Ozone treatment of microcirculation and peripheral circulation disorders in neurocirculatory dystonya

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Topicality

Topicality of of restorative therapy problem of patients suffered from neurocirculatory dystonia (NCD) has determined of its high prevalence, social and economic importance, increasing risk of cardio-vascular diseases (Трошин В.Д., 2004).

In structure of cardio-vascular diseases functional disturbances occur in 3 time more frequently than organic pathology, especially in young and intermediate ages. Such pathology composes 32-50 % of all cardiologic patients (Абакумов С.А., 1996, 1997, 2003; Маколкин В.И., 2000-2004; Аникин В.В., 2001; Сидоренко Г.И., 2003; Окороков А.Н., 2003; Стрижаков Л.А., 2004).

Aim of investigation – to explore capacity of microcirculation disorders correction in neurocirculatory dystonia with intravenous infusion of ozone saline.

Goals

1. Research of microcirculation condition features and reological blood characteristics, systemic and central hemodynamics in different forms of neurocirculatory dystonia.
2. Estimate of ozone saline using efficacy in neurocirculatory dystonia in comparison with trental on the ground of microcirculation parameters and reological characteristics study, research of systemic hemodynamics and peripheral circulation of blood.

Clinical material:

Patients suffered from neurocirculatory dystonia with different clinical symptoms had been included in research:

NCD with hyperkinetic syndrome 23 (standard treatment)

NCD with c resistive syndrome 25 (standard treatment)

NCD with neurocardial syndrome 25 (standard treatment)

NCD with myocardial syndrome 25 – trental treatment and 26 – ozone treatment

NCD with venous hypertension 27-trental treatment, 25 ozone treatment

All: 176 patients with NCD

Methods of investigations

- Estimation methods of systemic and regional hemodynamics
  - САД, ЧСС, МОС, УОС.
  - Dimension of venous pressure.
- Methods of microcirculation estimation
  - Biomicroscopy of eyeball conjunctiva vessels with microphoto
  - TV capillaroscopy of paronychium area
  - Нефелография
  - Radioisotope indication of peripheral muscular blood flow with Xe133 (В.В. Боголюбова method)
- Methods of reologic blood characteristic
  - Viscozimetria
  - Erythrocyte deformability
  - Hematocrit determination

Method **of systemic ozone using concludes drip intravenous infusions of 200 ml of ozonized isotonic solution of Na Cl. 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 мсg/ml. Ozone dosage in one procedure was 90-120 мсg.

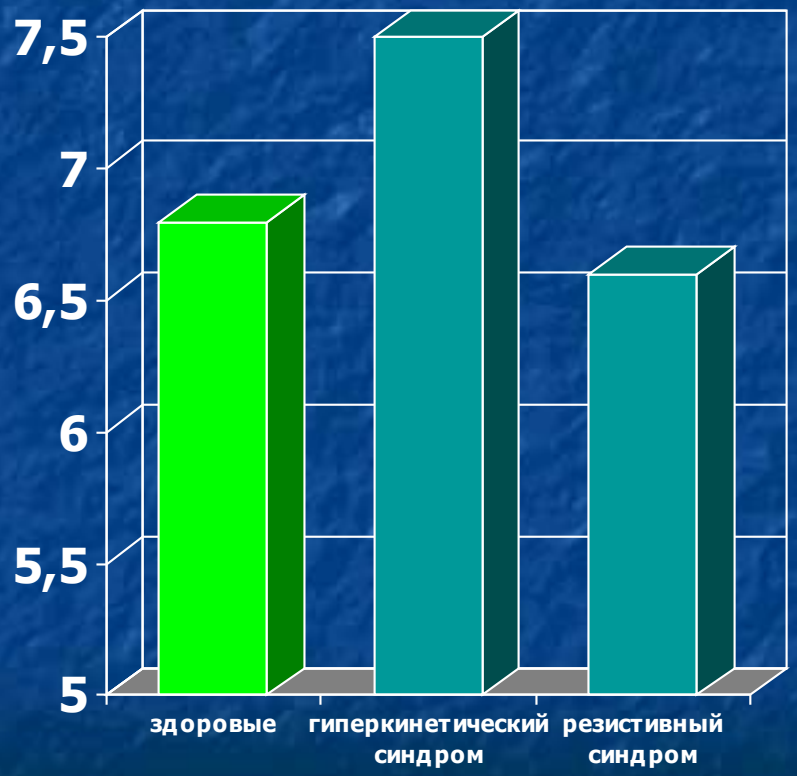
During course patient got 12-15 procedures.

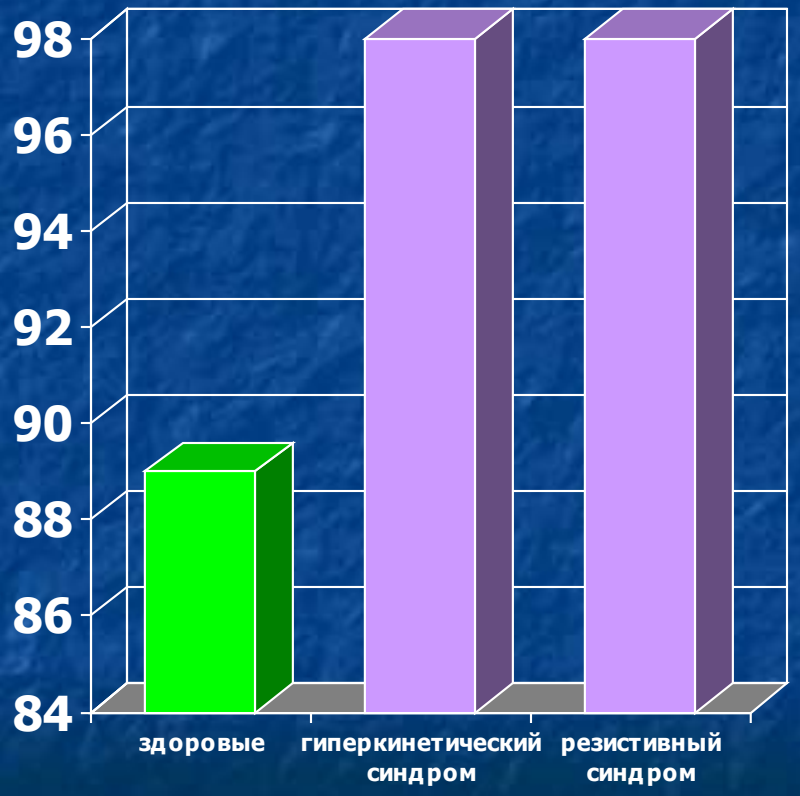
Total quantity of ozone during course of therapy composed as maximum 1080-1800 мкг.

