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TOTAL HIP JOINT REPLACEMENT IN YOUNG MALE PATIENT WITH OSTEOPOROSIS, SECONDARY TO HYPOGONADOTROPIC HYPOGONADISM

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Abstract

Introduction. Hypogonadotropic hypogonadism is an endocrine disease with a major effect on bone tissue turnover leading to bone demineralization and secondary osteoporosis.

Case report. A 42 year old man underwent a total left hip joint arthroplasty for a left aseptic femoral head necrosis with an unsatisfactory evolution because of pain, marked functional deficit, limping and instability sensation in the operated lower limb. Five years before the patient was diagnosed with hypogonadotropic hypogonadism presenting gynecomastia, gynoid fat distribution, eunuchoidal skeletal proportions, reduced facial hair, a Tanner III stage of the external genital development, without erectile dysfunction. The unsatisfactory post-operative result was secondary to an aseptic mechanical degradation due to bone mineral loss (secondary osteoporosis) and also application of undersized non-cemented implant. Standard biological analyses did not show modification, the inflammatory tests were negative. The DXA examination, after a period of 2 years without treatment, showed a decrease of bone mineral density and confirms the diagnosis of secondary osteopenia. It was made the decision of surgical intervention and replacement of the uncemented femoral component with a cemented one. After the surgery, the therapy with bisphosphonates, calcium, vitamin D3 and testosterone is reinitiated.

Discussion. The clinical outcome of biointegration of a non-cemented prosthesis depends in first of all of the biological status of the patient, with normal BMD, normal calcium and D vitamin levels. The secondary osteoporosis with local aseptic inflammation on the surface of the prosthesis and bone contact led to mechanical failure which maked necessary the revision surgery, in order to replace the prosthesis with a cemented one.

Conclusions. In our case the presence of hypogonadotropic hypogonadism with secondary osteoporosis, represents a contraindication for non-cemented total hip joint arthroplasty, due to major risk of loosening.

Key words: osteoporosis, arthroplasty, male.

INTRODUCTION

The number of total hip joint replacements showed an increase in the past few years, even though this surgical intervention is still a complex one. Arthroplasty is applied also in primary and in secondary coxarthrosis as well, due to: post traumatism, aseptic femoral head necrosis, rheumatic joint diseases. This surgical intervention needs to follow well-defined principles, it has to be carefully prepared and it has to meet the needs of each patient. Particular aspects of each case can definitely change the therapeutic attitude. Hypogonadotropic hypogonadism is an endocrine disease which has a major effect on bone tissue turnover; it facilitates bone demineralization, which leads to secondary osteoporosis.

CASE REPORT

Our patient was a 42 year old man, who presented with moderate pain, marked functional deficit, limping and an approximately 2 cm shortening of the length of the left lower limb. The symptoms appeared in the beginning of 2011 with hip joint pain and irradiation to the femoral region, with minimal functional impotency, due to an important physical effort. A spine disorder was suspected, and a MRI examination took place. The results of the MRI showed a minimal involvement of the lumbar spine, which could not be the reason for pain appearance. Several medical investigations were done, inside a rheumatology consult in 2011, for ankylosing spondylitis, an MRI examination of the pelvis establishes the diagnosis of a left aseptic femoral head necrosis. The patient underwent in 2012 to orthopedic surgical treatment, where transtrohanteric cervicocephalic core decompression and intraarticular vascoelastic solution injection took place (2 doses in an interval of 6 months).

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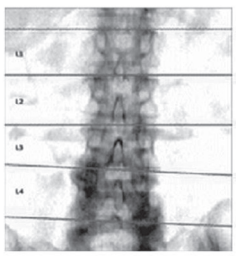
The results of this treatment was not satisfying, the patient underwent to total left hip joint arthroplasty in august 2013, which was followed by an interdiction of limb load for 8 weeks. After intervention the evolution was unsatisfactory, the symptoms did not disappeared, the patient still showed pain on active and passive movement, marked functional deficit, limping and instability sensation in the operated lower limb.

At present (5 months after the hip surgery), the patient presents pain during active and passive movement, sever functional impotency, leg length shortening with approximately 2 cm and limping.

