A 12-week aerobic training program reduced serum C-reactive protein in women with metabolic syndrome

OBJECTIVE It is widely accepted that individuals with metabolic syndrome present a proinflammatory state that may finally result in an increased cardiovascular risk profile. This study was designed to determine the effect of regular exercise on serum C-reactive protein (CRP) in women with metabolic syndrome. METHOD Sixty adult women with metabolic syndrome according to the National Cholesterol Education Program Adult Treatment Panel III criteria volunteered for this study, of whom 45 were randomly included in the experimental intervention group. These women performed a 12-week aerobic training program, 3 days/week, consisting of warm-up (10 min), main part (20–35 min, increasing by 5 minutes each three weeks) at a work intensity of 60–75% of peak heart rate (increasing by 5% each three weeks) and cool-down (10 min). The control group of 15-age and BMI-matched women with metabolic syndrome did not perform any training program. Written informed consent was obtained from all participants and the protocol was approved by an institutional ethics committee. Levels of serum high-sensitivity CRP (hs-CRP) were assessed by immunonephelometric assay twice, 72 hours before starting the program (pre-intervention) and after its completion (post-intervention). Indices of body fat distribution were also calculated. RESULTS When compared to the baseline, hs-CRP levels decreased significantly following the exercise program (5.2±0.9 vs 3.7±0.7 mg/L; P<0.05). A moderate association was found between hs-CRP and waist circumference. No changes were reported in the controls. CONCLUSIONS A 12-week aerobic training program reduced serum hs-CRP levels in women with metabolic syndrome.
MATERIAL AND METHOD

Sixty adult women with metabolic syndrome according to the criteria reported by the National Cholesterol Education Program Adult Treatment Panel III volunteered for this study. Forty-five were randomly included in an intervention group to perform a 12-week aerobic training program, 3 days/week, consisting of warm-up (10 min), main part (20–35 min, increasing by 5 minutes each three weeks), at a work intensity of 60–75% of peak heart rate (increasing by 5% each three weeks) and cool-down (10 min). Participants in the program underwent a complete physical examination at the start of the program. None of the subjects was under any drug therapy (mainly drugs known to effect insulin resistance or lipids including hormone replacement therapy or oral contraceptives) and none had a prior history of disease or injury that would contraindicate daily exercise. The control group included 15 age-, sex- and BMI-matched women with metabolic syndrome that did not perform any training program during the course of the study.

Written informed consent was obtained from all participants and the protocol was approved by an institutional ethics committee.

Blood samples were drawn after a 12-h overnight fast twice: 3 days before starting the program (pre-intervention) and 3 days after its completion (post-intervention). Serum hs-CRP levels were assessed by immunonephelometric assay (N Latex CRP mono, Dade Behring, Germany). Indices of body fat distribution, including waist circumference and waist-to-hip ratio, were also calculated.

Statistical analysis was performed using the statistical package for social sciences (SPSS 11.0 for Mac). Results were expressed as mean±SD. Pre-intervention and post-intervention values were compared using matched paired t-tests. Pearson’s “r” coefficient was used to determine potential correlations between assessed parameters. A value of P<0.05 was considered statistically significant.

RESULTS

When compared to baseline, the mean hs-CRP level was significantly lower (5.2±0.9 vs 3.7±0.7 mg/L; P<0.05) after the exercise program. Similarly, both waist circumference (96.2±2.1 vs 94.6±1.8; P<0.05) and waist-to-hip ratio (0.88±0.06 vs 0.85±0.06; P<0.05) were also decreased to a statistically significant degree. A moderate association was found between hs-CRP and both waist circumference (r=0.49; P<0.001) and waist-to-hip ratio (r=0.42; P<0.05). In contrast, no changes were reported in the hs-CRP levels of the control subjects over the course of the study period.

DISCUSSION

This study was designed to investigate the effects of a short-term intervention program based on aerobic exercise in adult women with metabolic syndrome. The findings suggested that a 12-week training program may reduce proinflammatory biomarkers such as hs-CRP in participants.

Several authors, including Kadoglou et al. and Thompson et al., have recently reported that regular exercise improved proinflammatory status in adult women, reducing significantly plasmatic cytokines and acute phase reactants. The most striking feature of the present study was that the exercise program lasted only 12 weeks.

