



**Ozone and Advanced Oxidation**  
Leading-edge science and technologies

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## ADMINISTRATION PROCEDURES OF MEDICAL OZONE BY LOCAL INJECTION IN SMALL AND LARGE JOINTS

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Scuola di Formazione in Ozono Terapia



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Società scientifica riconosciuta dal Ministero della Salute  
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**WFOT**  
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## What is oxygen-ozone therapy?

- Oxygen-ozone therapy is a medical practice consisting in the administration of a gas mixture composed by **pure oxygen** and **ozone**.
- Oxygen-ozone therapy can be used in **many diseases**, since **different administration routes** (local and systemic ones) and **different ozone concentrations** lead to different therapeutic effects.



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- Oxygen-ozone therapy has **not only an antalgic function**, acting on painful manifestations, **but also a curative function** since it treats the cause of the problem.
- Oxygen-ozone therapy induces at the cellular level a **self-repairing mechanism** and the subject-specific variants (starting pathological conditions, use of the body, response to the therapy) may generate **different responses in time and mode**.

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## Biological effects

- Anti-inflammatory action
- Anti-oedemigenic action
- Painkilling action
- Activating-improving action on microcirculation
- Tissue regenerating action
- Wound healing action
- Dehydrating action on the intervertebral nucleus pulposus
- Anti-bacterial, virus-static, anti-mycotic action (due to the highly oxydative effect, cytokine production and phagocytosis are activated)
- Neurotrophic action
- Immunomodulating action

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## Side effects and contraindications

- The scientific literature recognizes the effectiveness of Oxygen-ozone therapy, which in some cases is even better than other treatments, while in many cases improves the response. Moreover, it points out the very low rate of both side effects due to gas action and complications due to administrative procedures carried out by expert ozone therapists and in accordance with the Guidelines.
- **Side effects** may be a **short burning sensation** at the injection site (similarly to any injection), **very rare bruises** at the injection site (similarly to any injection), or **vagal reactions** (sweating, bradycardia, hypotension with abnormal heart rhythm); **infections** at the injection site **are very rare** thanks to the antiseptic properties of ozone.
- Oxygen-ozone therapy administered locally is **contraindicated** during **pregnancy** (due to medico-legal reasons); **patients on therapy with dicumarolics or history of epilepsy** must notify the doctor before treatment.

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## Administration and concentration

- Intramuscular injection
- Intra- e peri-articular injection
- Intraforaminal and intradiscal injection
- Perinervous and peritendineal injection
- Subcutaneous injection
- Insufflation (rectal,nasal,vaginal)
- Great(venous) and small(intramuscular) systemic therapy
- Bagging
- Ozonized water, oil or cream

**OZONE CONCENTRATION MAY RANGE  
FROM 7-10 TO 50 MICROGRAMS PER ml of OXYGEN**

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## Standard therapeutic cycle

**10 sessions (two per week)** are the standard cycle (except in special cases where a longer treatment is needed)

In general, it is better to avoid more frequent treatments per week, to allow the gas mixture to properly work. (within 72 hr)

**In case of particularly important pain, 3 sessions per week may be applied**

### BOOSTERS

- one session 7-10 days after the cycle end
- a single session after another 20 days
- a single session after another 30 days
- possible further boosters (for weaning/maintenance)

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## During the therapeutic cycle

Generally, during the cycle session, the Patient reports an **IMPROVEMENT** in symptoms:

- the improvement onset is variable (it cannot be established a priori from which session it will occur) because it depends on several factors (type of pathology, current and previous working activity, sport, everyday activity)
- gradualness
- regression phasis may sporadically occur, with pain restarting: the Patient felt better and was not held back by pain, therefore he/she excessively or improperly used the body. **Pain is a natural brake.**

**THE IMPROVEMENT MAY OCCUR ALSO AFTER THE END OF THE THERAPEUTIC CYCLE**

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## At the end of the cycle

### MAINTENANCE – RECALLS

The treatment is carried out on a monthly basis or longer when necessary (depending on pathology, job, lifestyle)

Generally patients need frequent sessions when doing a weary job or in the presence of a chronic disease.