In 2009 at the age of 37, the patient was diagnosed with hypogonadotropic hypogonadism, in order to know the organic cause of the disease (Klinefelter, Kallman syndrome), karyotype and genetic examination was performed, which was normal. The final diagnosis was idiopathic isolated hypogonadotropic hypogonadism (since then he has been on hormone replacement therapy), infertility, secondary osteoporosis (treated with bisphosphonates), and features of metabolic syndrome (dislipidemia, hyperuricemia).

Now 42 years old, the patient was diagnosed at the age of 37, with isolated, idiopathic hypogonadotropic hypogonadism, during an endocrinology examination for



Exam date: 13/04/2011 15:14:41
Analyse date: 13/04/2011 15:24:00
Exam Age: 39 years
Height: 180cm **Weight**: 116kg
BMI: 35.80 kg/m²
District: Spine
Analyse: Automatic

Densitometry Data

R.O.I.	BMD (g/cm²)	BMC (g)	Area (cm²)	Z-score	T-score
L1	0.706	8.13	11.52	-2.3 (-31%)	-2.3 (-32%)
L2	0.777	11.24	14.46	-2.3 (-30%)	-2.4 (-31%)
L3	0.647	10.80	16.70	-3.1 (-40%)	-3.2 (-41%)
L4	0.686	13.33	20.64	-2.8 (-39%)	-2.9 (-39%)
Total	**0.687**	**43.51**	**63.31**	**-2.7 (-36%)**	**-2.8 (-36%)**

Figure 1. BMD values after 2 years of bisphosphonates therapy.

infertility. Clinical examination at that time showed: male phenotype with gynecomastia, gynoid fat distribution, eunuchoidal skeletal proportions, reduced facial hair, a Tanner III stage of the external genital development, without erectile dysfunction. There was no evidence of clinical or structural (on MRI) neurologic and ophthalmologic defects. Biological analysis showed: low LH (1.2IU/L), FSH (0.6IU/L), testosterone serum levels (1.9ng/mL), normal thyroid function (TSH 2.67 mIU/L, TT4 89 nmol/L, TT3 2.1nmol/L) normal prolactin serum level (7.9ng/dL). Semen analysis showed azoospermia. An insulin –induced hypoglycemia test was performed to asses the GH and ACTH secretory reserve. GH increased to 15 ng/mL after adequate hypoglycemia was achieved and plasma cortisol levels were 39ug/dL. The MRI examination did not show any abnormality of the hypothalamo-hypophyseal region. The patient was also investigated for the complications for the chronic low level of testosterone, and co-morbidities. The bone mineral density (BMD) determination by Dual-energy X-ray absorptiometry (DXA) showed the followings: score Z L1-L4 = -4 SD and BMD L1-L4 = 0.550g/cm^2; score Z 1/3 distal radius = -6 SD. Biologically the metabolic syndrome manifested in the followings: dyslipidemia, hyperuricemia, renal lithiasis, without any cardiovascular modification. A transcutan hormone replacement therapy (testosterone, androgel 1%, 50 mg once a day), a bisphosphonates therapy