Tsechnic and methods of intravenous ozone therapy are allow to appliance – new medical technology «Application of oxygen-ozone mixtures in traumatology» № ФС -2007/029-У 28.02.2007г.

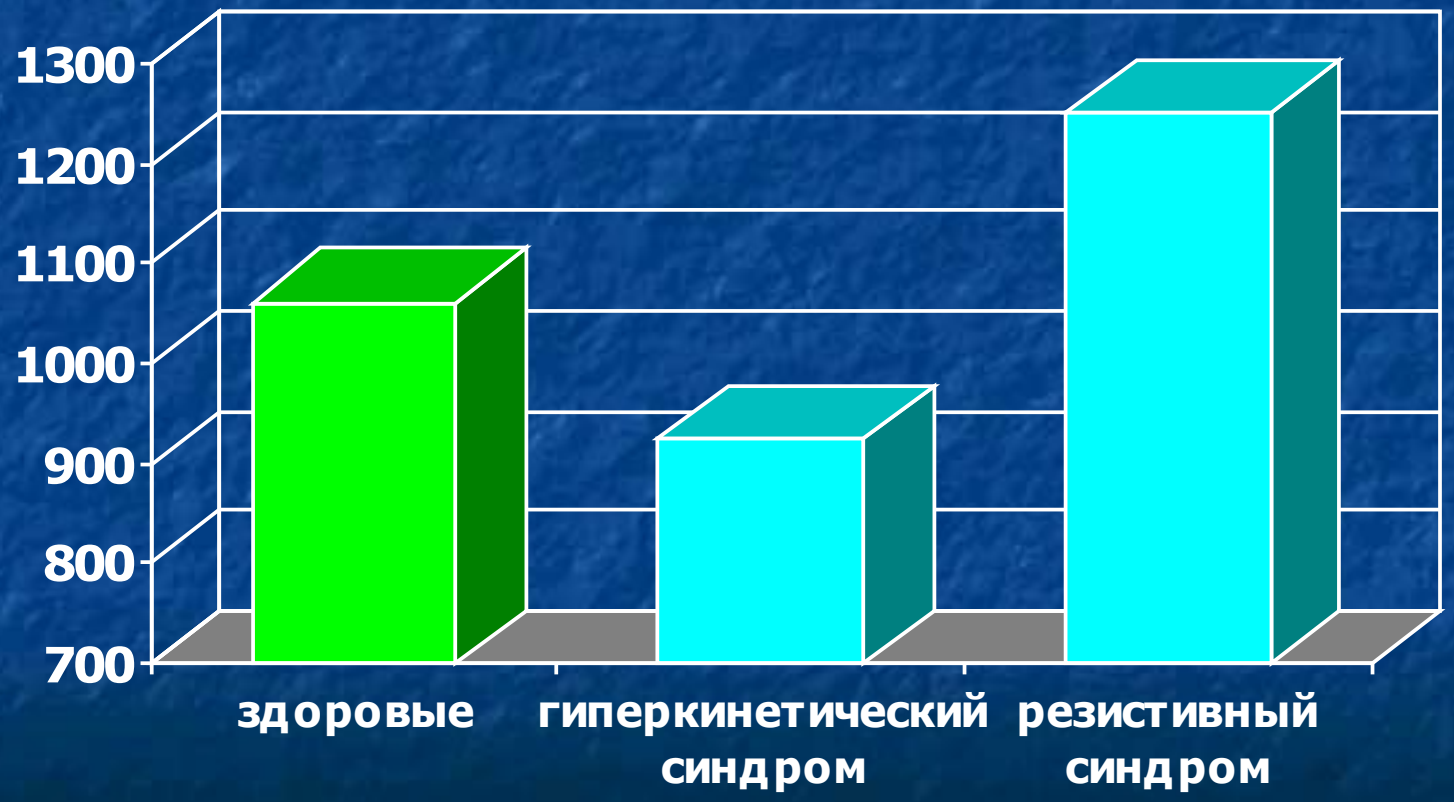
- Results of investigations shower that development of basic variants of cardiac-vascular pathology (arterial hypertension and ischemic disease) covered from functional changes to clinical form in two ways:
- In some patients – for account of cardiac hyperdynamics (hyperkinetic syndrome), in others – for account of peripheral vessels resistance increasing (resistive syndrome)
- In first case - enlargement of minute and percussion cardiac volume on phone of relatively discount or unconverted total peripheral vessel resistance.
- In second case – increasing of percussion volume with unconverted cardiac minute volume on phone of increasing TPVR.

Central hemodynamic in hyperkinetic syndrome and resistive syndrome characterized increasing MV and УО