**When the patient cannot completely remove the causes responsible for the healthy problem, A SINGLE SESSION AT FIXED TIME INTERVALS ALLOWS TO MAINTAIN A CONSTANT STATE OF WELL-BEING.**

**It is the Patient who decides his maintenance therapy.**

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## After the end of the cycle

### PHYSIOTHERAPY

When symptoms improve, the patient is addressed to the Physiotherapist to learn rehabilitation and/or posture exercises that can be then performed at home.

These gymnastics sessions are followed by medical checks.

**RECALLS, GYMNASTICS A PROPER USE OF THE BODY HELP TO AVOID THAT THE PROBLEM RETURNS.**

**ACCURATE INFORMATION** must always be given (this is not a loss of time for the Doctor!!)

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## Results

The success rate of this procedure is high:

**ABOUT 95% OF PATIENTS REPORT A MARKED  
IMPROVEMENT AT THE END OF THE TREATMENT**

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## Permanence of benefit

Patients monitored for long time and maintaining the treatment at regular intervals (1-2-3-6 months) **did not have significant relapses**, despite performing arduous work activities (masons, tilers, coachbuilders, etc.).

Some patients did not need recalls.

Some follow up of 25 years demonstrate optimal results:  
**no recurrence of the problem.**

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**AIM:** Achieving physical and mental well-being



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## HAND-WRIST-ELBOW



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## Disorders of the hand and wrist

- Rhizarthrosis
- Carpal tunnel syndrome
- Ulnar nerve compression (Guyon Canal Syndrome)
- Wrist arthritis and arthrosynovitis
- Metacarpophalangeal and interphalangeal arthrosis
- Tendonitis and tenosynovitis of the digital flexors and extensors
- De Quervain's tenosynovitis
- Dupuytren's disease
- Scarring outcomes
- Onychomycosis and ungueal infections
- Ganglion cyst of the wrist
- Rheumatoid arthritis
- Stenosing flexor tenosynovitis (trigger finger)



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## Carpal Tunnel Syndrome - I

### PATIENT'S POSTURE

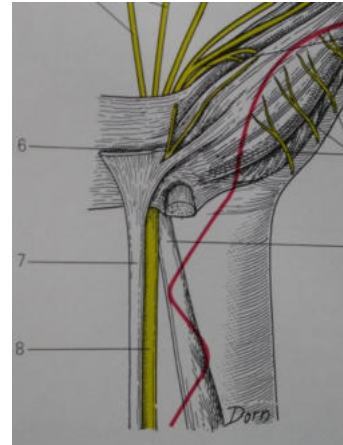
The patient must be placed lying down, the arm extended and the forearm supinated.

### IDENTIFICATION OF THE REFERENCE POINTS

As a reference point, the palmaris longus tendon is to be taken. Infiltration must be made radially to it.

We use:

- 10 ml syringe
- 27G x 20 mm needle
- Concentration: **10  $\mu$ g** of O<sub>3</sub> / ml of O<sub>2</sub>
- Dose: 1 ml underligament, and 1 ml periligament subcutaneously



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## Rhizarthrosis

### PATIENT'S POSTURE

The Patient must be placed lying down or sitting, in a comfortable position.

### IDENTIFICATION OF THE REFERENCE POINTS

We use: OZONE

- 10 ml syringe
- 27G x 20 mm
- Concentration: 16  $\mu$ g of O<sub>3</sub> / ml of O<sub>2</sub>
- Dose: about 1 ml per injection

### HYALURONIC ACID CONCENTRATION AND VOLUMES

0.5 ml of 16 mg of HA

PRP (platelet rich plasma)

### OPERATION SEQUENCE

- First session: Endoarticular and Periarticular ozone infiltration
- Second session: Endoarticular hyaluronic acid and Periarticular ozone infiltration
- Third session: Endoarticular and Periarticular PRP (Platelet Rich Plasma)
- infiltration, alternating one session of ozone and A.J



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## Dupuytren's disease

### PATIENT'S POSTURE

The Patient must be placed lying down or sitting, in a comfortable position.

