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LEUCOCYTE RESPONSE IN NIGERIAN INDIGENOUS DOGS WITH SURGICALLY INDUCED RADIAL NERVE PARALYSIS

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INTRODUCTION

Surgical stress is known to cause varied leucocyte responses (Kim and Sakamoto, 2006). The anaesthetic agent used may also modify intra or post surgical leucocyte response e.g. propofol producing a dose-dependent inhibition of phagocytosis *in vitro* (Heine *et al.*, 2000). Surgery constitute a form of traumatic stress, which varies with the duration and invasiveness of the procedure undertaken (Plunkett, 2001). This stressful condition alters the body's homeostasis which is further aggravated by the release of adrenocorticotrophic hormone (ACTH) in the body (Guyton and Hall, 1996). Radial nerve damage and subsequent repair is a major surgical procedure that is not commonly reported in dogs and its effect on leucocyte response has not been documented. The radial nerve resection was primarily undertaken to evaluate various management protocols, with the aim to adapting them for clinical management of radial nerve damage in dogs. In this report, we present the total and differential leucocyte response in Nigerian Indigenous dogs with radial nerve resection.

Major surgeries, such as cardiopulmonary and coronary artery bypass are known to trigger an inflammatory response, leading to the activation of leucocytes, platelets and endothelial cells (Asimakopoulos and Taylor, 1998; Asimakopoulos *et al.*, 2000; Ngaage, 2003).Major surgeries reportedly also produce PMNL (neutrophil) dysfunction (Wakefield *et al.*, 1993). In surgical stress, massive neutrophil and monocyte trafficking into tissues (surgical sites) have been documented (Viswanathan and Dhabhar, 2005; Zaldivar *et al.*, 2006) and is thought to occur as a result of direct response of the neutrophils to the effect of tumour necrosis factor-á (TNF-á) produced during inflammation/ healing (Viswanathan and Dhabhar, 2005). Platelet activating factor (PAF) and CD18 have also been reported to mediate neutrophil infiltration into tissues (surgical sites) (Beyer *et al.*, 1998), while monocyte trafficking into tissues is believed to be mediated by the combined effects of TNF-á and lymphotactin (LTN).

MATERIALS AND METHODS

The ten (10) dogs acquired for this study were housed in the small animal kennel of the Ahmadu Bello University Veterinary Teaching Hospital (ABUVTH), Zaria, Nigeria and left for 2 weeks to acclimatize to the new environment. These animals were fed once daily and water provided *ad libitum*. A thorough pre-surgical examination was conducted on each dog during which pre-surgical blood, faecal and urine samples were analyzed (Willard, 1989). Endo- and ecto-parasitic control measures were instituted using pyrantel pamoate (Combantrin®, Pfizer Inc. Ikeja, Nigeria) and flumethrin (Bayticol Pour-on®, Bayer, Germany) respectively. A pre-surgical (baseline) haemogramme was established (Hoffbrand and Pettit, 1993) and all the dogs were designated numbers one (1) to ten (10) for the project.

In addition to the pre-surgical samples, further samplings from the cephalic vein were undertaken 24 hours, 72 hours and 7 days post-surgery in each case. Total and differential leucocyte counts were determined using standard procedures (Hoffbrand and Pettit, 1993).

Radial nerve exposure, resection and evaluation of dysfunction were carried out as described by Piermattei and Greely (1979) while post-operative care of the dogs was carried out using standard protocols (Wagner, 1985).

Data obtained was analysed as mean ±standard deviation (SD) using analysis of variance (ANOVA, Duncan multiple range test) and values of $P<0.01$ were considered significant (Chartfielf, 1983).

RESULTS AND DISCUSSION

The mean total leucocyte (14, 750 ±4350) and differential counts in the pre-surgical sample were normal (Table I). Twenty four (24) hours post-surgery, the mean total leucocyte count showed neutrophilic leucocytosis, with segmented neutrophils predominating ($P<0.01$). At 72 hours post-surgery, there was a statistically significant decrease ($P<0.01$) in the mean total leucocyte count. There was no statistically significant difference ($P>0.01$) between mean total leucocyte counts 72 hours and 7 days post-surgery. Mean lymphocyte count decreased ($P<0.01$) 72 hours post-surgery while mean eosinophil count decreased to zero levels ($P<0.01$) at 24 and 72 hours post-surgery. Monocyte count also decreased at 24 and 72 hours post-surgery ($P<0.01$).

