Biochemical Parameters in Patients Using Teriparatide

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Teriparatide (TPT) is the active 1-34 amino acid sequence with osteoanabolic use for severe osteoporosis. Our aim is to analyze the biochemical and clinical profile of patients treated with TPT based on Romanian protocol. The inclusion and exclusion criteria are based on specific country protocol for TPT 20 µg/day, for 2 years, once in life time based on self administration. This is a transversal study including data of a tertiary centre of endocrinology on patients who signed the informed consent. This is a real life study, of observational type (the intervention meaning the TPT recommendation was done by individual decision of each clinician). Normal total and ionic calcium is associated with low 25-hydroxyvitamin D levels and a mean lumbar T-score of -3.1±0.7SD. 50% of patients treated with TPT have digestive conditions, less than 10% are first time users, a high severity profile is based on a median of 4 years regarding prior anti-osteoporotic medication and of 3 previous fragility fractures.

Keywords: teriparatide, osteoporosis, calcium

Parathormone is a parathyroid gland product aiming bone health and disturbing it when primary hyperparathyroidism is registered, and also secondary parathormone raise as feedback to low vitamin D levels [1-4]. Teriparatide (TPT) is the active 1-34 section of the hormone which represents a potent osteoanabolic agent, independent of metabolic events in human body [5-9]. The indication is mainly for severe primary osteoporosis (hypogonadism- or age-related) and glucocorticoid induced bone loss which are typically seen in association with other conditions of skeleton, some with increased severity [8-17].

Experimental part

Aim of the study
The aim of this study is to analyse the biochemical and clinical profile of patients treated with TPT based on Romanian protocol [18].

Materials and method
This is a transversal study including data of a tertiary centre of endocrinology on patients who signed the informed consent. This is a real life study, of observational type (the intervention meaning the TPT recommendation was done by individual decision of each clinician). The inclusion and exclusion criteria of the patients are based on Romanian protocol for TPT 20 µg/day, for 2 years, once in life time based on self-administration [18]. The baseline assessment was clinical, biochemical, and also based on central DXA (Dual X-Ray Absorptiometry), using a GE Lunar Prodigy device as mentioned in national protocol. Data were introduced in Excel/SPSS. The parameters were expressed as mean, median, standard deviation, minimum and maximum.

Results and discussions
43 patients were included (female/male ratio was 41/2). Baseline parameters of age at TPT start, number of years since menopause and body mass index (BMI) are introduced in table 1. Numerous co-morbidities were identified at baseline as seen in table 2.

The patients were introduced based on Romanian protocol: either de novo, either non-DXA responders, fracture-responders, meaning they lost BMD (Bone Mineral Density under a prior medication for osteoporosis), either non-DXA, non-fracture responders, meaning they lost BMD

| Age at TPT start (yrs) | Years since menopause | BMI (KG/m²) |
|-----------------------|-----------------------|-------------|
| Mean                  | 67.093                | 21.931      | 24.559      |
| SD                    | 8.348                 | 10.131      | 4.326       |
| Min                   | 47                    | 4           | 17          |
| Max                   | 83                    | 44          | 37          |
| Median                | 66                    | 21          | 24          |

Table 1

STUDIED POPULATION: AGE AT TERIPARATIDE START, YEARS SINCE MENOPAUSE AND BODY MASS INDEX (BMI)

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and had a fracture under specific medication, or DXA, non-fracture responders, as seen in table 3.

The prior number of fragility fractures and years of specific anti-osteoporosis drugs exposure are introduced in table 4.

Baseline biochemistry panel is introduced in table 5. The DXA report is centralised in table 6. Bone turnover markers and hormones are displayed in table 7. Collateral panel of endocrine evaluation required by protocol is introduced in table 8.

| Co-morbidities          | N(%)  |
|-------------------------|-------|
| Digestive conditions    | 20 (46.51) |
| Active corticotherapy   | 4 (9.30) |
| Autoimmune conditions   | 11 (25.58) |
| Arterial hypertension   | 24 (55.81) |
| Hyperlipemia             | 23 (53.48) |
| Chronic heart conditions| 1 (10.27) |
| Diabetes mellitus       | 4 (9.3) |
| Thyroid conditions      | 18 (41.86) |
| Active smokers          | 6 (13.95) |

Table 2
THE BASELINE CO-MORBIDITIES OF THE PATIENTS TREATED WITH TPT

| Type                | N(%)  |
|---------------------|-------|
| De novo             | 4 (9.3) |
| Non-DXA, non-fracture| 13 (30.22) |
| DXA, fracture       | 10 (23.35) |
| DXA, non-fracture   | 14 (32.33) |

