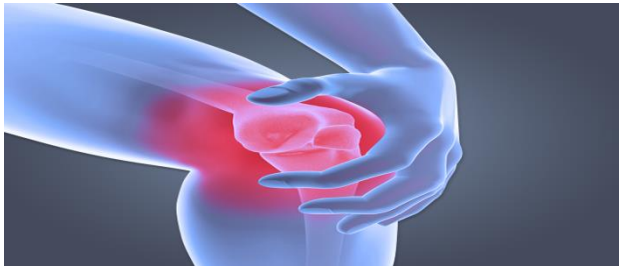
Ozone in treatment of knee osteoarthritis: Challenges & Limitations



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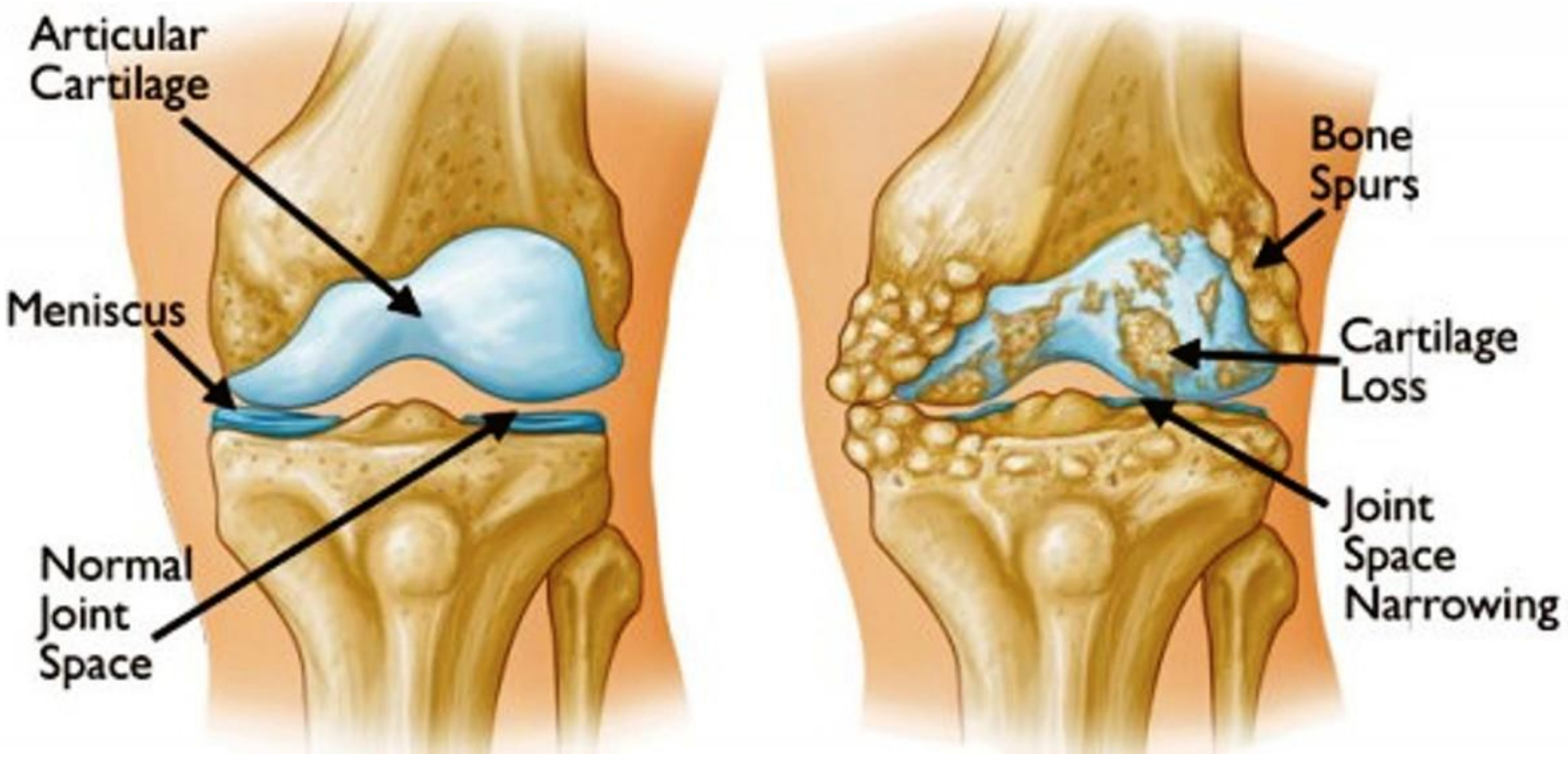
AGENDA

