Functional – metabolic and methodological basement of rehabilitation ozone therapy

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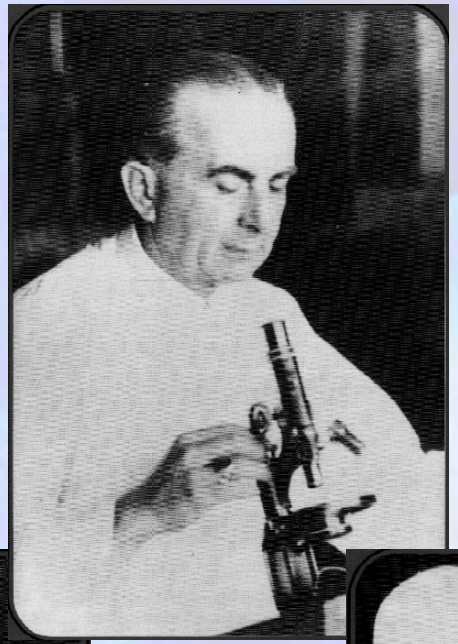
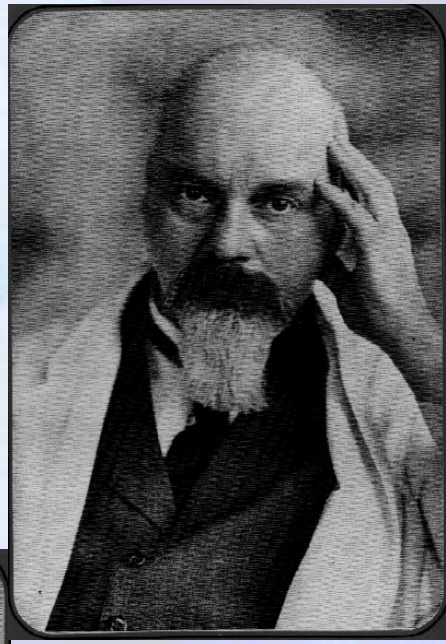
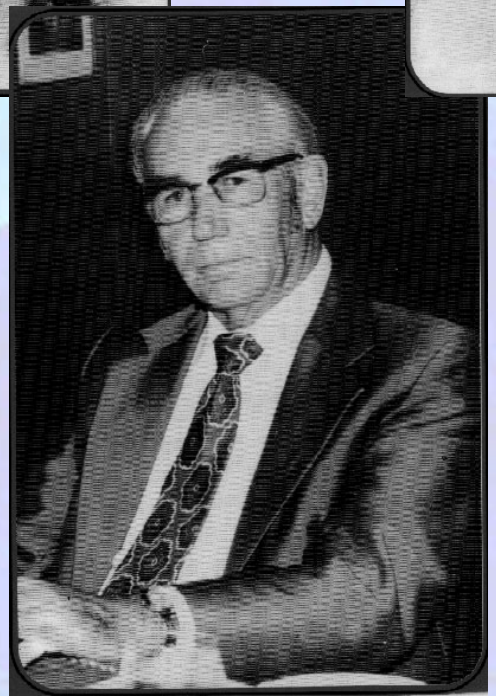
PIONEER OF OZONOTERAPY







Main aim of ozone therapy is reactivation of organism oxygen homeostasis with maintenance of pro- and antioxidative system balance and prooxidative system predomination

S.Rilling, R.Viebahn

(«Practical ozone therapy»)

Phisiological and therapeutical effects of ozone therapy

Moderate «physiological» activation of free-radicals reaction of lipoperoxidation

- maintenance of respyratory chain activity
- stimulation of BAS biosynthesis (hormones, prostoglandin E, leucotriens, tromboxan A2, progesterone, collagen, ozonolysis, stimulation and metabolism of aminoacids.
- regulatory role in nervous tissue restoration processes after stimulation.
- ozone and ozonides may play role «molecular phag», conduce to microorganism destruction, phagocytosis, depuration of damage areas.
- ozonides take part in chemotaxis factor generation which cause leucocytes migration in inflammation focus.
- ozone and ozonids – cofactors of bioenergetic processes.
- ozone and ozonids – activators of oxygen depend processes and enzymes.

Ozone has therapeutic action over physiological LPO effects as far as LPO activation compensate with adequate changes of all antioxidative system links.

Российская академия естественных наук

Международная академия авторов научных открытий и изобретений
Международная ассоциация авторов научных открытий

ДИПЛОМ № 309

на открытие

«ЗАКОНОМЕРНОСТЬ ФОРМИРОВАНИЯ АДАПТАЦИОННЫХ МЕХАНИЗМОВ ОРГАНИЗМОВ МЛЕКОПИТАЮЩИХ ПРИ СИСТЕМНОМ ВОЗДЕЙСТВИИ НИЗКИМИ ТЕРАПЕВТИЧЕСКИМИ ДОЗАМИ ОЗОНА»

Формула открытия

Установлена неизвестная ранее закономерность формирования адаптационных механизмов организмов млекопитающих при системном воздействии низкими терапевтическими дозами озона, заключающаяся в пусковом влиянии действия терапевтических зон озона на про- и антиоксидантный баланс организма и обусловленная интенсификацией свободнорадикальных реакций, увеличивающей активность ферментативного и неферментативного звеньев антиоксидантной системы защиты.

Приоритет открытия

сентябрь 1989 г. - по дате сообщения «Positive therapeutic effect of prooxidant properties» на Международной конференции «Regulation of free radical reactions» (Bulgaria. Varna, 1989).

На основании установленных в соответствии с действующим законодательством правовых положений Устава Международная академия авторов научных открытий и изобретений выдала настоящий диплом на открытие ***«Закономерность формирования адаптационных механизмов организмов млекопитающих при системном воздействии низкими терапевтическими дозами озона»***

КОНТОРЩИКОВОЙ КЛАВДИИ НИКОЛАЕВНЕ
ПЕРЕТЯГИНУ СЕРГЕЮ ПЕТРОВИЧУ

Президент Российской академии естественных наук — О.Л. Кузнецов

Президент Международной академии авторов научных открытий и изобретений — В.В. Потоцкий

«16» 09 2006 г.

г. Москва. Регистрационный № 387

Physiological and therapeutic effects of ozone therapy

Enlargement of bioenergetic process intensiveness

- Activation of oxidative phosphorilization and enlargement of energy generation in tissue.
- Oprovision of high cell respiration level for account of key enzymes increment of respiration chain

Activation of desintoxication processes

- Inhibition of toxic metabolites formation (lactate, pyruvate), activation of its destruction and utilization.
- Stimulation of metabolic defense system
- Modeling of monooxygenase systems.

Activation of biosyntesis regeneration processes

- Extrication of cytokins from fibroblasts and epitheliocytes (transformation growth facto, growth factor of basic fibroblast, monocyte chemotaxis protein, growth factor of keratinocytes) and stimulation or restoration of dermo-epidermal layers.

Basic therapeutic effects of ozone in systemic application

1. Reactivation of oxygen homeostasis
   Enlargement pO_2 AB, decrement of Hb affinity to O_2, improvement of oxygen utilization in tissues
2. Increment of total antioxidative plasma activity (for account of lipoproteid concentration addition, ceruloplasmine, albumin, serotonin, insulin and others antioxidants) and erytrocytes (enzimes - catalase, SOD, glutationperoxidase)
   Decrement of lipoperoxidation products concentration (diene conjugates, malone dialdehydes, Shiffs basements)
3. Vessel dilatation effect, restoration of microcirculation
4. Antiinflammatory effect, increment of fagocytosis activity
5. Immune modulation effect. Stimulation of basic serum immune globulins production, cytokins.
6. Activation of enzyme system
7. Increment of energetic metabolism in cells
8. Correction of hemostasis system
9. Dehydratation effect
10. Activation of microsomal oxydation and its modeling in vessels
11. Detoxication effect

Methods of systemic ozone therapy

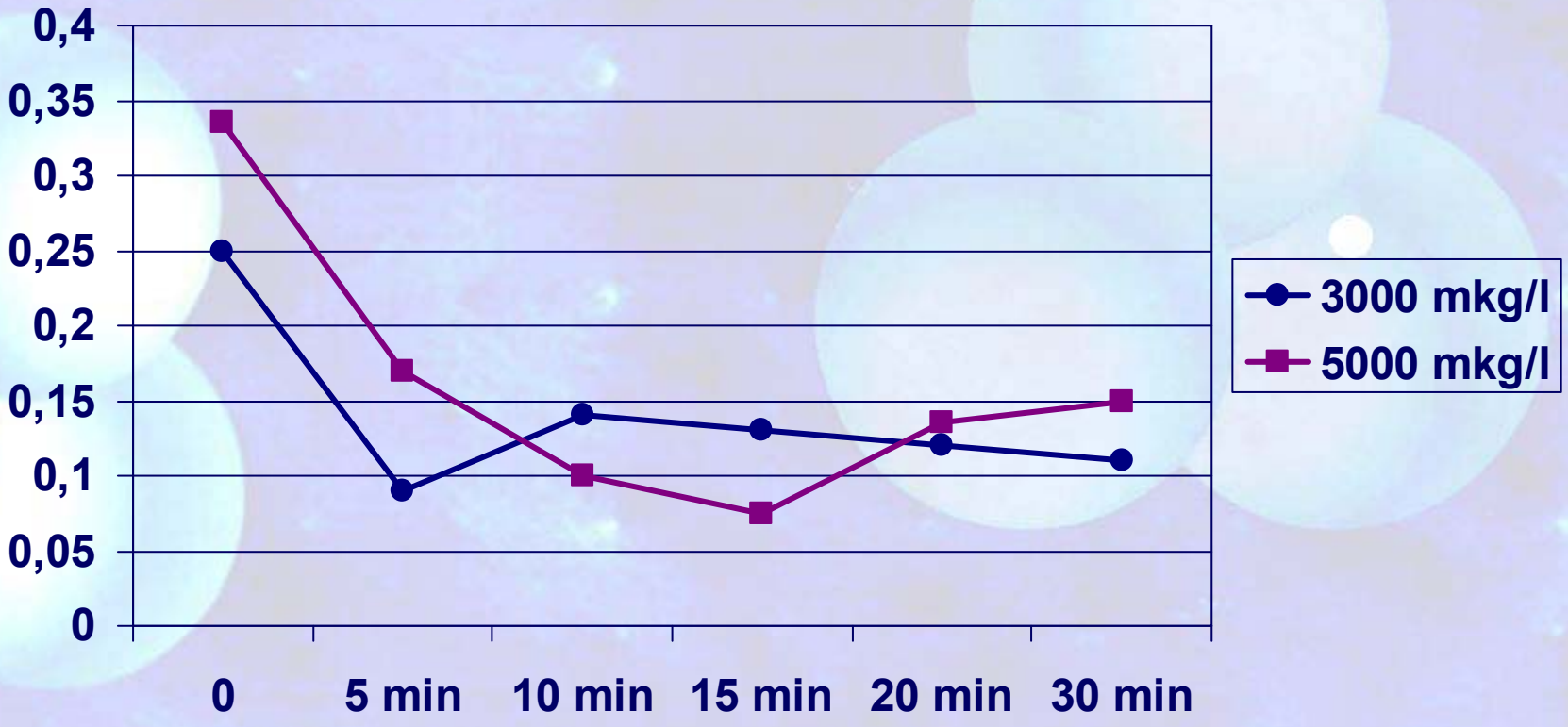
- Mayor AHT with ozone
- Minor AHT with ozone
- Intravenous infusion of ozonized saline
- Rectal ozone insufflation
- Ozone baths
- Combine application of local and parenteral ozone therapy

Rationale of parenteral ozonized saline using

Ozone dilution in saline (isotonic solution)

- Physical and chemical investigations in Russia in 70-80 years of XX century determined coefficient of ozone dilution in NaCl solutions, which equal as 0,2. So from gas mixture ozone concentration dilution in 1L of NaCl solution (on the average) – 1/5 of gas mixture concentration.