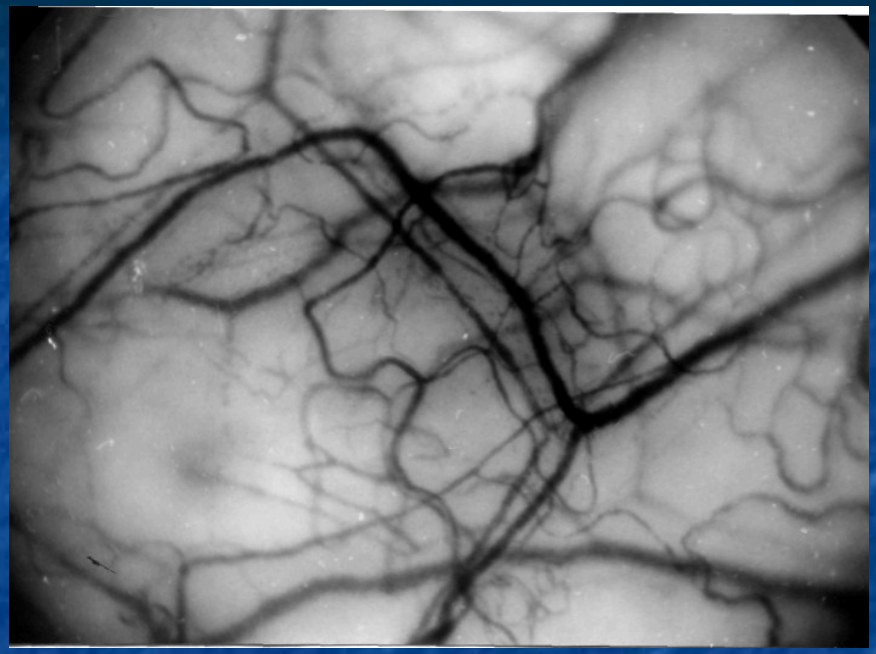


Total peripheral vessels resistance in hyperkinetic and resistive syndromes



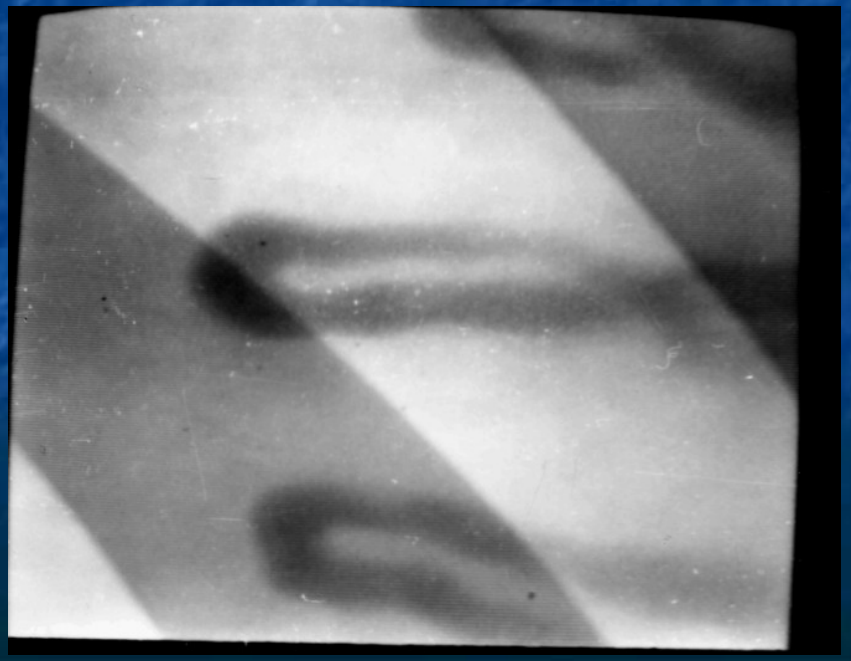
- Microcirculatory changes in considered variants of NCD were the following:
- In practically health persons perivascular chances are absent, arteriols and venuls are deep red color, relationships of their diameters 1 : 2
- Nail bed capillaries are precise as pin.

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

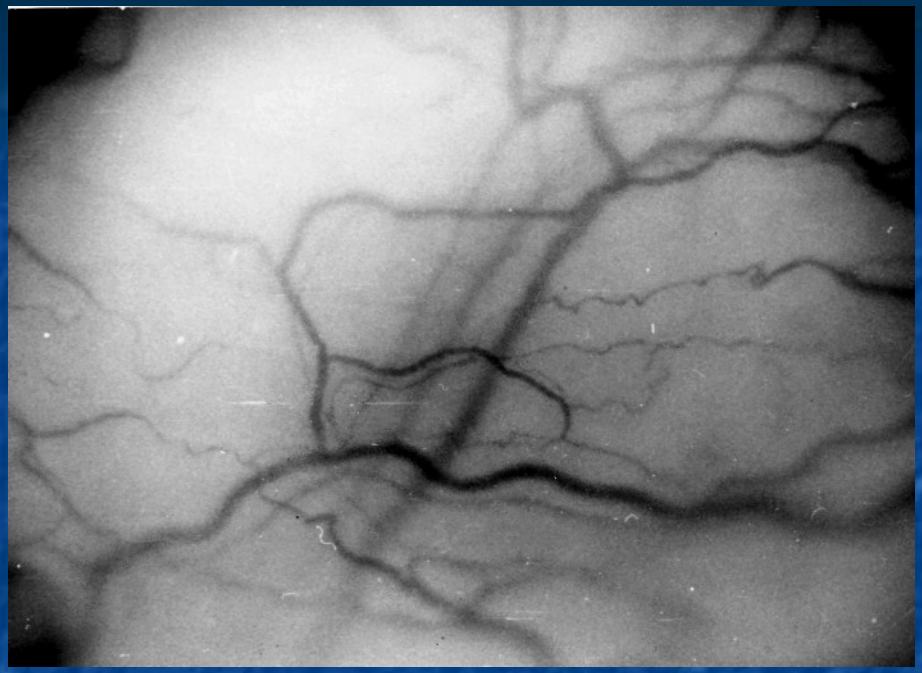


Perivascular changes practically absent, arteriolas and velulas are situated parallel. Arteriolas are pink rosy color, with narrow diameter, quick blood flow. Venulas are deep red color, with more large diameter (interrelation of diameters 1:2). Blood flow in venulas is more slow and direct from small 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 eyeball vessels and nail bed capillaries in patients suffered from NCD, hyperkynetic syndrome.



Initial morphological changes of microvessels. Capillaroscopy – perivascular oedema, locci character, arteriolas and venuls preserve parallel direction, in some venuls – moderate significant sinuosity and irregular caliber. Blood flow is even, quick, with reversible single aggregation of erythrocytes in postcapillary venulas and capillaries.

