CLINICAL

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PATELLO-FEMORAL CHONDROPATHY TREATED WITH MD-KNEE + ZEEL® T TRANSMITTED WITH O_2 *VS* NIMESULIDE + CHONDROITIN SULPHATE

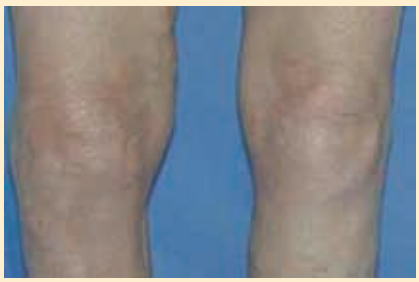
SUMMARY

The aim of this study is to evaluate the effectiveness of the treatment with a new method, the propulsion of high pressure O_2 (2.5 atm) to transmit MD-KNEE + Zeel® T in patients with patello-femoral chondropathy vs controls receiving nimesulide + chondroitinsulphate. – 40 patients (divided into 2 Groups) were administered 2 questionnaires to record the degree of disability resulting from the chondropathy; it has been adopted the WOMAC Index for the pain scale, function and stiffness of lower limbs and the Lequesne Index concerning the functional limitation. The evaluation was performed before treatment and after 1, 2, 3, 6 and 12 weeks since the first administration. The conveyance of MD-KNEE + Zeel® T was performed with the propulsion of O_2 (98%), 2.5 atm pressure, supported by a device leaned on the skin, once a week for 12 weeks vs a daily oral administration of nimesulide + chondroitin.

– The results were evaluated with t Student and are statistically significant at $p < 0.0001$, both with the WOMAC index of pain, stiffness and joint function and with the scale, that assesses the Lequesne algo-functional Index in patients receiving O_2 + MD-KNEE + Zeel® T.

– It is noteworthy the absolute lack of side effects in the Group treated with O_2 infusion + low dose medication + medical device in addition to the low cost of treatment if compared to that of the Group treated with oral conventional medications.

KEY WORDS **PATELLO-FEMORAL CHONDROPATHY, MD-KNEE, ZEEL® T, NIMESULIDE, CHONDROPROTECTANS, PHYSIATRICS, ORTHOPAEDICS**



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INTRODUCTION

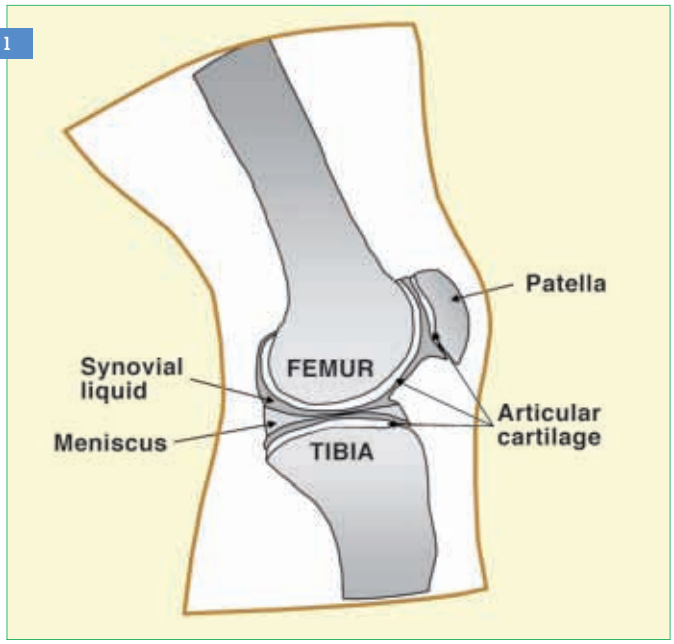
The chondropathies are broadly defined as a form of suffering of the cartilaginous tissue.
The patello-femoral chondropathy is a joint disease, whose etiopathogenesis is repeated, mechanical, and microtraumatic (FIG. 1).
The articular cartilage is formed by an elastic connective tissue covering the ends of the joint, characterized by considerable resistance to pressure and traction.

– An incorrect joint biomechanics – along with repeated microtrauma phenomena – may lead to the suffering of the cartilage of the femoral trochlea and of the patella.