Ozone solubility and destruction in saline



Data of spectrophotometric dimension of dissolve ozone in saline with different ozone concentrations in gas phase.

After solution saturation ozone quickly resolves. Speed of breakdown is enough high.

Physical-chemical parameters of ozonized saline

Examined Solution	O_2 content	O_3 content	Temp., °C	pH	Oxedativ-restoration potential	mS conduction
Dist. water	6.5 ± 0.6	0	22.1 ± 1.8	9.60 ± 0.92	243 ± 26	0.16 ± 0.06
NaCl 0.9%	7.0 ± 0.4	0	23.2 ± 1.8	8.04 ± 0.60	188 ± 16	12.2 ± 1.1
NaCl 0.9% +O_2	23.2 ± 2.1	0	22.1 ± 2.1	7.82 ± 0.60	247 ± 22	12.6 ± 1.2
NaCl 0.9% + [O_3] 1 mg/l (gas)	19.6 ± 1.2	0.9 ± 0.06	22.5 ± 1.9	7.94 ± 0.60	249 ± 22	12.2 ± 1.1
NaCl 0.9% + [O_3] 5 mg/l (gas)	23.0 ± 2.1	2.4 ± 0.2	22.3 ± 1.9	7.86 ± 0.60	327 ± 29	12.7 ± 1.1
NaCl 0.9% + [O_3] 10 mg/l (gas)	21.3 ± 1.9	2.7 ± 0.2	22.4 ± 2.9	7.80 ± 0.72	528 ± 42	15.1 ± 1.4

Rationale of parenteral ozonized saline using Reaction products: $NaCl+O_3$

$$NaCl + O_3 \xrightarrow{?} H_2O_2$$

$$NaCl + O_3 \xrightarrow{?} NaOCl$$

- **Methods of analytic chemistry determined formation of H_2O_2 in very little quantity - to 0,0004% during ozone saturation of isotonic solution**
  (Kudryavtsev V.A., Galkin A.A., 2007; Obuhova L.M., Kontorschikova K.N., 2010)
- **In saturation concentration 3000 mkg/l in volume of 1000 ml of solution ml 600 mkg O_3 will dissolve, but saline volume of 200 ml will maintain 120 mkg O_3**
- **H_2O_2 will compose: 0,00048 mkg**

Metods of ozone isotonic solution infusions

1. Method with **direct constant saturation** of ozone in intravenous solution
   advantage: constant saturation provides with the constant O_3 concentration in saline and accordantly correct ozone dosage
   disadvantage: system for infusion and patient are «attach» with apparatus
2. Method of **preliminary ozone saturation** with following saline infusion
   advantage: mobility in manipulation (scope of infusions on distance from ozonator)
   disadvantage – unstable concentration in solution (half of dissociation period - 7-10 minutes)

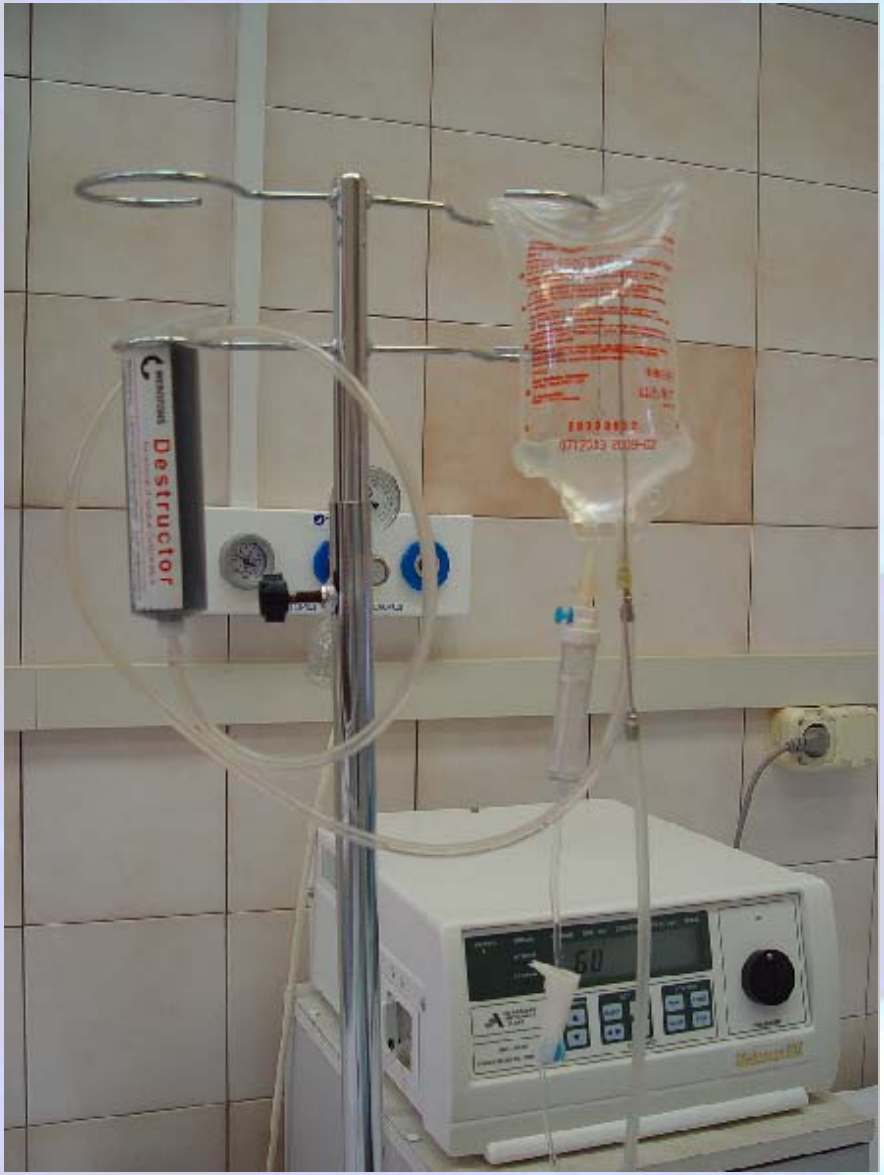
Further – method of this disadvantage riddance

Method 1:

- For procedure we use saline in volume 200-400 ml.
- Bottle with isotonic solution must be connected with plastic blood transfusion tubing (1 needle), air-way – Defo needle, from it polychlorvinil tube goes to destructor (2 needle), needle for ozone-oxidative mixture admission with concrete concentration from ozone generator (3 needle).
- Conditional name - «3-needles system» (picture). Before procedure solution has been ozonize 15 minutes, after that without abatement of barbotage, administer in intravenous infusion with speed 20-30 drops per 1 minute. Ozonisation will stop when in bottle not less 50 ml of infusion solution remains.

METHOD 1

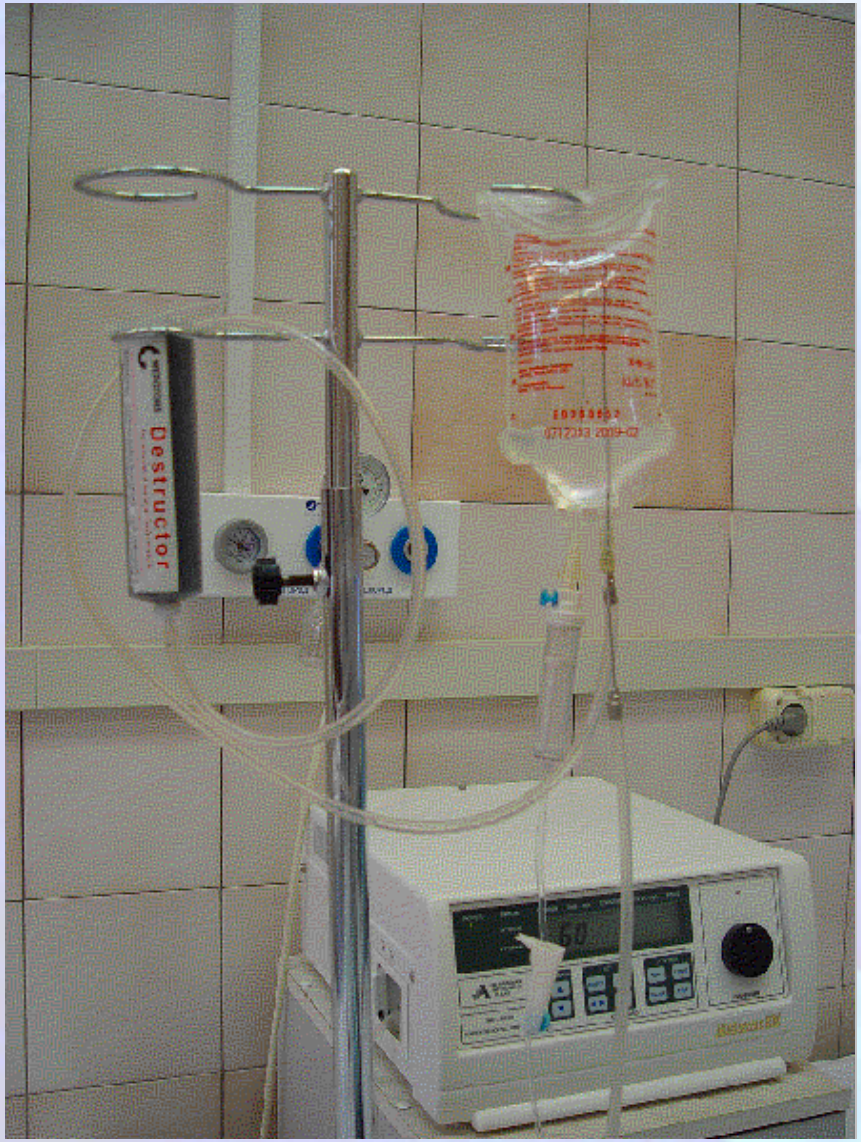
direct infusion of ozonized saline on saturation phone



2nd method of ozonized saline infusion

- Ozone saturated isotonic solution infuses to patient with **previously preparation of saline**. In procedure with barbotage discontinuance in period of intravenous infusion we must allow that half of ozone dissociation in average is 7 - 15 minutes. Accordingly in barbotage ozone concentration must be enlarge on 50-75%. Barbotage time of infusion solution - 15-20 minutes. Ozonated solution infusion must be conduct just after its ozone saturation. Speed of parenteral introduction must be enlarge.
- This variant is efficient for patients with impossibility of transportation to stationary ozone generator.
- Procedures are recommend daily or day after day from 6 to 12 times.

method 2



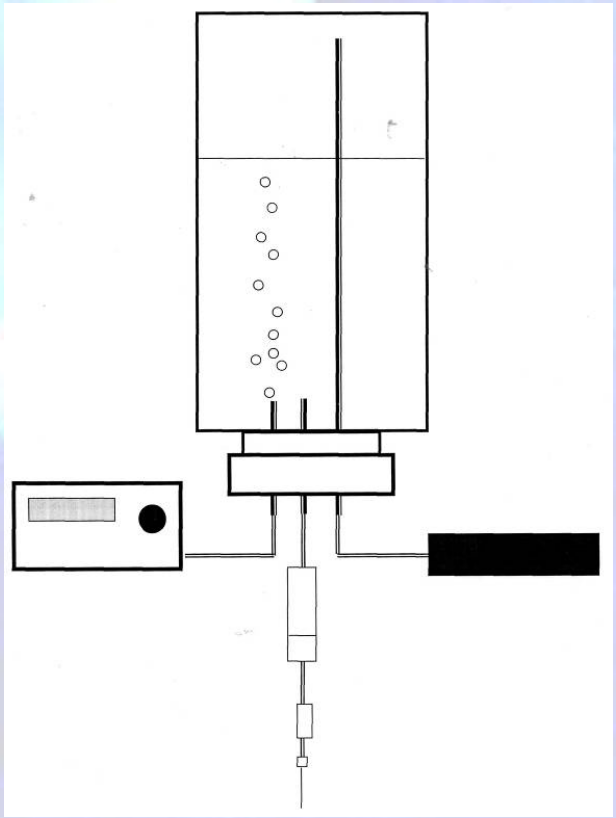
Method of constant ozone concentration maintenance in preliminary prepared ozonized saline

