How to deal with hypotension on dialysis?

*CME Basics in Nephrology*

*SGN-SSN Interlaken 2016*

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Leitender Arzt  
Nephrologie und Dialyse  
Kantonsspital Frauenfeld  
www.spital-thurgau.ch
Intradialytic hypotension is a frequent problem...

...yet there is no simple solution to it....

...and the evidence-base for most preventive measures is scarce.
Mr. Ivo Dieter Höfler (I.D.H.)

• 68 yo male patient with DNP on HD for 4y
• with a number of comorbidities...
  – Diabetic retinopathy
  – Ischemic heart disease (nSTEMI 6y ago)
  – Peripheral arterial disease
  – Right calf amputee for infected diabetic ulcer
  – Obesity (BMI 33)
## Mr. Ivo Dieter Höfler (I.D.H.)

<table>
<thead>
<tr>
<th>Time</th>
<th>BP</th>
</tr>
</thead>
<tbody>
<tr>
<td>13:05</td>
<td>152/68</td>
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<td>109/60</td>
</tr>
<tr>
<td>16:47</td>
<td>113/63</td>
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lightheaded, nausea
Does this patient have intradialytic hypotension?

☐ Yes
☐ No
☐ Don’t know
☐ It depends
Why bother about IDH?

☐ Because of the annoying alarms
☐ Because it causes dyscomfort to the patient
☐ Because the nurse asks me to change the prescription
☐ Because it negatively affects dialysis efficacy
☐ All of the above
Definition of IDH

• **KDOQI:**
  - decrease in systolic blood pressure by ≥20 mmHg or MAP by ≥ 10 mmHg
  - associated with symptoms that include: abdominal discomfort; yawning; sighing; nausea; vomiting; muscle cramps; restlessness; dizziness or fainting; and anxiety

• **HEMO:**
  - Fall in BP resulting in intervention of UF reduction, blood flow reduction or saline administration

• **EBPG guidelines on hemodynamic instability:**
  - ...no evidence based recommendation regarding the definition of IDH can be given
  - ...both a reduction in BP, as well as clinical symptoms with need for nursing intervention should be present in order to accept the presence of IDH

• **Many different definitions in different studies...**
Association of Mortality Risk with Various Definitions of Intradialytic Hypotension

Jennifer E. Flythe,*†‡ Hui Xue,§ Katherine E. Lynch,*† Gary C. Curhan,*†‖ and Steven M. Brunelli*†

*Renal Division and †Channing Division of Network Medicine, Boston, Massachusetts; ‡Harvard Medical School, Boston, Massachusetts; Chapel Hill, North Carolina; §Divisions of Hospital Medicine, Medicine, University of California, San Diego, California.


Table 1. A priori IDH definitions

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nadir90</td>
<td>Minimum intradialytic SBP &lt; 90 mmHg</td>
</tr>
<tr>
<td>Nadir100</td>
<td>Minimum intradialytic SBP &lt; 100 mmHg</td>
</tr>
<tr>
<td>Fall20</td>
<td>(Pre-HD SBP−minimum intradialytic SBP) ≥ 20 mmHg</td>
</tr>
<tr>
<td>Fall30</td>
<td>(Pre-HD SBP−minimum intradialytic SBP) ≥ 30 mmHg</td>
</tr>
<tr>
<td>Fall20Nadir90</td>
<td>(Pre-HD SBP−minimum intradialytic SBP) ≥ 20 mmHg and minimum intradialytic SBP &lt; 90 mmHg</td>
</tr>
<tr>
<td>Fall30Nadir90</td>
<td>(Pre-HD SBP−minimum intradialytic SBP) ≥ 30 mmHg and minimum intradialytic SBP &lt; 90 mmHg</td>
</tr>
<tr>
<td>KDOQI</td>
<td>(Pre-HD SBP−minimum intradialytic SBP) ≥ 20 mmHg and symptoms of cramping, headache, lightheadedness, vomiting, or chest pain during HD</td>
</tr>
<tr>
<td>HEMO</td>
<td>Fall in SBP resulting in intervention of UF reduction, blood flow reduction, or saline administration</td>
</tr>
</tbody>
</table>
Does this patient have intradialytic hypotension?

☐ Yes
☐ No
☐ Don’t know
☑ It depends …on the definition
Mr. Ivo Dieter Höfler (I.D.H.)