- Intro
- Ozone efficacy in KOA
- Ozone Mechanism of action in KOA
- Procedure
- Cases
- Limitations
- Conclusion

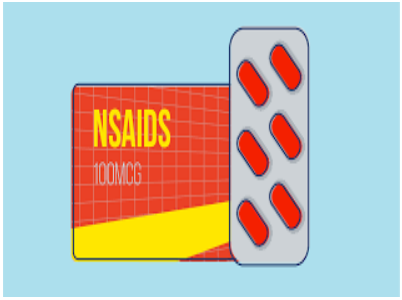

Articular Cartilage
Meniscus
Normal Joint Space
Bone Spurs
Cartilage Loss
Joint Space Narrowing

INTRO

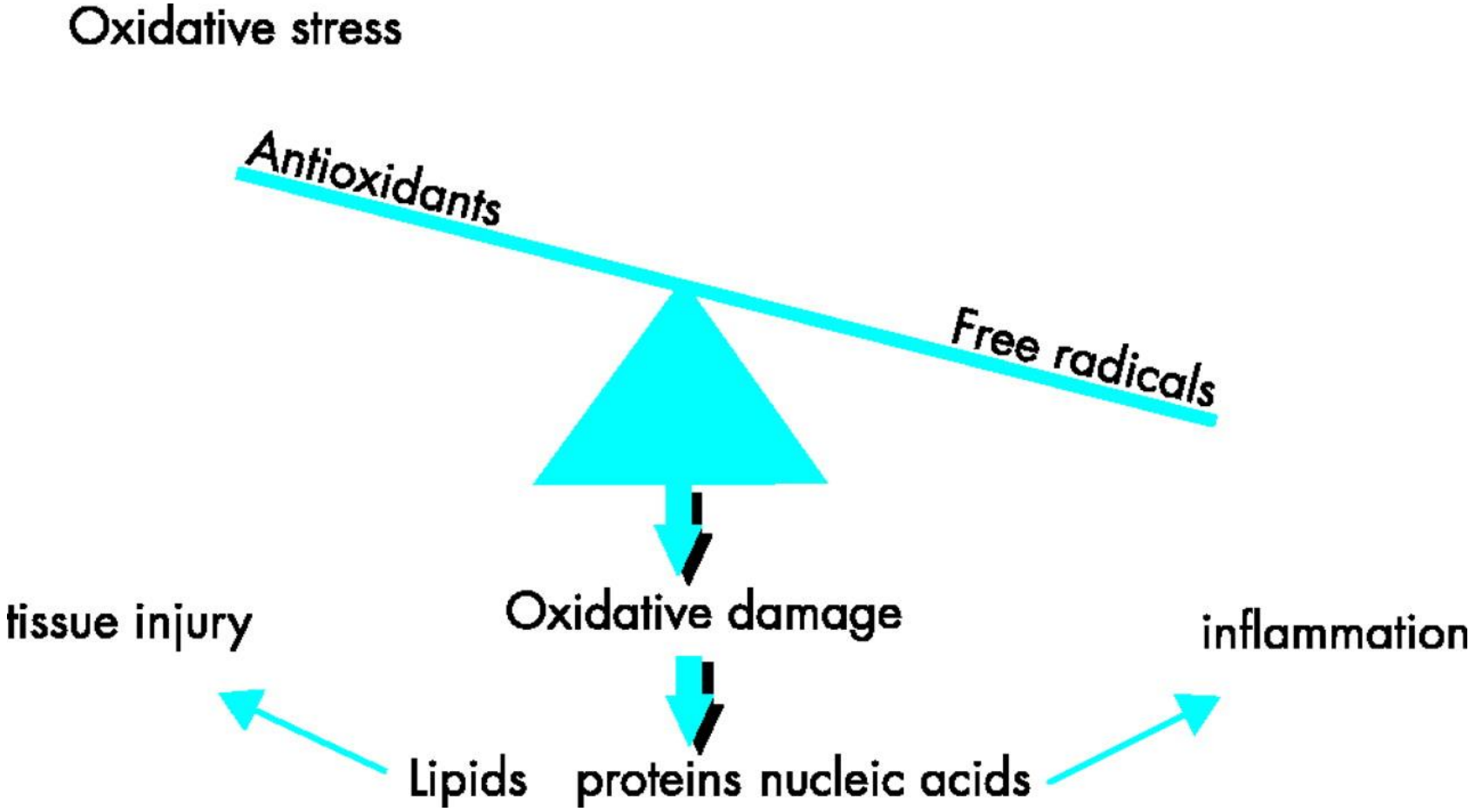
- Osteoarthritis (OA) is a group of common, age-related clinical conditions affecting synovial joints .
- Symptoms are pain and stiffness particularly after prolonged activity.
- Articular cartilage has a limited capacity for intrinsic healing and repair .
- Symptomatic knee OA is a leading cause of disability, affecting more than 9.3 million US adults