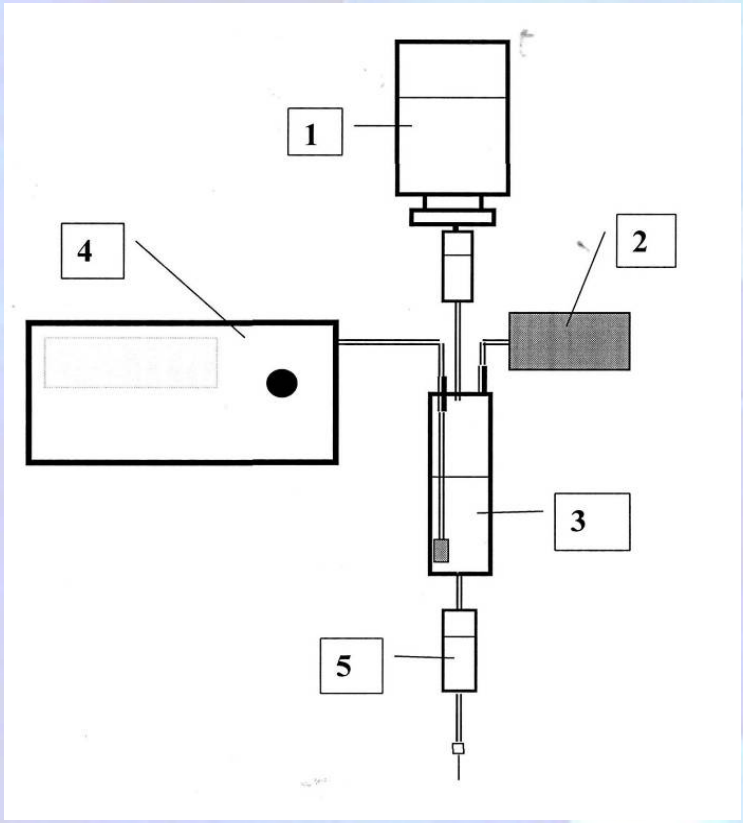
- Method of **hyperbaric maintenance**: introduction into bottle additional ozone volume with Janet syringe with command ozone concentration on 20 %

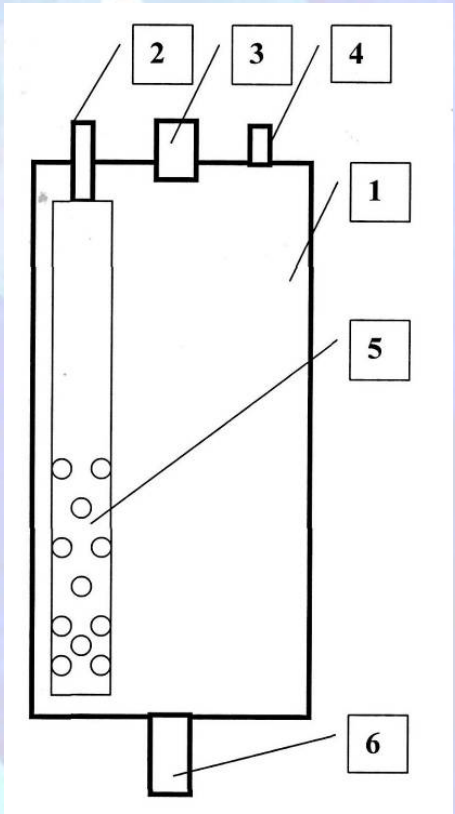
Conformation for isotonic solution ozonization

Priority № 2009112002 from 01.04.2009

Authors: A.A. Struckov, S.P. Peretyagin, A.V. Vorobiev







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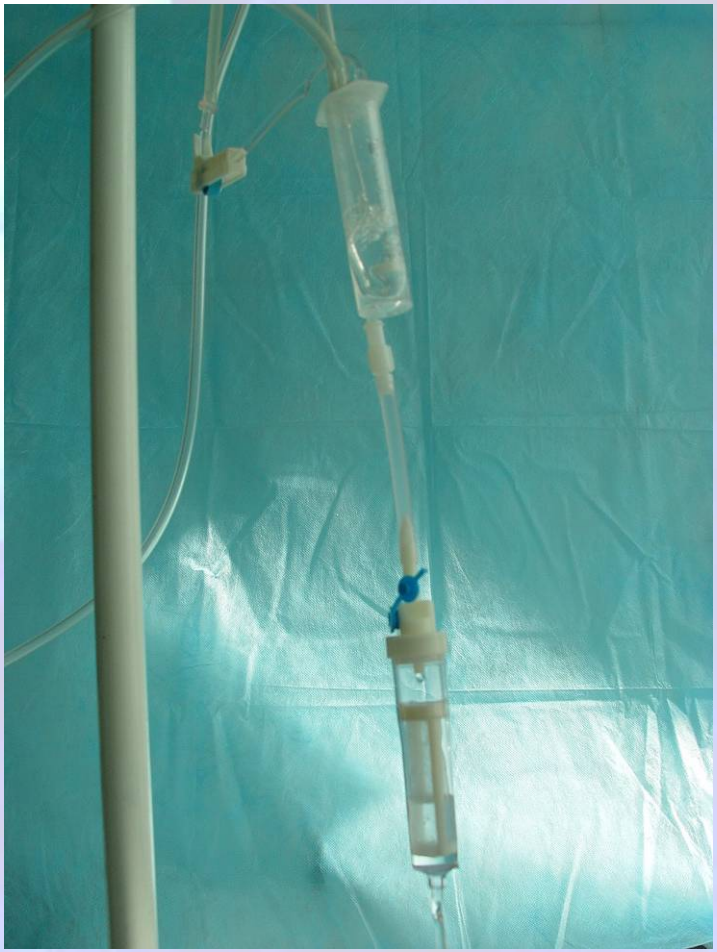
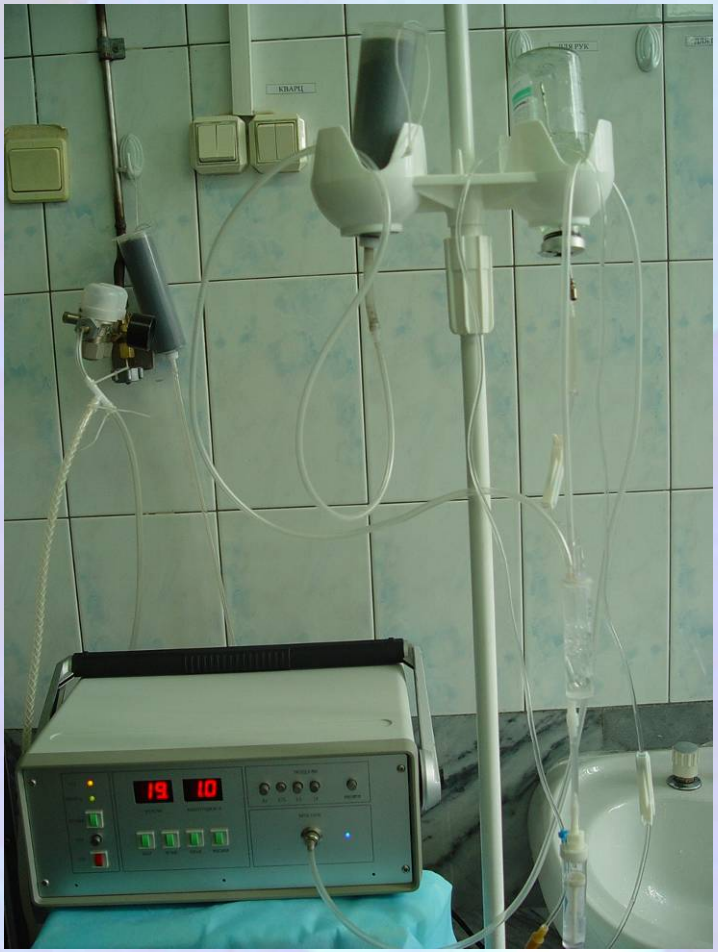




Main difference between ozonized saline infusion and major ozone autohemotherapy

- In major AHT all direct reaction with blood biosubstrata originate in little volume (50-100 ml of extracorporeal autoblood)
- In intravenous ozonated saline infusion direct ozonolysis reactions and induction of biochemical enzyme and metabolic reactions originate immediately in blood vessels during 25–30 minutes**!**
- Contact with great volume of pass venous blood

Mechanisms of therapeutic action of ozonized saline in experiment

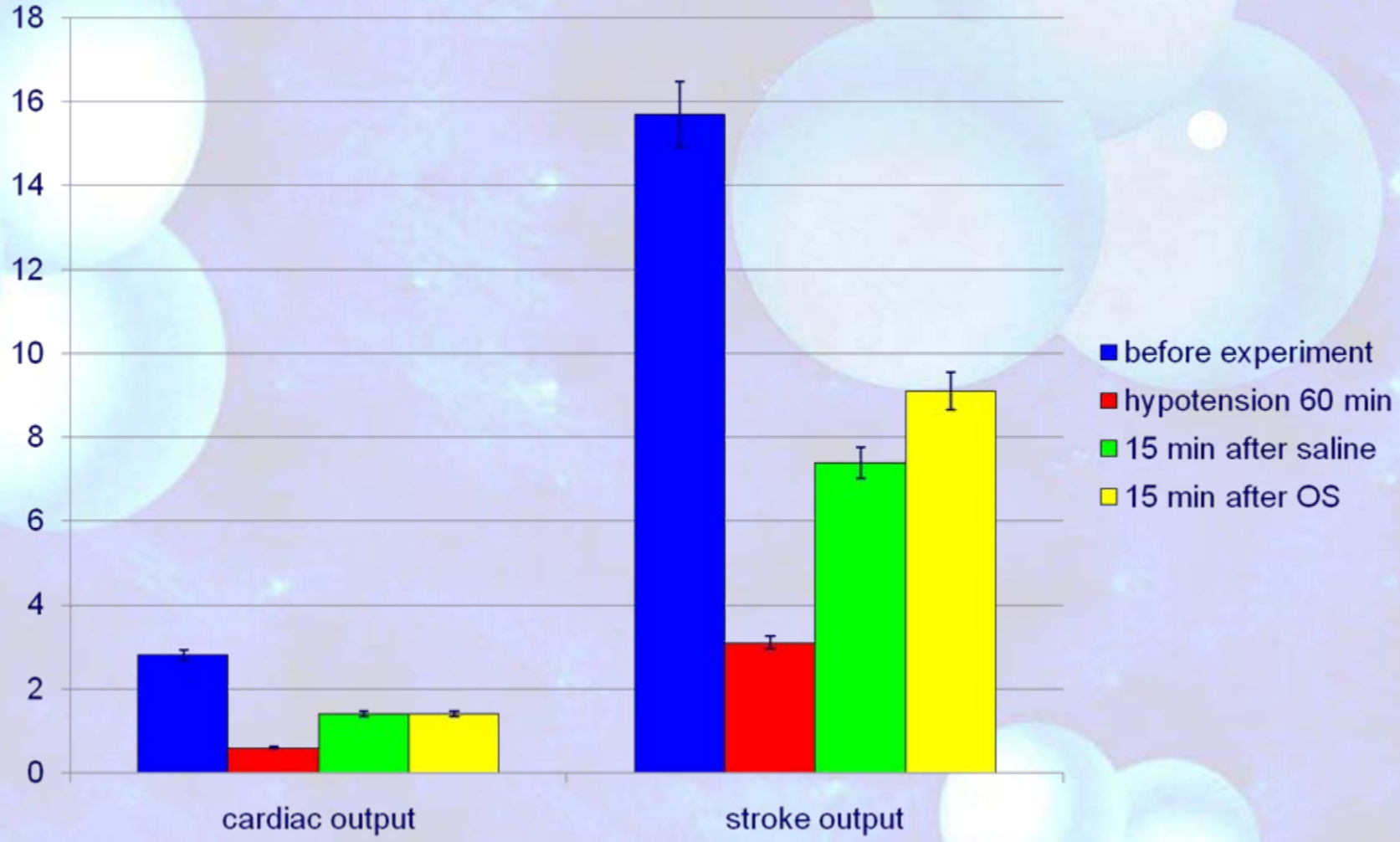
Investigation of antihypoxanthic action of ozonized saline

Model: hemorragic Wiggers shock, 60-minute hypotension in dogs. Treatment – infusion of ozonized saline in volume of discharge blood with ozone saturation concentration 1000 mkg/l. Ozone dosage was 80 mkg.