The high total leucocyte counts noticed in some of the dogs eventually affected the mean total leucocyte counts and this was attributed to the excitement which is known to result in adrenalin release resulting in transient physiologic leucocytosis due to a shift from the marginal leucocyte pool into circulation (Hoffbrand and pettit, 1993; Carlos and Harlan, 1994). The neutrophilia observed 24 hours post-surgery was largely responsible for the increase in the total leucocyte count, suggesting an active inflammatory response to the surgical trauma resulting in cellular mobilization (Howard and Watts, 1994).

At 72 hours post-surgery, decreased mean total leucocyte counts (although within normal range) was observed. The infiltration of leucocytes into the surgical sites leads to decrease in peripheral blood which has been reported as a mechanism preceding healing (Devereux *et al.,* 1991). Neutropaenia following surgery has been attributed to increased neutrophil trafficking (infiltration) into the tissue (surgical site) mediated by the combined effects of TNF-á, PAF and CD18 (Beyer *et al.,* 1998; Viswanathan and Dhabhar, 2005). Since neutrophils account for 60-77% of total leucocytes in peripheral blood, it is logical to suggest that the decreased mean total leucocyte counts (although within normal range) observed post-surgery in this report may be as a result of neutrophil trafficking (infiltration) which agrees with the reports of other workers (Devereux *et al.,* 1991; Viswanathan and Dhabhar, 2005).

Lymphopaenia and eosinopaenia, which are the classical haematological signs in stress, were also observed. In stress, adreno-corticosteroids are released and these have been reported to produce a humoral erythropoeitic regulatory response which affects the bone marrow and causes striking degenerative changes in the lymphoid tissues (Dellman and Brown, 1981) resulting in the shedding of lymphocyte cytoplasm to cause pyknosis, karyorrhexis of the cells and inhibition of mitosis (Dellman and Brown, 1981) and a decrease in circulating lymphocytes thus manifest. On the other hand, gluco-corticosteroids, for instance adrenocorticotrophic hormone (ACTH), produced during surgical stress have been reported to cause eosinopaenia by inducing lyses of Eosinophils, increased phagocytosis of eosinophils by macrophages, stimulation of eosinophil migration from peripheral blood into the small intestine and lymphoid tissues, and reduction of bone marrow production of eosinophils (Bush, 1991; Nebe, 1994).

Monocytopaenia, which was also observed in this study, has been associated with monocyte infiltration into tissues to assist healing and the process is reported to be mediated by the combined effects of TNF-á and lympholactin (LTN) (Viswanathan and Dhabhar, 2005). Leucopaenia was noticed as from 72 hours post-surgery, suggesting that with the low leucocyte count, the dogs may become vulnerable and succumb to post-surgical infection. Antibiotic chemotherapy in radial nerve resection as well as other invasive surgeries prior to or 72 hours post-surgery would be beneficial.

TABLE I: Mean leucocyte changes in 10 dogs with surgically induced radial nerve paralysis

	Pre-surgical sample	24 hour sample	72 hour sample	7 day Sample
Total WBC count/µL X ± SD	14,750 ±4,350	21,100 ±8,900	13,500 ±4,100	13,650 ±3,350
Neutrophils (Segmental) X ± SD / µL	11,027 ±3,851	14,868 ±6,132	9,229 ±4,945	11,282 ±4,278
(Bands) X ± SD / µL	0	0	0	0
Lymphocytes X ± SD / µL	4,864 ±2,056	5,026 ±2,474	4,478 ±3,138	1,907 ±977
Monocytes X ± SD / µL	900 ±191	390 ±160	0	476 ±373
Eosinophils X ± SD / µL	594 ±443	0	0	154 ±54

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