### IDENTIFICATION OF THE REFERENCE POINTS

#### OZONE CONCENTRATION AND VOLUMES:

- 10 ml syringe
- 30G x 13 mm
- Concentration: 16 µg of O<sub>3</sub> / ml of O<sub>2</sub>
- Dose: 1 ml per injection

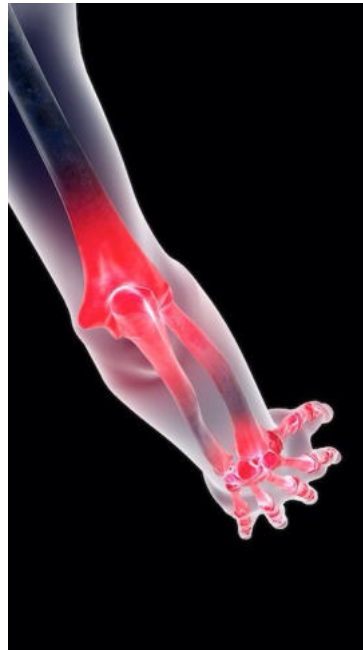
#### OPERATION SEQUENCE

Peri- and intra-lesional subcutaneous infiltrations (detachment). This therapy is suitable for lesions with up to 90° flexion (Grade 2 of the Tubiana's Staging System)



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## THE ELBOW



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## Elbow disorders

Epicondylitis  
 Epitrocleitis (Golfer's elbow)  
 Septic arthritis  
 Autoimmune arthritis  
 Primary or post-traumatic arthrosis  
 Compression of the ulnar nerve at the eiptrochlear groove and of the radial nerve at the arcade of Fröhse and of the median nerve of the round pronator muscle.



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## Epicondylitis and epitrocleitis

### PATIENT'S POSTURE

The Patient must be placed lying down.

### IDENTIFICATION OF THE REFERENCE POINTS

### OZONE CONCENTRATION AND VOLUMES:

- 10 ml syringe
- 27G x 20 mm
- Concentration: 16 µg of O<sub>3</sub> / ml of O<sub>2</sub>
- Dose: 1 ml per injection

### OPERATION SEQUENCE for epicondylitis

Subcutaneous infiltrations on the epicondylus, and radioulnar intra- and peri-articular infiltrations.



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## Compression of the ulnar nerve at the elbow

### PATIENT'S POSTURE

The Patient must be placed lying down.

### IDENTIFICATION OF THE REFERENCE POINTS

#### OZONE CONCENTRATION AND VOLUMES:

- 10 ml syringe
- 27G x 20 mm
- Concentration: **10  $\mu$ g** of O<sub>3</sub>/ ml of O<sub>2</sub>
- Dose: 1 ml per injection

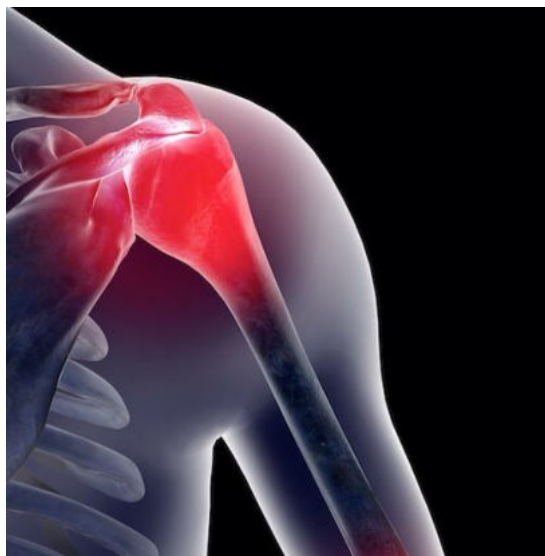
### OPERATION SEQUENCE

Perinervous subcutaneous infiltrations (epitroclea-olecranon groove).