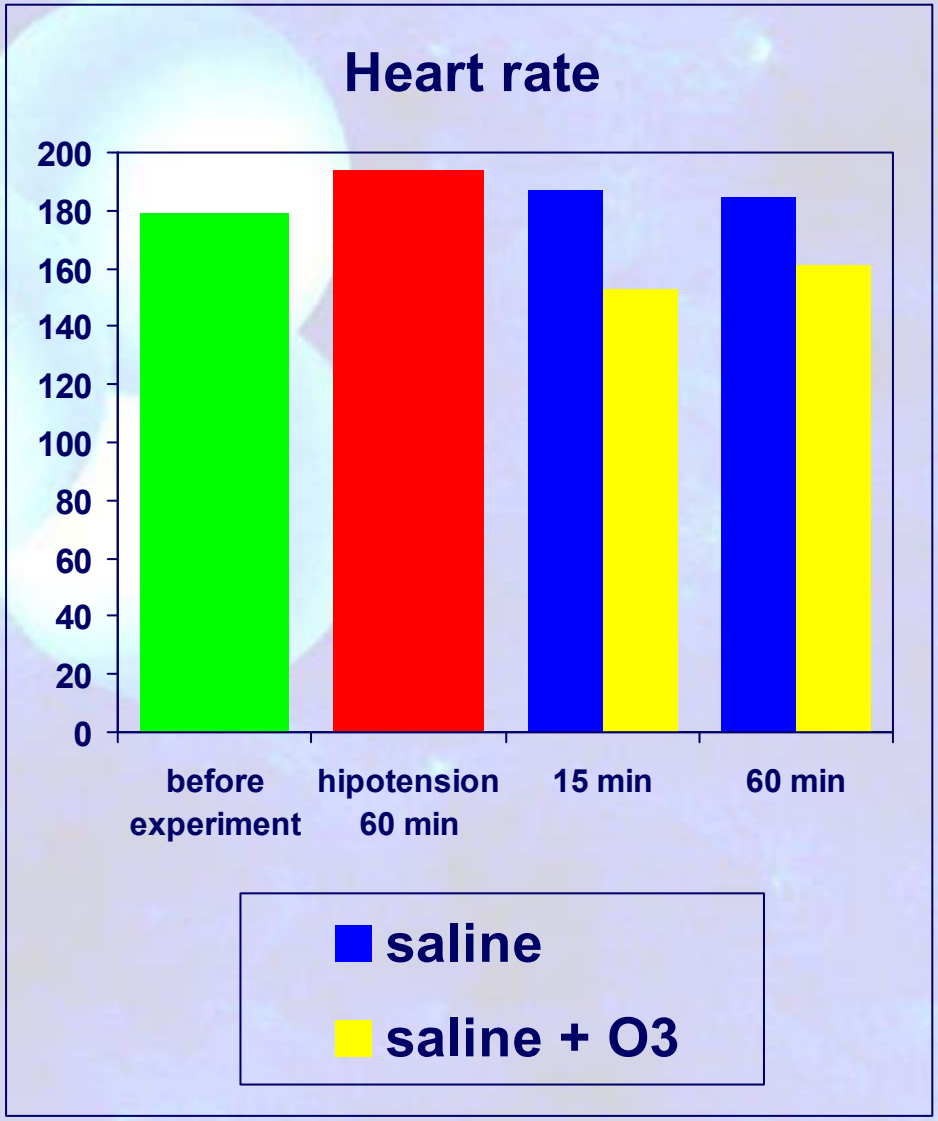
Results:

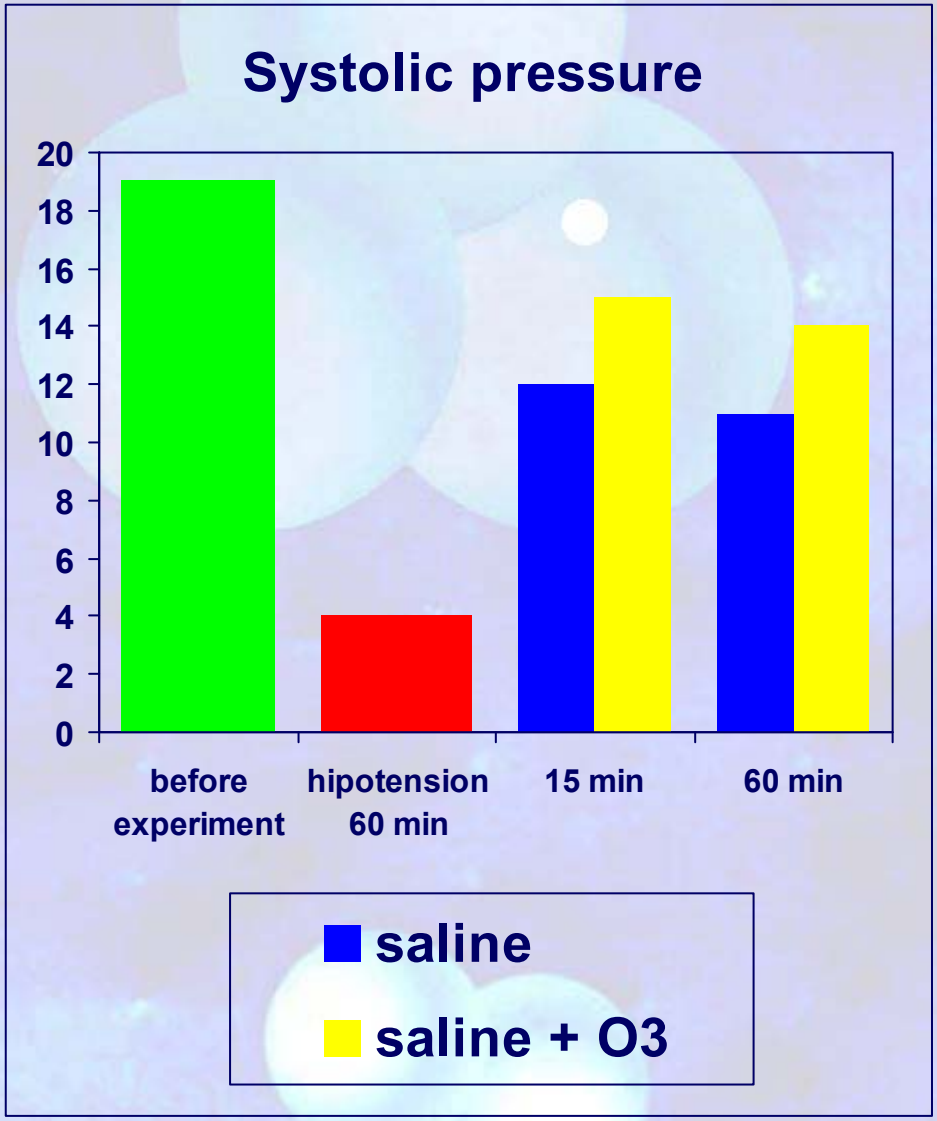
- more adequate status of basic hemodynamic parameters
- more adequate status oxygen metabolism homeostasis
- optimization of blood metabolic systems
- optimization of morpho-hystologic ultrastructure of tissues

Data of myocardial functional condition in different variants of hemorrhagic shock experimental therapy

