Investigation about the effects and the detection of finasteride

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Introduction

Finasteride is an inhibitor of 5-alpha reductase and used for the treatment of benign prostatic hypertrophy and androgenetic alopecia. Investigations with finsteride with only one volunteer have shown, that the use of finasteride complicates the detection of the misuse of several anabolic steroids in doping control (1). To confirm this result excretion studies with several volunteers were performed.

Methods

To study the influence of finasteride on the urinary steroidprofile and on the metabolism of anabolic androgenic steroids, excretion studies with single oral administrations of 5 mg and 1 mg finasteride were performed with 5 volunteers. Urine samples were collected before and till 8 days after the application and the profiles of endogenous urinary steroids were analysed by GC/MS according to the screening procedure for anabolic steroids (2).

Results: Influence of finasteride on the steroidprofile

It could be shown, that finasteride led to obvious changes of several steroidprofile parameters. The excretion of 5-alpha-steroids like androsterone, 5α-androstane-3α, 17ß-diol, allo-tetrahydrocortisol, 11ß-hydroxy-androsterone, and dihydrotestosterone decreased, whereas the excretion of the 5ß-steroids increased or didn't change. The results were obvious decreases of the ratios between epimeric 5α-and 5ß steroids like e.g. androsterone/ etiocholanolone, 5α-androstane-3α, 17ß-diol/5ß-androstane-3α, 17ß-diol and allo-tetrahydrocortisol/ tetrahydrocortisol (Fig. 1). These changes could be detected for more than 8 days both with 5 mg and 1 mg finasteride (Fig. 2). The suppression of the excretion of the 5-alpha-steroids showed the same extent for 5 mg and 1 mg finasteride, whereas the increase of the excretion of the 5ß-steroids was weaker with 1 mg finasteride compared to 5 mg finasteride. The ratio testosterone/ epitestosterone showed no changes after the application of finasteride and varied within the normal variation.

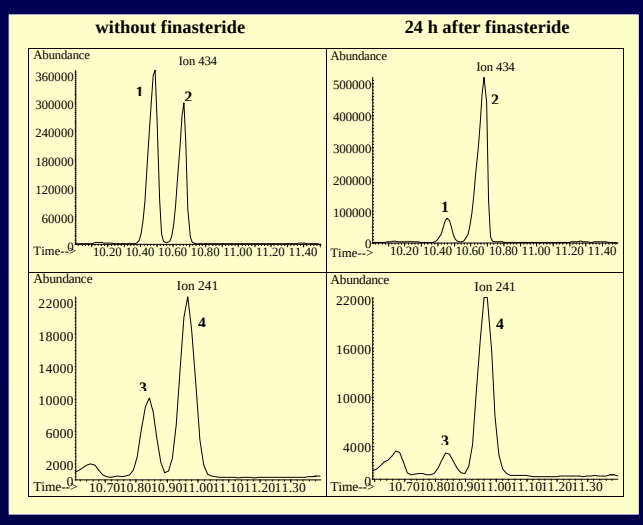


Fig. 1: Chromatograms (SIM) of endogenous steroids of a volunteer before and 24 h after the application of 5 mg finasteride. (1: andosterone, 2: etiocholanolone 3: 5a-androstane-3a,17 ß- diol, 4: 5ß-androstane-3a,17 ß-diol)

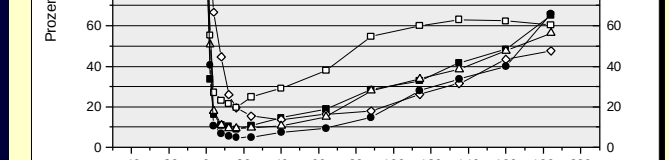


Fig. 2: Relative changes of the ratios androsterone/etiocholanolone in the urine samples of the five volunteers (VP1-VP5) after application of 5 mg finasteride (mean of pretest values = 100%)

Results: Influence of finasteride on the metabolism of norandrostendione

Further excretion studies with 5 mg finasteride were performed with 5 volunteers, who administered additionally 20 µg norandrostendione. It could be shown that under the influence of finasteride the excretion of the 5α-steroid norandrosterone, the main metabolite of norandrostendione, is suppressed to 20-40% of values without finasteride, whereas the excretion of the 5ß-metabolite noretiocholanolone increased under the influence of finasteride up to 400% of the values without finasteride (fig. 3, 4). Based on these results the ratios of norandrosterone/ noretiocholanolone changed from values between 1.7-8.4 to values between 0.3-0.7.