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## THE SHOULDER



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## Shoulder disorders

- Subacromial bursitis, Arthrosynovitis
- Scalenus syndrome
- Lesion of the brachial plexus
- Biceps tendon disorders
- Acute or chronic lesions of the rotator cuff
- Fracture outcomes
- Arthrosis (primary or due to the cuff rupture)
- Glenohumeral instability
- Adhesive capsulitis (frozen shoulder)
- Thoracic outlet syndrome (presence of cervical rib, anomalous fibromuscular bundle in the thoracic outlet, post-traumatic fibrosis of the scalene muscle)
- Tietze syndrome

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## Shoulder disorders: Method - I

### PATIENT'S POSTURE

The Patient must be placed seated.

### IDENTIFICATION OF THE REFERENCE POINTS

### OZONE CONCENTRATION AND VOLUMES:

- 20-30 ml syringe
- 27G x 20 mm or 25G x 25 mm for extra-articular infiltration; 23G x 30 mm or 22G x 40 mm for intra-articular infiltration
- Concentration: 16 µg of O<sub>3</sub> / ml of O<sub>2</sub>
- Dose: 1-2 ml per peri-articular injection and 3-5 ml for intra-articular injection

**In case of gleno-humeral arthrosis, hyaluronic acid intraarticular and PRP intra and periarticular are to be associated.**



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## Shoulder disorders: Method - II

MODE FOR SAFE INFILTRATION

OPERATION SEQUENCE

The following points are to be infiltrated, depending on the shoulder disorder:

- supraspinatus,
- Infrapinatus,
- extra-rotator insertion,
- acromioclavicular joint,
- subacromial bursa,
- distal insertion of the deltoid,
- deltopectoral groove for the biceps long-head.

Intra-articular infiltration *via* the posterior and anterior route.



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## Shoulder disorders: Method - III

Usually, to obtain the best result it is advisable to also treat the cervical spine and the contralateral . shoulders.



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## THE LOWER LIMB



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## THE HIP



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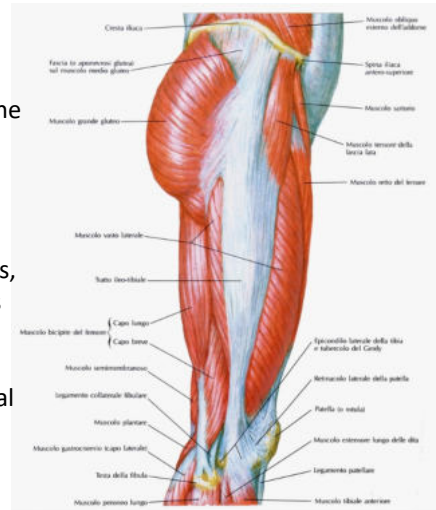
## Administration modes

The ozone infiltrations may be:

- **INTRA-ARTICULAR**: under echographic control, by anterior route or infiltrating the retrotrochanteric region.
- **EXTRA-ARTICULAR**: this is used for the **trochanteritis (external dancer's hip)**

For the **adductor syndrome**, peri-tendineous, perinsertional and peri-osseous infiltrations may be made.

**Systemic ozone therapy** (by hematic or rectal route) may be associated for **arthrosic or osteoporotic disorders**, and for the **aseptic necrosis of the femoral head**.



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## Protocol for the coxarthrosis

### PATIENT'S POSTURE:

The Patient must be placed lying down, on the healthy side.