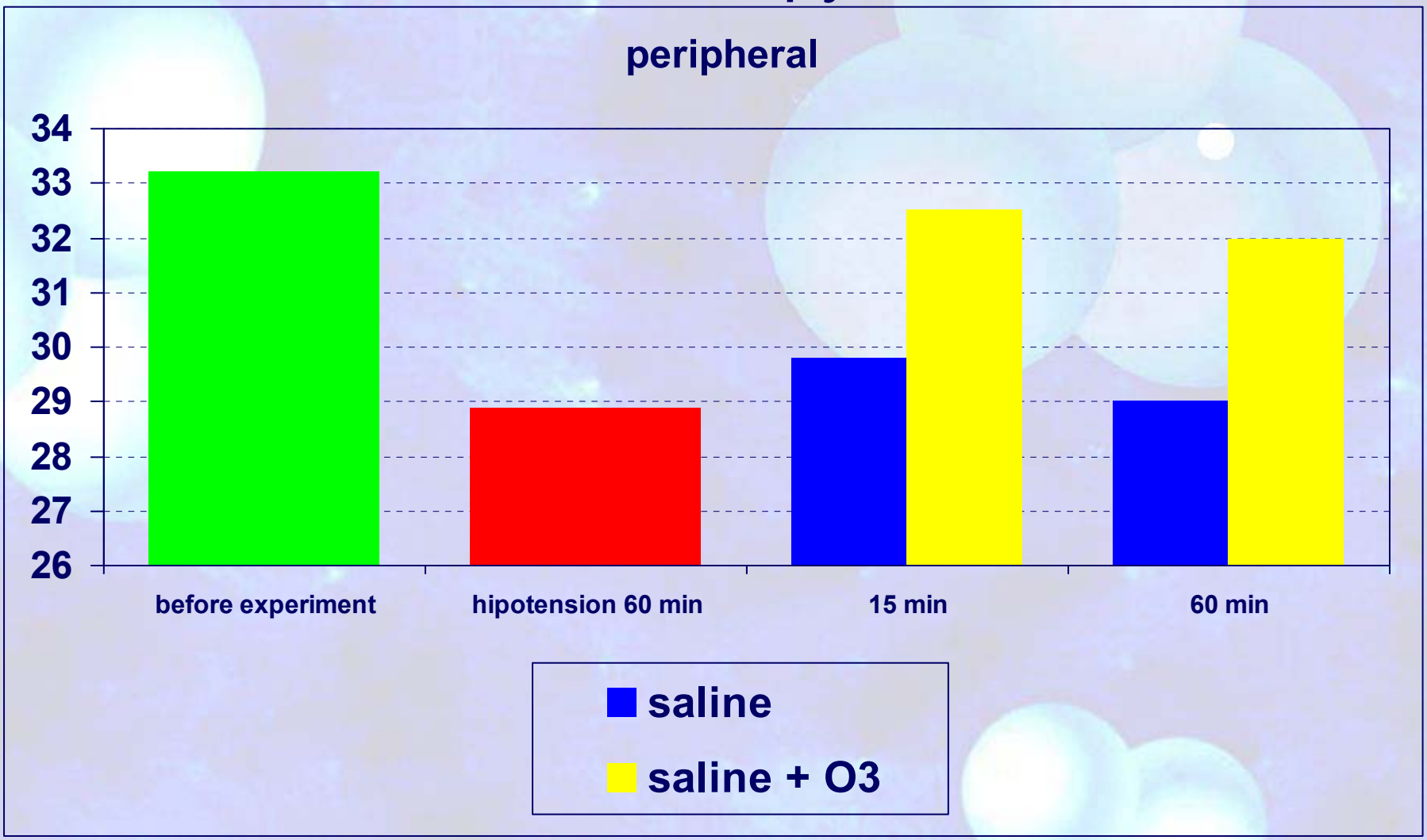


Systemic hemodynamic condition in ozone therapy of hemorrhagic shock

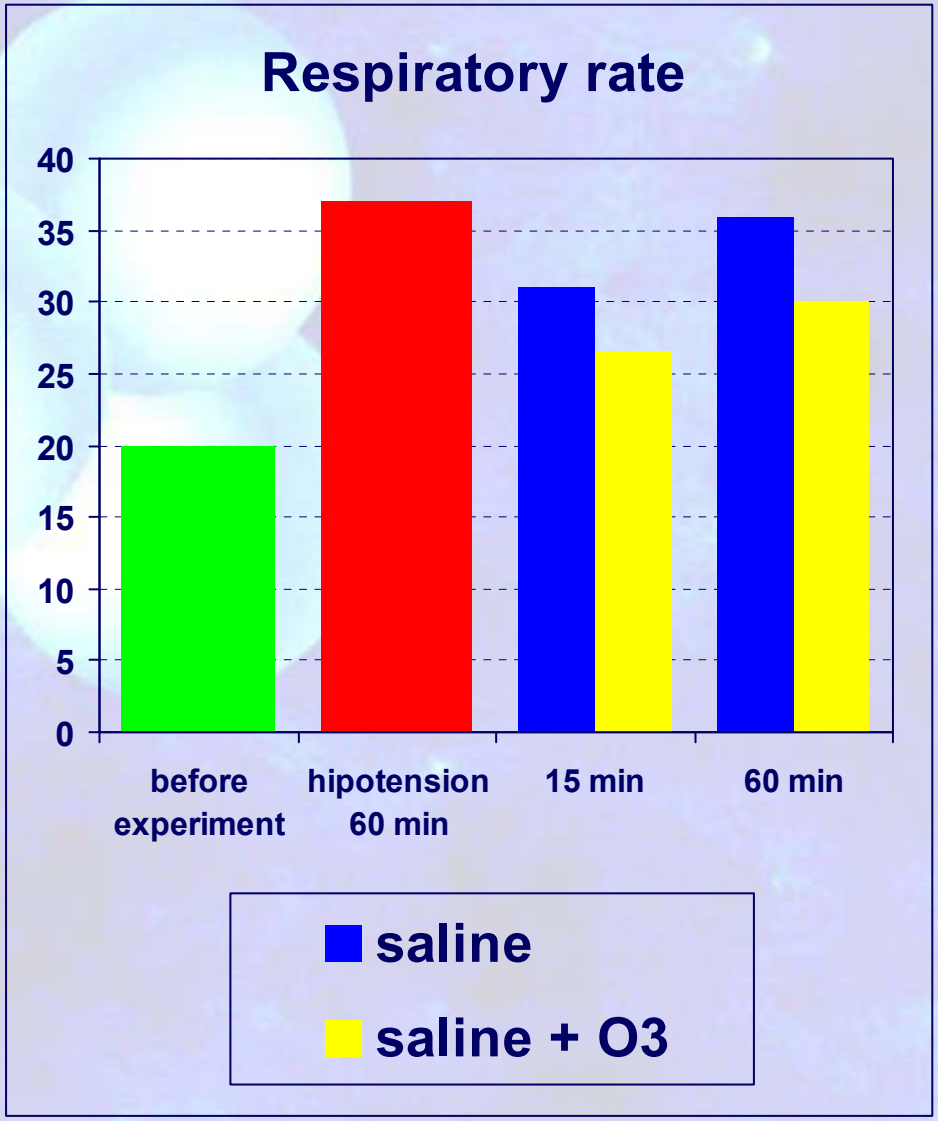


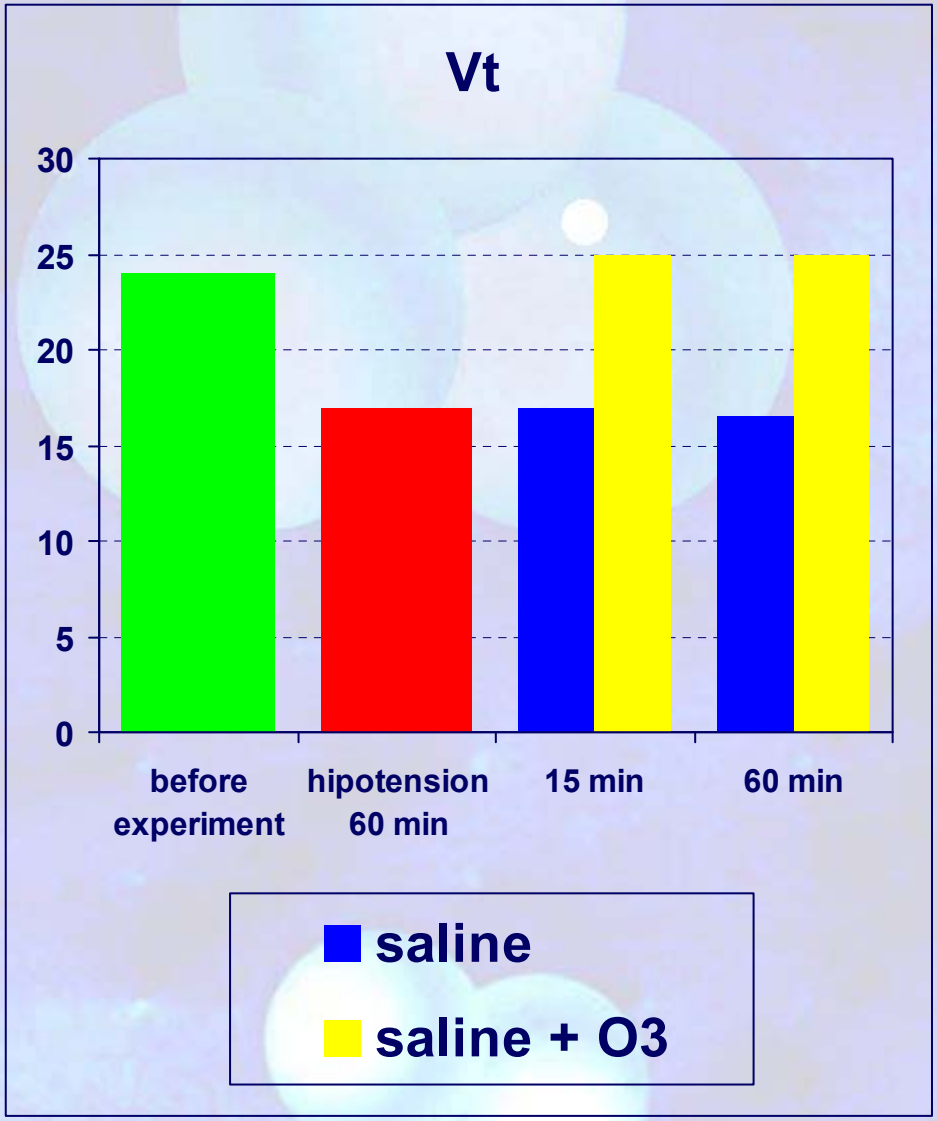


Changes of peripheral temperature in hemorrhagic shock modeling and its ozone therapy