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<tr>
<td>15:40</td>
<td>103/61</td>
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<td>15:45</td>
<td>87/48</td>
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<tr>
<td>15:48</td>
<td>89/54</td>
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lightheaded, nausea
Why bother about IDH?

- Because of the annoying alarms
- Because it causes dyscomfort to the patient
- Because the nurse asks me to change the prescription
- Because it negatively affects dialysis efficacy
- All of the above
- All of the above *plus...*

...because of the consequences of IDH
Pathophysiology

Fluid removal

Reduction of intravascular volume

Vascular refilling

Vasoconstriction

Maintenance of Blood pressure

Cardiac response
Excessive fluid removal leads to reduced intravascular volume, which can impair vascular refilling and cardiac response.

Medications, vascular calcification, autonomic dysfunction, eating (splanchnic pooling), dialysate temperature, and endotoxins can contribute to target weight being too low.

High salt and fluid intake can also contribute to IDWG, which can lead to ischemic heart disease and hypertensive cardiopathy.

Impaired vascular refilling results in IDH and impaired cardiac response.

Dialysate composition, anemia, and low albumin can further contribute to impaired cardiac response.
Consider rare severe complications of dialysis:

- Dialyzer reaction
- Hemolysis
- Air embolism

... and rare serious medical conditions:

- Hemorrhagee
- Pericardial tamponade
- Acute myocardial infarction
- Sepsis

Excessive fluid removal
Impaired cardiac response
Impaired vasoconstriction
Consequences of IDH

Mortality

Access thrombosis

Inadequate dialysis

Organ hypoperfusion

brain

heart

gut

Kidneys (RRF)
Consequences of IDH: brain

Ischemic brain injury in hemodialysis patients: which is more dangerous, hypertension or intradialytic hypotension?

Christopher W. McIntyre\textsuperscript{1} and David J. Goldsmith\textsuperscript{2}

\textsuperscript{1}Division of Nephrology, Schulich School of Medicine and Dentistry, University of Western Ontario, Canada
\textsuperscript{2}Guy’s and St. Thomas’ NHS Foundation Trust, King’s College, London, UK
Consequences of IDH: heart

Consequences of IDH: heart

Gut and beyond: endotoxinemia

Excessive fluid removal

Reduction of intravascular volume

Impaired cardiac response

Impaired vasoconstriction

IDWG

Low RBF

High salt and fluid intake

Medications
Vascular calcification
Autonomic dysfunction
Eating (splanchnic pooling)
Dialysate temperature
Endotoxins

Target weight too low

Ischemic heart disease
Hypertensive cardiopathy
Myocardial stunning

Systolic and diastolic dysfunction

Dialysate composition
Anemia
Low albumin

Impaired vascular refilling

Vicious cycles
How to deal with IDH?

Acute management

Preventive measures
Mr. Ivo Dieter Höfler (I.D.H.)

Before calling you, the nurse reacted to the hypotensive episode by:

- Stopping ultrafiltration
- Placing the patient in Trendelenburg position
- Slowig blood flow rate to 100ml/min
- Infusing a bolus of 250ml substitute

Did she react correctly?
Mr. Ivo Dieter Höfler (I.D.H.)

Before calling you, the nurse reacted to the hypotensive episode by:

- ✔ Stopping ultrafiltration
- ✔ Placing the patient in Trendelenburg position
- ✗ Slowig blood flow rate to 100ml/min
- ✔ Infusing a bolus of 250ml substitute
- ✗ Oxygen!
Why is blood flow often lowered with IDH?

- Misconception that access flow depends on dialyzer blood flow
- In parallel plate dialyzers, extracorporeal blood volume depended on blood flow
- BF reduction lowered TMP and hence UF rate in the era before UF control was standard
- BF reduction reduced acetate delivery to the patient in the era of acetate buffering
- With cuprophane membranes, slowing BF reduced contact to the bio-incompatible, complement activating membrane
- When higher dialysate temperatures and lower dialysate Na were standart, a reduction of BF lowered temperature and increased Na of blood returning to the patient
What actions will you take at this point?