The function of the cartilage is similar

FIG. 1

Schematic anatomy of the knee, lateral view. - For patellar chondromalacia it is meant the suffering of the cartilage of the patella. It rarely reaches the ulceration of the cartilage with exposure of the underlying bone.



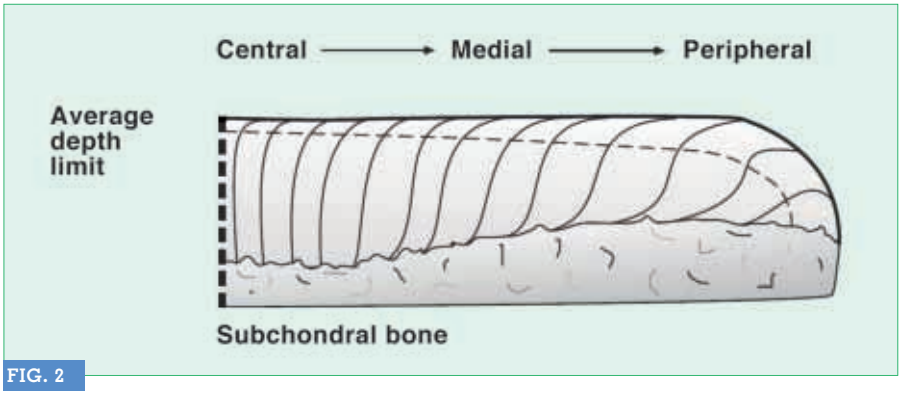


FIG. 2

Normal schematic architecture of collagen fibers.
- The layers are indicated according to the position in the joint.

to that of a bearing damper that protects the normal articular movements (FIG. 2).
– To further facilitate the flow without friction, the joint produces synovial fluid, mainly lubricating function.

A healthy cartilage allows scrolling mutual joint surfaces and can amortize well the load during movement.
– The patellar chondromalacia is, from an anatomopathological point of view, a form of suffering of the cartilage of the patella and of the femoral trochlea, which occurs on the patella.
Most frequently, the suffering cartilage is that of the lateral compartment.

Lesions vary with the severity of the cartilage injury (FIG. 3).
– Frequently, patients suffering from this disease have abnormalities in the biomechanics of the joint:
the **Q angle** of the knee (the angle between femur and tibia) is more open medially, tending to valgism; tibia tends to external rotation, it may occur excessive tension of ischio-crural muscles, causing stronger impact forces between trochlea and patella; the latter can be (anatomically) "high" (*retracted quadriceps tendon*) or "low" (*retracted patellar tendon*).
– A common area of intrinsic malalignment is the orientation of the patellar tendon in relation to the mechanism of extensors, defined as Q angle (FIG. 4).
This angle expresses the relationship between anterior tibial tuberosity and anterior superior iliac spine; it is determined – in distal direction – from the intersection of a segment from the anterior superior iliac spine to the center of the patella with a segment connecting the anterior tibial tuberosity to the center of the patella.

– The Q angle is usually inferior than 10° in males and inferior than 15° in females.
The upper limit of a Q angle is normally included between 13° and 15°.

A Q angle > 15° may depend on the rising of anteversion of the femur, on external tibial torsion and on the lateralization of anterior tibial tuberosity which increases the forces causing lateralization of the patella during muscle contraction, according to "the law of valgus".
– It is necessary to mention the concept of "static" Q angle and that of "dynamic" Q angle.
In this case, a hypotonic *vastus medialis obliquus* (VMO) can turn a static Q angle falling within the normal values in a dynamic Q angle, predisposing to patello femoral pathology.

The reduction of the angle Q does not cause the possible medial dislocation of the medial of the patella, but is responsible of compressive forces on medial tibiofemoral compartment, through an increase of the varus orientation of the knee joint and resulting in progressive damage of the medial joint compartment.

