SHORT REPORT

Raised concentrations of C reactive protein in anabolic steroid using bodybuilders

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Objective: To examine levels of C reactive protein in users of anabolic androgenic steroids (AAS) compared with age matched control groups consisting of AAS using (but abstinent)/resistance trained and non-drug using/sedentary controls.
Method: Subjects included AAS using bodybuilders (n = 10); bodybuilders who denied AAS use (n = 10); sedentary controls (n = 8). Venous blood was sampled, from which serum concentrations of C reactive protein, male sex hormones, and cardiac troponin T were determined.
Results: A significantly altered hormonal profile in the AAS using group provided indirect confirmation of AAS use. C reactive protein concentrations were significantly ($p<0.05$) higher in the AAS using bodybuilders. There was no relation between C reactive protein and cardiac troponin T.
Conclusion: AAS using bodybuilders had significantly higher C reactive protein concentrations, indicating a greater propensity to develop peripheral arterial disease.

Take home message

Higher levels of C reactive protein in anabolic androgenic steroid using bodybuilders indicate a greater propensity to develop future thromboembolytic events.

Three decades of research have outlined serious consequences of anabolic androgenic steroid (AAS) use on the haemostatic system.[1–3] Recent work has shown raised levels of C reactive protein (CRP) to be a strong predictor of cardiovascular events.[4] CRP concentrations have not been studied in AAS users to date.

MATERIALS AND METHODS

Ethical approval for the study was granted by the Bro Taf local health authority. Subjects were divided into three groups: AAS users who were still using AAS at time of testing (n = 10); bodybuilding controls who did not use any pharmacological ergogenic aids (n = 10); sedentary male controls (n = 8). Venous blood was sampled using the standard venepuncture method, from an antecubital vein after an overnight fast and 30 minutes supine rest[5] between 10 00 am and 11 00 am. Morning blood samples were taken because of the daytime biological variation in testosterone and sex hormone binding globulin.[6] CRP concentrations were determined using an immunoluminometric assay on a Roche Integra analyser (Roche Diagnostics, UK).

Data were analysed using the SPSS 10.0 for Windows statistical package. Group differences were analysed using a one way analysis of variance followed by a post hoc Tukey test. Statistical significance was accepted at the $p<0.05$ level.

Table 1 Male sex hormone data, C reactive protein (CRP), and troponin T concentrations for anabolic androgen steroid (AAS) users compared with bodybuilding and sedentary controls

Variable	AAS users (n = 10)	Bodybuilding controls (n = 10)	Sedentary controls (n = 8)
Testosterone (nmol/l)	41 (26.1)*	17 (3.7)	15 (3.00
SHBG (nmol/l)	4.0 (2.8)**	13 (8.4)	21 (11.1)
Free androgen index	10.3***	1.3	0.7
CRP (mmol/l)	1.2 (0.5)*	0.7 (0.3)	0.5 (0.2)
Troponin T (μmol/l)	<0.1	<0.1	<0.1

Values are mean (SD).
*p<0.05; **p<0.01; ***p<0.001 compared with both controls.
SHBG, Sex hormone binding globulin.

RESULTS

Testosterone was significantly ($p<0.05$) higher in the AAS using group than controls. Sex hormone binding globulin was significantly ($p<0.01$) lower in the AAS users than the controls. The hormonal profile in the AAS using group is consistent with the use of exogenous androgens and thus provided indirect confirmation of AAS use. CRP was significantly ($p<0.05$) higher in the AAS using bodybuilders than the controls (table 1).

DISCUSSION

The mechanism for AAS induced CRP alterations is not known. An absence of a concurrent increase in troponin T in the AAS using group indicates inflammation at a source other than the myocardium. CRP is secreted by hepatocytes in response to in vivo inflammatory events. Indeed, much biological activity of AAS also centres around the liver. This possible link certainly warrants more detailed investigation.

This study adds to the list of potentially prothrombotic consequences[1–3] of non-therapeutic AAS use, and provides a contraindication to such use.

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Abbreviations: AAS, anabolic androgenic steroid; CRP, C reactive protein

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