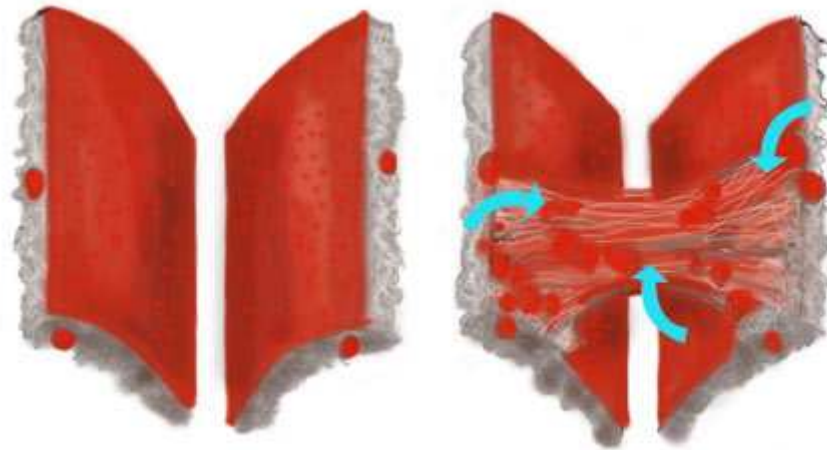


Peritoneal Adhesion Formation and Modulation



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Index

Abstract

Author Statement

Chapter 1: Introduction

Chapter 2: Literature Review

Statement of authorship

Article; Abdominal Adhesion Prevention: Still a Sticky Subject?

Chapter 3: Challenge to Current Practice

Statement of authorship

Article; Abdominal adhesion prevention, time to change our everyday practice?

Chapter 4a: Experimental Work

Rat Model of adhesion formation

Statement of authorship

Article; Use of a modified chitosan – dextran gel to prevent peritoneal adhesions in a rat model.

Chapter 4b: Experimental Work

Porcine Model of adhesion formation

Statement of authorship

Article; Use of a Modified Chitosan – Dextran Gel to Prevent Peritoneal Adhesions in a Porcine Hemicolectomy Model

Chapter 5: Conclusions

Chapter 6: Discussion

Acknowledgements

Abstract

This thesis examines the subject of peritoneal adhesion formation following surgery in the format of a Master of Surgery by publication. A comprehensive literature review examines all aspects of peritoneal adhesions from the basic science to the evidence supporting products aimed at adhesion reduction.

Subsequent experimental work utilises two animal models to form adhesions and test the ability of a novel gel product to reduce adhesion formation. The gel is a hybrid hydrogel consisting of modified chitosan and dextran. These two components are combined by a chemical cross linking reaction to form an inert gel that can be applied to the site of surgery. The gel confers several beneficial properties when used to prevent adhesions. Firstly it provides a physical separation of the injured peritoneal surfaces whilst also inhibiting the ingress of fibroblasts to the area. Secondary characteristics which promote haemostasis and inhibit bacterial growth enhance the gels adhesion reducing potential.

Initially the gel was trialled in a small animal model to test varying compositions and volumes of the gel. Two different surgical models of adhesion formation were utilised to provide a range of stimuli in the post operative period. Results from these experiments were encouraging, showing a statistically significant reduction in adhesion formation.

Following on from this initial study a large animal study was conceived to further evaluate the effectiveness of the gel in differing environments. The porcine model also allowed for a true bowel resection with anastomosis to test the safety of the gel when used in this scenario. Allied to this the gel was also trialled following adhesiolysis at the mid point of the study, while monitoring for sensitisation or toxicity to the gel. Infective complications and abscess formation proved to be a difficult hurdle to overcome in this model. As such, no significant reduction in adhesion reformation following adhesiolysis was observed. There were however some promising results with a reduction in adhesions to the wound noted with treatment at the time of laparoscopy, as well as a reduction in adhesions involving the bowel at the study end point.

The experimental work highlights the difficulties associated with peritoneal adhesion reduction. Overcoming the numerous stimuli to adhesion formation is not an easy task, and there remains no currently available treatment for the prevention of adhesions without certain caveats to its use. An effective product that could be used safely in practically all environments would certainly be a step forward in this branch of surgical research. It is plausible that a product such as the gel may be improved upon to show further benefit. However, long term studies will still be required to show a beneficial effect in long term outcome measures such as the incidence of small bowel obstruction.

Author declaration

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Published work contained within the thesis;

Abdominal adhesion prevention: still a sticky subject?

Lauder CI, Garcea G, Strickland A, Maddern GJ.

Dig Surg. 2010;27(5):347-58. Epub 2010 Sep 16.

Abdominal adhesion prevention, time to change our everyday practice?

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ANZ J Surg. 2010 May;80(5):306-7.

Use of a Modified Chitosan-Dextran Gel to Prevent Peritoneal Adhesions in a
Rat Model.

Lauder CI, Garcea G, Strickland A, Maddern GJ.

J Surg Res. 2010 Sep 8

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