It should be remembered that the articular cartilage, in general and more easily, finds its original form after intense efforts, but temporally limited.
On the contrary, after efforts of lesser in-

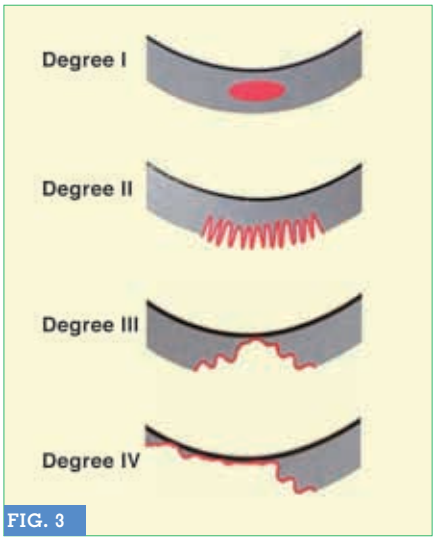


FIG. 3

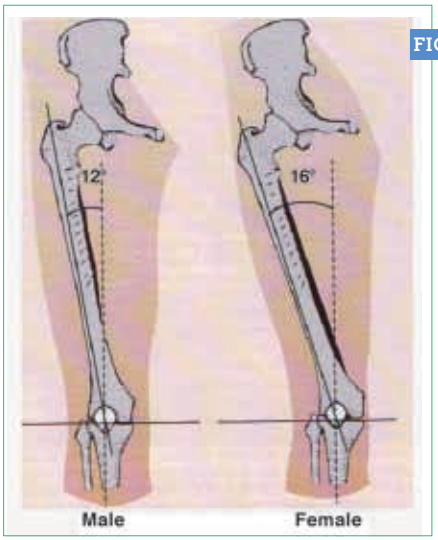


FIG. 4

The Q angle measurement allows to evaluate the alignment of the extensor system of the lower limb.

- In the badly aligned knee its value increases or decreases compared to normal ones, which differ slightly according to gender.
An increased valgus knee involves an increase of the Q angle.

tensity which are prolonged in time (eg. endurance sports or high endurance sports), cartilage shows a sharp mechanical suffering.

The femoral anteversion is a clinical sign that appears when the internal rotation of the diaphysis leads the femoral sulcus to a medial position considering the anterior tibial tuberosity and also leads the patellar tendon more laterally considering the patella, thus increasing the lateral vector force exerted on it during the contraction of the quadriceps muscle.

Another intrinsic factor is the laxity of the anterior medial quadrant of the patella (both static and dynamic).
Patellar stability is guaranteed by static patello femoral ligaments that surround the capsular tissue.
The decreased medial static stability, accompanied by excessive tension of the lateral compartment (*retinaculum*, iliotibial aponeurotic fascia), can lead to excessive tension of the structures.

– This malalignment is defined as "syndrome of side hyper pression" and is radiologically detectable at **30°** of knee flexion.

As for the dynamic component, patellar malalignment may be the result of a pathological mechanism of the VMO (underdevelopment, dysplastic disorders, post-lesional atrophy).
The VMO, in fact, guarantees the dynamic stabilization of the patello femoral joint (it is the only dynamic medial stabilizer).
– Its intersection is at III proximal of the patella with an angle of 55° in relation to the vertical axis of the patella.

▶ Its peculiar action is that of offsetting the *vastus lateralis* (VL) muscle during contraction and to provide tension of the ligaments.
In pathological conditions the VMO does not reach the III superior or the middle of the patella, and its line of action tends to be vertical and - therefore - less effective.

The combination of these anomalies undermines the medial stabilizing function of the VMO.
EMG tests of an healthy knee muscle show that the *ratio* between the activities of the VMO and those of the VL is **1:1** and that of the VMO is a tonic one.

Tests performed on the knee that has patello femoral syndrome highlight a ratio VMO/VL <1:1, as well as the fact that the activity of the VMO is a phasic one. This may be the result of a loss of asymmetry of the quadriceps (a 20-30 ml effusion may inhibit the VMO, while one of 50-60 ml can inhibit the activity of the VL) with consequent lateral shift of the patella.

Also the retraction or permanent hypertonia of the *rectus femoralis* muscle may cause a patellar hyperpression from 30° of flexion, also resulting in the tilt of the front pelvis, in which case the ischio-crural muscles stretch, decrease the tibiofemoral vertical "brake" thus encouraging the anterior translation of the tibia, which aggravates the patellar overload.
– A major retraction of the ischio-crural muscles can lead to knee flexed with disharmony of the rotatory movement.