- You raise the dialysis Na concentration in the prescription
- You raise the target weight by 1 kg
- You raise the target weight if there is no edema
- You adjust dry weight depending of BCM results
- You tell the patient to drink less
- You limit the ultrafiltration rate to 10ml/h/kg
- You stop antihypertensives before dialysis
- You prescribe Midodrine (Gutron) 10 drops before dialysis
Excessive fluid removal

Reduction of intravascular volume

Impaired vascular refilling

Impaired vasoconstriction

IDH

Impaired cardiac response

low RRF

High salt and fluid intake

IDWG

Medications
Vascular calcification
Autonomic dysfunction
Eating (splanchnic pooling)
Dialysate temperature
Endotoxins

Target weight too low

Ischemic heart disease
Hypertensive cardiopathy
Myocardial stunning

Systolic and diastolic dysfunction

Dialysate composition
Anemia
Low albumin

Target weight too low

Dialysate composition
Anemia
Low albumin
Dry weight

“the lowest tolerated postdialysis weight achieved via gradual change in postdialysis weight at which there are minimal signs or symptoms of hypovolemia or hypervolemia”

Agarwal and Singh
Associations of Posthemodialysis Weights above and below Target Weight with All-Cause and Cardiovascular Mortality

Jennifer E. Flythe,*† Abhijit V. Kshirsagar,* Ronald J. Falk,* and Steven M. Brunelli†‡


All-cause mortality

Cardiovascular mortality
How to assess dry weight?

→ Clinical assessment
The Agreement between Auscultation and Lung Ultrasound in Hemodialysis Patients: The LUST Study


Table 3. Agreement (weighted-κ [95% confidence interval]) between ultrasound B lines and pulmonary crackles, peripheral edema, and a combination thereof considering the individual average number of ultrasound B lines in the 79 patients and the simultaneous average grading of crackles and peripheral edema or the whole series of measurements considered one by one (n=1106)

<table>
<thead>
<tr>
<th>Clinical Signs</th>
<th>Individual Average US-B Lines Values, n=79 Patients</th>
<th>Whole Series of US-B Lines, n=1106</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulmonary crackles</td>
<td>0.10 (0.01 to 0.20)</td>
<td>0.16 (1.13 to 1.20)</td>
</tr>
<tr>
<td>Peripheral edema</td>
<td>-0.01 (-0.11 to 0.09)</td>
<td>0.02 (-0.01 to 0.04)</td>
</tr>
<tr>
<td>Crackles/edema</td>
<td>-0.00 (-0.02 to 0.01)</td>
<td>0.07 (0.05 to 0.09)</td>
</tr>
</tbody>
</table>

US-B, ultrasound B.

How to assess dry weight?

→ Clinical assessment
→ Lung ultrasound
How to assess dry weight?

→ Clinical assessment
→ Lung ultrasound
→ Chest X-ray
How to assess dry weight?

→ Clinical assessment
→ Lung ultrasound
→ Chest X-ray
→ Inferior vena cava ultrasound
How to assess dry weight?

→ Clinical assessment
→ Lung ultrasound
→ Chest X-ray
→ Inferior vena cava ultrasound
→ Bioimpedance
Bioimpedance

Conductor
- Electricity flows easily.
- Resistance is low.
- Impedance is low.

Muscle Body Water

Insulator
- Electricity does not flow.
- Resistance is high.
- Impedance is high.

Fat
BCM-guided treatment and outcomes
How to assess dry weight?

→ Clinical assessment
→ Lung ultrasound
→ Chest X-ray
→ Inferior vena cava ultrasound
→ Bioimpedance
→ Online blood volume monitoring
Blood volume monitoring

Table 3. RR for hospitalization (adjusted\textsuperscript{a})

<table>
<thead>
<tr>
<th>Hospitalization Type</th>
<th>RR</th>
<th>95% CI</th>
<th>P Value</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Estimate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-access-related</td>
<td>1.61</td>
<td>1.15 to 2.25</td>
<td>0.01</td>
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<tr>
<td>cardiovascular</td>
<td>1.85</td>
<td>1.19 to 2.86</td>
<td>0.006</td>
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<tr>
<td>other</td>
<td>1.53</td>
<td>1.07 to 2.19</td>
<td>0.02</td>
</tr>
<tr>
<td>Access-related</td>
<td>1.52</td>
<td>1.02 to 2.28</td>
<td>0.04</td>
</tr>
</tbody>
</table>

Table 7. Comparison of mortality by treatment groups with US Renal Data System data

