that of the sigmoid **colon**. In the lower part, rectum creates a dilatation referred to as rectal ampulla. When empty the anterior and posterior walls of the rectum are in contact and cross section of the rectum presents lumen in the create of a transverse slit (*Dujovny et al., 2014*).