▶ It is therefore understandable why most of the patellar syndromes are the consequence of a **dysfunction of the extensor system**, and, more generally, of the musculoskeletal structures, which must be corrected with rehabilitation or surgical treatment.

The patella, during the flexion and extension of the knee, flows inside the femoral trochlea (patellar trecking); it slides up in extension, and it slides down in flexion.
We remind briefly that the cartilage is made up of a fluid part (which gives the ability to absorb traumas) and a solid part (which increases its resistance).

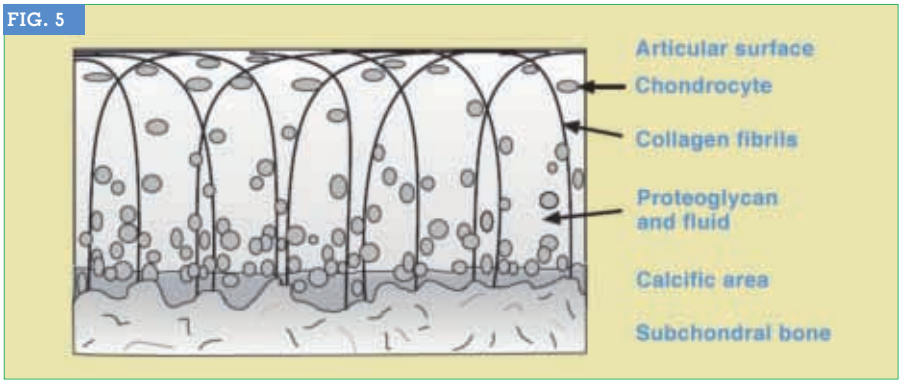
–The cartilaginous tissue are connective tissues, in which the extracellular matrix (ECM) is significantly dense, compact and consistent, so to imprison inside itself the chondrocytes (FIG. 5).

These, within their hosting niches, can face 1 or 2 mitoses maximum; therefore it can be observed the presence of small groups (isogenic groups) of 2, 3 or 4 chondrocytes.
– The most representative component of the cartilage is chondroitin sulfate, whose molecules are firmly bound by numerous sulfate bridges.
– The cartilage **is not vascularized**; therefore the cells can carry out metabolic exchanges by diffusion only through the ECM.

THE *CONSUMED CARTILAGE OF THE KNEE*

The clinical expression of osteoarthritis is manifested by various symptoms, the evolution is slow and quite unpredictable. The clinical symptoms of osteoarthritis are: osteoarticular pain, joint stiffness, crackles, joint deformity, functional limitations.

FIG. 5



Painful conditions

- occur when walking, going up and down the stairs;
- increase with the effort, accompanied by morning stiffness of short duration.

Inflammatory conditions

- sometimes particularly strong, with recrudescence during the night;
- presence of joint effusion, sometimes abundant.

In the current conception osteoarthritis is distinct from the physiological aging of the cartilage, and it is defined as a real disease, whose primary cause is represented by the metabolic alteration of the chondrocyte.

The patellofemoral joint chondropathy consists in a set of morphofunctional alterations that determine the onset of the pain of the front knee.
– In terms of etiology the alterations underlying this disease can essentially be attributed to a malalignment, or to dysplasia of the patella and / or of the femoral trochlea.

In addition to anatomical and biomechanical factors, there are a number of functional factors that, if determined in a "prone" person, may cause the onset or aggravation of symptoms (age, body weight, profession, sports activity, etc.).

The injury and pain to the structures of the knees are very common in the population because the patella lays in the system of the extensors and subject to large forces during physical activity.

1) the muscles
2) the patellar tendon
3) the patella (and its relationship with the femoral sulcus)
4) the meniscus and patella-femoral ligaments
5) the fat pads (infrapatellar and suprapatellar regions)
6) the bursa of the syuprapatellar and parapatellar regiones
7) the synovial membrane and the capsule in the anterior-medial and anterior-lateral areas of the joint.

The pain situated in the patella-femoral articulation is frequently found in clinical exams and requires the evaluation of various elements: anatomical alignment, static and dynamic stabilization system; activity level to determine mechanical joint load.

The femoral malalignment of the patella-femoral joint can result in a lateral patellar shift, which can be associated with subluxation, dislocation or both.

