The Impact of Preoperative Glucose Infusion on Postoperative Nutritional Status in Elective Laparoscopic Colectomy

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Introduction: Surgical stress, needing control by perioperative pain management, induces hypercatabolism. It is known that glycogen catabolism, gluconeogenesis, and lipid and protein metabolism lead to enhanced insulin resistance causing postoperative hyperglycemia. Studies have shown that preoperative carbohydrate loading reduces postoperative insulin resistance, however, the influence of preoperative glucose infusion needs further investigation. In order to examine the impact of preoperative glucose infusion on postoperative nutritional status, we compared the alterations of perioperative glucose and lipid metabolism under propofol/remifentanil general anesthesia combined with thoracic epidural analgesia.

Methods: Forty patients scheduled for elective laparoscopic colectomy were enrolled. Patients were randomly assigned to 2 groups to receive either extracellular solution without glucose (control group) or 10% glucose solution (glucose group) preoperatively. All participants fasted from 9 pm one day before surgery. Since no oral intake was allowed, appropriate intravenous infusion, extracellular solution without glucose or 10% glucose solution, was started. Total intravenous solution volume was 1,500mL in each patient until anesthetic induction. Gastrointestinal pretreatment was performed by surgeons. No premedication was given. After epidural catheterization, general anesthesia was induced with 0.5 μg/kg/min of remifentanil and 1 mg/kg of propofol intravenously. Continuous infusion of remifentanil at a rate of 0.25-0.5 μg/kg/min and end-tidal concentration of 1.5% sevoflurane were used for maintenance of anesthesia. Patient-controlled epidural analgesia was adopted for postoperative pain management. A Ringer's solution without glucose was infused at 8-15 mL/kg/hr during surgical period. Intravenous solutions containing carbohydrates, hetastarch, or amino acids were not administrated. The patients whose serum glucose level showed over 200 mg/dL or below 40 mg/dL were immediately medicated and withdrawn from the study. Total amounts of 2,500 mL of Ringer's solution without glucose were administrated for 24 hours after operation. The primary endpoints were pre- and intraoperative blood glucose levels. Perioperative surgical stress (serum catecholamine level) as well as perioperative nutritional status including glucose (levels of blood glucose and insulin), lipid (levels of ketone body fractions and free fatty acids), and protein metabolisms (urinary level of 3-methyhistidine) were compared between 2 groups. Significance was considered at $P<0.05$.

Results and Discussion: Twenty patients each were assigned to the control and the glucose groups, of which 2 patients were excluded after randomization because of protocol violation; one patient showed impaired glucose tolerance after assignment and one patient whose blood glucose level dropped below 40 mg/dL. Morphometric and demographic characteristics and operative background were not significantly different between the two groups. Levels of blood glucose and insulin during intra- and postoperative periods remained significantly lower in the control group. Lipid catabolism

increased before the induction of anesthesia in the control group. There were no significant differences in protein catabolism between the two groups. The values of stress hormones were within the reference ranges. The incidence of hypoglycemia and the rate of lipid catabolism appear to increase before the induction of anesthesia in elective laparoscopic colectomy using remifentanil without glucose infusion.

Conclusion: In laparoscopic colectomy requiring gastrointestinal pretreatment, perioperative glucose infusion should be considered for the purposes of preventing hypoglycemia and suppressing catabolism.