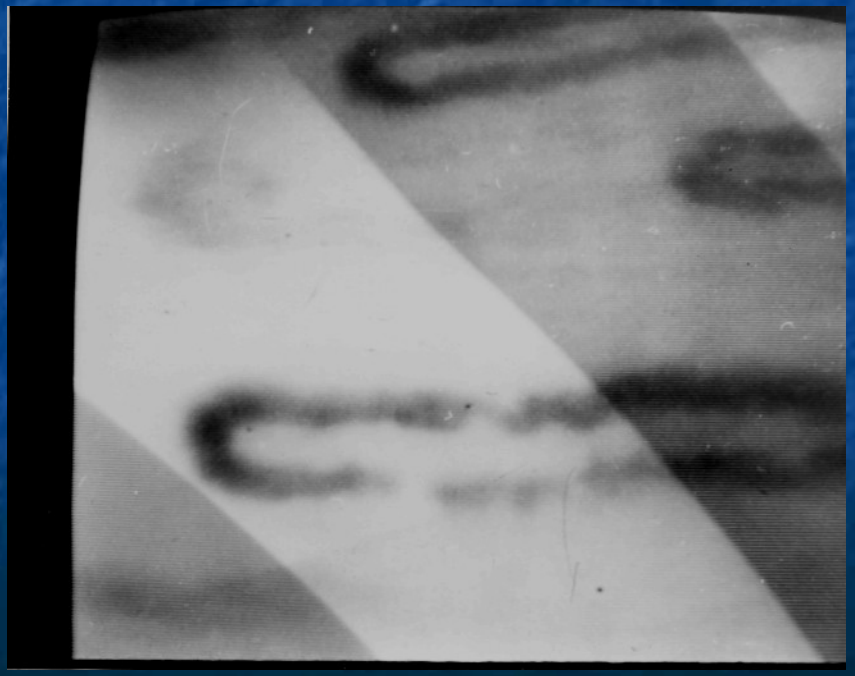
Diameter of arteriolas and venulas is enlarge. Distance between capillary walls is not changed.

- In hyperkinetic syndrome basic microcirculation phenomenon was perivascular oedema with enlargement of perivascular index, increasing of distance between branches of capillary, increasing time of recovery capillary blood flow. Parallel direction of arteriolas and venulas continues. Irregular caliber, moderate waviness, blood flow is quick and even.

Сосуды кConjunctiva eyeball vessels, nail bed vessels in paraungual area in NCD, resistive syndrome.

Bulboconjunctiva microcirculation characterized of feculent phone with perivacular diffuse oedema. Moderate sinuosity of venuls and irregular caliber. Increasing perivascular microcirculation index. Relationship of arteriols and venuls is decreased. l

Feculent phone, enlargement of distance between capillary branches. Constriction of capillaries, often reduction, arteriolas spasm.



- In resistive variant – increment of perivacular oedema; distance between branches enlargement, their reduction; arteriolas ; increasing time of capillary blood flow and resorption time Xe133

Blood viscosity in different forms of NCD

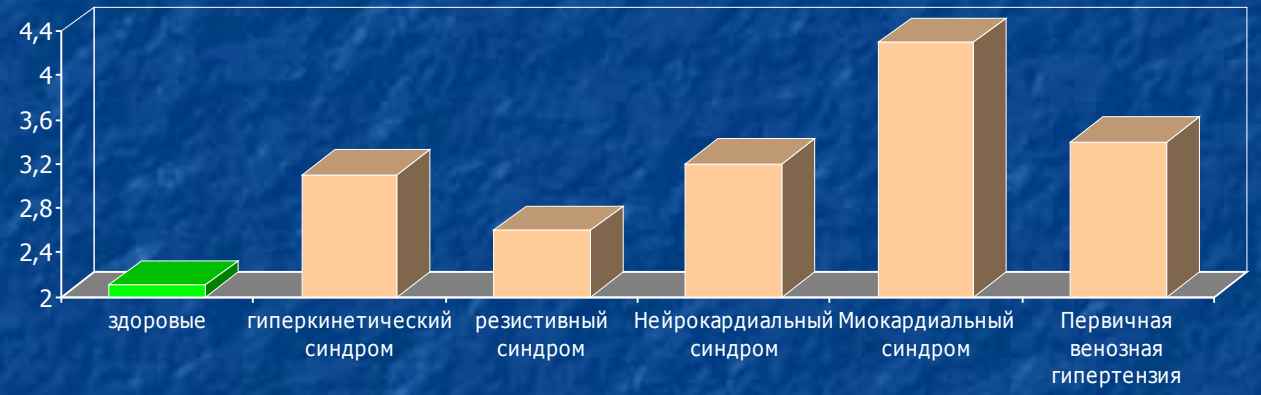
1 сек$^{-1}$

43 сек$^{-1}$

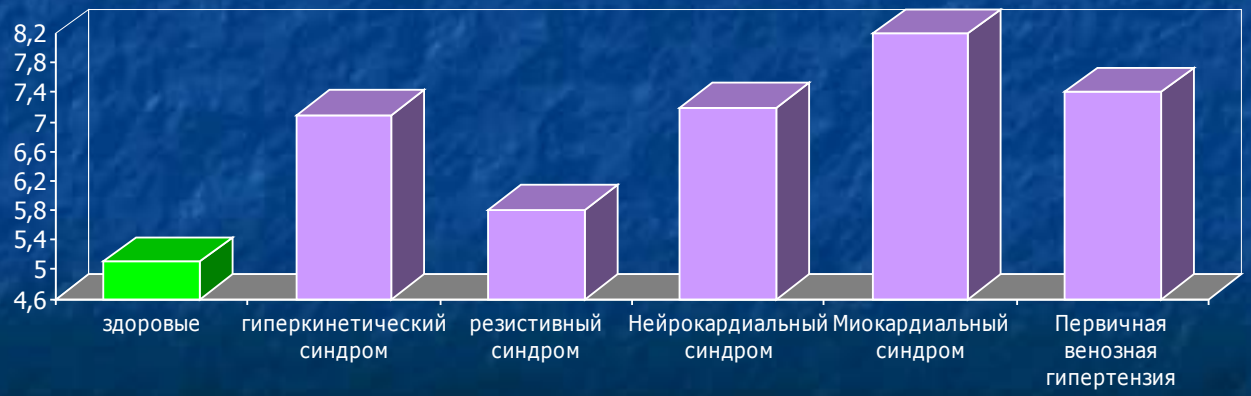
- Characteristic of reological disorders in all clinical initial disease forms was viscosity enlargement on small speed of faults of rotary viscosimeter (in small vessels system), especially in hyperkinetic syndrome. In large magistral vessels it was only in resistive syndrome. We also see increasing of deformability of erythrocytes, especially in miocardial syndrome.

