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Effect of Finasteride on the Urinary Steroid Profile: A Case Study

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Introduction

Previous routine analysis of anabolic steroids in urine from Brazilian soccer players, who were taking finasteride, showed different steroid profile parameters from the established reference ranges for athletes. The present study was performed to investigate the effect of finasteride on the urinary steroid profile, regarding testosterone and DHT, in particular.

Materials and methods

Excretion study

One male volunteer (35 years, 65kg) participated in this study. From day 2 until day 8 finasteride (1mg tablets, Propecia, MERCK SHARP & DOHME) was administered orally, after collecting cumulative urine. At day 9 finasteride and testosterone (40 mg tablets, Androxon, Organon) were given (single oral dose, table 1).

Analysis

Urine samples were prepared according to the screening procedure for conjugated steroids. The complete procedure was described by Geyer et al. (1-2).

Results and discussion

After finasteride administration, alterations of steroid profile could be observed in 24h, as shown in figures 1-2. The results of selected steroid concentrations (table 1) and ratios (figure 3), their excretion rates and statistical evaluation (table 2) showed that the concentrations of DHT, the 5α-metabolites, Androsterone (A), and 3α,5α-androstanediol (3α,5α-DIOL) decreased, as expected.

Table 1. Protocol of the finasteride and testosterone administration.

Day	Time* (hours)	Sampling	Remarks
1	-48	Cumulative urine	Blank urine
2	-24	Cumulative urine	Blank urine
	0	-	Finasteride
	4,10		
3	22	Cumulative urine	
	30,37		
4	46	Cumulative urine	
	57		
5	66	Cumulative urine	
	71,80		
6	90	Cumulative urine	
	99,109		
7	116	Cumulative urine	
	124,133		
8	141	Cumulative urine	
	147,159		
9	167	Cumulative urine	
			Finasteride and testosterone
	175,181		
10	190	Cumulative urine	
	198		

Table 2. Concentrations (ng/ml) of selected steroids in urine before (-48 to 0h) and after finasteride (0 to 167h) and finasteride/testosterone (167 to 198h) administration.

Steroid / Time (hours)	A[a]		E[b]		5α,3α–Diol[c]		5β,3α–Diol[d]		DHT[e]	
	mean	stdv	mean	stdv	mean	stdv	mean	stdv	mean	stdv
(-48) – (0)	3131.60	514.20	2484.64	1429.14	33.16	7.16	97.99	35.89	4.85	1.05
0 – 24	1962.10	1167.77	4251.35	2460.85	18.87	8.92	333.33	207.48	4.82	1.92
24 – 48	690.89	322.81	2924.16	677.15	5.06	1.34	167.99	134.56	1.52	0.63
48 – 72	594.28	295.03	3098.67	1426.66	7.96	4.205	63.84	620.26	2.11	0.64
72 – 96	391.72	174.04	1602.81	847.13	7.21	2.79	27.54	14.31	1.18	0.61
96 –120	344.10	25.11	2158.86	425.84	5.60	0.68	44.13	12.75	0.86	0.21
120 – 144	884.14	650.64	5052.93	1950.56	10.86	4.57	105.22	49.22	1.49	0.44
144 – 167	645.64	152.47	4201.23	544.86	12.47	6.786	105.99	39.09	1.69	0.55
167 –198	2495.64	2581.91	7838.28	4479.33	20.63	20.90	150.67	81.18	3.03	4.16

[a]Androsterone; [b]Etiocholanolone; [c]Androstanediol; [d]5β,3α-Diol-Androstanediol and [e]Dihydrotestosterone.

The obvious effect of finasteride on the inhibition of steroid Type II 5α-reductase can be better seen in the ratio of 5α/5β epimers (figures 1-2). As the administration of finasteride reduces only the excretion of 5α but not of 5β-steroids, the ratios of DHT and metabolites, to the 5β-epimers and to Epitestosterone (Epi) decrease. Therefore, clear reductions were found for A/T, A/E, DHT/E, DHT/Epi and 5 α,3α/5β,3 α–DIOL, of which the most significant was the decrease in the ratio of A/E (<0.82, figure 1). The differences evaluated by t-test at the level of significance 0.5 showed that the reductions in the ratios of A/E and 5α/5β metabolites were due to the decrease in A and 5α excretion values, respectively, and not to an increase in the formation of E or 5β-compounds.

The administration of testosterone is well known to increase significantly not only the concentration of T but also the ratio of T/Epi (3). In the present study it was observed that these parameters increased rapidly after T application, but did not remain high for long, returning to the mean values obtained before T administration, in less than 24 hours. The ratio of A/T in the presence of finasteride was maintained low (<25.53) and there was not a large difference between these values after and before testosterone administration (< 14.71, mean value from 0 – 168 hours).