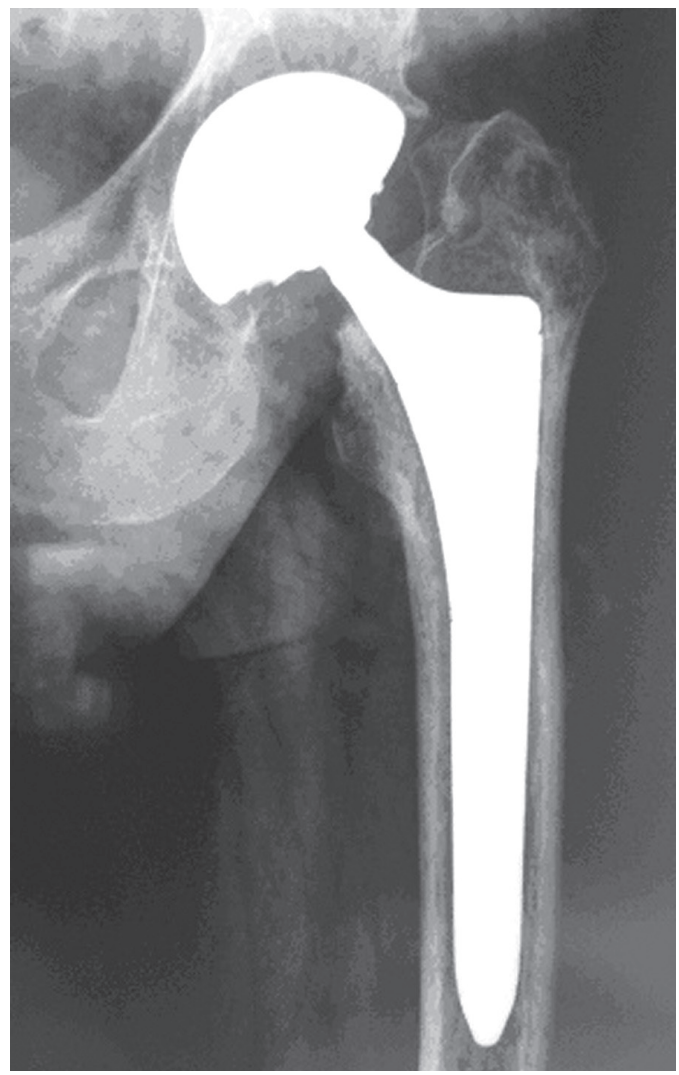
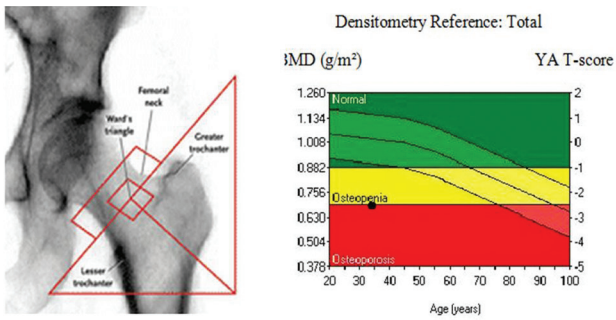


Figure 2. X-ray of the left hip joint replacement.

with risedronat (35mg /week, vitamin D3 800IU/d and calcium 1000mg/d p.o.) and a lipid-lowering treatment was initiated. Under treatment, the maximal morning values of plasma testosterone were 3.2 ng/mL). The clinical and biological evaluation was favorable (DXA reveals an increase of BMD values after 1 and 2 years of treatment) (BMDL1-L4 ay 2 ys = 0.687g/cm^2 (Fig. 1). After 30 months of treatment with bisphosphonates and testosterone, the patient has interrupted the therapy.

In order to exclude other causes of secondary osteoporosis, near the aforementioned examinations, Anti-endomysal antibody, prostatic specific antigen



Region	BMD (g/m²)	Young-Adult T-score	Aged-Matched Z-score
Neck	0.859	-1.6	-1.8
Total	0.778	-2.2	-2.5

Figure 3. Low values of BMD in the right hip joint.

was performed with negative result, PTH has normal values. MRI, and CT examination also took place to exclude paraneoplasic syndrome, which could also lead to secondary osteoporosis.

During the orthopedic consult in the University Emergency Hospital in Bucharest, the local examination of the left hip reveals the followings: length shortening of the left lower limb with approximately 2 cm, limping, a slightly external rotation, pain during active and passive movement, impossibility of complex movements and limitation in articular movement (F=60˚, E=10˚, IR=15˚, ER=30˚, ADD=5˚, ABD=15˚).

An anteroposterior X-ray examination of the pelvis reveals a non-cemented total hip prosthesis, lifting of the greater trochanter to the level of the superior acetabular limbus by the loosening of the femoral component of the prosthesis. A periprosthetic osteolysis and an incongruence between the femoral component of the prosthesis and medullary canal can be explored (Fig. 2).

The incriminated causes are the followings:

Mechanical degradation due to bone mineral loss (secondary osteoporosis);