ДErythrocytes deformability in patients with different forms of NCD

0,5 мл



1,0 мл

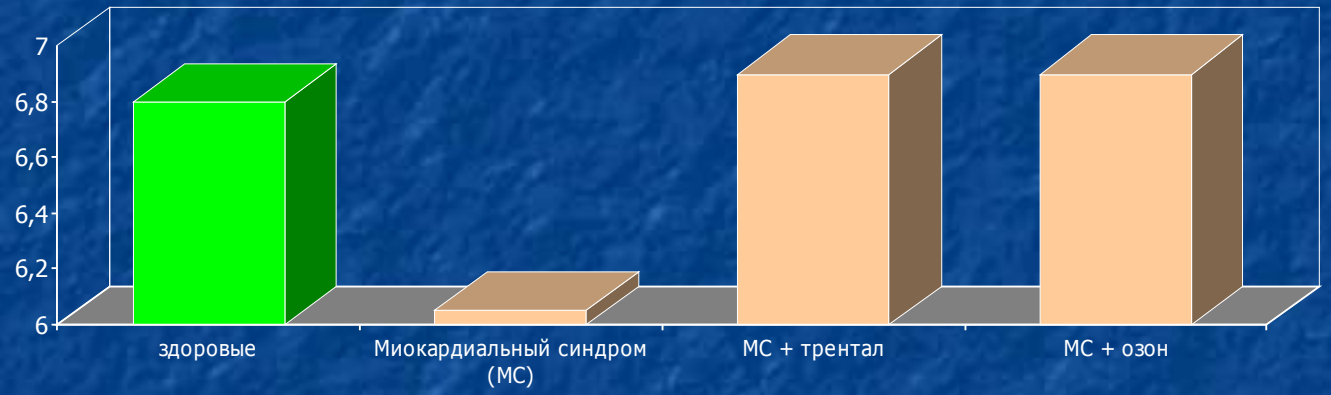


Eduction of microcirculation disorders in NCD and absence of success after previous traditional treatment allows us to add in therapy trental (preparation with positive reological action), also use ozone therapy as intravenous isotonic solution Na Cl.

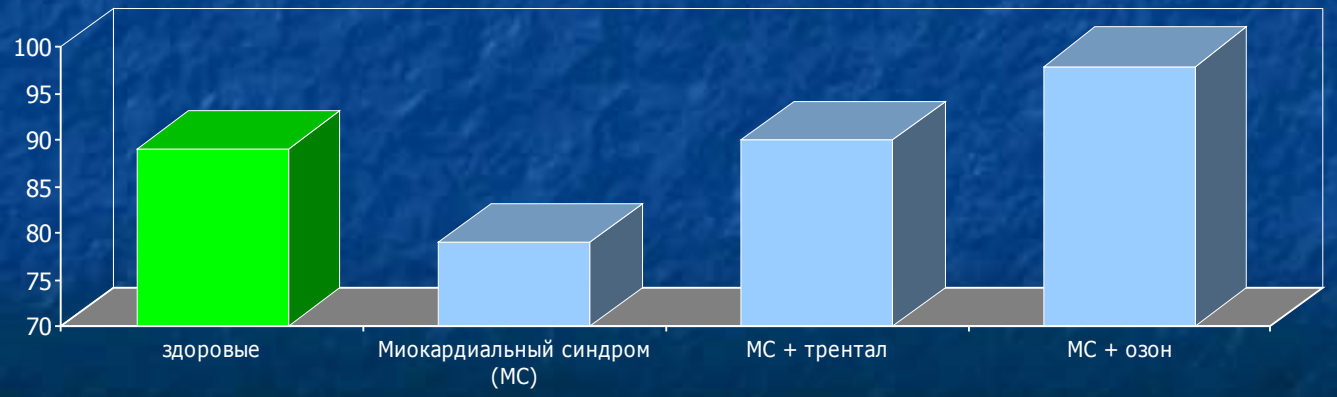
Analysis of data showed that trental using admit to receive significant positive result – clinical effect in 66 % of myocardial syndrome and in 81 % of primary venous hypertension combine with reliable improvement of blood flow. This fact confirms significance of microcirculation disorders in development of NCD and necessity of its correction.

Parameters of central hemodynamics in miocardial syndrome during trental treatment and ozone therapy

