



Renal analysis in 75 km ultra-marathon participants*

Análise renal de ultramaratonista em prova de 75 km

Análisis renal de corredora en la prueba de 75 kilómetros

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ABSTRACT

Objective: To identify urinary abnormalities, indicative of renal involvement, in 75 km ultra-marathon racer and pacer (cyclist that gives support to the racer). **Methods:** Renal analysis consisted of urine dipstick tests in four different times and anthropometric measures. **Results:** Both the racer and the pacer were in eutrophic conditions. There was an association between the capacity for maximum physical effort and detection of urinary abnormalities determined by the presence of hematuria and/or proteinuria. **Conclusion:** Renal analysis allowed the identification of transitory renal involvement in both healthy individuals during intense exercise.

Keywords: Sports; Exercise/physiopathology; Motor activity; Hematuria; Proteinuria; Kidney/physiopathology; Kidney diseases

RESUMO

Objetivo: Identificar alterações urinárias compatíveis com comprometimento renal em ultramaratonista e “pacer” (ciclista de apoio) ao longo de uma prova de 75 quilômetros. **Métodos:** Para tal, utilizou-se teste de urina com fita reagente em quatro tempos diferentes, além de avaliação antropométrica. **Resultados:** As medidas concernentes a ultramaratonista a classificaram como eutrófica, assim como o “pacer”. Observou-se, assim, associação entre os momentos de esforço físico máximo e a detecção de alterações urinárias, definidas pela presença de hematúria e, por vezes, positividade da proteinúria. **Conclusão:** Foi possível ilustrar alteração transitória em dois indivíduos saudáveis submetidos a exercício intenso.

Descritores: Esportes; Exercício/fisiopatologia; Atividade motora; Hematúria; Proteinúria; Rim/fisiopatologia; Nefropatias

RESUMEN

Objetivo: Identificar alteraciones urinarias compatibles con compromiso renal en una corredora y un “pacer” (ciclista de apoyo) a lo largo de una prueba de 75 Kilómetros. **Métodos:** Para tal efecto, se utilizó un test de orina con cinta reactiva aplicado en cuatro tiempos diferentes, además de una evaluación antropométrica. **Resultados:** Las medidas concernientes a la corredora la clasificaron como eutrófica, así como el “pacer”. Se observó que existe asociación entre los momentos de esfuerzo físico máximo y la detección de alteraciones urinarias, definidas por la presencia de hematuria y, a veces, proteinuria. **Conclusión:** Fue posible demostrar la alteración transitoria en dos individuos saludables sometidos a ejercicio intenso.

Descriptorios: Deportes; Ejercicio/fisiopatología; Actividad motora; Hematuria; Proteinuria; Riñón/fisiopatología; Nefropatías

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INTRODUCTION

In the last years, people presented an increasing interest in physical exercise practice, regardless of socio-economic status or age. Beneficial and well recognized aspects of these activities are related to quality of life and self esteem, in opposition to sedentarism, as well as increase of morbidity and mortality by chronic diseases⁽¹⁾. Nevertheless sport practice can present some undesirable effects, as systemic physiological alterations and common orthopedic lesions⁽²⁾.

Based on the review of different reports on renal disorders associated to physical activity, we observed that hematuria and proteinuria were documented in several groups of athletes⁽²⁻⁷⁾. Marathonists present predominantly urinary non glomerular bleeding, possibly due to bladder contusion, especially in shorter distance races, and glomerular hematuria in longer races⁽⁴⁾.

It is of note that hematuria and proteinuria due to "sports" do not use to progress as a chronic kidney disease, but the carriers should be followed closely to exclude significant underlying conditions that were not diagnosed at the first approach^(6,8).

So this study look for detecting eventual renal alterations secondary to the overload of physical exercise in two health subjects that performed an expressive effort in sports activities. The objective was to identify urinary abnormalities compatible with renal involvement in two athletes during a 75 km race.

METHODS

An ultramarathonist and her "pacer" (support cyclist) were observed and compared in a 75 km race, from Bertiooga to Maresias (in the coast of the State of Sao Paulo). Both were submitted to the same "protocol" that consisted of: clinical evaluation and anthropometric measures a day before the race. Collection of random urine for dipstick test (ChoiceLine 10 Urinalysis - Roche), in four different times along the race— Time 1: 30 minutes before the start; Time 2: during a stop in the

checking station 6 (Cantão da Jureia) after 4 hours and 23 minutes (43.6 km of race without intervals), for changing running shoes; Time 3: in the arriving station (Maresias), after 8 hours and 20 minutes of race; and Time 4: 4 hours after the end of the race (during the rest period). Hydration and nutritional supplementation was performed during the race.

The athletes gave their informed consent to participate of this study.

RESULTS

Based on anthropometric measures of abdominal circumference and cutaneous folds both athletes were classified as euthrofic. When asked about their ethnic origin they classified themselves as Caucasians. Other data about these subjects can be seen in Table 1.

In Table 2, the urinary test done before the race showed no urinary abnormalities (normal indexes). In all samples, urinary density, pH, white blood cells count and glucosuria were normal in both subjects, but hematuria was evident and it increased along the race, associated to positivity in the dipstick test for protein. The "pacer" presented less hematuria in the sample of time 3 than the ultramarathonist. The pacer had a stop after 69 km and he "rested" during 40 minutes before this collection. It was also observed that four hours after the end of the race, both were again without urinary abnormalities in the dipstick test.