Laboratory analyses to detect acute phase reactants in general and hs-CRP in particular are expensive, complex and invasive. Consequently this study was also designed to identify potential bioindicators of serum CRP. The results suggested that both waist circumference and waist-to-hip ratio may be considered cheap, easy and non-invasive bioindicators of hs-CRP levels in women with metabolic syndrome before and after training.

Similarly, Santos et al. reported that central obesity in general, and waist circumference in particular, were among the most important determinants of the low-grade chronic inflammation present in metabolic syndrome, based on a representative sample of 1,022 urban adults. Similar results were reported by Lim et al. in a community-based cohort of 9,773 Koreans aged 40–59 years. These findings may be explained at least in part by the role of abdominal adipose tissue as an important source of proinflammatory cytokines, which may finally increase the production of acute phase reactants such as CRPs.

From the findings of this study it may be concluded a 12-week aerobic training program reduced serum hs-CRP levels in women with metabolic syndrome. Further studies on this topic are required to confirm this effect.
ΠΕΡΙΛΗΨΗ

Πρόγραμμα αερόβιας άσκησης 12 εβδομάδων μείωσε τη C-αντιδρώσα πρωτεΐνη γυναικών με μεταβολικό σύνδρομο

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ΣΧΟΛΙΟ

Είναι γνωστό ότι τα άτομα με μεταβολικό σύνδρομο εμφανίζουν μια προφλεγμονώδη κατάσταση, που μπορεί τελικά να οδηγήσει σε αυξημένο καρδιαγγειακό κίνδυνο. Ο σχεδιασμός της μελέτης έγινε για τον καθορισμό της επίδρασης της άσκησης στη C-αντιδρώσα πρωτεΐνη σε γυναίκες με μεταβολικό σύνδρομο.

ΥΛΙΚΟ-ΜΕΘΟΔΟΣ

Έλαβαν μέρος 60 ενήλικες γυναίκες με μεταβολικό σύνδρομο σύμφωνα με τα διεθνή παραδεκτά κριτήρια. Σαράντα πέντε γυναίκες αποτέλεσαν τυχαία την πειραματική ομάδα για να συμμετάσχει σε ένα πρόγραμμα αερόβιας άσκησης, διάρκειας 12 εβδομάδων, 3 ημέρες/εβδομάδα, που περιλάμβανε από προθέρμανση (10 min), κύριο μέρος (20–35 min, με αύξηση 5 min κάθε 3 εβδομάδες), σε επίπεδο εργασίας 60–75% της ανώτερης καρδιακής συχνότητας (αύξηση 5% κάθε 3 εβδομάδες) και χαλάρωση (10 min). Η ομάδα ελέγχου περιλάμβανε 15 γυναίκες, τυχαιοποιημένες όσον αφορά στην ηλικία και το δείκτη μάζας σώματος (ΒΜΙ), που δεν έλαβαν μέρος σε κάποιο πρόγραμμα. Όλες οι συμμετέχοντες έδωσαν γραπτή συγκατάθεση και το πρωτόκολλο έγινε αποδεκτό από την Επιτροπή Δεοντολογία του Κέντρου. Οι τιμές της υψηλής ευαισθησίας C-αντιδρώσας πρωτεΐνης (hs-CRP) ελήφθησαν με διπλή μέτρηση, με ανοσονεφελομετρική μέθοδο, 72 ώρες πριν από την έναρξη του προγράμματος και μετά τη λήξη αυτού. Επίσης, έγινε προσδιορισμός του δείκτη κατανομής του σωματικού λίπους.

ΑΠΟΤΕΛΕΣΜΑΤΑ

Σε σύγκριση με τις βασικές τιμές, τα επίπεδα της hs-CRP βρέθηκαν σημαντικά μειωμένα μετά από την άσκηση (5,2±0,9 έναντι 3,7±0,7 mg/L, P<0,05). Επιπλέον, βρέθηκε μια μέτρια συσχέτιση μεταξύ της hs-CRP και της περιμέτρου της μέσης. Αντίθετα, δεν παρατηρήθηκαν μεταβολές στην ομάδα ελέγχου.

ΣΥΜΠΕΡΑΣΜΑΤΑ

Ένα πρόγραμμα αερόβιας άσκησης 12 εβδομάδων μειώνει τα επίπεδα της hs-CRP του ορού σε γυναίκες με μεταβολικό σύνδρομο.

Λέξεις ευρετηρίου: Άσκηση, hs-CRP, Μεταβολικό σύνδρομο

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