The patellar instability can be classified in 3 different degrees:

Degree 1: Patellar lateralization
Caused by the increase of the **Q angle**, during the contraction of the extensor muscles, a small contact area between the patellar articular surface and the trochlear one is formed.
– The consequence of this situation causes a lateral hyperpressure syndrome.

Degree 2: Marked inclination of the patella or subluxation of the patella
In case of excessive patellar tilt, a thickening occurs, as well as a retraction of the lateral *retinaculum* associated with capsular thickening.
– This determines, during knee flexion, patellar tilt, which results in lateral hyperpressure.
In the most severe cases there is a true lateral subluxation of the patella, usually caused by a sharp contraction of the quadriceps muscle with the extended knee.
– Recurrent subluxation in the long run cause severe suffering of the patellar and trochlear cartilage.

Degree 3: Dislocation of the patella
Condition that leads to severe and progressive suffering of the articular cartilage.

PURPOSE OF THE TRIAL

– The purpose of this controlled clinical randomized study is the evaluation of the clinical response to the administration of NSAID plus a cartilage protector vs. MD KNEE (Medical Device) + Zeel® T conveyed with the propulsion of O_2 in two homogeneous Groups of patients suffering from patellofemoral chondropathy.

MATERIALS AND METHODS

Several clinical studies published about O2 hyperbaric have shown the benefits of this treatment in various diseases concerning the ECM.
Hyperbaric O_2 therapy is used as support and as anti-inflammatory action in osteomyelitis,necrotic wounds and ulcers, necrotic fascitis, gangrene, pyodermitis, skin ulcers, diabetic foot, psoriasis, and purulent acne (1).
The effect of topical O_2 hyperbaric treatment is due to stimulation of the chemotaxis, of the phagocytosis, of the proliferation of fibroblasts and of the neosynthesis of collagen (especially Type I and Type III), of the epithelial proliferation and the final remodeling, with cascade processes (2).
The O_2 in the atmosphere penetrates the superficial layers of the skin to a maximum depth of 0.25 - 0.40 mm, while O_2 transported by the blood flow has less influence on the more superficial layers (3, 4).

TAB. 1

WOMAC Inferior limb – PAIN
How painful is it: • Walking? • Going up or down the stairs? • In bed, at night? • Standing up from a chair or sitting down on it? • Standing?

– A *in vivo* study [animal model (adult pig)] by Atrux-Tallau *et Al.* (5) showed that the O2 reaches the dermis, through:
1) **penetration** (uptake)
2) **permeation**.

Hyperbaric O_2 therapy does not reduce the vitality of neutrophils and functions such as degranulation and phagocytosis, oxidative lysis in response to chemoattractors remains unchanged (6).

▶ **20** randomized **patients** (**Group A**: 15 M, 5 F) received daily **Nimesulide + chondroitin sulfate.**

▶ **20** randomized **patients** (**Group B**: 15 M, 5 F) received a weekly dose of **MD-KNEE** (Guna Laboratories, Milan - I) + **Zeel® T** (-Heel, Baden Baden-D) conveyed using O_2 propulsion.

All patients were informed regarding the purposes and methods of the study and were required a written informed consent.

– Upon inclusion, all patients were administered 2 questionnaires aimed at defining the degree of incapacity following the chondropathy.

WOMAC Scale (*Western Ontario and McMaster Universities Osteoarthritis Index*) for pain, stiffness and lower limb function (TABB. 1, 2, 3) and the **Lequesne Index** for the functional limitation (TAB. 4) were used.

– WOMAC is probably the reference test for the evaluation of the results of the treatments of knee pathologies.
Each WOMAC item has 5 possible responses (from "none" to "very strong ").
The Lequesne Index assigns a score to each response up to a total that is recorded and which is the reference value for the following evaluation.

These assessments were made **before** the beginning of the treatment and at **1**, **2**, **3**, **6**, and **12 weeks**.
Statistical analysis was performed with Student's t.

– Each patient was subjected to clinical examination for the evaluation of criteria correspondence for **patello-femoral chondropathy**.
Each patient, upon inclusion, produced recent x-ray of the joints.
– These were classified according to the Kellgren-Lawrence scale.