### IDENTIFICATION OF THE REFERENCE POINTS:

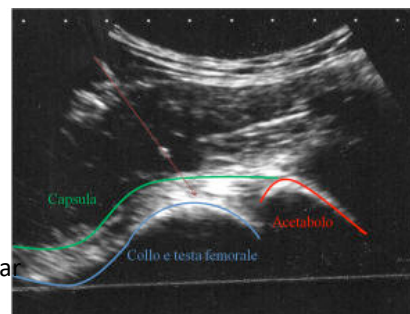
Iliac crest, trochanter: under **echographic guidance**, the articular retrotrochanteric cavity is localized.

### OZONE CONCENTRATION AND VOLUMES:

- 20 ml syringe
- 22G x 40 o 50 mm (or more) needle (depending on the thickness of the subcutaneous tissues)
- Concentration: 16  $\mu\text{g}$  of  $\text{O}_3$  / ml of  $\text{O}_2$
- Dose: 5 ml, intra-articularly

### OPERATION SEQUENCE

- First session: Endoarticular and Periarticular ozone infiltration
- Second session: Endoarticular hyaluronic acid and Periarticular ozone infiltration
- Third session: Endoarticular and Periarticular PRP (Platelet Rich Plasma)



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## THE KNEE



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## Pathologies to be treated

- Gonarthrosis
- Patellofemoral and femorotibial choindropathies
- Meniscopathies
- Post-traumatic outcomes (ligaments and fractures)
- Synovitis, Hoffitis, synovial folds
- Tendinopathies (patella, goose foot, flexors)
- Post-operative septis (infected prostheses or devices)
- Osteomyelitis
- Bursitis (prepatellar inflammatory and septic; prepatellar, anserine, popliteus)
- Baker's cyst
- Post-operative adhesions
- Compartment syndromes (medial or lateral)
- Osteochondritis dissecans (Koenig's disease)
- Outcomes of the Osgood-Schlatter disease
- Patellar hyperpressure



syntho

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## **Protocol for patellofemoral and femorotibial chondropathies**

### **Ozone, Hyaluronic acid and PRP**

#### **OPERATION SEQUENCE**

- First session: Endoarticular and Periarticular ozone infiltration
- Second session: Endoarticular hyaluronic acid and Periarticular ozone infiltration
- Third session: Endoarticular and Periarticular PRP (Platelet Rich Plasma)

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## **Platelet-Rich Plasma (PRP)**

The platelet-rich plasma or platelet gel is a hemoderivative for transfusion use: it is an autologous concentrate of platelets, which is obtained from blood by centrifugation, and is characterized by a high concentration of growth factors.

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## Protocol

Almost always both knees are treated.

### FIRST SESSION:

Intra- and peri-articular injection of ozone **in one knee only** (the one that is more aching)

### SECOND SESSION:

Intra- and peri-articular injection of ozone **in both knees**.

### From the THIRD SESSION onwards:

- intra-articular injection: the administration of hyaluronic acid and ozone must be alternated, for 6 or 10 sessions, depending on the suitable acid for a given pathology.
- immediately after, peri-articular injection: **always with ozone only**.

**EVERY 2 WEEKS, A SESSION WITH PLATELET-RICH PLASMA (PRP) for three times**

### PERICAPILLARY AND PERIVENOUS INFILTRATION TREATMENT:

Especially in women, heaviness of the lower limbs may coexist due to disorders of the microcirculation or the lymphatic system.

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## Method - I

### PATIENT'S POSTURE

The patient must be placed lying down, with a pillow under the knee

### MODE FOR SAFE INFILTRATION

Ask the Patient to wax the knee area.

For disinfection, use gauze balls and an antiseptic solution such as povidone iodine.

### IDENTIFICATION OF THE REFERENCE POINTS - I:

**INTRA-ARTICULAR:** access from the external (or internal) subquadriceptal recess.

An anterior parapatellar access may also be used, through the Hoffa's fat pad.



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## Method - II

### IDENTIFICATION OF THE REFERENCE POINTS - II:

**EXTRA-ARTICULAR:** alar ligaments of the patella, goose foot, collateral ligaments, suprapatellar region, medial compartment of the knee, patellar tendon, suprapatellar bursa.

