Effect of Ovariohysterectomy under Halothane Anesthesia on Canine Neutrophil Adhesion

Naoyuki ITOH

SUMMARY

The effect of ovariohysterectomy under the halothane anesthesia on canine neutrophil adhesion was investigated. The ovariohysterectomy was performed in 14 clinically healthy female dogs. The canine neutrophil adhesion was assessed before and after the operation. The adhesive index was significantly decreased immediately after the operation (p<0.001) and recovered to the approximately preoperative value at 1 day postoperation. The results suggest that canine neutrophil adhesion is suppressed after ovariohysterectomy under the halothane anesthesia. Key Words: adhesion (粘着能), canine neutrophil (犬好中球), halothane anesthesia (ハロタン麻酔)

Neutrophils have the ability to adhere, migrate, phagocytose particles and kill microbes, and play major roles in nonspecific host defense mechanisms.1,21) The neutrophil adhesion to surfaces is one of the most important phenomena of the inflammatory response.1,21) Neutrophils adhere to endothelial cells as an initial event in diapedesis, and enter the tissues at the site of infection.1,21) Some investigators found that the reduced neutrophil adhesion may predispose patients to pneumonias and other infections.5,19) The suppressed effects of general anesthesia and/or surgery on lymphocyte blastogenesis6,14-17) and on neutrophil nitroblue tetrazolium reduction ability8) were reported in dogs. However the effect of ovariohysterectomy under the halothane anesthesia on canine neutrophil adhesion is not understood in dogs. The present study was undertaken to investigate the canine neutrophil adhesion before and after ovariohysterectomy under the halothane anesthesia.

The ovariohysterectomy was performed in 14 clinically healthy mongrel female dogs, aging from 4 months to 9 years old and weighing from 5.6 to 10.0 kg. All dogs were normal in blood and fecal examinations. After atropine sulfate (0.05 mg/kg) was administered subcutaneously, the anesthesia was introduced by an intravenous injection of thiopental sodium (25.0 mg/kg) and maintained with inhalation of a mixture of oxygen (1 l/min) and halothane (1-2%). Blood samples were collected before, immediately after, 1 day after and 7 days after operation. The neutrophil adhesion was assessed by the method previously
Fig. 1. Canine neutrophil adhesive index before and after operation.

a): Mean ± S.D.
b): Significantly different from the preoperative value, p<0.001.

reported. The principle of this method is application of neutrophil adhesion to a glass surface. In brief, blood was collected using heparinized disposable syringes (containing 20 units of heparin sodium/ml of blood), and 25 μl of the blood was dropped on two coverslips, respectively. After the incubation for 20 min at 37°C, the coverslips were rinsed gently in a physiological saline solution to remove the excess blood and were stained by Wright-Giemsa stain. The adhesive neutrophil numbers were counted microscopically (× 400) in five fields on each coverslip (total ten fields on two coverslips). The neutrophil adhesion was revealed as adhesive index calculated by the following formula.

Adhesive index = adhesive neutrophil numbers on coverslips/neutrophil numbers in sample blood (× 10³/μl)

Student's t-test was used for statistical comparison. The adhesive index of canine neutrophil decreased significantly immediately after the operation as compared with the preoperative value (p<0.001). The decreased adhesive index recovered to almost the preoperative value at 1 day postoperatoon (Fig. 1). The result suggest the inhibition of neutrophil adhesion and predisposition to the infections immediately after ovariohysterectomy under the halothane anesthesia. It is unclear what are the factors responsible for suppressed neutrophil adhesion in this study, however, some factors are suspected. The potential factor is epinephrine secretion related to the surgical trauma. In general, it appears that increased intracellular cyclic AMP is associated with decreased neutrophil adhesion. Epinephrine introduces the increased intracellular cyclic AMP and decreased neutrophil adhesion. The elevated concentration of epinephrine in plasma after surgery under the halothane anesthesia is reported in human being and the similar change in plasma probably occurs in dogs after ovariohysterectomy under the halothane anesthesia. The other potential minor factor is the direct effect of general anesthesia on neutrophils. Though the direct effect of general anesthesia on neutrophil function is unknown, the neutrophil adhesion is an energy-dependent phenomenon dependent on glycolysis and the halothane directly suppresses blastogenesis of lymphocytes via a depression of intracellular metabolism. The depression of intracellular metabolism may occur in neutrophils under the halothane anesthesia, and which may bring about the decreased neutrophil adhesion. Further studies related to plasma factors and neutrophil intracellular metabolism are required to elucidate the effects of surgery under the halothane anesthesia on canine neutrophil adhesion.

References