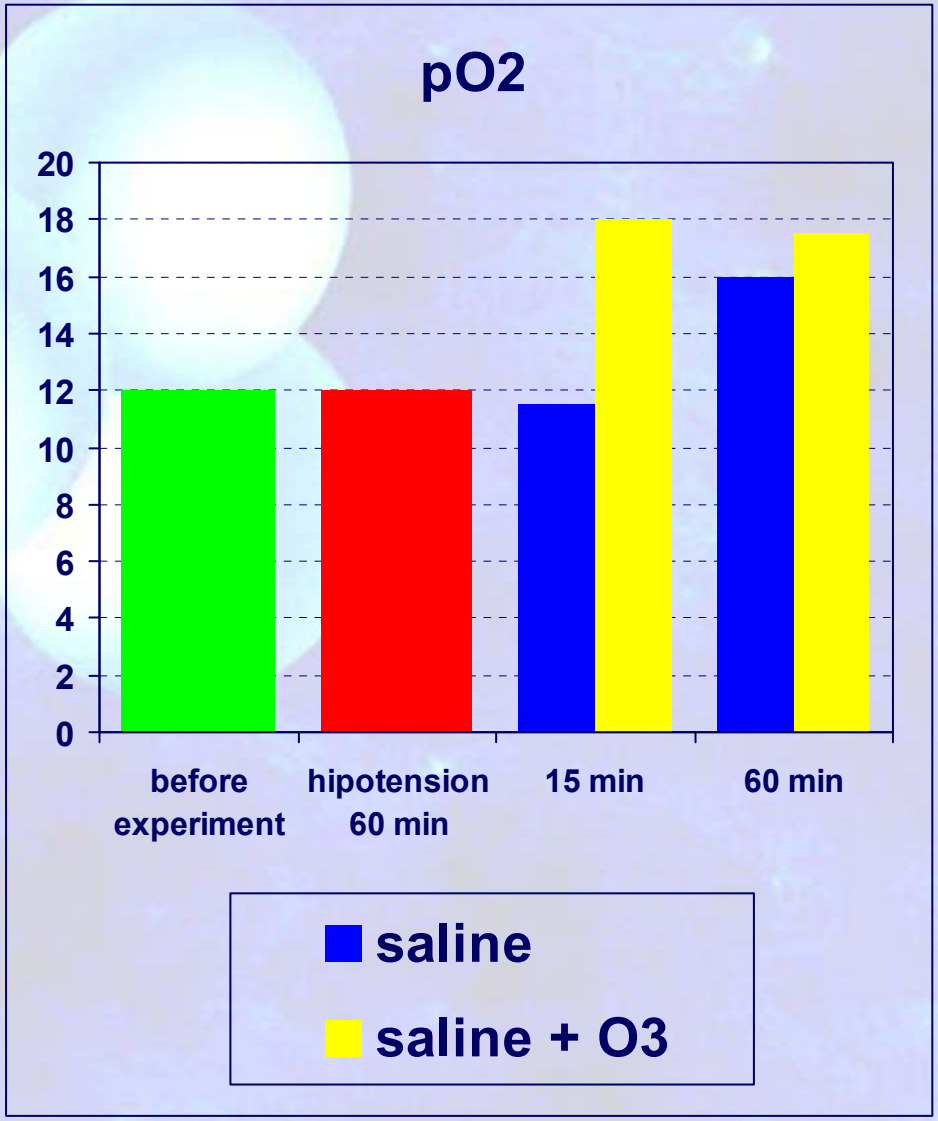


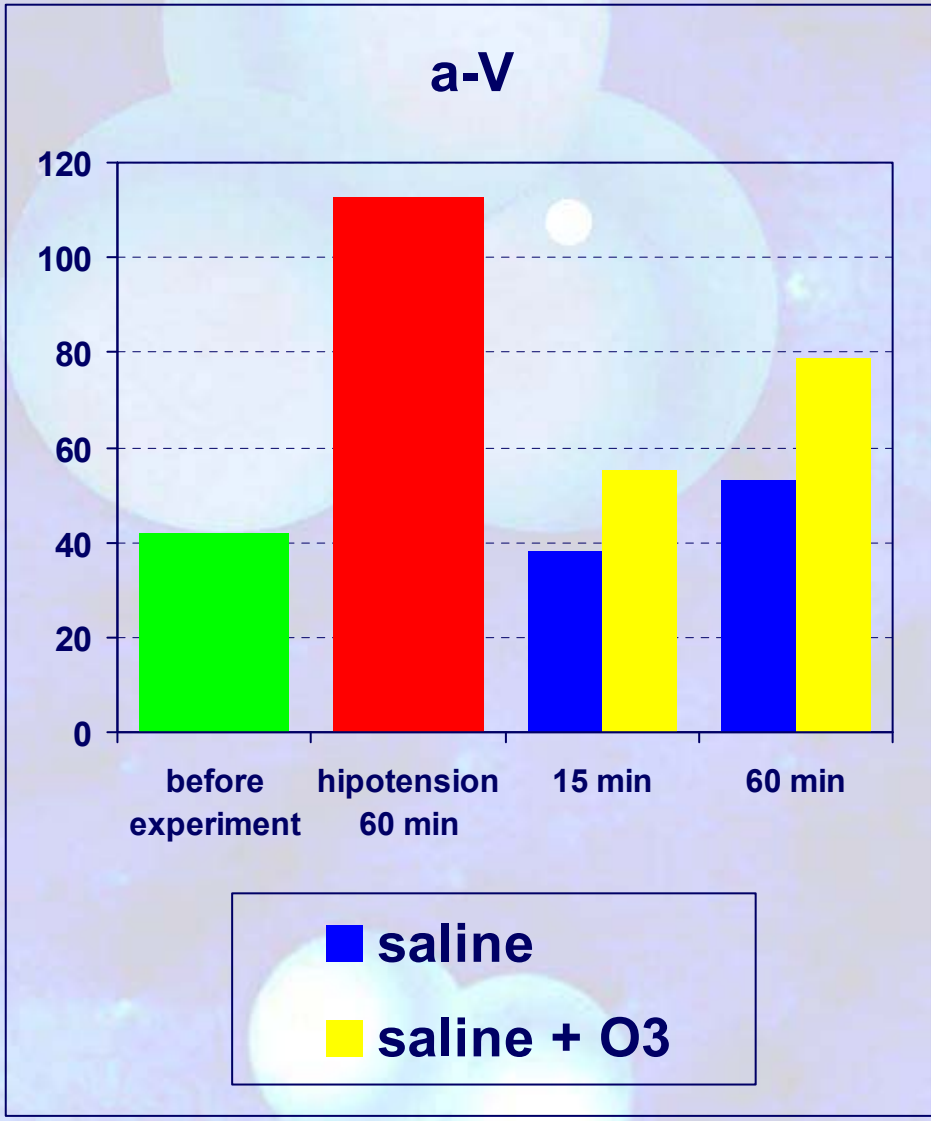
Function of external perspiration in hemorrhagic shock modeling and its ozone therapy



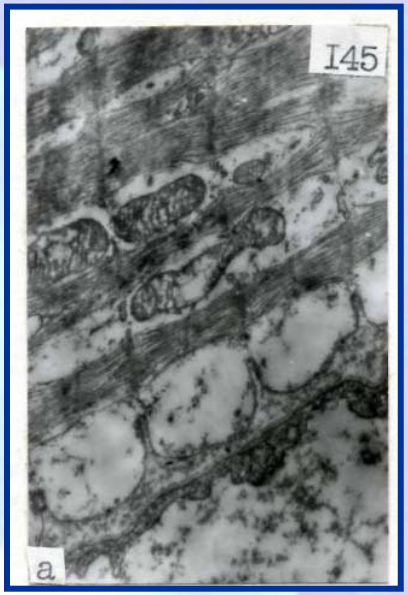


Gas-transport blood function in hemorrhagic shock modeling and its ozone therapy

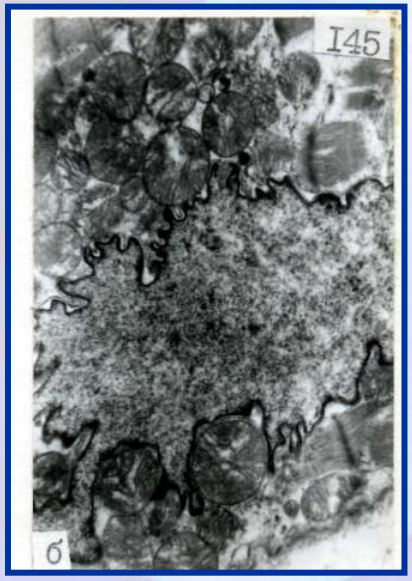




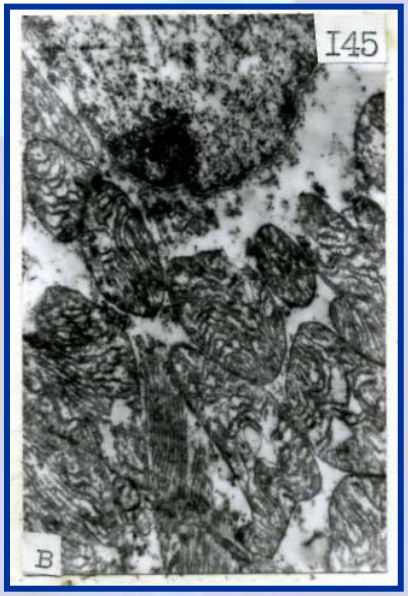
Myocardium ultrastructure on top of hemorrhagic shock (in dog model)



Diffuse cardiac hystiocyte edema, membranes arcual changes



Mitochondrial swelling, matrix enlightenment and mitochondrial crista disorientation

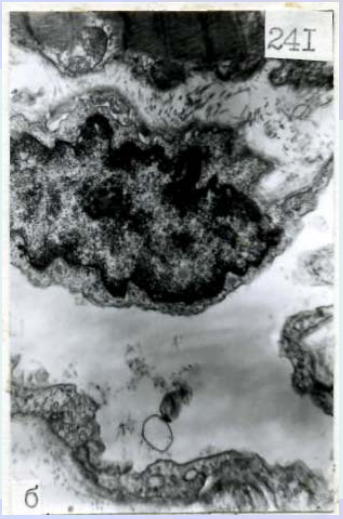


Cell nucleus with chromatin even distribution and plicate surface

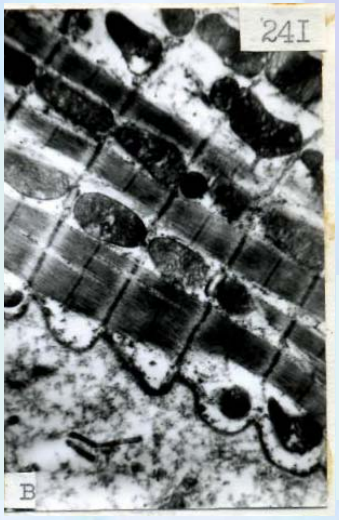
Myelin-like structures

Myocardium ultrastructure in post hemorrhagic period after infusion therapy (in dog model)

Plasmatic capillary with large aperture, nucleus with small karyolemma invagination



Deserted capillary. Endotheliocyte nucleus with compact chromatin and plicate surface



Intracellular and extracellular edema

Nucleus fragmentation

Mitochondria heterogeneity

Sarcoplasmic reticulum broadening

Myocardium ultrastructure after ozoized saline infusion and blood ozonization in posthemorrhagic period (in dog model)

Wide capillary apertures with erythrocytes and plasma

Wide capillary apertures with erythrocytes and plasma

nucleus with nucleolus and little folding

giant mitochondria

Mitochondria heterogeneity, matrix enlightenment

Mitochondria heterogeneity, granules lessening

Clinical efficasy of ozonated saline infusions. Ozone as combine part of burn disease complex therapy

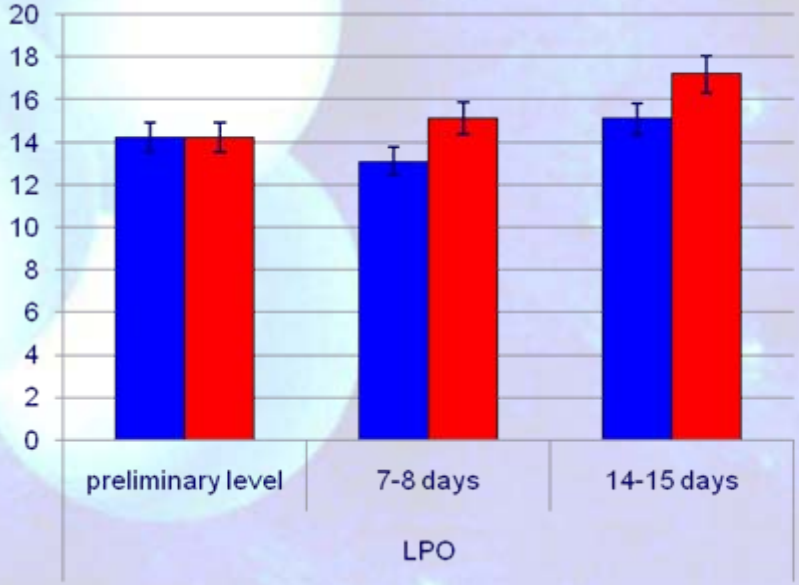
(Resourse-conservation technology, 2009)

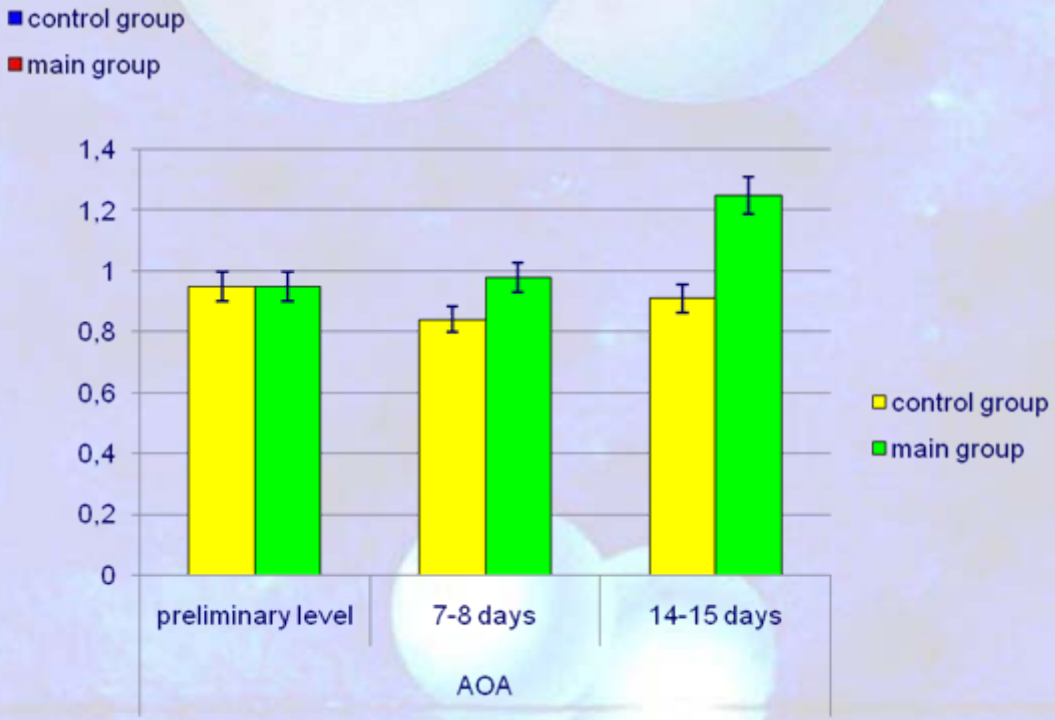
Autors:Traumatologist, M.D., M. Sc.Struchkov A.A., Therapeutist Artemieva S.V.