МОС, л/мин

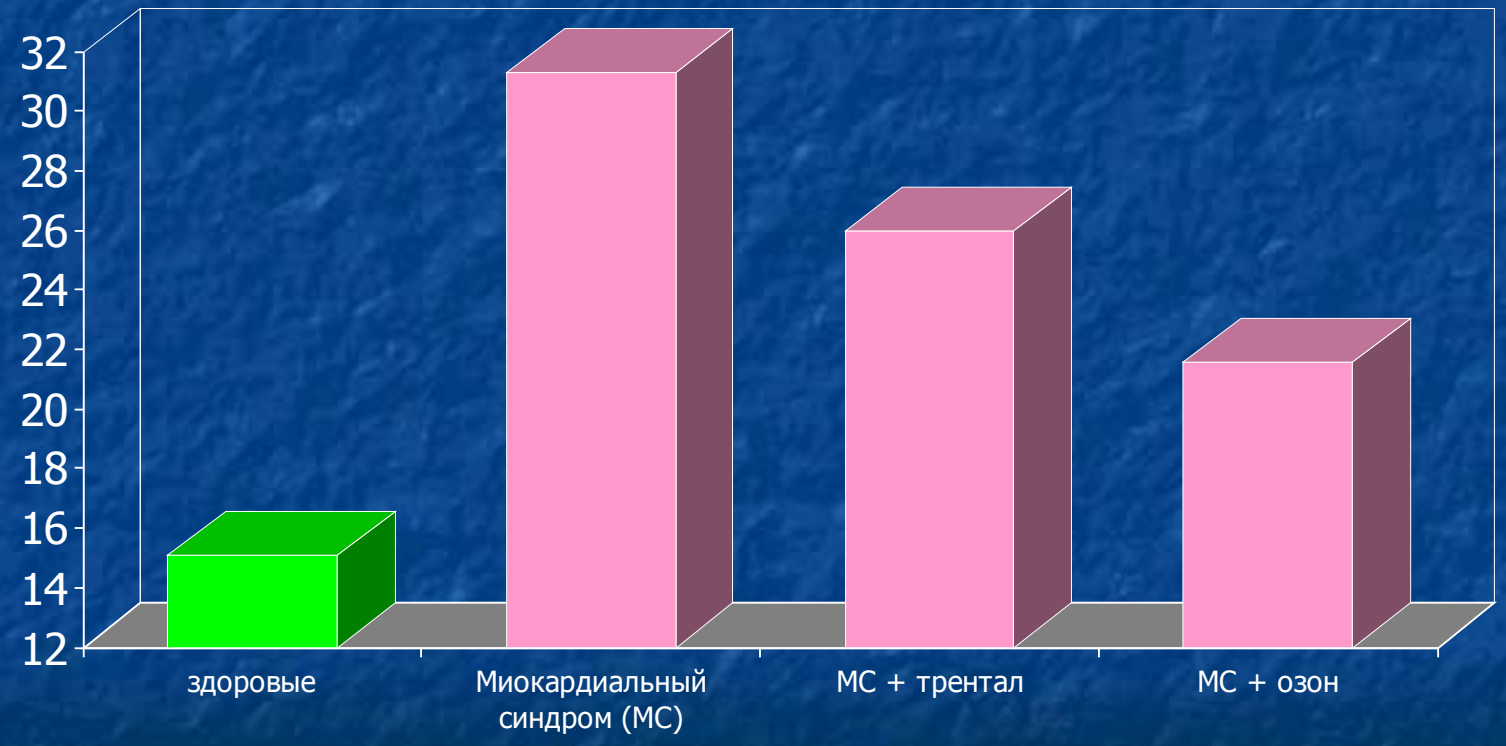


УО, мл/мин



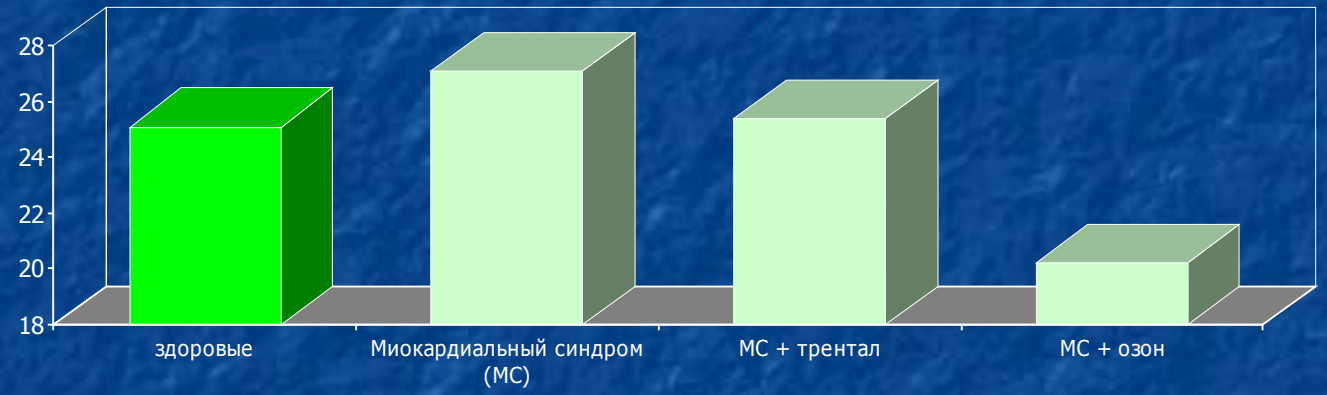
- Main differential sign of hemodinamics action of both drugs was optimization of central hemodynamics parameters – reconstraction of minute and percussion cardial volume. Percussion volume increases more intensively on ozone therapy phone, accordingly myocardial contractile ability was higher in ozone therapy.

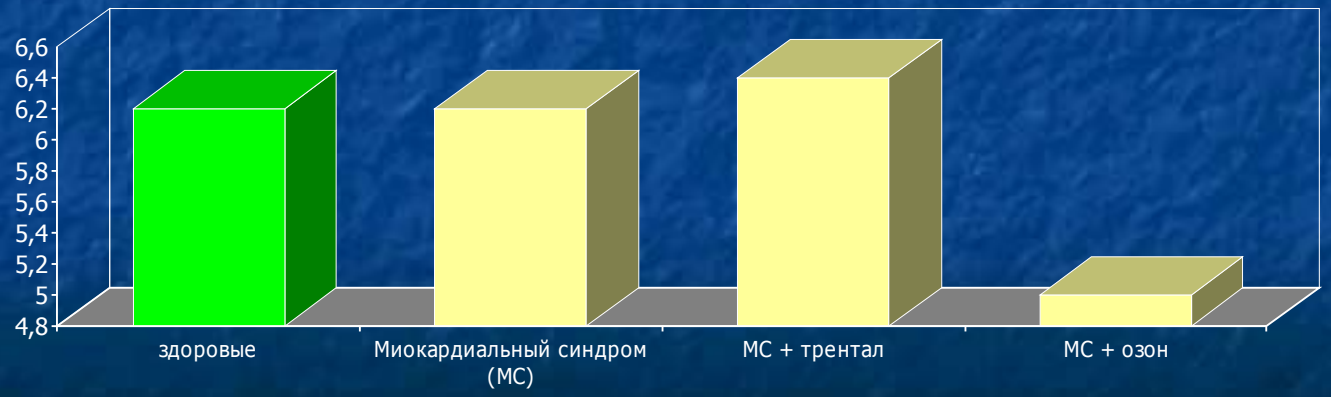
Microcirculation parameters in patients suffered from miocardial syndrome during trental therapy and ozone treatment



- More quick continuation of microcirculation (microcirculation index restores more quick)

Reological signs in patients with miocardial syndrome during trental and ozone treatment





- Reological characteristics during trental and ozone therapy of patients with NCD also demonstrated advantages of parenteral ozone therapy with blood viscidity parameters determination.