Conclusions

The following changes on steroid profiles could be observed after administration of finasteride:

(1) T concentrations and T/EpiT ratios suffer no apparent change.

(2) Etiocholanolone concentrations remain constant.

(3) A/T ratios suffer a sharp decrease to values of approximately 10.

(4) A/E drops sharply, the ratio decreases from 1.7 to 0.1 (17 times).

(5) 5α/5β-DIOL decreases from 1.17 to 0.09 (13 times).

(6) DHT concentrations decrease significantly.

Upon joint administration of finasteride plus testosterone, all evaluated parameters change in the same way as for administration of testosterone alone, but reference ranges change significantly, as expected (see 1-5 above). This is particularly significant for concentrations and ratios involving androsterone which may render identification of positive testosterone cases more difficult or even inconclusive.

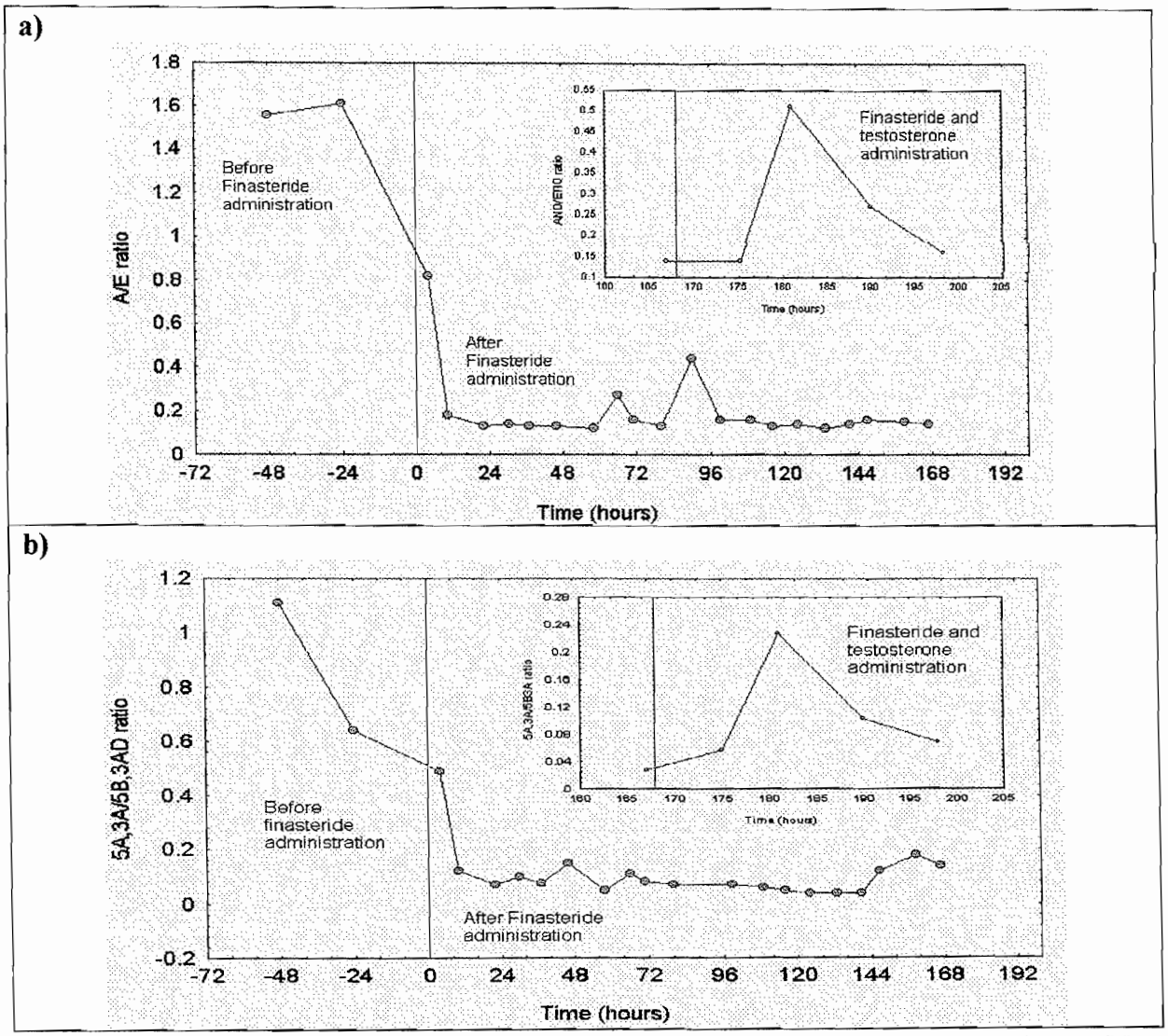

Figure 1. Ratios of 5α/5β metabolites (a) Androsterone/etiocholanolone and (b) 5α/5β-DIOL, before (-48 to 0h) and after finasteride (0 to 167h) and finasteride/testosterone (167 to 198h) administration.

