

Rheohaemapheresis



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What is Rheology?



- ⌘ The Rheology examines the measuring and description of the fluidity of solid and fluid matters
- ⌘ Two basic qualities are distinguished:
 - elastic behaviour
 - viscous behaviour
- ⌘ How to measure the rheological behaviour in blood?

Rheology of blood is influenced by...



⌘ Hematocrit-erythrocytes

⌘ Viscosity of plasma-protein concentration,

in particular

- Fibrinogen

- α_2 -Macroglobulin

- Immunoglobulin

- LDL-Cholesterol

⌘ Diameter and nature of the vessels

Effects of lower blood viscosity are:



⌘ Hagen-Poiseuilles law: blood flow and viscosity are inversely proportional

⌘ But we have shear thinning

⌘ Increase of the cardiac output

-> The organ perfusion is ameliorated and with it the oxygenation of the tissue

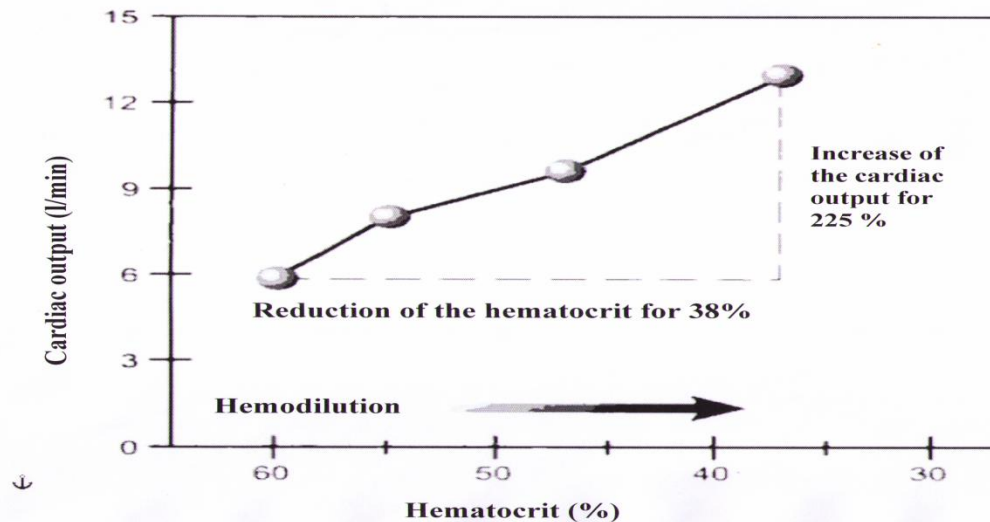
How to enhance the blood fluidity?



- ⌘ Bloodletting - reduction of erythrocytes
- ⌘ Infusion therapy, f. e. by HES
- ⌘ Reduction of high molecular plasma components by apheresis procedures

Hematocrit and viscosity

- ⌘ Decrease of hematocrit induces an increase of cardiac output



- ⌘ LeVeen et al. Lowering blood viscosity to overcome vascular resistance, Surg Gynecol Obstet 1980; 150; 139

Indications for the Rheohemapheresis



- ⌘ Age-Related Macula Degeneration (AMD)
- ⌘ Idiopathic Sudden Hearing Loss (ISHL)
- ⌘ Central Retinal Vein Occlusion
- ⌘ Diabetic Perfusion Disorders:
 - Ischemic Diabetic Foot Syndrome
 - Diabetic Retinopathy
- ⌘ Other disorders of microcirculation
- ⌘ Hyperviscosity syndrome

AMD:



- ⌘ Etiology and pathogenesis are not clear
- ⌘ The leading cause of severe and irreversible vision loss in the western world among people older than 50 years
- ⌘ Disease of the retinal pigment epithelium and the Bruch`s membrane; chorioidal neovascularization
- ⌘ Dry and wet form
- ⌘ CFH, C3 and ARMS2 as risk loci for susceptibility

AMD Stages



1. Early AMD

No symptoms

Several small drusen

2. Intermediate AMD

Irritations in the center of vision

Many medium sized drusen

3. Advanced AMD

The blurred spot gets bigger

Several large drusen

AMD Treatment



AIM of the treatment
of the AMD is to stop or
to slow the progression
of this disease

AMD Treatment



- ⌘ Brunner et al. 2000
- ⌘ 40 patients, visual acuity measured by ETDRS-scale
- ⌘ 20 patients treated by cascade filtration with 5 treatments in 21 weeks
20 patients as controls
- ⌘ Treated patients: mean improvement of 1.8 lines after a single treatment, 1.6 lines after 21 weeks
Control group: deterioration of 0.6 lines

AMD Treatment



- ⌘ RheoNet-Registry analysis 2007
- ⌘ 7209 treatments in 1062 patients
- ⌘ 279 patients (428 eyes) could be analysed
8.1 treatments within 15 weeks
- ⌘ 42% of the eyes had an improvement of 0.6 lines or more after 6 months
2 lines or more: 28% in treatment group, 8% in control group
- ⌘ No severe adverse effects