Except for the urinary abnormalities no other alterations were detected.

Table 1 – Descriptive demographic and anthropometric data of the participants

Parameters	Ultramarathonist	Pacer
Sex	Female	Male
Age (anos)	36	32
Weight (kg)	47.8	73
Height (m)	1.57	1.69
Body mass index (kg/m ²)	19.40	25.55

Table 2 - Results of the tests performed in urine with dipstick in four different times along the ultramarathon.

Parameters (urine)	Time 1		Time 2		Time 3		Time 4	
	ultra	pacer	ultra	pacer	ultra	pacer	ultra	pacer
Density	1020	1025	1020	1030	1020	1020	1025	1025
pH	5	6,5	6,5	6,0	5	5	5	6,5
White blood cells (µL)	neg	neg	neg	neg	neg	neg	neg	neg
Hemoglobin (µL)	neg	neg	10	10	250	25 ^a	neg	neg
Protein (mg/dL [mmoL/L])	neg	neg	15[0,15]	15[0,15]	30[0,3]	30[0,3]	neg	neg
Glucose (mg/dL [mmoL/L])	normal	normal	normal	normal	normal	normal	normal	normal

Ultra:Ultramarathonist; pacer: support cyclist; neg: negative; a sample collected in km 69 stop (the duration of the race was 7 hours and 40 minutes; and he only got the sample after 40 minutes).

DISCUSSION

First of all it is necessary to say that it was not possible to perform more complex exams for evaluation of renal function during this study due to a possible interference in the performance of the athletes along the race.

The urinary abnormalities observed in both cases indicate a possible role for physical exercise on renal physiology as previously established⁽⁹⁾. Some studies have shown proteinuria corresponding to a transitory increase in urinary protein excretion related to hemodynamic glomerular alterations that can occur during exercise or fever^(6,10). Similarly hematuria is seen in about 20% of marathon runners^(3,6). We believe that the same alterations can occur with ultramarathon participants, as documented here.

It is of note the excellent performance of the athletes in the resistance race, possibly due to previous adequate training, optimizing individual conditions and minimizing lesions (adequate nutritional supplementation to avoid hypoglycemia and to attenuate dehydration and eventual

hyperthermia⁽¹¹⁾. In Addition it is important to emphasize that presenting urinary abnormalities during physical activity (race) does not mean that the individuals have or will develop permanent renal injury⁽¹²⁾.

It is possible to say the urine dipstick test is a practical instrument to explore possible pathophysiological mechanisms implicated in the urinary alterations seen in high intensity physical activities.

CONCLUSION

Studies related to the follow up of athletes in the course of physical activity are uncommon, and this study demonstrates of a transitory alteration in two health subjects submitted to intense exercise. In the present evaluation it was observed an association between the moments of maximal effort and the detection of urinary alterations, identified by positivity in the areas of hematuria and proteinuria in the dipstick. Studies with more subjects are certainly necessary to consolidate these findings in athletes that run in ultramarathons.

REFERENCES

1. Dunn AL, Marcus BH, Kampert JB, Garcia ME, Kohl HW 3rd, Blair SN. Comparison of lifestyle and structured interventions to increase physical activity and cardiorespiratory fitness: a randomized trial. *JAMA*. 1999;281(4):327-34. Comment in: *JAMA*. 1999;281(4):375-6. *JAMA*. 1999;282(16):1515-6; author reply 1516-7.
2. Cavagnaro F. Riñón y deportes. *Rev Chil Pediatr*. 2006;77(2):185-8.
3. Jones GR, Newhouse I. Sport-related hematuria: a review. *Clin J Sport Med*. 1997;7(2):119-25.
4. Kallmeyer JC, Miller NM. Urinary changes in ultra long-distance marathon runners. *Nephron*. 1993;64(1):119-21.
5. Reid RI, Hosking DH, Ramsey EW. Haematuria following a marathon run: source and significance. *Br J Urol*. 1987;59(2):133-6.
6. Kirsztajn GM, Heilberg IP. Anormalidades urinárias associadas à atividade física. In: Cruz J, Cruz HMM, Barros RT, coordenadores. *Atualidades em nefrologia 9*. São Paulo: Sarvier; 2006.
7. Polito C, Andreoli S. Sport hematuria in boys: a provocative test. *Pediatr Nephrol*. 2005;20(8):1171-3.
8. Cianflocco AJ. Renal complications of exercise. *Clin Sports Med*. 1992;11(2):437-51.
9. Ponce P, Cruz J. Alterações urinárias induzidas pelo esforço físico. *Acta Med Port*. 1988;1(3):209-11.
10. House AA, Cattran DC. Nephrology: 2. Evaluation of asymptomatic hematuria and proteinuria in adult primary care. *CMAJ*. 2002;166(3):348-53.
11. Gusmão L, Galvão J, Possante M. A resposta do rim ao esforço físico. *Rev Port Nefro Hipert*. 2003;17(1):73-80.
12. Patel DR, Torres AD, Greydanus DE. Kidneys and sports. *Adolesc Med Clin*. 2005;16(1):111-9, xi.