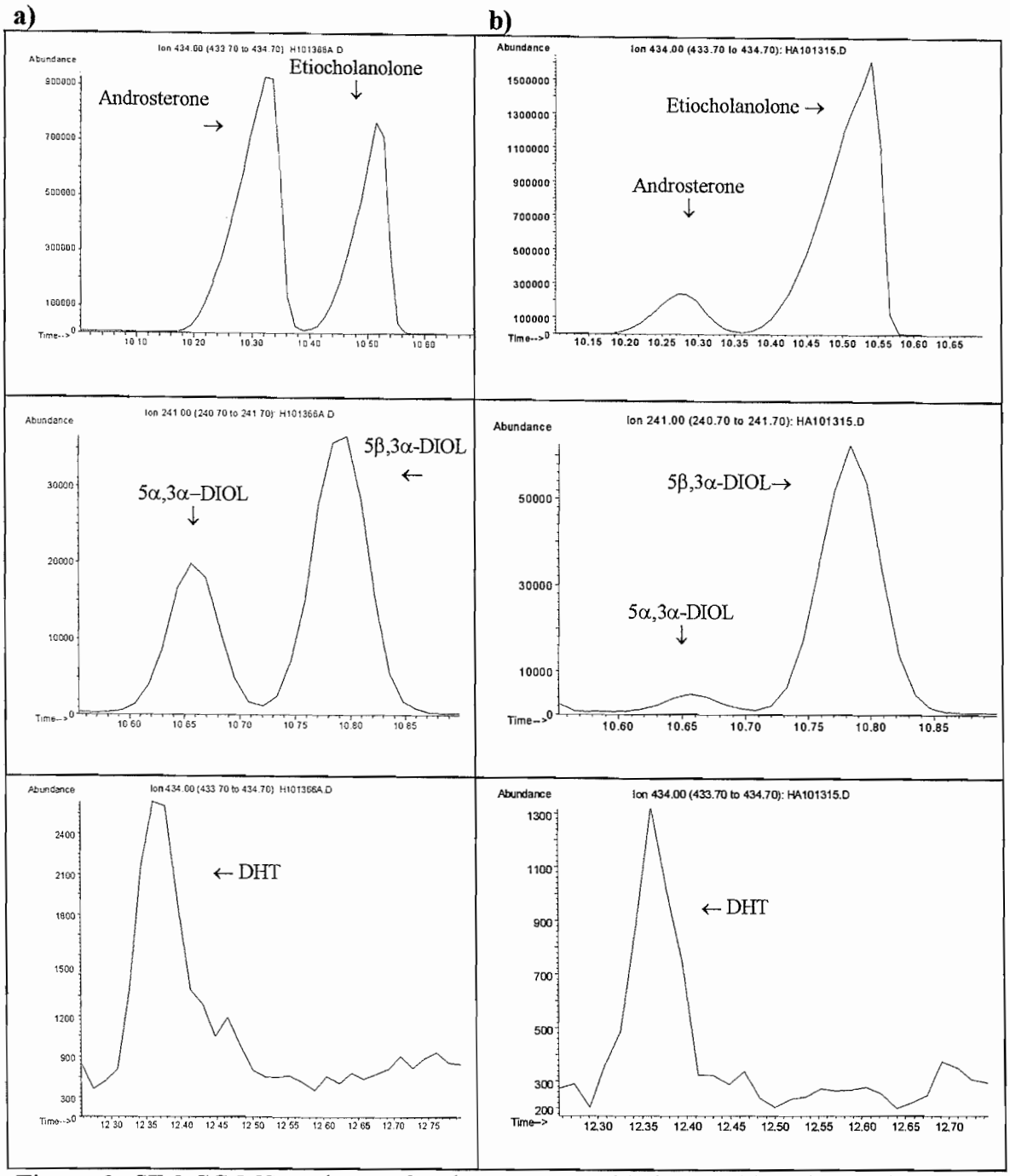

Figure 2. SIM GC-MS analyses of endogenous steroids before (a) and after (b) finasteride administration.

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