<table>
<thead>
<tr>
<th></th>
<th>Crit-Line Group</th>
<th>Usual Care Group</th>
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</thead>
<tbody>
<tr>
<td>Patients</td>
<td>227</td>
<td>216</td>
</tr>
<tr>
<td>Deaths</td>
<td></td>
<td></td>
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<tr>
<td>observed</td>
<td>19</td>
<td>7</td>
</tr>
<tr>
<td>expected</td>
<td>24.7</td>
<td>26.8</td>
</tr>
<tr>
<td>Deaths/100 patient-years at risk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>observed</td>
<td>17.4</td>
<td>6.4</td>
</tr>
<tr>
<td>expected</td>
<td>22.6</td>
<td>24.6</td>
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<tr>
<td>Standardized mortality ratio</td>
<td>0.77</td>
<td>0.26</td>
</tr>
<tr>
<td>$\chi^2$</td>
<td>1.3</td>
<td>14.6</td>
</tr>
<tr>
<td>$P$ value</td>
<td>NS</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Blood volume monitoring

Blood volume monitoring

Nesrallah, ASAIC

Spital Thurgau

Assessment of dry weight will usually rely on a combination of clinical assessment, history taking, technical tools as available and some trial and error.
**Excessive fluid removal**

- Low RRF
- High salt and fluid intake

**Reduction of intravascular volume**

- Impaired vascular refilling
  - Target weight too low
  - Dialysate composition
    - Anemia
  - Low albumin

**Impaired cardiac response**

- IDH

**Impaired vasoconstriction**

- Medications
  - Vascular calcification
  - Autonomic dysfunction
- Eating (splanchnic pooling)
- Dialysate temperature
- Endotoxins

- Ischemic heart disease
- Hypertensive cardiopathy
- Myocardial stunning

- Systolic and diastolic dysfunction

**Target weight too low**

**Dialysate temperature**
Excessive fluid removal

Reduction of intravascular volume

Impaired vascular refilling

Impaired vasoconstriction

IDH

Impaired cardiac response

Medications
Vascular calcification
Autonomic dysfunction
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Target weight too low

Low RRF

High salt and fluid intake

IDWG

Ischemic heart disease
Hypertensive cardiopathy
Myocardial stunning
Systolic and diastolic dysfunction

Dialysate composition
Anemia
Low albumin

Target weight too low
Are Diuretics Underutilized in Dialysis Patients?

Emilie Trinh and Joanne M. Bargman
Division of Nephrology, University Health Network, Toronto, Ontario, Canada

ABSTRACT

While oral diuretics are commonly used in patients with chronic kidney disease for the management of volume and blood pressure, they are often discontinued upon initiation of dialysis. We suggest that diuretics are considerably underutilized in peritoneal dialysis and haemodialysis patients despite numerous potential benefits and few side effects. Moreover, when diuretics are used, optimal doses are not always prescribed. In peritoneal dialysis, the use of diuretics can improve volume status and minimize the need for higher glucose-containing solutions. In patients on haemodialysis, diuretics can help lessen interdialytic weight gain, resulting in decreased ultrafiltration rates and fewer episodes of intradialytic hypotension. This paper will review the mechanism of action of diuretics in patients with renal insufficiency, quantify the risk of side effects and elaborate on the potential advantages of diuretic use in peritoneal dialysis and hemodialysis patients with residual kidney function.

200ml x 3 = 600ml
Are Diuretics Underutilized in Dialysis Patients?

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ABSTRACT

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Advising dialysis patients to restrict fluid intake without restricting sodium intake is not based on evidence and is a waste of time

Charles R. V. Tomson

Department of Renal Medicine, Southmead Hospital, Bristol, UK
Interdialytic Weight Gain: Trends, Predictors, and Associated Outcomes in the International Dialysis Outcomes and Practice Patterns Study (DOPPS)

Michelle M.Y. Wong, MD, MSc, FRCP,1,2 Keith P. McCullough, MS,1
Brian A. Bieber, MPH, MS,1 Juergen Bommer, MD,3 Manfred Hecking, MD,4
Nathan W. Levin, MD,5 William M. McClellan, MD, MPH,6,7 Ronald L. Pisoni, PhD, MS,1
Rajiv Saran, MD, MRCP, MS,8,9 Francesca Tentori, MD, MS,1 Tadashi Tomo, MD,10,11
Friedrich K. Port, MD, MS,1,12 and Bruce M. Robinson, MD, MS1,8
Excessive fluid removal

Reduction of intravascular volume

Impaired vascular refilling

Impaired vasoconstriction

IDH

Impaired cardiac response

Medications
Vascular calcification
Autonomic dysfunction
Eating (splanchnic pooling)
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low RRF
IDWG
High salt and fluid intake

Ischemic heart disease
Hypertensive cardiopathy
Myocardial stunning
Systolic and diastolic dysfunction

