THE EFFECT OF LAPAROSCOPY ON IMPLANTATION, DISSEMINATION AND GROWTH OF INTRA ABDOMINAL MALIGNANCY

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TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

ABSTRACT

The work presented in this thesis documents the establishment of a reproducible model of carcinoma implanted into the abdominal wall of an immunocompetent Dark Agouti rat, which has been used to study the relationship between laparoscopy and the development of port site metastases.

At the commencement of this work, the factors leading to the development of port site metastases following laparoscopic surgery of tumours had not been elucidated. The aims were to examine aspects of laparoscopic surgery and their association with the development of port site metastases, as follows:

- surgical technique, environment and instrumentation;
- dissemination, implantation and growth characteristics of tumour cells and
- alterations in the host environment and responses.

The initial work showed an increased incidence of metastases to laparoscopic wounds following laparoscopic laceration of the abdominal wall tumour. The distribution pattern of metastases suggested factors inherent in the laparoscopic environment contributed. The elimination of CO_2 pneumoperitoneum, by gasless laparoscopy, lowered the metastatic incidence to that which occurred by laparotomy. CO_2 may play a crucial role in the development of this phenomena.

An alternative model using free cells injected into the peritoneum demonstrated that CO_2 laparoscopy leads to increased peritoneal distribution and growth of tumour, when compared to gasless laparoscopy or laparotomy. Subsequent studies investigated the capacity of circulating CO_2 to transport cells, by using radio labelled free cells introduced into the peritoneal cavity. These studies revealed viable tumour cells were transported outside the peritoneal cavity by large gas leaks. Laparoscopic procedures increased peritoneal dispersion of cells when compared to laparotomy. The possible immune and metabolic effects of CO_2 on the peritoneal environment are discussed.

Further studies conducted revealed that the tumour bearing state or altered peritoneal environment influenced the tumour spread to wounds and the peritoneum. When macrophage activation following CO_2 pneumoperitoneum was investigated, the preliminary data indicates CO_2 may have a suppressive effect on peritoneal macrophage activation. In a subsequent study immunohistochemistry revealed that macrophage infiltration of laparoscopic wounds was significantly decreased following CO_2 insufflation. Surface pH measurement showed significant acidosis of the peritoneum following CO_2 insufflation. These findings suggest that CO_2 significantly changes the immune and metabolic environment of the wound and peritoneum.

The development of port site metastases appears to be multifactorial and further studies are needed to clarify issues raised in this work. Until the mechanisms of port site metastases are fully understood, this work gives support to the contention that laparoscopic surgery for malignancy should be conducted only within the context of clinical trials.