Method: during 2 weeks after trasportation from intensive therapy room 30 patients have been treated with standard complex infusion-transfusion and medication therapy (control), 29 patients at the same time (investigation) have been treated additionaly with **parenteral ozone therapy** as every days infusions of ozoized saline (120 -240 mkg.O_3), 2-3 every days Major AHT with O_3 (300 -500 mkg) under control of blood BCL. Together **daily dosages** of all basic drugs in standard medication schema was decreased on **30%.**

Decrement of drug capacity on phone of system ozone therapy
Results of investigations

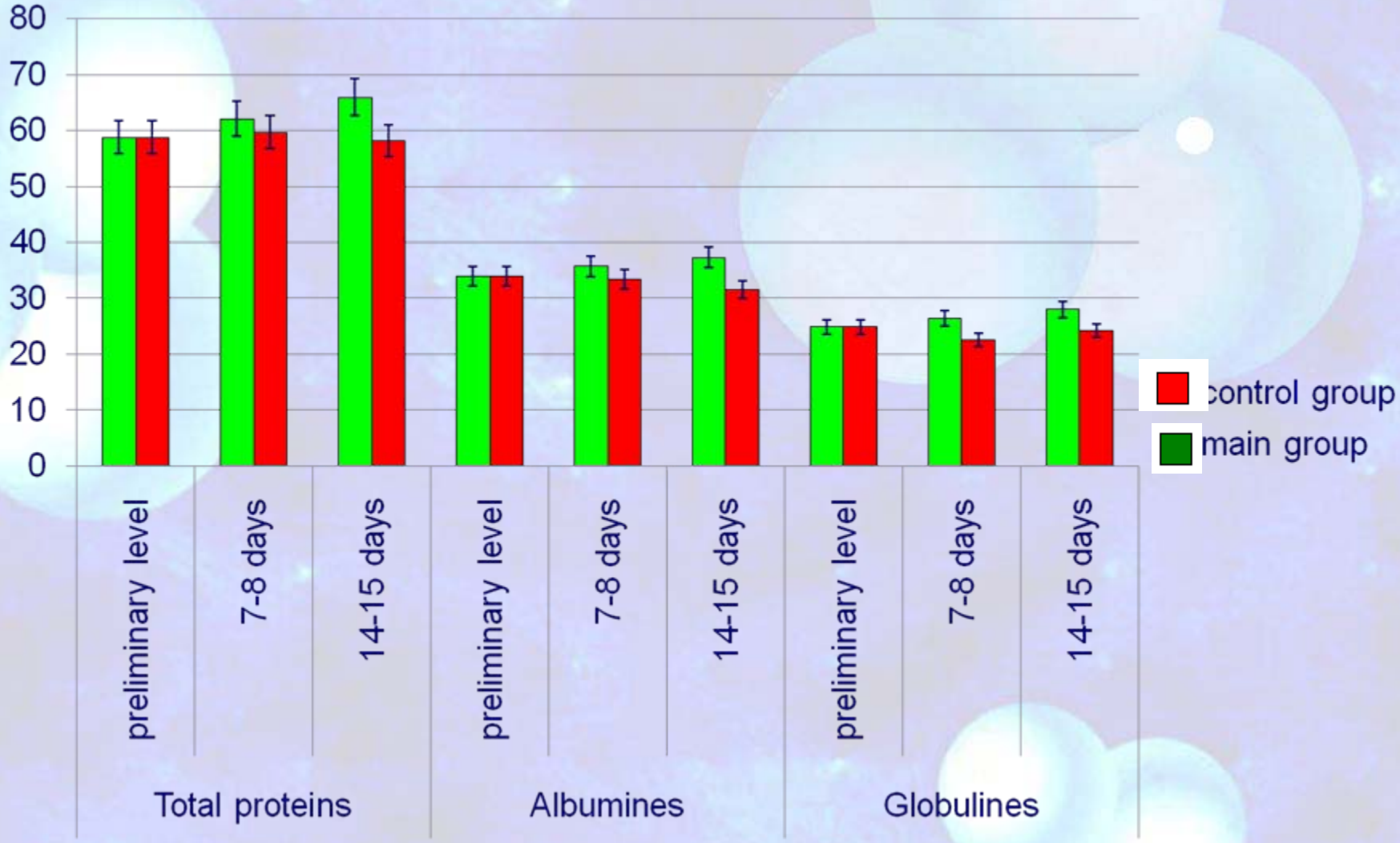
Condition of pro- and antioxidative potential on phone of systemic ozone using in complex therapy of severe burn patients





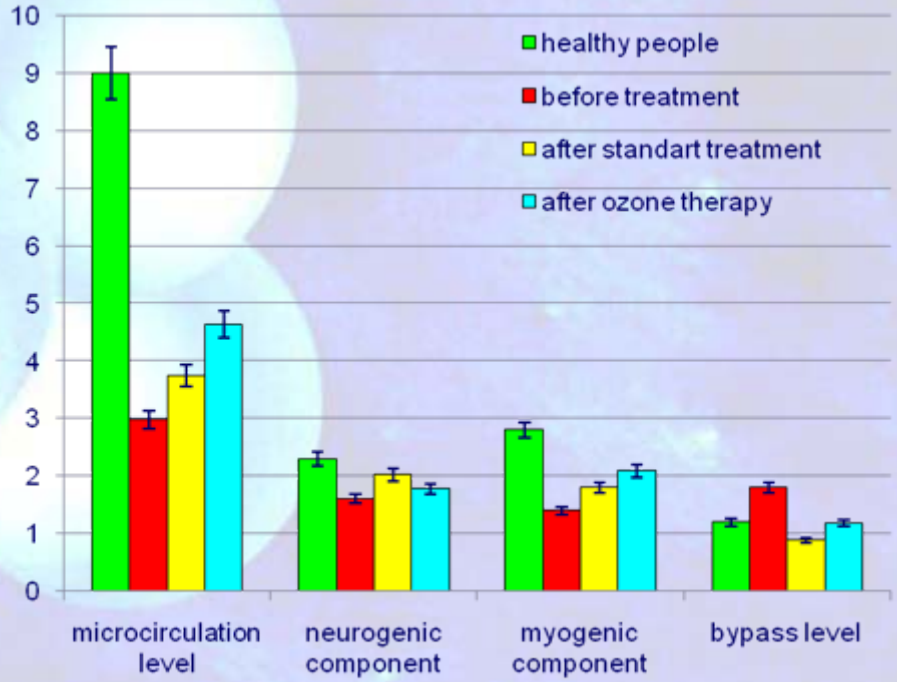
Decrement of drug capacity in systemic ozone therapy

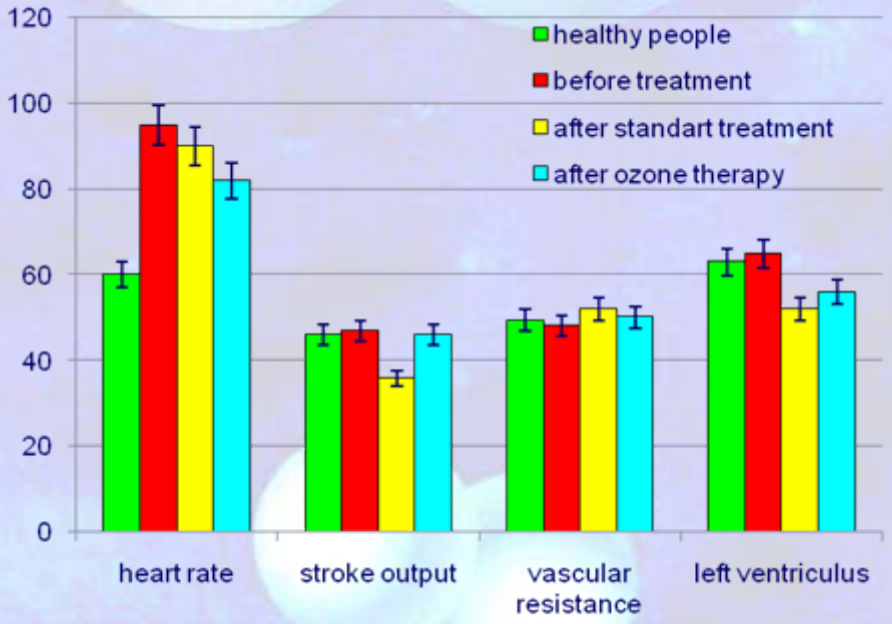
Results of investigations



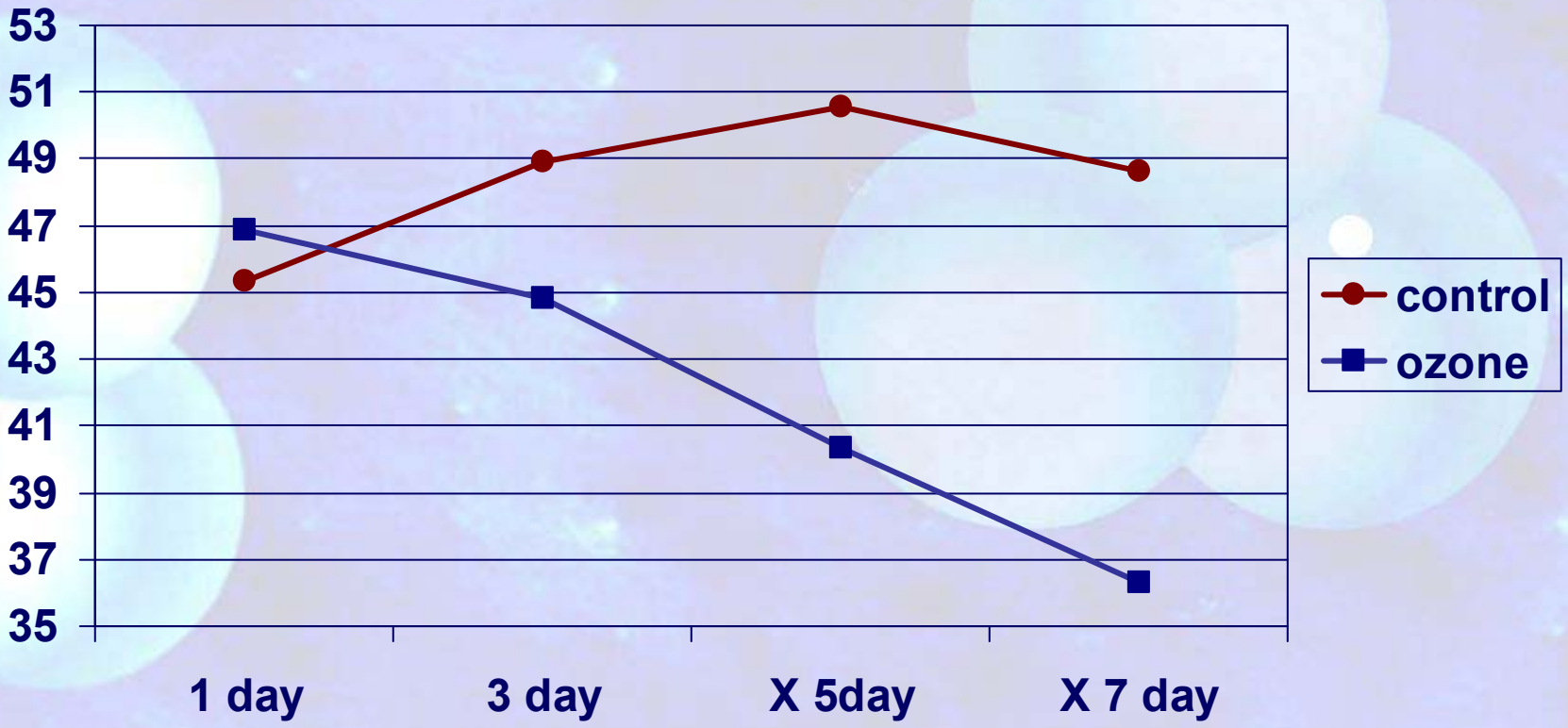
Decrement of drug capacity in systemic ozone therapy

data of systemic hemodynamic and microcirculation





Clinical efficasy of ozonized saline in patients with c cranial-cerebral trauma Detoxication ozone action (Prof. Boyarinov G.A. et al., 2007)