Target weight too low

Dialysate composition
Anemia
Low albumin

Endotoxins
Dialysate composition

- (Acetate)
- Na⁺
- Ca²⁺
- Mg²⁺
Dialysate composition

- (Acetate)
- $\text{Na}^+$
- $\text{Ca}^{2+}$
- $\text{Mg}^{2+}$

**Acute effect:**
- hemodynamic stability

**Chronic effect:**
- Na loading
- Thirst
- Higher IDWG
A meta-analysis of sodium profiling techniques and the impact on intradialytic hypotension

Nina DUNNE
University of Brighton, Brighton, UK

- Endpoint: IDH
- Advantage only for stepwise profiling
- Considerable heterogeneity of studies
Excessive fluid removal

Reduction of intravascular volume

Impaired vascular refilling

Impaired vasoconstriction

IDH

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Target weight too low
Eating on HD


Postprandial blood pressure changes during hemodialysis.

Sherman RA, Torres F, Cody RP.

Abstract
The effect of eating on BP during hemodialysis was examined in nine nondiabetic end-stage renal disease (ESRD) patients. A standard meal was given during 62 of 125 dialysis treatments in a prospectively controlled study. Diastolic (P = 0.01) and mean (P = 0.03) BPs fell significantly faster in the 45-minute postprandial period in the fed treatments compared with equivalent times in the fasting treatments. In this period, symptomatic hypotension occurred 13 times in five patients fed during dialysis compared with two episodes in one patient while fasting (P less than 0.05). Consumption of meals during hemodialysis should be avoided in patients at risk for hypotension during treatment.

Eating before or during HD should be discouraged in IHD prone patients...

... But consider the risk of malnutrition!
Dialysate temperature

- **Less IDH**
- **Less MAP change**
- **No effect on kt/V**
- **More discomfort**

**Figure 2.** Effect of low temperature dialysis on intradialytic hypotension. 95% CI, 95% confidence interval; BTM, biofeedback temperature monitoring.

**Figure 3.** Effect of low temperature dialysis on change in mean arterial pressure. 95% CI, 95% confidence interval; BTM, biofeedback temperature monitoring.

**Figure 4.** Effect of low temperature dialysis on dialysis adequacy. 95% CI, 95% confidence interval; BTM, biofeedback temperature monitoring.

**Figure 3.** Effect of low temperature dialysis on symptoms of discomfort. 95% CI, 95% confidence interval; BTM, biofeedback temperature monitoring.
Randomized Clinical Trial of Dialysate Cooling and Effects on Brain White Matter

Mohamed T. Eldehni, Aghogho Odudu, and Christopher W. McIntyre

Division of Medical Sciences and Graduate Entry Medicine, School of Medicine, University of Nottingham, Nottingham, United Kingdom

## Medication review

<table>
<thead>
<tr>
<th>Medication</th>
<th>Dosage</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspirin cardio</td>
<td>100mg</td>
<td>1-0-0</td>
</tr>
<tr>
<td>Calcitriol</td>
<td>0.5mcg</td>
<td>1-0-0</td>
</tr>
<tr>
<td>Ca-acetate</td>
<td>400mg</td>
<td>1-1-1</td>
</tr>
<tr>
<td>Sevelamer</td>
<td>800mg</td>
<td>1-2-2</td>
</tr>
<tr>
<td>Fluvstatin</td>
<td>80mg</td>
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<tr>
<td>Bisoprolol</td>
<td>5mg</td>
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<tr>
<td>Losartan</td>
<td>100mg</td>
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<tr>
<td>Amlodipin</td>
<td>10mg</td>
<td>1-0-0</td>
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<tr>
<td>Doxazosin</td>
<td>4mg</td>
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<tr>
<td>Insulin</td>
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<td>Special Scheme</td>
</tr>
<tr>
<td>Gabapentin</td>
<td>300mg</td>
<td>After Dialysis</td>
</tr>
</tbody>
</table>
Blood pressure in HD patients

- *IDH is just part of the story...*
- *...We measure BP only during 12 of 168 hours*
- *Consider orthostatic effects (particularly in DM)*
- *We have to make many trade offs when treating HD patients...*
- *Consider pharmacokinetics of antihypertensive medications!*
Lisinopril Therapy for Hemodialysis Hypertension: Hemodynamic and Endocrine Responses

Rajiv Agarwal, MD, Rebecca Lewis, RN, BSN, Joyce L. Davis, NP, MSN, and Bruce Becker, NP