Problem

- Increasing number of OA patients .
- Current treatments are focused on symptomatic relief .
- Such treatments lack efficacy to control the progression of this disease.
- Effective therapies to regenerate damaged cartilage or to slow its degeneration have not been developed.
- Development of effective disease-modifying drugs is urgently needed.


NSAIDS
100MCG

Role of oxidative stress in KOA

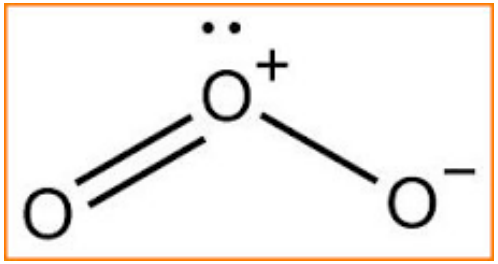


Role of Ozone in KOA

- Analgesic effect
- Anti-inflammatory effect
- Antioxidant effect
- Tissue oxygenation effects

Ozone mechanism of action in KOA

- Activating the cellular metabolism.
- Reducing prostaglandin synthesis.



- Making the redox system function properly
- Reducing oxidative stress through induction of the synthesis of antioxidant enzymes (superoxide dismutase, glutathione peroxidase, and catalase).
- Immunological modulatory properties.
- Improving tissue oxygen supply.

Efficacy of intra-articular ozone in KOA

- A study published by Plos One in 2017 Comparing between intra-articular ozone and placebo in the treatment of knee osteoarthritis: A randomized, double-blinded, placebo-control:

Results from WOMAC.

Variable	Time	Groups Median (min, max)		Median of Differences	CI 95% Median of differences		p value
		Placebo	Treatment		Lower	Upper	
Pain	Basal	50.0 (40, 70)	60.0 (42, 70)	0.000	-9.999	10.000	0.752
	4 weeks	20.0 (7, 37)	45.0 (25, 60)	15.000	5.000	25.000	<0.001
	8 weeks	10.0 (0, 30)	20.0 (10, 40)	9.999	0.000	15.000	0.019
	16 weeks	10.0 (0, 20)	25.0 (2, 52)	14.999	0.000	25.000	0.005
Stiffness	Basal	37.5 (25, 62)	37.5 (25, 62)	0.000	-12.499	12.499	0.5695
	4 weeks	0.0 (0.0, 12)	12.5 (0, 25)	0.000	0.000	12.500	0.0336
	8 weeks	0.0 (0.0, 12.5)	12.5 (0, 25)	12.499	0.000	12.500	<0.001
	16 weeks	0.0 (0, 0)	0.0 (0, 12)	0.000	0.000	0.000	0.1135
Functional deficit	Basal	44.1 (26, 68)	50.0 (40, 61)	5.879	-44.100	147.100	0.2973
	4 weeks	17.6 (9, 31)	33.8 (26, 51)	16.170	7.350	23.529	<0.001
	8 weeks	11.7 (3, 26)	27.9 (14, 35)	11.760	4.409	19.119	0.003
	16 weeks	11.8 (2, 24)	25.0 (7, 35)	7.350	1.469	16.180	0.016

PLoS One.
DOI: 10.1371/journal.pone.0179185

O3 Vs NSAIDs and Glucosamines

- A Study published by Journal of Clinical Diagnostic research in Sep 2017about Therapeutic Efficacy of Ozone Injection into the Knee for the Osteoarthritis Patient along with Oral Celecoxib and Glucosamine vs Oral Celecoxib and Glucosamine only :

Comparison of the VAS scores in each Group and between the two Groups. ANOVA test and Independent t-test was used. Results represented as mean±SD.

