Adhesion formation is common after abdominal surgery. The incidence and severity of adhesion formation following open or laparoscopic surgery remain controversial. The role of CO2 pneumoperitoneum is also largely discussed. This study aimed to compare adhesion formation following peritoneal injury by electrocoagulation performed through open or laparoscopic procedures in a rat model.

Sixty male rats were randomized to undergo a 1.5cm peritoneal injury with unipolar cauterity under general anaesthesia: open surgery (group A, n = 20), laparoscopic surgery with CO2 pneumoperitoneum (group B, n = 20) and laparoscopic surgery with air pneumoperitoneum (group C, n = 20). Duration of the procedures was fixed at 90 minutes in all groups, and pneumoperitoneum pressure at 10 mmHg. Ten days later, the animals underwent a secondary laparotomy to score peritoneal adhesions using qualitative and quantitative parameters.

Forty-five rats developed at least one adhesion, respectively 95% in group A, 83% in group B and 55% in group C (P < 0.01 : Group C vs Group A, P < 0.01). According to number, thickness, tenacity, vascularization, extent, type, and grading according to Zühkle classification, no significant difference was observed between groups A and B. The distribution of adhesions after open surgery was significantly different than after laparoscopic surgery (P < 0.001). Interestingly, group C rats developed significantly less adhesions at the traumatized site, and their adhesions had less severe qualitative scores compared to open surgery (P < 0.01).

In this animal model, CO2 laparoscopic surgery did not decrease the formation of postoperative adhesion, compared to open surgery. The difference with the animals operated with air pneumoperitoneum emphasizes the role of CO2 in peritoneal injury leading to adhesion formation.