Mechanical degradation due to application

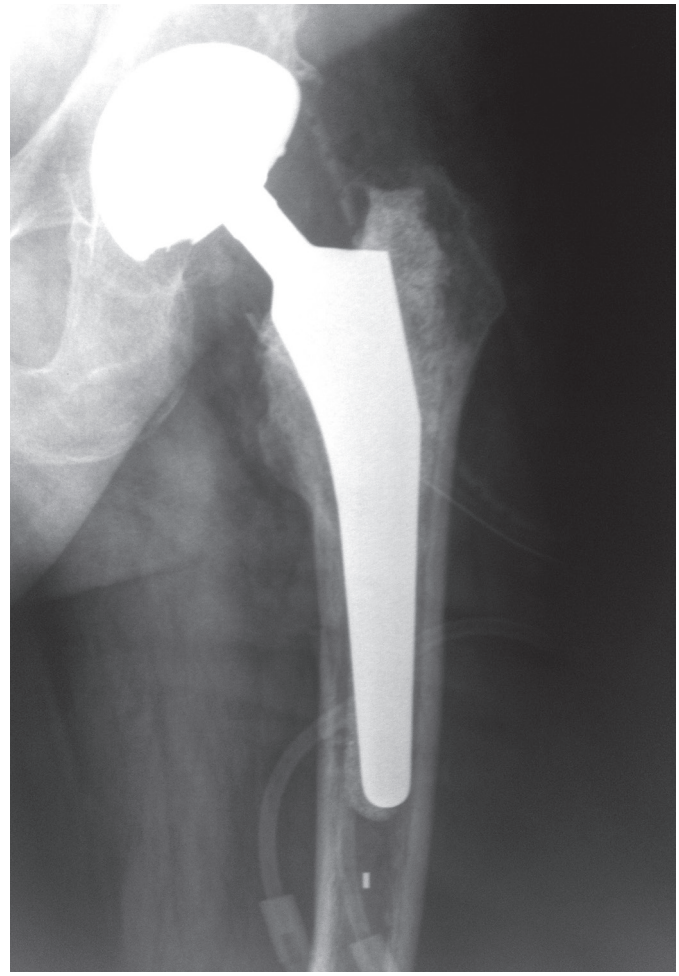


Figure 4. Post operative X-ray of hip replacement.

of undersized non-cemented implant (despite of the insertion of the highest size of the implant);

Secondary degradation due to an aseptic local process.

Standard biological analyses like HLG, coagulation tests, glycemia, urea, creatinine, AST, ALT, C reactive protein, ESR, Fibrinogen, etc. did not show modification, the inflammatory tests were negative. The ECG revealed a normal cardiac activity. The DXA examination, after a period of 2 years without treatment, showed a decrease of bone mineral density: BMD on right total femur =0.778g/cm^2, and BMD L1-L4 = 0.615 g/cm^2, and confirms the diagnosis of secondary osteopenia (Fig. 3).

The final confirmed diagnosis was the following: Aseptic mechanical degradation of the femoral component of a non-cemented total left hip prosthesis.

The following decision was made: surgical intervention, the ablation of the femoral component, and a replacement of this with a cemented femoral component. It has to be mentioned that during the operation the

femoral stem showed a marked instability, which could be mobilized easily in the femoral canal. It was not necessary any intervention on the acetabular component, because this was stable. The secondary mobilization of the prosthesis could not be excluding, however the bone tissue neoformation on the implant surface may reduce the risk of this (Fig. 4).

The rotation center of the hip prosthesis after the first hip arthroplasty was progressively adulterated by the loosening of the stem, fact that explains the progressive appearance of the symptoms. It has to be mentioned that the increase of the pain in the hip was proportional with the appearance of the functional impotency and with the limitation in articular movement. Inguinal pain appeared lately, showing a displacement in the rotational center of the hip prosthesis, gluteal pain was not revealed, typical sign for acetabular component degradation.

After the surgery the therapy with bisphosphonates, calcium, vitamin D3 and testosterone is reinitiated.

DISCUSSION

Hip joint arthroplasty is considered a routine orthopedic intervention nowadays, but every intervention has its own particularities, which can modify the operation steps. The clinical outcome of biointegration of a non-cemented prosthesis depends in first of all of the biological status of the patient, with normal BMD, normal calcium and D vitamin levels. The secondary osteoporosis with local aseptic inflammation on the surface of the prosthesis and bone contact led to the loosening of the implant. These processes led to mechanical failure of the prosthesis which makes necessary the revision surgery in order to replace the prosthesis with a cemented one.

Total hip joint replacement, with non-cemented prosthesis in these cases, in which the bone mineral density is lower, has a high risk of loosening, however this procedure is elective for aseptical necrosis treatment of the femoral head. In order to achieve a better biointegration and mechanical resistance of the implant and to prevent the loosening of the components, and reivison surgery, cemented total hip joint replacement has to be chosen despite of the age of the patient.

