

CO₂ abdominal insufflation pretreatment increases survival after a lipopolysaccharide-contaminated laparotomy

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Abstract

Carbon dioxide (CO₂)-pneumoperitoneum is known to favorably modify the systemic immune response during laparoscopic surgery. The presented studies were designed to determine whether treating animals with CO₂ abdominal insufflation before undergoing a lipopolysaccharide (LPS)-contaminated laparotomy would serve as "shock prophylaxis" and thus improve survival and attenuate cytokine production. Rats were randomized into five groups: CO₂-pneumoperitoneum, helium-pneumoperitoneum, anesthesia control, laparotomy/LPS control, and LPS only control. Animals in the first four groups all received a laparotomy and a lethal dose of LPS. Immediately preceding their laparotomy, animals in the pneumoperitoneum groups received a 30-minute pretreatment of abdominal insufflation with either CO₂ or helium. The anesthesia control group received a 30-minute pretreatment of isoflurane. Animal mortality was then recorded during the ensuing 72 hours. Subsequently, a similar protocol was repeated for measurements of cytokines. CO₂-pneumoperitoneum increased survival at 48 hours compared with LPS control (P <.05), and decreased interleukin-6 plasma levels at 2 hours (P <.05). Abdominal insufflation with CO₂ before the performance of a laparotomy contaminated with endotoxin increases survival and attenuates interleukin-6. The beneficial immune-modulating effects of CO₂-pneumoperitoneum endure after abdominal insufflation. CO₂-pneumoperitoneum pretreatment may improve outcomes among patients undergoing gastrointestinal surgery who are at high risk for abdominal fecal contamination.