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EFFECTS OF LOW-CARBOHYDRATE DIET ON PHYSICAL STRENGTH

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I. Background

Recently, low-carbohydrate diets (LCD) for weight control and management of the metabolic syndrome has become increasingly popular\textsuperscript{12–20}. However, there is a paucity of research about effects of LCD on physical performance\textsuperscript{12–20}.

II. Objective

In the present study, we examined the effects of LCD vs low-calorie diets on physical performance in untrained subjects.

III. Methods

We recruited 12 sedentary young subjects (20±2

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Fig. 1. Representative menus of low-carbohydrate diets and low-caloric diet.
Changes in obesity measures

Fig 2. Significant decreases in body weight, BMI (body mass index) and waist were seen only in low-carbohydrate group.

Changes in glucose tolerance measures

Fig 3. Significant decrease in HbA1c was seen only in low-carbohydrate group.

yr). Subjects were randomly assigned to LCD (carbohydrate intake<20g) and low-calorie diet group (Fig 1). We measured body composition, various performance aspects (Thigh muscle thickness, leg extension power, exercise tolerance by bicycle ergometer), blood metabolic parameters (fasting glucose: FBS, hemoglobin A1c: HbA1c, insulin, lipids, ketone bodies), inflammatory markers (C-reactive protein: CRP, white blood cell count: WBC and thiobarbituric acid reactive substance: TBARS) before and after 1 month of each diet therapy.
Changes in inflammatory markers

![Graphs showing changes in inflammatory markers](image)

Fig 4. Significant decreases in inflammatory markers were not seen in both groups.

Changes in ketone bodies

![Graphs showing changes in ketone bodies](image)

Fig 5. Remarkable increases in ketone bodies were seen in low-carbohydrate group.

IV. Results

Body weight, fat and waist significantly decreased (p<0.05) in LCD groups, whereas no significant changes were seen in low-carbo diet group (Fig 2). HbA1c level was significantly decreased (p<0.05) only in LCD groups (Fig 3). CRP, WBC and TBARS did not significantly change in both groups (Fig 4). The other parameters also did not significantly change in both groups. Acetoacetic acid, 3-hydroxybutyric acid, total ketones were remarkably
Changes in muscle mass and physical strength

Fig 6. Significant decreases in muscle mass, strength and exercise tolerance were not seen in both group.

elevated in LCD group (Fig 5, p<0.05), while those were not change in low-calorie group. On the other hand physical performance aspects similarly maintained in both groups (Fig 6).

V. Conclusions

We have demonstrated that LCD for a relatively short-term can decrease body weight and body fat without negative effects on physical strength.

Acknowledgments

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References

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第6回アジア栄養療法学会議
(2014年7月21－24日、台北、台湾)における研究発表
糖質制限食が体力面へ与える影響

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日本語要約

近年、肥満症、メタボリック症候群、糖尿病患者の予防・改善を目的とした低糖質食療法
が、米国糖尿病学会で推奨され、我が国では、民間を中心に普及してきている。しかしこう
うな中、一方で低糖質食が体力面に与える悪影響が懸念されている。本研究では、低糖質食お
よび総カロリーが体力指標に与える影響を検討した。12人（男性5人、女性7人、平均年齢20
才）の被験者を低糖質食と総カロリー制限群に無作為に割り付け、1ヶ月間の介入を施行し、
前後において、身体計測、筋力、持久力および血液生化学的検査を行なった。介入後、糖質制
限群のみにおいて、体重、体格指数、腹囲およびHbA1c有意に減少した（p<0.05）。一
方、血中ケトン体は、糖質制限群で極めて顕著に増加していた（p<0.05）。膝伸展筋力、最
大酸素摂取量および大脳四頭筋厚は、両群で有意な変化および差異を認めなかった。低糖質食
では、比較的短期間に有効な減量が得られ、体力面への悪影響は明らかではないことが示され
た。