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Systemic immune responses to general anaesthesia with endotracheal intubation and spinal anaesthesia in patients undergoing elective surgery in Korle-Bu Teaching Hospital Accra, Ghana: A baseline study

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Background: Surgical operations and anaesthesia have been shown to cause a variety of immunological disturbances in patients. The observation made from this study indicates suppression of the cellular component of the immune system up to 48 hours postoperatively. The implications of these observations are that host defenses may be compromised by surgical and anaesthesia procedures, thus providing a 'fertile soil' for bacterial invasion and tumour cell metastasis at the very time when risks from invading pathogens and viable tumour cells are maximal.

Aim: The study aims at assessing the effect of general anaesthesia with endotracheal intubation and spinal anaesthesia on systemic immune responses in patients undergoing elective surgery at Korle-Bu Teaching Hospital (KBTH), Accra, Ghana

Study Design: A cross-sectional study was done which involved recruitment of patients undergoing elective surgery at KBTH.

Study Site: The study was conducted at the Department of Anaesthesia and Surgery, KBTH between the months of August 2011 and July 2012 among both male and female patients undergoing elective surgery under general anaesthesia with endotracheal intubation (mastectomy, thyroidectomy) and spinal anaesthesia (herniorrhaphy). KBTH, situated in the nation's capital, Accra, Ghana is the leading tertiary hospital and the major referral center in the country.

Methodology: After an explanation of the study and following informed consent, total of 37 individuals participated in the study. All the consenting participants were interviewed using an anonymous structured questionnaire assessing socio-demographic and other characteristics considered generally as risk factors for the study. All the study participants received midazolam (7.5-15 mg/kg) orally in the night and in the morning before operation as pre-medication. General anaesthesia was induced with intravenous propofol (1.5-3 mg/kg), and either pethidine (0.5-1 mg/kg), morphine (0.05-0.1 mg/kg) or fentanyl (0.5-1 µg/kg) as analgesic, followed by vecuronium (0.1 mg/kg) for muscle relaxation. Anaesthesia was maintained with 0.5%-2.0% isoflourane or halothane and airway was secured by an endotracheal tube. Spinal anaesthesia was induced with 2-3 ml of 0.5% bupivacaine (heavy) after skin infiltration with 2 ml of 1% lidocaine. Muscle relaxation was reversed with neostigmine (0.05 mg/kg) and atropine (0.02 mg/kg) in all the study participants. Patients were given either paracetamol (1g 6 hourly) or diclofenac (100 mg twice daily) suppository with 1-1.5 mg/kg intramuscular pethidine post-operatively as analgesic. Three millitres (3 ml) of blood sample was collected in ethylene diamine tetra acetic acid (EDTA) vacutainer tube pre-operatively within 24 hrs before anaesthesia and after anaesthesia induction before incision and post- operatively at 24 hrs, and 48 hrs, from each of the patient. Full blood count was done using automated full blood count machine (Cell Dyn 3700). Fluorescence activated cell sorting (FACS) Calibur E975006436 4-color lyse no-wash was used to analyse the CD3+ CD4+ and CD3+ CD8+ cells.

Results: There was a reduction in circulating numbers of all leukocyte subpopulations at 48 hours following surgery as compared to their base line values [neutrophils: -53.51% ± 8.15% (SEM) eosinophils: -33.66% ± 5.76% (SEM), monocyte: -56.52% ± 14.32% (SEM)) except for basophils and CD4+ cells which increased at 48 hours as compared to the base line values (basophils: 50.00% ± 11.10% (SEM), CD4+ cells: 15.90% ± 8.60% (SEM)]. However, no statistical significant difference was observed, between pre and post-surgery leukocyte count except for neutrophils (P = 0.02). Interestingly, CD8+ cells decreased in both spinal and general anaesthesia group, however it decreased significantly in the general anaesthesia group [thyroidectomy (P = 0.02) and mastectomy (P = 0.04)]. However a different pattern of responses was observed in the monocyte, eosinophils and basophils count in the entire surgical group. A remarkable increase was observed after induction and persisted up to 24 hours after surgery and then decreased at 48 hours after surgery in mastectomy and herniorrhaphy group. Interestingly, eosinophils significantly (P = 0.01) decreased in the spinal anaesthesia group at 48 hours (Her: -64.82% ± 13.63%). The magnitude and duration of the reduction in cell numbers and the subpopulation affected was related to the degree of surgical trauma, stress, pain and the anaesthetic agents used. The results of the study indicate suppression of the cellular immune responses. Anaesthesia and surgery therefore suppresses the cellular immune responses thus providing a 'fertile soil' for intracellular pathogen invasion and tumour cell metastasis.

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