The scale describes 4 stages of osteoarthritis:
Stage 1: not well-determined initial thinning of the joint space with the possible presence of osteophytes;
Stage 2: osteophytes and possible narrowing of the joint space;
Stage 3: moderate osteophytosis, well-defined thinning of the joint space, subchondral sclerosis, and possible sub-

TAB. 2

WOMAC
Inferior limb – RIGIDITY

What is the degree of rigidity of your joint:
- Getting up in the morning?
- When you move after having been sitting, in bed or at rest during the day?

TAB. 3

WOMAC
Inferior limb – FUNCTIONALITY

How difficult is it:
- Going down the stairs?
- Going up the stairs?
- Standing up from a chair?
- Standing?
- Leaning forward?
- Walking on a flat ground?
- Getting into/out of a car?
- Doing your usual activities?
- Putting on your socks?
- Getting out of bed?
- Lying on the bed?
- Entering/leaving the bathtub?
- Doing your daily housework?

TAB. 4

LEQUESNE INDEX

- ***Knee pain***

A) At night
None / According to movements / Also when staying still
B) Morning block
<1 min. / 1-15 min. / >15 min.
C) Standing or walking on a way down for half an hour
Yes / No.
D) Walking
No / after a certain distance / Immediately and progressively
E) Standing up from a chair without the help of the arms
No / Yes / >15 min.

- ***Maximum walking length***

No limitation / Limited, < 1 km / About 1 km (about 15 min.) / 500-900 m. (8-15 min.) / 300-500 m. / 100-300 m. / < 100 m. / with a stick or a crutch / with two sticks or crutches

- ***Difficulty in the daily life***

Going up a floor / Going down a floor / Crouching / Walking on an even ground

chondral bone deformities;
Stage 4: severe arthritis.

– The study included patients with patellar femoral chondropathy, clinically and radiographically documented at Stage 1, 2 or 3 according to Kellgren-Lawrence.

Patients included in the study did not report any previous knee surgery, nor rheumatic diseases or auto-immune ones, being underway or documented.

– The 20 patients in **Group A** received Nimesulide 100 mg sachet + galactosaminglucoronoglicane sulfate sodium salt 400 mg (Condral®) once a day orally.

– The 20 patients in **Group B** received **MD-KNEE** 1 ampoule + **Zeel® T** 1ampoule applied to the skin of the knee, O_2-propelled.

Patients were treated 1 time / week, after careful disinfection of the skin (alcohol or iodine based antiseptic solution).

The propulsion technique with pure O_2 (98%) was performed with an equipment that concentrates the O_2 from the air environment (zeolite filters) and that – through a compressor – provides O_2 at the pressure of 2.5 atm, using a device placed on the skin (Maya Beauty Engineering, Oxyendodermia Medicale).
– The patient lays in supine position with the affected knee slightly flexed through a popliteal pad; on the area to be treated were applied MD-KNEE + Zeel® T, mixed together with a neutral serum solution.
- Immediately afterward O_2 was delivered at 2.5 atm, for 20 minutes.
• **Group A** (Nimesulide + chondroitin) consists of 15 M and 5 F, average age 46.9 years (min 28, max 65), with Standard Deviation (SD) 11.8; average BMI of 25.4 with SD 2.45.
It was also calculated the average body fat, equal to 20.32% DS 7.04,evaluating the circumference of the neck, abdomen and, in females, hips too.

– The average pre-treatment WOMAC score was **59 points** (34 min, max 80), on a scale from 0 to 96.
- The average algo-dysfunctional Index of Lequesne was **18 points** (12 min, max 22) on a scale from 0 to 24.
The right knee was affected in 15 cases, the left one in 5 cases.

• **Group B** (MD-KNEE + Zeel® T + O_2 propulsion) is also composed of 15 M and 5 F, average age 49.4 years (min 31, max 66) with DS 9.1;average BMI of 24.4 with SD 2.4.
It was also calculated the average body fat, equal to 26.11% with SD 17.8, considering the circumference of the neck, abdomen and, in females, the hips too.
- The average pre-treatment WOMAC score was **58 points** (min. 42, max 89).
- The average algo-dysfunctional Index of Lequesne was **18 points** (min. 12, max 22).
The right knee was affected in 10 cases, the left one in 10 cases.

