

The effect of laparotomy and laparoscopy on the establishment of spontaneous tumor metastases

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Abstract

Background: Surgical extirpation of solid tumors may not be entirely possible, and the consequence of surgical excision is invariably the release of tumor cells into the systemic circulation. The aim of this study was to determine whether laparotomy affects the establishment of spontaneous pulmonary metastases after excision of the primary tumor in a murine flank tumor model and to determine possible underlying immune abnormalities. **Methods:** An initial experiment was carried out to compare the development of gross spontaneous pulmonary metastases in the presence of a primary flank tumor and after excision of the tumor in C57/BL6 female mice. Another group of mice had flank tumors excised and were simultaneously randomized to undergo anesthetic only (control), laparoscopy, or laparotomy, after which the subsequent development of pulmonary metastases was determined. Finally, a third experiment entailed determination of natural killer cell (NK) cytotoxicity and the effect of splenic macrophages on NK cytotoxicity at days 1, 7, and 14 after tumor excision. **Results:** Excision of the primary tumor resulted in a significant increase in the number of pulmonary metastases in mice compared with mice that did not have tumors excised ($P = .01$). Both laparotomy and laparoscopy significantly increased the number of spontaneous pulmonary metastases after tumor excision compared with controls ($P \leq .01$), and there was also a significant difference between laparotomy and laparoscopy groups ($P = .00$). NK cytotoxicity was significantly suppressed at all time points after operation in the laparotomy group compared with both the laparoscopy group and the controls ($P \leq .01$). Suppression occurred after laparoscopy at 24 hours after the procedure compared with controls ($P = .00$); by day 7 this difference was not significant, but at day 14 there was again a significant suppression ($P \leq .03$). Splenic macrophages appeared to be a suppressor to natural killer cell cytotoxicity (NKCC) in the corresponding groups and at the corresponding time points. **Conclusions:** The differential establishment of spontaneous metastases after tumor excision and laparotomy and, to a lesser extent, laparoscopy results in lowered host antitumor surveillance and may be mediated at least in part by the generation of splenic suppressor cells in the early postoperative period, causing a more marked and prolonged effect after laparotomy than after laparoscopy. (Surgery 1998;124:516-25.)