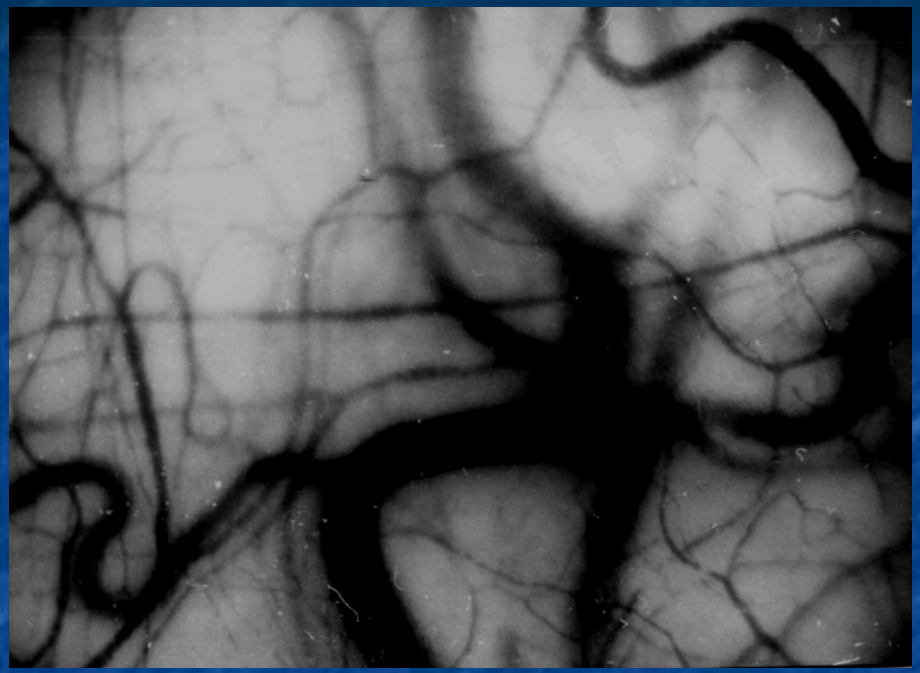
- More clear positive influence of ozone therapy was in treatment of NCD with venous hypertension syndrome.
- Before therapy capillaroscopy educed diffuse perivascular oedema, fragmentation dilatation of venous vessels. Sinuosity of venuls was very high. On nail bed area of capillaries was insreased. Arterola-venula coefficient was low, aneurismas of in-between zone.

осудConjunctiva of eyeball vessels and nail bed vessels in NCD venous hypertensio

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.

Сосуды кEyeball conjunctiva vessels and nail bed capillaries in eponichium area in NCD venous hypertension after trental

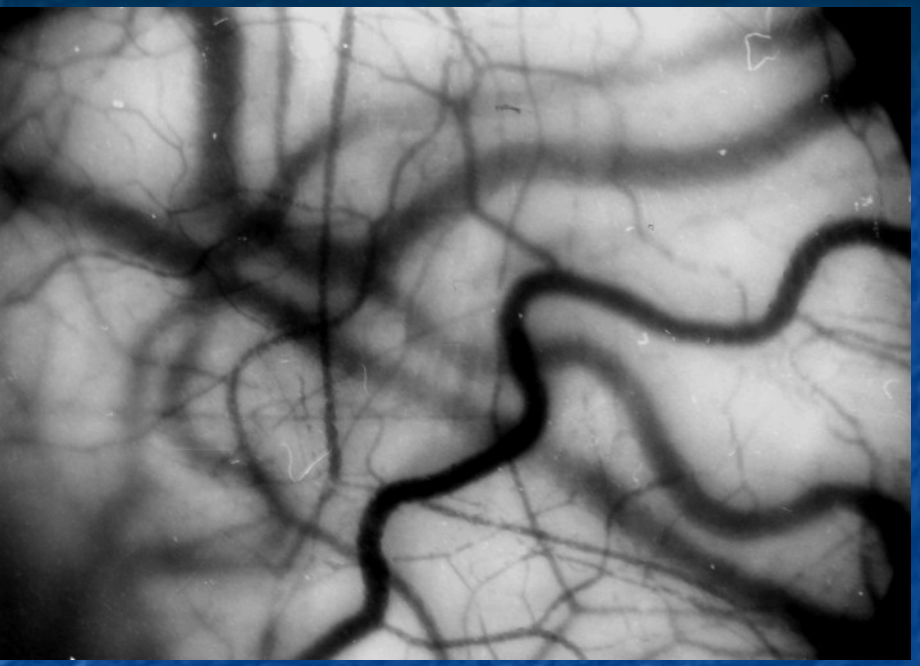


Biomicroscopy of vessels – moderate perivasulatopy oedema, venulas sinuosity, irregular caliber, arteriola-venula relationship is 1:3. Blood flow is slow. Aggregation – 1 st.

Feculent phone Capillaries look like “8”. Single aneurismas of in-between zone. Area of capillaries enlarged, blood flow is slow.

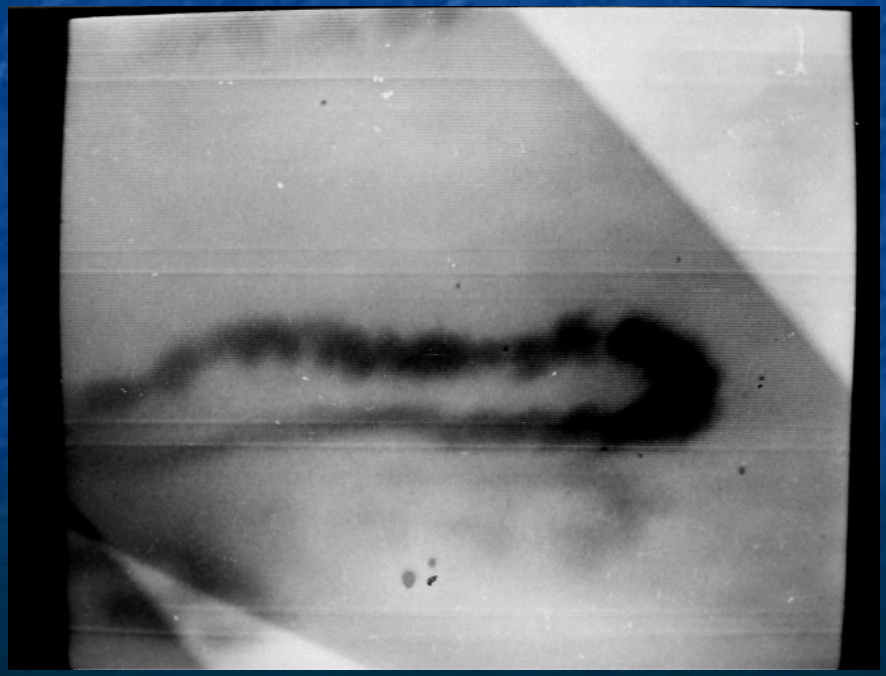
- Trental therapy aid to involution of that signs, but moderate perivascular oedema, sinuosity of venulas, slow blood flow, single aneurisma of intermediate zone are present. Курс лечения с тренталом способствовал инволюции этих изменений, однако сохранялся умеренно выраженный пеиваскулярный отёк, извитость венул, замедленный кровоток, единичные аневризмы переходной зоны.

