OXIDATIVE STRESS IN MIDDLE AGE MALES WITH OSTEOPOROSIS: CORRELATION OF HORMONAL PATTERN AND PLASMA TOTAL ANTIOXIDANT CAPACITY

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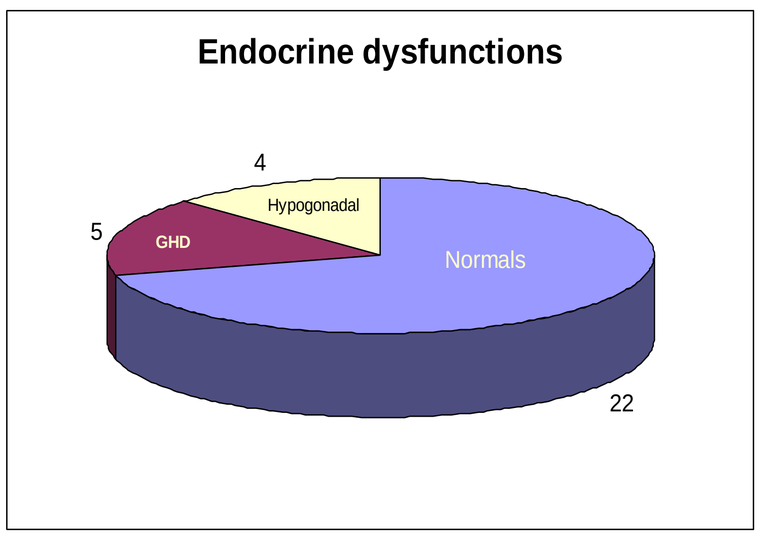
Objective

Male idiopathic osteoporosis represents an underestimated disease although it is becoming a clinically and socially relevant problem. The biochemical mechanisms underlying the metabolic abnormalities of bone are still poorly understood, even if the interaction between genetic factors and hormone environment (especially gonadal steroids and growth hormone) plays a undoubtful role. In previous studies we demonstrated low plasma levels of both Total Antioxidant Capacity (TAC) and Coenzyme Q10 (CoQ10), powerful lipophilic antioxidant, in hypogonadal patients. The aim of this study was therefore to investigate oxidative stress as risk factor for bone fracture, and its relationships with endocrine milieu, evaluating antioxidant defences and the ratio between oxidized and total Coenzyme Q10 (CoQ10) as index of oxidative damage.

Figure 1



Methods

We enrolled 31 male subjects (36-72 years), all affected by back pain/spine fracture as a consequence of trivial trauma and 10 healthy controls (30-48 years). TAC was determined using a colorimetric assay based on the reaction between the system H_2O_2-metmyoglobin as source of radicals and a chromogen (ABTS); the latency time (LAG) in the accumulation of ABTS.+, spectroscopically detectable, is proportional to antioxidants concentration. This assay mainly measures nonprotein and nonenzymatic antioxidants that are primarily extracellular chainbreaking antioxidants, such as ascorbate, urate and glutathione. Coenzyme Q10 was assayed by electrochemical method and corrected for cholesterol levels. An endocrine evaluation including testosterone, estradiol, insulin, IGF-1, PRL, FT3, FT4, TSH levels was also performed. Finally, bone mineral density was assessed by DEXA. Bone metabolic parameters were evaluated (PTH, Vitamin D, osteocalcin, beta-cross laps). Statistical evaluation was performed using Mann-Whitney test.

Results

The prevalence of IGF-1 defects (52.8 ± 15.28 ng/ml) was 5/31 (suggesting growth hormone deficiency, GHD, confirmed by GHRH + Arginine test, Figure 2). Hypogonadism (mean testosterone levels 2.03 ± 0.46 ng/ml) was present in 4/31. The remaining 22 patients did not show alterations in the hormonal parameters studied (Figure 1). Despite mean levels of LAG were not different between patients and controls (72.7±8.5 vs 75.0±6.0 sec), 12 out of 31 patients had low LAG levels (between 50 and 60 sec) irrespective of hormonal milieu. Similarly, CoQ10 exhibited the lowest levels in GHD patients, but the ratio oxidized/total CoQ10 was higher in patients with normal hormone values, in agreement with lower TAC levels (Table 1). Finally, when considering parameters of bone metabolism we found significantly lower Vitamin D levels in hypogonadal subjects, than in patients with GHD and patients with normal hormonal parameters (10.7 ± 5.8 ng/ml vs 19.7 ± 17.7 and 22.7 ± 9.7 respectively).

Conclusions

These preliminary data suggest a possible involvement of oxidative stress in unexplained fractures even if further investigations are needed to establish a possible correlation with anabolic hormones involved in bone metabolism. Low Vitamin D levels could exert a worsening effect on osteoporosis in hypogonadal patients.

Figure 2

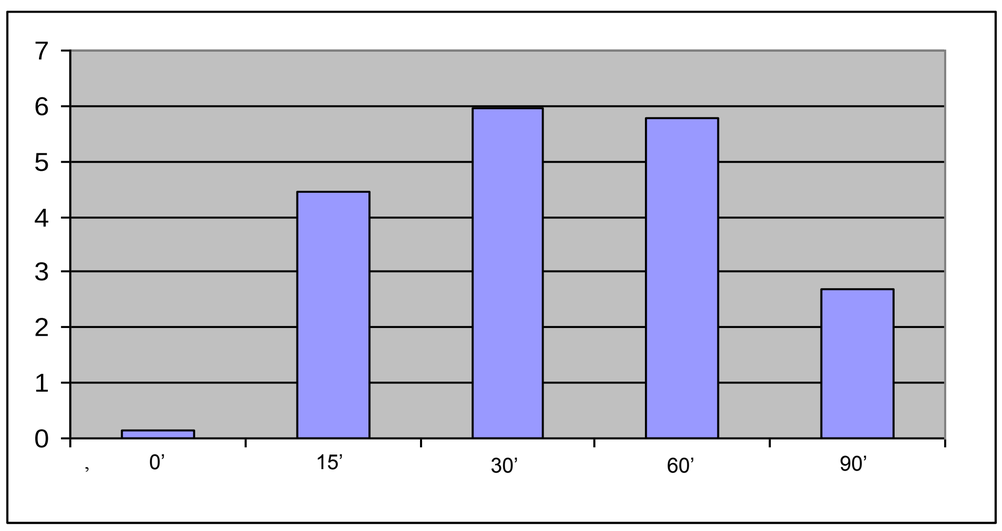


Table 1

	CoQ10 (µg/mL)	CoQ10/ Cholesterol (nmol/mmol)	Qox/Qtot (%)	LAG (sec)
GHD	0.54 ± 0.28	137.38 ± 51.59	11.0 ± 1.9	82.5 ± 15
Hypogonadism	0.71 ± 0.25	170.78 ± 63.60	16.5 ± 2.6	80.0 ± 1.5
Others	0.82 ± 0.30	167.33 ± 53.74	16.7 ± 1.7	66.4 ± 10.3
Controls	0.75 ± 0.24	213.45 ± 67.73	4.0 ± 0.5	75.0 ± 6.0