

09M.D
L941



THE APPLICATION OF NEW TECHNOLOGY TO COLORECTAL SURGERY

Thesis submitted in January 1999 for
the degree of Doctor of Medicine
in the University of Adelaide

by

Andrew James Luck, M.B., B.S. (Adel), F.R.A.C.S.

The work described was performed within
the Department of Surgery of the
University of Adelaide at
The Queen Elizabeth Hospital

TABLE OF CONTENTS

	<u>Page No.</u>
TITLE	I
TABLE OF CONTENTS	II
LEGEND OF TABLES	VI
LEGEND OF FIGURES	XI
SUMMARY	XV
DECLARATION	XIX
ACKNOWLEDGEMENTS	XX
PREFACE	XXIII
SECTION I AIMS	1
SECTION II INTRODUCTION	7
2.1 Intra-operative ultrasound	11
2.2 Laparoscopic colorectal surgery	20

	<u>Page No.</u>
2.3 Advanced prognostic techniques in colorectal cancer	26
2.4 Ambulatory anorectal surgery	35
2.5 Patient information by video	48

SECTION III

METHODS, RESULTS & DISCUSSION	51
3.1 INTRA-OPERATIVE ULTRASOUND	53
(i) Ultrasound detection of colorectal hepatic metastases	55
(ii) Ultrasound of the colon	76
3.2 LAPAROSCOPIC COLORECTAL SURGERY	103
(i) Laparoscopic reversal of Hartmann's procedure	104
(ii) Laparoscopic-assisted colonoscopic polypectomy	112

SECTION III (continued)

	(iii) Core temperature changes during laparoscopic and open colorectal surgery	118
3.3	ADVANCED PROGNOSTIC TECHNIQUES IN COLORECTAL CANCER	
	(i) Immunobead reverse transcriptase-polymerase chain reaction (RT-PCR) detection of free intra-peritoneal malignant cells at colorectal cancer resection	134
3.4	AMBULATORY ANORECTAL SURGERY	
	(i) Day case haemorrhoidectomy	153
	(ii) Pre-emptive, local anaesthetic, ischio-rectal fossa block for haemorrhoidectomy	178

Page No.

SECTION III (continued)

- (iii) Glyceryl trinitrate paste 189
versus lateral sphincterotomy
in the management of
chronic anal fissure

3.5 VIDEO INFORMATION

- (i) The impact of visual 210
information by video
on pre-colonoscopy
knowledge and anxiety
levels

SECTION IV SUMMARY AND CONCLUSIONS 227

APPENDIX 244

BIBLIOGRAPHY 249

SUMMARY

The impact of several technological advances and their appropriate clinical application to the field of colorectal surgery was investigated in this thesis.

Intra-operative ultrasound was shown to be valuable in the assessment of the liver for hepatic metastases at the time of resection of colorectal cancer. This technology is best applied in the assessment of abnormalities that have been found on pre-operative computed tomography, rather than as the definitive screening tool itself. Laparoscopic ultrasound was found to be a difficult technique to master. Further investigation will be required in order to assess the role of laparoscopic ultrasound of the liver during laparoscopic colectomy for cancer.

Intra-operative ultrasound of the colon is a technique that was developed in the two years of this thesis. Excellent images of colon and colonic neoplastic lesions were produced during a benchtop study, particularly when the colonic lumen was filled with fluid. In vivo investigation is continuing in order to assess the value of this technique in the localisation and assessment of impalpable colonic lesions for resection.

Laparoscopic reversal of Hartmann's procedure and laparoscopic-assisted colonoscopic polypectomy were shown, in small series, to be feasible and safe procedures that appear to provide many of the short-term post-operative patient advantages that have been reported with other laparoscopic procedures.

A case-controlled study of the core temperature changes during surgery showed that there is no difference in the incidence of hypothermia between laparoscopic and open colorectal surgery. The use of a forced-air warming device was shown to decrease the incidence of hypothermia in laparoscopic colorectal surgery, a finding not previously reported. A subsequent analysis suggested that this device might only be of value in female patients. The unanswered questions posed by this study led to the designing of a randomised follow up trial that has recently commenced.

The ability of the new technique of immunobead reverse transcriptase-polymerase chain reaction to detect small numbers of free intraperitoneal malignant cells at colorectal cancer resection was tested. Although long-term follow up will be required to assess its true prognostic value, early anecdotal evidence suggests that this technique may be able to identify some patients who have early stage, but poor prognosis colorectal cancer.

The results of the first three years of a project designed to enable the performance of ligation excision haemorrhoidectomy as day surgery was reported. This project achieved a high same day discharge rate, with low rates of readmission and complications and a high level of patient satisfaction. This project also provided a prospective database for the assessment of post-haemorrhoidectomy pain. Wide ranges of pain scores were recorded, but in general pain was well controlled by a multimodal peri-operative analgesic regime. Pain was worst at the time of the first bowel action after surgery, but all patients except one were able to manage at home.

Pain scores were particularly low in the first four hours after surgery. It was hypothesised that this was due to the effect of a pre-emptive, local anaesthetic, ischio-rectal fossa block. This hypothesis was tested in 1998 in a prospective, randomised, double blind trial. Patients who received the block had significantly lower pain scores and lower analgesic requirements in the first 24 hours after surgery than a control group who had infiltration of the haemorrhoidal complexes only.

The relative merits of pharmacological treatment using glyceryl trinitrate paste and surgical treatment with lateral sphincterotomy were assessed in a prospective randomised trial. The healing rate for lateral sphincterotomy was significantly higher and considerably quicker. Many patients would still, however, prefer first-line treatment to be medical. A preliminary assessment of pain scores suggested that it might be possible to predict the chances of a fissure healing with glyceryl trinitrate early in the treatment period, but that larger patient numbers are required. A protocol combining the best aspects of both treatments is presented.

The final section shifted the emphasis to an investigation of whether new technology can have a direct impact on a patient's preparation for surgery. This was assessed in the form of a randomised trial analysing the effect of an information video on the anxiety and knowledge levels of patients prior to colonoscopy. Patients randomised to watch the video had significantly lower anxiety levels prior to colonoscopy than those who did not watch the video. The difference was greatest in the group of patients who had severe initial anxiety, but was still significant in low anxiety patients. The patients who watched the video also had significantly

better knowledge about the purpose, procedural details and potential complications of colonoscopy than those who did not watch the video.

The assessment of new technology and its application to surgery must be ongoing. The studies reported in this thesis have answered many questions regarding the appropriate clinical role of some aspects of new technology to colorectal surgery. In addition, they have led to several changes in clinical practice and considerable further research, which will attempt to answer those questions that have been left unanswered.