In our case: idiopathic isolated hypogonadotropic hypogonadism represents an important element in the therapeutic attitude, which has to be followed, due the major influence of this disease on bone turnover. Male hormone deficit is one of the reasons of the appearance of secondary osteoporosis. In physiological bone growth the following hormones plays key roles: growth hormone (GH), insulin like growth factors (IGFs), thyroid hormones (FT4, T4) .

The appearance of the avascular necrosis of the femoral head may be the result of a crippling side effect of hormone replacement therapy which our patient has had in the past. The most accepted mechanism is the appearance of deposits of fat derangements in bone marrow spaces, which reduce blood circulation in the femoral head, especially in patient with short term steroid therapy (5).

In female, but also in male, estradiol is main promoter of growth, mediating: linear growth, skeletal maturation, bone mass acquisition, and maintain bone mass in adult life. Testosterone has also a direct action on bone tissue but the main effect is obtained after transformation (aromatization) to estradiol. Testosterone deficit leads to the increase of bone remodeling and bone turnover (by stimulating osteoclasts, apoptosis of osteoblasts, and by inhibiting osteoclast apoptosis), also leads to inbalance of resorbtion and formation, by increasing the bone resorbtion and loss of bone mass. The direct influence of testosterone on bone is the followings: greater bone cortex and higher bone resistance.

Several pathologies can be the cause of secondary osteoporosis in male, in which the most common are: neoplasia as paraneoplasic syndrome, thyroid function disease with suppressed TSH, alcohol abuse or hepatic disease, hypogonadotrophic hypogonadism with low level of testosterone, celiac disease and prostatic cancer with bone metastazes (6-8). Klinefelter syndrome is the most common cause of hypogonadotrophic hypogonadism, with a prevalence of 0.1-0.2% at brith (9, 10). In our case the clinical, and paraclinical (genetic, full hormonal profile analysis, MRI) results didn't confirmed any cause of the hypogonadotrophic hypogonadism.

In conclusion, the presence of a chronic genetic endocrine disease with low level of male sexual hormones has a major negative effect on skeletal health, by is negative influence on growth processes, maturation and bone mass density. When this condition is associated with the side effects of horomon replacement therapy, a very common hip disease like avascular or aseptic femoral head necrosis may occur, which will change the usual medical approach making necessary the application of special orthopedic therapeutic procedures. In our case the presence of hypogonadotropic hypogonadism with secondary osteoporosis, represents a contraindication for non-cemented total hip joint arthroplasty, due to major risk of loosening.

Conflict of interest

The authors declare that they have no conflict of interest concerning this article.

References

1. Collis DK. Cemented total hip replacement in patients who are less then fifty years old, J Bone Joint Surg. 1984; 66A:353-359.
2. Harris WH. Revision surgery for failed, nonseptic total hip arthroplasty: the femoral side, Clin Orthop Relat Res. 1982; 170:8-20.
3. Kim YH, Oh JH, Oh SH Cementless total hip arthroplasty in patients with osteonecrosis of the femoral head, Clin Orthop Relat Res. 1995; 320:73-84,
4. Larsen PR, Kronenberg HM, Melmed S, Polonsky KS. Williams Textbook of Endocrinology Tenth Edition. Elsevier Health Sciences, 2002; 252-260.
5. Zizic TM, Hungerford DS, Stevens HB. Ischaemic bone necrosis in systemic lupus erythematosus: 1, The early diagnosis of ischaemic necrosis of bone. Medicine.1980;59:134–142.
6. Tuck S P and Datta H .K Osteoporosis in the aging male: Treatment options Clin Interv Aging 2007 2(4) 521-536.
7. Behre HM, von Eckardstein S, Kliesch S, Nieschlag E, Long-term substitution therapy of hypogonadal men with trans-scrotal testosterone over 7–10 years. Clin Endocrinol.1999;50:629–35.
8. Center JR, Nguyen TV, Schnieder D, Sambrook PN, Eisman JA, Mortality after all major types of osteoporotic fracture in men and women: an observational study. Lancet.1999;353:878–882.
9. Dunkel L, Perheentupa J, Virtanen M & Maenpaa J. GnRH and HCG tests are both necessary in differential diagnosis of male delayed puberty. Am J Dis Child 1985; 139: 494–498.
10. Dunkel L, Quinton R. Transition in endocrinology, Induction of puberty, Eur J Endocrinol. 2014; 170: 229-239.