AMD Treatment



- ⌘ Widder et al. 2002
- ⌘ 20 patients
- ⌘ Mean 6 treatments per year
- ⌘ Patients were treated at minimum for three years
- ⌘ Mean improvement of visual acuity:
 - after two years: 1.9 lines (15/20 patients, $p < 0.05$)
 - after three years: 1.2 lines (15/20 patients, $p < 0.05$)
 - after four years: 0,8 lines (7/20 patients, $p = 0.77$)

AMD Treatment



⌘ Koss et al. 2009

⌘ 43 patients, analysis 7.5 months after begin of treatment

⌘ 22 patients treated by apheresis
21 patients as control

⌘ mean difference of 0.95 ETDRS-lines ($p=0.01$)


⌘ improvement ≥ 2 lines	apheresis 9%	control 0%
deterioration	apheresis 0%	control 24%

AMD Treatment



- ⌘ Rencova et al. 2009
- ⌘ 16 patients treated with cascade filtration
16 patients in the control group
- ⌘ 8 treatments in 10 weeks
- ⌘ Positive influence on the absorption of the soft drusen,
reduction of the retinal pigment epithelium detachment
- ⌘ Possible improvement of the visual acuity of the treated
patients
- ⌘ the rheohaemapheresis as a well tolerated method may
cause the retardation or stop of the unfavorable course of
the AMD

Idiopathic Sudden Hearing Loss (ISHL)



- ⌘ Etiology and pathogenesis are unclear
- ⌘ Incidence up to 300/100000 persons/year in Germany
- ⌘ Acute inner ear dysfunction
- ⌘ LIN et al. 2008: risk of stroke 1.64 times higher five years after ISHL

Clinical aspects of ISHL



- ⌘ Normally unilateral sudden hearing loss
- ⌘ the list of differential diagnoses is very long
- ⌘ Is ISHL a therapeutic emergency?

ISHL Treatment



- ⌘ Glucocorticoids
- ⌘ Plasma expanders
- ⌘ Local therapy
- ⌘ Fibrinogen reduction

ISHL Treatment

- ⌘ Suckfüll et al. 2002
- ⌘ HELLP-apheresis (n=122, 1 treatment) versus standard therapy for 10 days (n=61)
- ⌘ Pure tone thresholds in the apheresis-group improved more, but not significantly
- ⌘ Remission rate of speech perception was significantly higher in the apheresis-group than in the control group (Freiburg speech test)

ISHL Treatment



- ⌘ Balletshofer et al. 2005
- ⌘ Pilot study with six patients, 1 single treatment
- ⌘ Average hearing threshold improved from 42 dB to 29 dB
- ⌘ Relative hearing improvement was more than 40% for four patients
- ⌘ Significant reduction of
 - total cholesterol 228 to 98 mg/dl
 - LDL cholesterol 153 to 83 mg/dl
 - Fibrinogen 364 to 142 mg/dl

ISHL Treatment



- ⌘ Mösges et al. 2008
- ⌘ 94 patients treated with apheresis, 99 as control
- ⌘ Average hearing threshold improved
 - 23.95 dB in apheresis group
 - 24.95 dB in control group
 - same efficacy ($p < 0.001$)
- ⌘ A significant increase of health-related quality of life could be documented by SF 36-questionnaire for the apheresis group

ISHL Treatment



- ⌘ Uygun-Kiehne 2007
- ⌘ Retrospective examination of 25 patients with 2.1 ∓ 0.4 ISHL
- ⌘ Refractory to infusion therapy according Stennert regimen
- ⌘ After two apheresis 40% of the patients showed a total remission, 28% a partial remission

Central Retinal Vein Occlusion



- ⌘ Erdtracht et al. 2002
- ⌘ Case report: 41 year old female after her third pregnancy complicated by preeclampsia with acute CRVO in the left eye
- ⌘ 6 treatments within 3 months
-> Restitutio ad integrum

Diabetic Retinopathy



- ⌘ Lüke et al. 2001
- ⌘ Leading cause of blindness among people in the working age in the western world
- ⌘ Measurement of visual acuity (ETDRS) 24 hours pre and post each treatment (two sessions per cycle) and at follow up (mean 9 weeks)
- ⌘ Compared to baseline examination visual acuity was improved by a mean of
1.4 lines after the last treatment
1.3 lines at follow up

Ischemic Diabetic Foot Syndrome

- ⌘ Klingel et al. 2003
- ⌘ Pilot Trial, 8 patients with non-healing foot ulcers, no wound healing for two months under standard wound care
- ⌘ 7 Apheresis treatments in 11 weeks
- ⌘ 4 patients (Wagner 2): accelerated wound healing
- 2 patients (Wagner 2): no change in wound healing but minor amputation(tcPO₂ ↑)
- 2 patients (Wagner 4,5): no improvement in foot lesions
- > Rheohemapheresis may prevent an amputation or reduce the extent of amputation

Rheohaemapheresis is...



- ⌘ an effective therapy when indicated
- ⌘ well tolerated
- ⌘ in some cases more comfortable for the patient as other therapy-options
- ⌘ sadly too little applied and so a disadvantage for the patient

Thank you



**for your attention
and your patience**

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