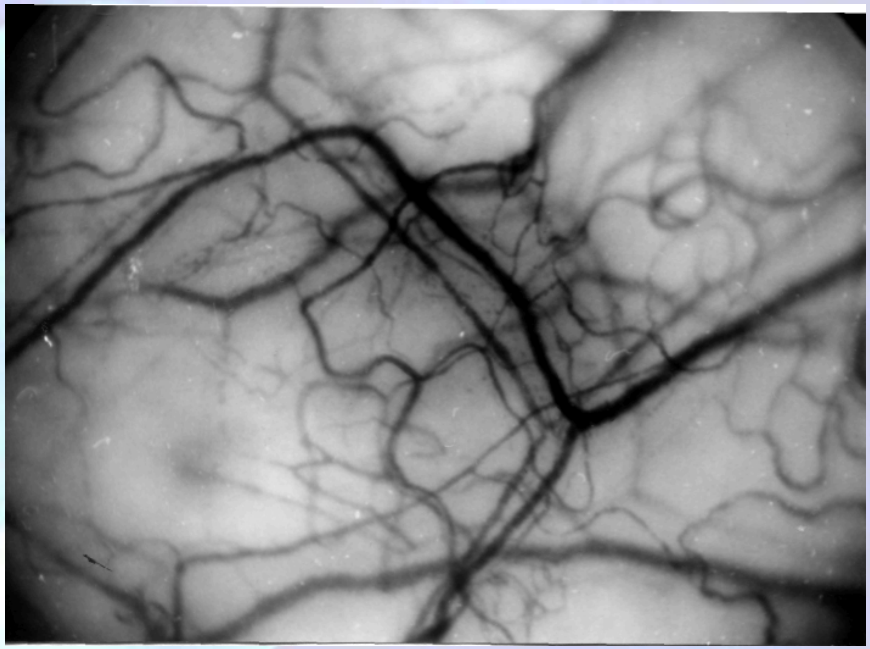
Dynamic of intermediate molecules in plasma of patients suffered from cranial-cerebral trauma during traditional therapy and using of ozonized saline - 2 mg/l O_3

200 ml of solution daily

Clinical efficassy of intravenous ozone saline infusions in patients suffured from NCD (Schigragimov V.A., 2009)

- Method of systemic ozone using concludes drip intravenous infusions of 200 ml of ozonized isotonic solution of NaCl. It was prepared in barbotage in standard glass bottle with ozone oxygen mixture (2,5-3,0 mg/l in gas phase) rendering through solution.
- Ozone concentration in fluid composes 0,45-0,6 мkg/ml. Ozone dosage in one procedure was 90-120 мkg.
- During course patient got 12-15 procedures.
- Total quantity of ozone during course of therapy composed as maximum 1080-1800 mkg.
- Investigation of eyeball microcirculation (biomicroscopy) and nail bed (capillaroscopia)

Conjunctiva vessels of eyeball and capyllary in nail bed of health person



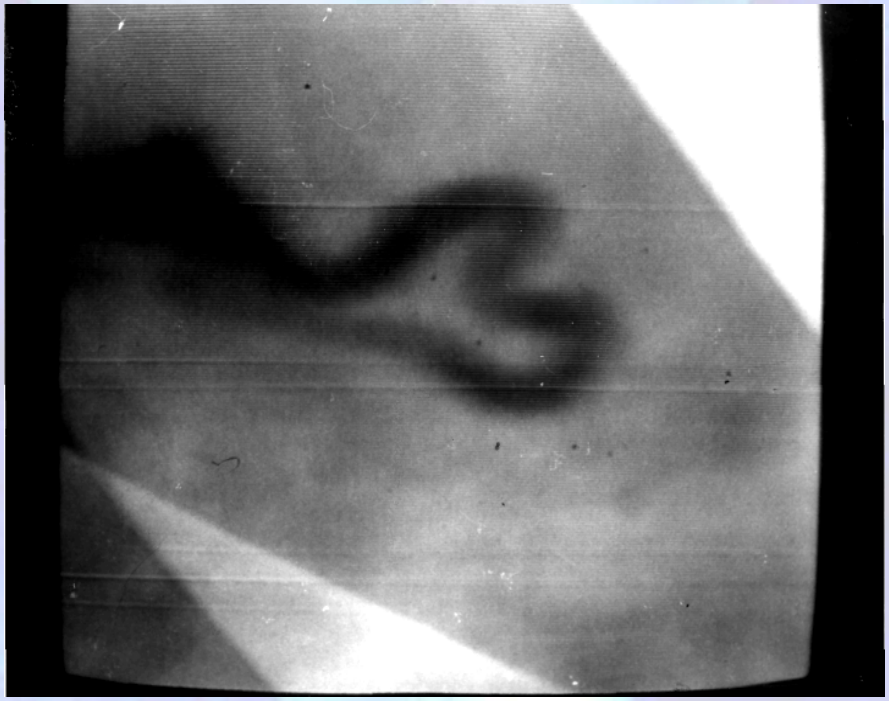
Perivascular changes practically absent, arteriolas and velulas are situated parallel.
Arteriolas are pink rosy color, with narrow diameter, quick blood flow.
Venulas are deep red color, with more large diameter (interrelation of diameters 1:2).
Blood flow in venulas is more slow and direct from small diameter to larch.
Capillaries are more pale, evenly state in field vision, blood flow in all vessels is often equable, some times impermanent aggregation of erythrocytes is possible.

On clear phone well-defined deep color capillary collars are determined. They are situated parallel lines. Configuration looks like “pin” with lead arterial vessel and retract venous vessel. Arterial vessel is more narrow and short. May be waviness of venous vessel.

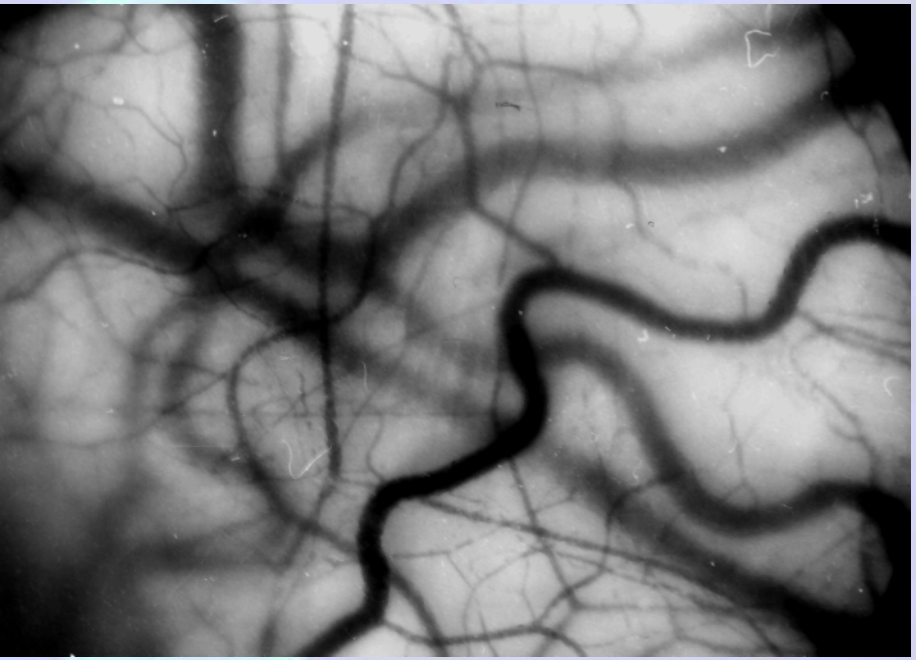
Conjunctiva of eyeball vessels and nail bed vessels in NCD venous hypertension

Capillaroscopy –diffuse perivascular oedema. High sinuosity in combination with fragment dilatation of venulas is morphological sign of pathological venulas blood flow. Arteriolas and venulas continue parallel direction. Arteriola-venula koefficient decreased due dilatation of venulas. Enlargement and high blood filling of postcapillaries, kapillaroaggregations of erytrocytes).

Area of capillaries is enlarged.
Diameter of arteriolas and venulas increased.
Arteriola-venula coefficient decreased.

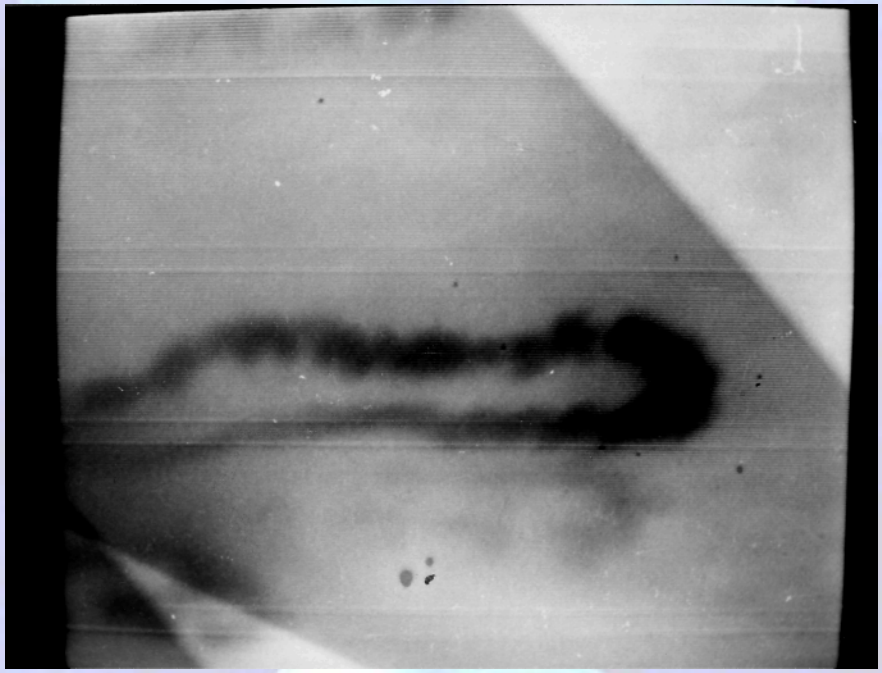


Eyeball conjunctiva vessels and nail bed capillaries
in NCD venous hypertension after ozone



Biomicroscopy – capillaries are showed, rule shape as a “pin”, aneurismas of intermediate zone, blood flow is quick.

Biomicroscopy phone is clear, perivascular oedema is not significant, vena sinuosity is small. Arteriola-venula coefficient 1:4. Capillary net in all field vision. Blood flow is enough significant.



Gracias por suyo atencion