- 20 ml syringe
- 25G x 25 mm (intra-articular injection) or 27G x 20 mm (extra-articular injection)
- **Concentration:**  
16  $\mu\text{g}$  of  $\text{O}_3$  / ml of  $\text{O}_2$  (intra-articular)  
or  
16  $\mu\text{g}$  of  $\text{O}_3$  / ml of  $\text{O}_2$  (extra-articular)
- **Dose:**  
5-10 ml (intra-articular) or  
1-2-ml for each infiltration (extra-articular)



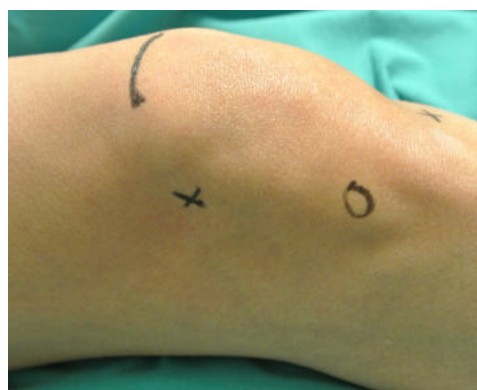
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## Method - III

### SEQUENCE OF ACTIONS

After the intra-articular injection of ozone, the knee must be passively flexed, to promote diffusion of the gas mixture.

Following this maneuver, a typical sound is heard, due to the mixing of the gas mixture with the synovial fluid



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## **Hyaluronic acid, ozone and PRP administered together**

In our experience, the intra-articular administration of hyaluronic acid ozone and PRP results in a positive synergistic effect.

Hyaluronic acid is mostly or exclusively administered by intra-articular injection.

PRP is administered intra and extra articular

Knee pathologies also involve extra-articular structures, capsules, ligaments and tendons.

In our protocol, the intra-articular hyaluronic acid is associated to the peri-articular ozone administration.

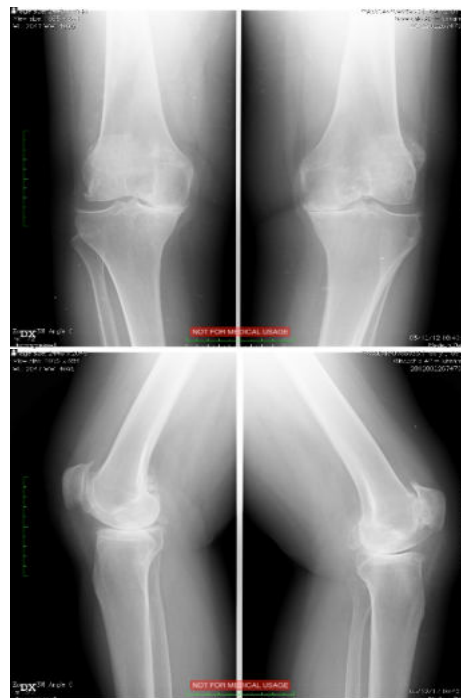
**Hyaluronic acid and ozone should not be simultaneously administered intra-articularly.**

By this protocol, we reached a success score of 90%.

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## **Extreme case**

A 70-year-old patient who came to our attention two years ago, with evident syntomatology of functional impairment and important pains.



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## Postoperative adhesions

In the knee, following prosthesis implantation, postoperative adhesions often cause pain and limit the joint motion, especially in flexion and extension.

Subcutaneous injections must be made bilaterally to the incision, to solve the adhering tissue layers.

During the first sessions, it often happens that the gas hardly diffuses in some points: in any case, avoid to apply exceeding pressure to inject the gas mixture.



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### PATIENT'S POSTURE

The patient must be placed lying down, with a pillow under the knee.