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



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.

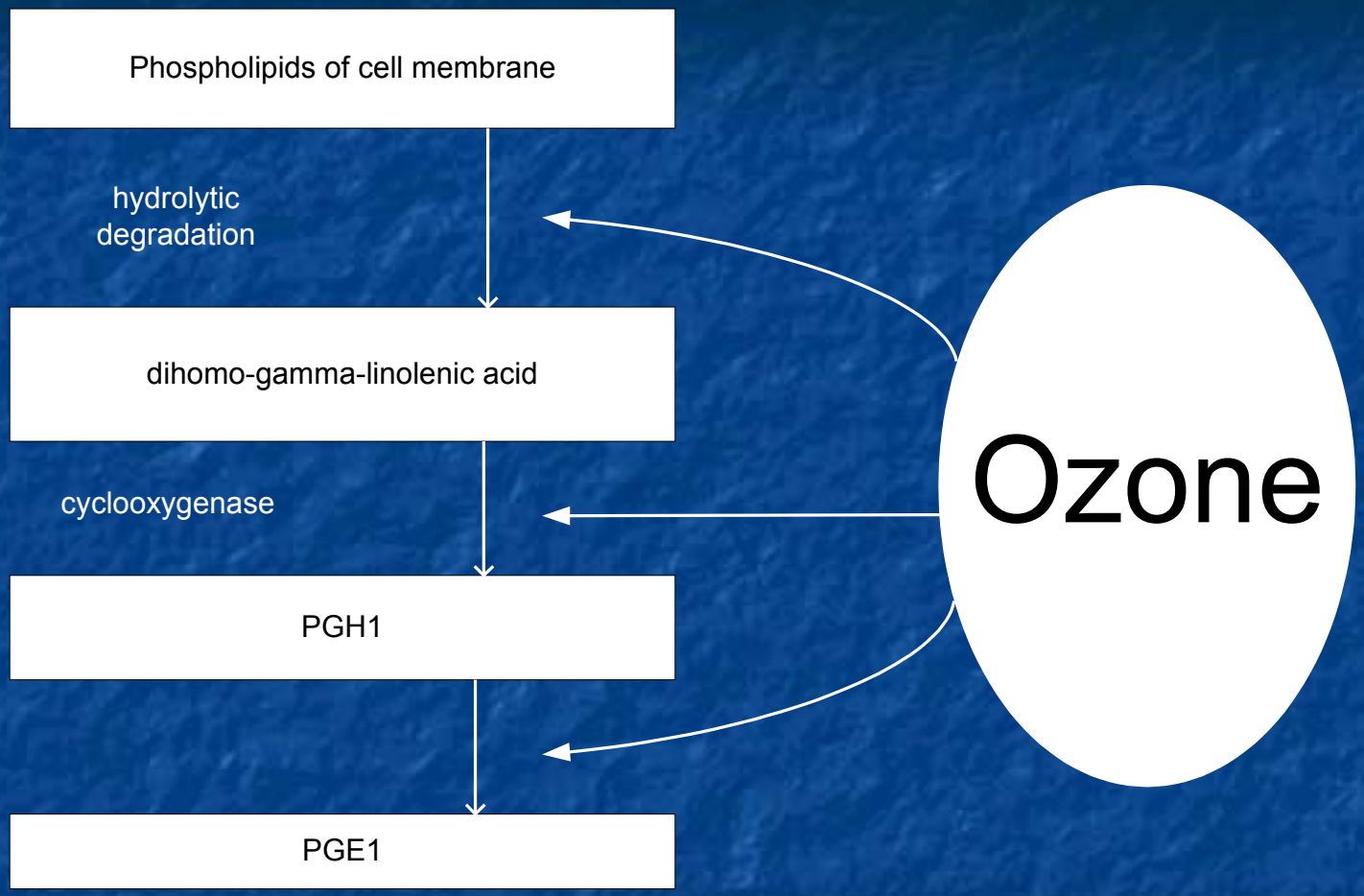
Biomicroscopy – capillaries are showed, rule shape as a "pin", aneurismas of intermediate zone, blood flow is quick.



- Ozone therapy using improves previously present microcirculation disorders:
- Perivascular oedema is not significant, capillary net has been look over all field vision, blood flow speed is enough high. On nail bed capillaries - as “pin” with rule shape, separate aneurismas are present in intermediate zone.

One of microcirculation optimization mechanism on ozone therapy phone

- In our research of spectrum of fat acid of plasma in ozone therapy(Перетягин С.П., Андреева Н.Н., Шихрагимов В.А. и др. 2001) we determined that blood ozonizing adduces to significant increasing of pool of saturated fat acids. We noted temporal enlargement of blood content of arachidonic and linolenic acids. Oxidative metabolite of that acids is prostaglandin E1. Accumulation on ozonolyse of FA 20:4 and 18:3 assumes following synthesis of PGE1 with cyclooxidation. Possible mechanism of such biological active substunces in organism present on this scheme with illustration of biosynthesis of PG.


Phospholipids of cell membrane
hydrolytic degradation
dihomo-gamma-linolenic acid
cyclooxygenase
PGH1
PGE1
Ozone

- Resume:
- Pathophysiological basement of progressive forms of cardiovascular dyscyrculation in NCD is alteration of microcirculation with lead to organic changes (sinuosity of vessels, irregular caliber, development of fusiform and saccular aneurismas, consistent arteriola spasms) and specific reological disfunction in hypertonic disease and ischemic disease – increasing blood tenacity for choice low grades) that make pathological process more severe.
- Intravenous infusions of ozonized physiological solution land to normalization of microcirculation parameters (increasing of muscles blood flow on 26 %, decreasing of total peripheral vessel resistancy on 15 %, microcirculation index – on 49-68 %), also capacity of cor work (enlargement of percussion cardial volume on 25 %).
- One of pathogenetic mechanism of parenteral ozone therapeutic action is modulation of prostaglandins extrication which aids to optimization of microcirculation part of cardiovascular system optimization.

Thank you for attention