Groups	Pretreatment	one week post-treatment	three week post-treatment	six week post-treatment	intragroup p-value
The ozone group (n=35)	7.89±1.08	5.25±1.74	3.97±1.15	3.46±1.04	<0.001
The control group (n=41)	8.34±1.04	5.83±2.07	4.95±1.56	3.83±1.26	<0.001
Intergroup p-value	0.0651	0.2008	0.0030	0.1694	

J Clin Diagn Res
doi: 10.7860/JCDR/2017/26065.10533

Intra-articular and rectal O3 in treatment of KOA

- A study published by journal of IOA in Dec 2012 about application of Ozone Therapy in Patients with Knee Osteoarthritis (Intra-articular and rectal administration) showing VAS changes at the beginning and at the end of therapy :

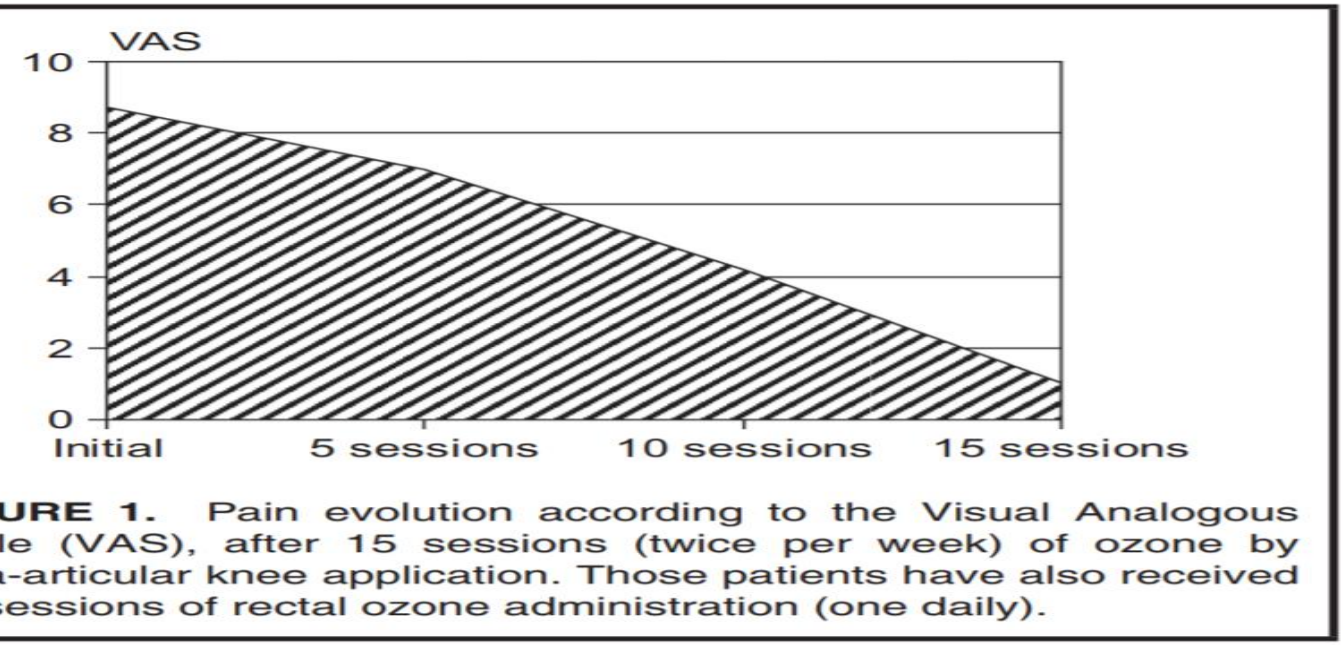


FIGURE 1. Pain evolution according to the Visual Analogous Scale (VAS), after 15 sessions (twice per week) of ozone by intra-articular knee application. Those patients have also received 20 sessions of rectal ozone administration (one daily).