### OZONE CONCENTRATION AND VOLUMES:

20 ml syringe

27G x 20 mm or 25G x 25 mm needle

Concentration: 16  $\mu\text{g}$  of  $\text{O}_3$  / ml of  $\text{O}_2$

Dose: 1-2 ml by injection



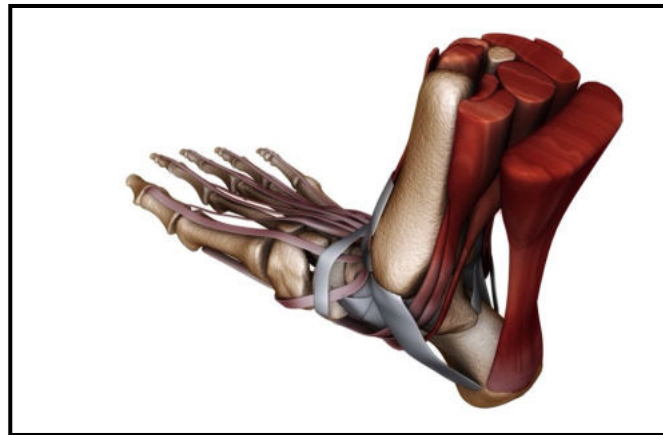
### OPERATION SEQUENCE

The scar must be bilaterally infiltrated, to solve the adhesions.

Treatment recalls are then made monthly.

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## TIBIOTARSAL JOINT AND FOOT



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## Tibiotarsal and foot pathologies

- Arthrosis of the tibiotalar joint, midfoot and toes
- Achilles tendinitis
- Painful consequences of distortions or fractures
- Plantar fasciitis (calcaneal spur)
- Civinini–Morton's neuroma
- Hallux valgus bursitis
- Metatarsalgia
- Algodystrophy of the tibiotalar joint and foot
- Tarsal tunnel syndrome
- ULCERS
- WARTS
- DIABETIC FOOT

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## Plantar fasciitis

### PATIENT'S POSTURE

The patient must be placed in prone position.

### IDENTIFICATION OF THE REFERENCE POINTS

#### OZONE CONCENTRATION AND VOLUMES:

- 10 ml syringe
- 27G x 20 mm needle
- Concentration:  $16 \mu\text{g O}_3 / \text{ml of O}_2$
- Dose: 1 ml by injection

### OPERATION SEQUENCE

Perifascial, intrafascial and peri-insertional calcaneal infiltrations



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## Achilles tendinitis

### PATIENT'S POSTURE

The patient must be placed in prone position.

### IDENTIFICATION OF THE REFERENCE POINTS

#### OZONE CONCENTRATION AND VOLUMES:

- 10 ml syringe
- 27Gx 20 mm needle
- Concentration:  $16 \mu\text{g O}_3 / \text{ml of O}_2$
- Dose: 1 ml by injection

### OPERATION SEQUENCE

Infiltrations along and out of the tendon and in the peri-insertional areas.



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## Civinini–Morton's syndrome

### PATIENT'S POSTURE

The patient must be placed in a lying position, with the sole of the foot set on the bed

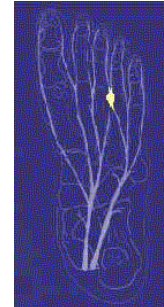
### IDENTIFICATION OF THE REFERENCE POINTS

#### OZONE CONCENTRATION AND VOLUMES:

- 10 ml syringe
- 27G x 20 mm needle
- Concentration: **10  $\mu\text{gO}_3$**  / ml of  $\text{O}_2$
- Dose: 1 ml by infiltration

### OPERATION SEQUENCE

Infiltration therapy in the affected interdigital space, in the neighbor spaces and in the interdigital fold.



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## Conclusions

Our treatment is cheap and does not require immobilization or interruption of the work activity

- It has no contraindications or adverse effects
- Positive results are maintained over time, allowing recovery of an optimal quality of life
- So i think that this therapy should be used in the first instance for all the pathologies which we talked about



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