SYSTEMIC INFLAMMATORY RESPONSE SYNDROME AND SEPSIS IN MAJOR VASCULAR SURGERY

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Abstract

Background

Prediction of post-operative systemic inflammatory response syndrome (SIRS) and sepsis would assist risk stratification prior to major vascular surgery, and may positively affect morbidity and mortality rates. Reciprocal regulation exists between immuno-inflammatory and neuroendocrine responses. Like inflammatory events, the neuroendocrine stress response is an important component of surgical pathophysiology. Psychological variables may influence neuroendocrine function and therefore modulate the neuroendocrine response to major vascular surgery. Comparison of both immuno-inflammatory and neuroendocrine responses to open abdominal aortic aneurysm (AAA) repair and endovascular aneurysm repair (EVAR) would enhance understanding of biological mechanisms underlying the differing clinical outcomes from these surgical approaches.

Aims

The aims of the current study were: (1) to identify relationships between post-operative SIRS and sepsis and markers of immunological, neuroendocrine, nutritional and psychological status; (2) to examine relationships between psychological variables and neuroendocrine responses to surgery; and (3) to identify differences in immunological and neuroendocrine responses to open AAA repair compared with EVAR.

Methods

A prospective cohort study was performed involving patients undergoing elective open AAA repair (n = 36), EVAR (n = 17) and lower limb revascularisation (n = 17). Pre-operative neutrophil expression of CD11b and CD16b was determined, and CD32a and CD16b genotyping performed. Plasma cytokines were assayed pre-operatively, during maximal intra-operative ischaemia (T_0), and 4, 24 and 72 hours following T_0. Twenty-four hour urinary free cortisol (UFC) and catecholamine excretion was assayed pre-operatively [T(pre-op)], from anaesthetic induction [T(0-24)] and 72 hours later [T(72-96)]. Pre-operative nutritional status was assessed by dual energy x-ray absorptiometry (DEXA). Pre-operative depression and trait anxiety were evaluated using self-report inventories. SIRS severity and duration within five post-operative days and sepsis within 30 days were documented.

Results

A positive correlation was identified between CD11b expression and SIRS severity score amongst EVAR patients. Neither CD32a nor CD16b genotypes were associated with sepsis. Fluctuations in IL-6, IL-8, and IL-10 were frequently observed in association with AAA repair whereas elevations in TNF-α, Il-1β and IL-12p70 were infrequent. IL-10 production predicted sepsis in this cohort but could not be used to confidently predict sepsis for any individual. Negative correlations were identified between fat free mass (FFM) and both SIRS score following open AAA repair and SIRS duration following EVAR. A negative correlation existed between skeletal muscle mass (SMM) and both SIRS score and duration following open AAA repair. SIRS duration was significantly longer amongst non-depressed compared to depressed EVAR subjects categorised by the Beck Depression Inventory - II (BDI-

II), however no difference was apparent when the Center for Epidemiological Studies-Depression Scale (CES-D) was employed.

UFC excretion at T(0-24) was significantly greater amongst non-depressed compared to depressed subjects, but only when BDI-II classifications were used. Correlations between trait anxiety and neuroendocrine responses to surgery were weak and non-significant.

Open AAA repair stimulated greater production of IL-6, IL-8 and IL-10 than EVAR. Accordingly, SIRS was more frequent, severe and prolonged following open AAA repair. At T(72-96) both UFC and adrenaline excretion were greater amongst the open AAA than the EVAR cohort. These neuroendocrine responses were positively correlated with measures of SIRS and were significantly greater amongst those who developed sepsis.

Conclusions

Higher pre-operative CD11b may be associated with more severe SIRS following major vascular surgery. Lower pre-operative FFM and SMM are associated with more severe SIRS after AAA repair. Neuroendocrine responses reflect rather than predict post-operative SIRS and sepsis. No relationships between psychological parameters and neuroendocrine responses to surgery were identified. Robust evidence of a greater inflammatory response to open AAA repair than EVAR has clarified contradictory reports in existing literature.