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Topic : Adhesion Prevention

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Prevention of postoperative adhesion formation in a laparoscopic mouse model

Pneumoperitoneum (PP) during laparoscopy has been shown to be a cofactor in adhesion formation. CO₂ pneumoperitoneum increases adhesion in time and pressure-dependent manner and this increase is reduced by adding 3-4% of oxygen to the pneumoperitoneum. Moreover, desiccation increases adhesions and hypothermia reduces adhesions. The aim of this study was to test the hypothesis that maximal adhesion prevention will be achieved by preventing sequentially the different adhesiogenic mechanisms.

Adhesions were induced during 60 min PP in a laparoscopic mouse model. Pure CO₂ (hypoxia model) or CO₂ with the addition of 3-4% O₂ (normoxia model) were used. The insufflation gas was humidified. Body temperature (BT) was strictly kept at 32°C or 37°C. First, the effect of adding 3-4 % O₂ to the PP in combination with lowering BT was analysed. Second, different products (antiinflammatories, ROS scavengers, calcium channel blocker, barriers, surfactant, flotation agents, antifibrinolytic products, etc) were tested in the hypoxia model. Third, some of these products were tried in the normoxia model and combined with low temperature.

The effect of adding 3-4 % O₂ to the PP and of decreasing body temperature was not additive. Adhesion formation was decreased by using SOD, ascorbic acid, dexamethasone, diltiem, wortmannin, Reteplase, phospholipids, Hyalobarrier gel and Spraygel in the hypoxia model ($p < 0.05$ for all comparisons, Wilcoxon test). Maximal adhesion prevention was observed when dexamethasone, diltiem, Hyalobarrier Gel and phospholipids were combined with both adding 3-4% O₂ to the PP and reducing BT to 32°C ($p < 0.05$ for all comparisons).

Firstly, the insufflation gas should be conditioned in order to minimize hypoxia and desiccation; this requires humidification of the gas and the addition of 3-4 % of oxygen to the CO₂. Moreover, cooling of the peritoneal cavity is important since it can decrease both the effects of hypoxia and of desiccation. Conditioning the insufflation gas, adhesion formation can be reduced by around 48% and this reduction can be increased to 58 to 90% by applying different prevention products.