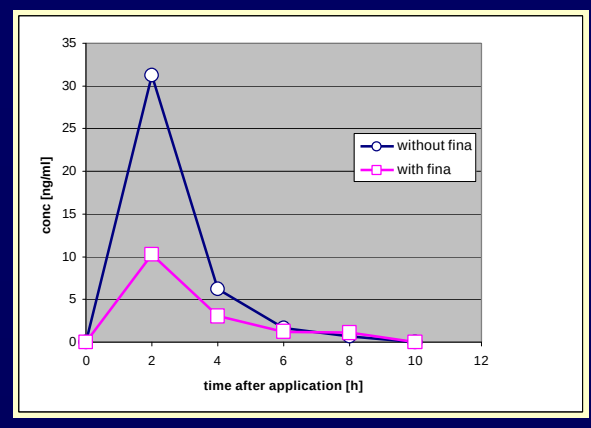


Fig. 3: Norandrosterone concentrations of volunteer VP1 after the administration of norandrostendione (20 µg orally) without and with finasteride (5 mg orally)

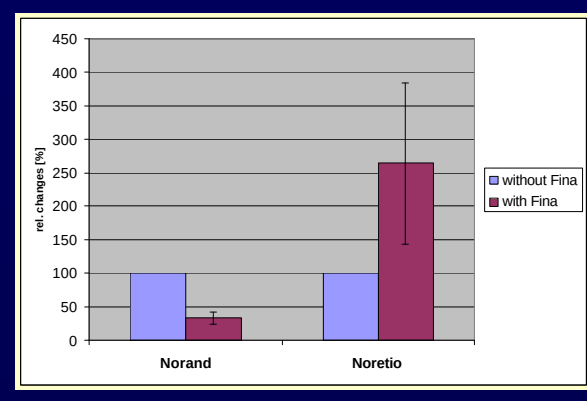
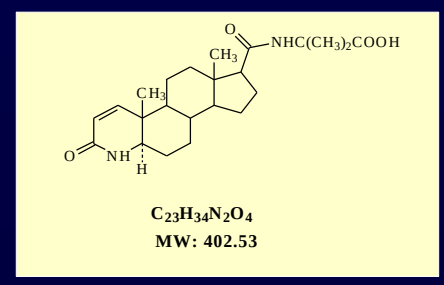


Fig. 4: Relative changes of the maximum excretion rates of norandrosterone and noretiocholanolone of 5 volunteers after the administration of norandrostendione (20 µg orally) without and with finasteride (5 mg orally)

Results: Detection of finasteride

The main urinary metabolite of finasteride is the carboxy-finasteride ((3), see Fig 5). This metabolite can be detected with LC/MS/MS in the screening procedure for diuretics (4). The finasteride metabolite, carboxy-finasteride, is monitored in the extracted ion chromatograms of ion transition m/z 401-102.

After a single oral application of 5 mg of finasteride the carboxy metabolite could be detected for 90 hours.



$C_{23}H_{34}N_2O_4$
MW: 402.53

Fig. 5: Carboxy-finasteride, the main metabolite of finasteride (3).

Conclusion

The results of the present study show, that the use of finasteride may cause serious problems for the interpretation of steroidprofiles which play an important role in doping control (detection of the misuse of endogenous steroids, longitudinal studies, individualisation of samples, etc.). Furthermore finasteride can complicate or even prevent the detection of 19-norsteroids, which is mainly based on the detection of the their 5-alpha metabolite norandrosterone. These results show that finasteride can be misused as masking agent.

References

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