Journal of International Ozone Association
DOI: 10.1080/01919512.2012.719120

- A study published by Journal of IOA in Dec 2012 showing effect of Ozone therapy (intra-atricular and rectal administration)

in respect to limitation of articular movements and grade of tumefaction:

TABLE 2. Evaluation of the Joint Capacity, According to the Limitation of Articular Movements and Grade of Tumefaction, at the Beginning and at the End of the Study

Evaluation of the Joint Capacity	Beginning of the Study			End of the Study		
Limitation of articular movements (%)	Total	Partial	Null	Total	Partial	Null
	20	75	5	0	43	57
Grade of tumefaction (%)	Severe	Moderate	Slight	Severe	Moderate	Slight
	35	55	10	0	5	45

Journal of International Ozone Association
DOI: 10.1080/01919512.2012.719120

- A study published by Journal of IOA in Dec 2012 showing

the radiological changes of knee joint as regard the presence of synovitis at the beginning and one month after Ozone Therapy (Intra-articular and rectal adminstration) :

TABLE 3. Results of the Radiological Study, at the Beginning and One Month after Finishing the Ozone Therapy Treatment

	Beginning of the Study			End of the Study		
Radiological Evaluation	Severe	Moderate	Slight	Severe	Moderate	Slight
Presence of synovitis (%)	40	55	5	0	15	85

Journal of International Ozone Association
DOI: 10.1080/01919512.2012.719120

Procedure

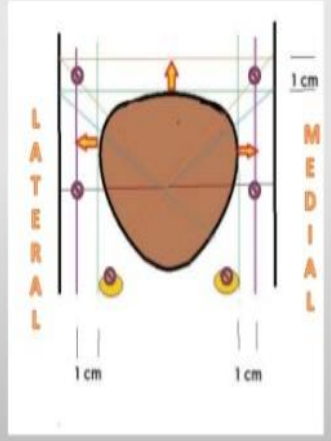
- Patient is positioned sitting over a stretcher with the legs bent.
- The point of entrance of the needle is the femorotibial articular interline.
- Ozone dose at 20µg/ml x 10 ml.
- An anesthetic effect is obtained by injecting 0.5ml of 2% lidocaine solution.
- The procedure is carried out once a week, for 8 consecutive weeks.

Intraarticular Approaches

1. Lateral superopatellar
2. Medial superopatellar

3. Lateral midpatellar
4. Medial midpatellar

5. Lateral inferopatellar
6. Medial inferopatellar



Limitations

- The main restrictions for the use of ozone are: acute alcohol intoxication, recent myocardial infarction, hemorrhage from any organ, pregnancy, hyperthyroidism, thrombocytopenia, and ozone allergy.

- There no significant side effects other than pain at site of needle puncture .

- Some patients experience pain at the day of injection .

PloS one 2017

Case presenation

- 67 years male patient
- Moderate pain and stiffness for 1 year , Severe pain for 1 month.
- Grade 2 Osteoarthitis ,Baker’s cyst and partial mensical tear.
- Not responsive to NSAIDS and Topical agents.
- Hx of HTN and Peptic Ulcer.

- Patient received 8 sessions of intra-articular O3 on a weekly basis.

- Improvement started after 4 weeks of injection.

Case presentation

- 56 years obese female patient.
- Moderate pain for 2 years, episodes of severe pain .
- Grade 3 Osteoarthritis .
- Not responsive to NSAIDS and Glucosamine.
- PRP injection was done 1 year ago with no significant response.

- Patient received 12 sessions of intra-articular O3 injection.
- Injection was done on a weekly basis
- Improvement started after 7 weeks of injection

Case presentation

- 75 years old , Obese , Diabetic Female patient
- Severe pain and stiffness for 3 years
- Grade 3 knee osteoarthritis
- Not responsive to NSAIDS,PRP,HA
- Not candidate for surgery

- Patient received 15 sessions of intra-articular O3 injection plus 20 sessions of rectal O3 insufflation.
- Therapy was done on a weekly basis.
- Improvement started after 12 weeks of injection.

Conclusion

- Knee OA is a common disabling problem .
- There is no definitive cure for KOA currently.
- Ozone has regenerative properties .
- Intra-articular Ozone may provide a simple , effective and safe way for treatment of KOA

THANK YOU