RESULTS

All patients completed the prearranged treatment. The results are reported according to the Group membership of the patients (A, B); these were recorded during **5** ***follow-ups*** performed at **1**, **2**, **3**, **6**, and **12 weeks** after initial administration.

• After the **first** week: patients belonging to both groups showed a reduction of the total WOMAC score, compared to "basal" score, not statistically significant.
- The average score of the Group A patients was **54** WOMAC points (min 30, max 78), p <0.374.
- The average score of the Group B patients was **50** WOMAC points (min 34, max 74), p <0.087.

• **Second** week: patients of both Groups showed a reduction of the WOMAC total score, compared to the previous score.
- The average score of the Group A patients was **53** WOMAC points (min 30, max 78), p <0.217.
- The average score of the Group B patients was **47** WOMAC points (min 30, max 68), p <0.0047.

• **Third** week: patients of both Groups showed a reduction of the WOMAC total score, compared to the previous score.
- The average score of the Group A patients was **51** WOMAC points (min 30, max 74), p <0.0109.
- The average score of the Group B patients was **44** WOMAC points (min 30, max 66), p <0.0031.

• **Sixth** week: between 3rd and 6th week since the first treatment, there was no change in the WOMAC average score of Group A patients, while the WOMAC average score of Group B patients is statistically significant, marking a decrease in pain, stiffness, and functionality.
- The average score of the Group A patients was **50** WOMAC points (min 32, max 72), p <0.097.
- The average score of the Group B patients was **41** WOMAC points (min 30, max 68), p <0.0004.
The difference is statistically significant (p <0.001).

• **Twelfth** week: the last follow-up showed that the WOMAC average score of the Group A patients is **47** points (32 min, max 70), p <0.014.
- The WOMAC average score of the Group B patients has further decreased to **39** points (min. 24, max 60), p <0.0001.
The difference between the 2 experimental Groups is statistically significant (p <0.001).
As far as the algo-dysfunctional Lequesne Index is concerned, it has increased from **18** to **15 points** among the Group A patients; it has increased from **17** to **10** among the Group B patients (TABB. 8, 9).

CONCLUSIONS

Conservative treatment of patellofemoral chondropathy has a well documented background in the scientific literature of the last fifty years.

The use of NSAIDs, corticosteroids and chondro-protectants is common in conventional medicine.

The mechanism of action of corticosteroids is very clear: inhibition of the synthesis of prostaglandins, decrease of the collagenase activity and reduction of the production of IL-1, TNFα, and various proteases that attack the cartilage.

– NSAIDs and corticosteroids act only on the painful symptoms.

	BASIC WOMAC	WOMAC 1st week	WOMAC 2nd week	WOMAC 3rd week	WOMAC 6th week	WOMAC 12th week
M	36	30	30	30	34	34
	34	30	30	30	32	34
	66	54	54	50	52	48
	34	30	30	32	34	34
	72	68	64	64	66	55
	68	62	62	58	60	54
	68	62	64	62	60	56
	68	62	60	60	60	50
	70	68	60	58	52	48
	68	60	58	50	50	46
	68	60	58	54	50	46
	70	68	60	54	54	46
	66	60	60	58	60	48
	39	34	34	34	32	32
	70	70	68	66	66	64
F	80	78	76	74	72	70
	36	34	34	34	30	32
	34	30	34	34	34	32
	48	44	40	40	42	42
	78	74	70	70	68	66
	58,65	**53,9**	**52,3**	**50,6**	**50,4**	**46,85**
	16,68	**16,74**	**15,29**	**14,29**	**13,80**	**11,69**
	p	**0,374401**	**0,217196**	**0,109516**	**0,096581**	**0,013509**