Table 3
TYPES OF PATIENTS TREATED WITH TPT

| Years of medication | Prior fractures | Age at first fracture |
|---------------------|-----------------|-----------------------|
| Mean                | 4.651           | 3.264                 |
| SD                  |                 | 9.076                 |
| Min                 | 0               | 1                     |
| Max                 | 14              | 9                     |
| Median              | 4               | 3                     |

Table 4
THE PRIOR NUMBER OF FRAGILITY FRACTURES AND YEARS OF SPECIFIC ANTI-OSTEOPOROSIS DRUGS EXPOSURE ON PATIENTS TREATED WITH TPT

| Ionic calcium | Total calcium | 24h urinary calcium | Phosphorus | Hba1c |
|---------------|---------------|---------------------|------------|-------|
| Mean          | 4.082         | 9.476               | 0.153      | 3.518 | 5.811 |
| SD            | 0.319         | 0.352               | 0.102      | 0.69  | 0.901 |
| Min           | 3.1           | 8.8                 | 0.05       | 2.1   | 4.3   |
| Max           | 4.5           | 10.2                | 0.35       | 4.8   | 8.9   |
| Median        | 4.1           | 9.5                 | 0.12       | 3.35  | 5.5   |
| Unit          | Mg/dl         | Mg/dl               | g/24h      | Mg/dl |       |
| Normal        | 9.4-10.2      | 8.5-10.2             | 0.9-11.3   | 2.5-4.5 | 4.8-5.9 |

Table 5
BASELINE BIOCHEMISTRY PANEL

| AP | PINP | CL | OC | 25OHD | PTH |
|----|------|----|----|-------|-----|
| Mean| 71.131 | 41.841 | 0.326 | 11.109 | 29.719 | 43.745 |
| SD  | 22.266 | 28.208 | 0.176 | 7.725  | 15.783  | 10.918  |
| Min | 45    | 13    | 0.07 | 0.32   | 6       | 24.16   |
| Max | 155   | 153   | 0.885 | 43     | 38      | 65      |
| Median| 65 | 31.685 | 0.28 | 15.58 | 29.7 | 43 |
| Unit | µg/ml | µg/ml | µg/ml | µg/ml | µg/ml | µg/ml |
| Normal| 30-105 | 15-74 | 0.335-1.008 | 11-46 | 20-100 | 15-65 |

Table 6
THE DXA REPORT

| Lumbar | Femoral neck | Total Hip | L³ radius |
|--------|--------------|-----------|-----------|
| Mean   | 0.305        | 0.114     | 0.714     | 0.503     | 2.905   |
| SD     | 0.088        | 0.127     | 0.099     | 0.089     | 1.129   |
| Min    | 0.638        | 0.455     | 0.494     | 0.262     | -6.3    |
| Max    | 1.025        | -1.3      | 0.851     | -1.1      | 0.651   | -6.9    |
| Median | 0.793        | -2.2      | 0.725     | -2.25     | 0.514   | -2.8    |

Table 7
BONE TURN-OVER MARKERS AND HORMONES

| TSH | FT4 | TPOAb | ACTH | Plasma Cortisol |
|-----|-----|-------|------|-----------------|
| Mean| 1.992 | 15.317 | 31.621 | 22.265 | 13.595 |
| SD  | 3.073 | 2.5    | 94.338 | 9.499 | 5.663 |
| Min | 0.1  | 8      | 10    | 5.6   | 5.7   |
| Max | 20   | 21.6   | 577   | 44    | 25.92 |
| Median| 11   | 13.3   | 23    | 12.925 | |
| Unit | µg/ml | µg/L | µg/ml | µg/ml | µg/ml |
| Normal| 0.3-4.5 | 10.3-24.4 | <10 | 15-65 | 6-21 |

Table 8
COLLATERAL PANEL OF ENDOCRINE EVALUATION REQUIRED BY PROTOCOL

AP = alkaline phosphatase, CL = CrossLaps, OC = osteocalcin, 25OHD=25-hydroxyvitamin D, PTH = parathormone
The limits of the study are single centre experience and the need of follow-up data. The strength of the study is the component of real life medicine regarding a particular protocol of an anti-osteoporotic drug.

Conclusions
50% of patients treated with PTP have digestive conditions, less than 10% are first time users, a high severity profile is based on a median of 14 years regarding prior anti-osteoporotic medication and of 3 previous fractures.

Abbreviations
- AP = alkaline phosphatase
- CL = CrossLaps
- OC = ostecalcin
- 25OHD = 25-hydroxyvitamin D
- PTH = parathormone
- BMI = Body Mass Index
- BTM = Bone Turnover Markers
- BMD = Bone Mineral Density
- DXA = Dual-Energy X-Ray Absorptiometry
- TPT = teriparatide
- TSH = Thyroid Stimulation Hormone
- FT4 = Freethyroxine
- TPOAb = Thyroperoxidase antibodies
- ACTH = AdrenoCorticotropic Hormone

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