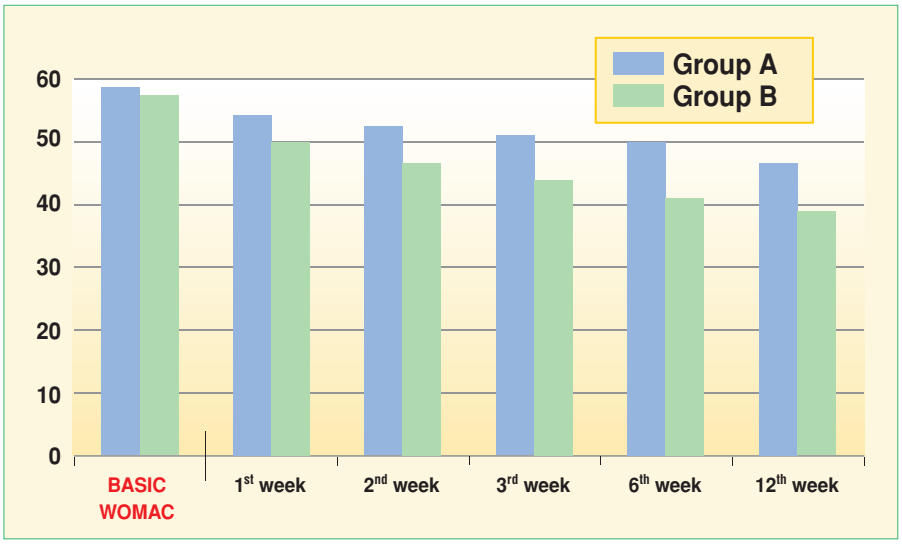
TAB. 5

Group A - Analytical WOMAC (basic evaluation, and at 1st, 2nd, 3rd, 6th and 12th week since the beginning of the therapy).

TAB. 6

Group B - Analytical WOMAC (basic evaluation, and at 1st, 2nd, 3rd, 6th and 12th week since the beginning of the therapy).

	BASIC WOMAC	WOMAC 1st week	WOMAC 2nd week	WOMAC 3rd week	WOMAC 6th week	WOMAC 12th week
M	42	38	38	36	34	28
	46	38	34	30	36	32
	64	60	48	48	52	44
	44	38	38	36	34	36
	89	74	68	66	68	60
	60	60	56	50	44	46
	46	44	44	42	40	40
	42	40	34	34	30	28
	86	72	68	66	64	60
	46	36	30	30	28	24
	46	38	40	42	38	34
	80	74	68	60	54	50
	77	70	60	52	45	38
	76	60	60	58	54	50
	64	49	45	40	34	34
F	49	38	34	30	24	24
	42	34	34	34	30	32
	50	42	42	40	34	34
	68	60	60	58	50	52
	52	34	34	36	34	32
	58	**49,95**	**46,75**	**44,4**	**41,35**	**38,9**
	15,91	**14,63**	**13,17**	**12,03**	**12,14**	**10,98**
	p	**0,086603**	**0,01551837**	**0,00317**	**0,0004773**	**0,00005**



TAB. 7

Progressive differences of average WOMAC in the 2 Groups of patients.

14	12	20	15	22	16	18	16	18	20	18	20	20	14	20	22	14	19	18	22	Average **17,9**	DS 2,99
10	10	15	14	15	11	14	15	18	18	18	15	14	11	18	18	14	18	18	22	Average **15,3**	DS 3,21

TAB. 8

Group A - Lequesne score before and after 12-week treatment.

12	15	19	14	20	18	16	15	20	16	16	20	22	19	18	22	18	14	15	12	Average **17,05**	DS 3,00
9	8	12	10	12	12	11	10	10	11	11	10	12	12	10	12	10	8	8	10	Average **10,4**	DS 1,39

TAB. 9

Group B - Lequesne score before and after 12-week treatment.

The use of chondro-protectants should aim to restore the natural rheological and metabolic homeostasis of the joint affected by arthritis, enhancing the protective effect, lubricating and "shock-absorbing" the synovial fluid.

– Both groups (A, B) showed – in the lapse of the period considered, i.e. 12 weeks – a significant improvement due to a decrease of pain and of limited functionally linked to the gonarthrosic process.

– The data show that the improvement of the clinical-functional situation is **more immediate in patients treated with O_2 (98%) conveyed at 2.5 atm + MD-KNEE + Zeel® T**: the Group B patients have shown a decrease in the average WOMAC score in joint stiffness and function more relevant from a statistical point of view than the score obtained by the Group A patients treated with nimesulide + chondro-protectants.

– The total absence of negative side effects recorded in the Group B patients and the use of a non-invasive, painless and very easy therapy, one treatment only per week) has allowed better acceptance and an expenditure definitely more advantageous. ■

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