- To evaluate the antihypertensive effects of lisinopril, a renally excreted angiotensin-converting enzyme inhibitor, we assessed supervised administration of the drug after hemodialysis (HD) three times weekly. Blood pressure (BP) was assessed by interdialytic 44-hour ambulatory BP (ABP) monitoring, and endocrine responses were assessed by plasma renin activity (PRA) before and after dialysis. Lisinopril dose was titrated at biweekly intervals. If this was not effective after full titration (lisinopril to 40 mg three times weekly), ultrafiltration was added to reduce dry weight. The primary outcome variable was change in BP from the end of the run-in period to the end of the study. No change in mean ABP was noted during run-in. However, mean 44-hour ABP decreased from 149 ± 14 (SD)/84 ± 9 to 127 ± 16/73 ± 9 mm Hg, a decrease of 22/11 mm Hg (P < 0.001) at final evaluation. Of 11 patients who completed the trial, only 2 patients had systolic hypertension (≥135 mm Hg) and 1 patient had diastolic hypertension (≥85 mm Hg) at the final visit. Four patients were administered 10 mg of lisinopril; 5 patients, 20 mg; and 2 patients, 40 mg; only 1 of these patients required ultrafiltration therapy. There was a persistent antihypertensive effect over 44 hours. BP reduction was achieved without an increase in intradialytic symptomatic or asymptomatic hypotensive episodes. PRA increased in response to dialysis, as well as lisinopril. In conclusion, supervised lisinopril therapy is effective in controlling hypertension in chronic HD patients. This may be related to blockade of angiotensin II generation by kidneys despite the loss of excretory function.

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INDEX WORDS: Hemodialysis (HD); hypertension; angiotensin-converting enzyme (ACE) inhibitors; renin-angiotensin system; ambulatory blood pressure monitoring (ABPM); antihypertensive therapy.
### Medication adjustments: suggestion

<table>
<thead>
<tr>
<th>Medication</th>
<th>Dose</th>
<th>Times</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspirin cardio</td>
<td>100mg</td>
<td>1-0-0</td>
</tr>
<tr>
<td>Calcitriol</td>
<td>0.5mcg</td>
<td>1-0-0</td>
</tr>
<tr>
<td>Ca-acetate</td>
<td>400mg</td>
<td>1-1-1</td>
</tr>
<tr>
<td>Sevelamer</td>
<td>800mg</td>
<td>1-2-2</td>
</tr>
<tr>
<td>Fluvstatin</td>
<td>80mg</td>
<td>0-0-1</td>
</tr>
<tr>
<td>Bisoprolol</td>
<td>5mg</td>
<td>1-0-0</td>
</tr>
<tr>
<td>Lisinopril</td>
<td>10mg</td>
<td>0-0-1</td>
</tr>
<tr>
<td>Amlodipin</td>
<td>10mg</td>
<td>0-0-1</td>
</tr>
<tr>
<td>Doxazosin</td>
<td>4mg</td>
<td>1-0-1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0-0-1 on HD days)</td>
</tr>
<tr>
<td>Insulin</td>
<td></td>
<td>Special Scheme</td>
</tr>
<tr>
<td>Gabapentin</td>
<td>300mg</td>
<td>After Dialysis</td>
</tr>
</tbody>
</table>

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**GUTRON Tropfen 10 mg/ml**

Midodrinn
C01CA17
Antihypotonikum, Sympathomimetikum

**Zusammensetzung**

Midodrin hydrochlorid (10 mg) 10mg = 30 drops
What actions will you take at this point?

- You raise the dialysis Na concentration in the prescription
- You raise the target weight by 1 kg
- You raise the target weight if there is no edema
- You adjust dry weight depending of BCM results
- You tell the patient to drink less
- You limit the ultrafiltration rate to 10ml/h/kg
- You stop antihypertensives before dialysis
- You prescribe Midodrine (Gutron) 10 drops before dialysis
Summary: how to deal with IDH?

**First line interventions:**

- Reassess target weight
  - But don’t rely on clinical signs of hypervolemia only!
- Review and adjust antihypertensive agents
  - But keep in mind BP between dialyses!
- Try to lower IDWG
  - Max out diuretics if RRF
  - Salt restriction
- No eating during dialysis
Summary: how to deal with IDH?

Second line interventions:
- Assess for cardiac disease
- Cool dialysate
- Consider Na profiling
- Consider online blood volume measurement
- Consider HDF
- Consider Midodrine
- Consider longer dialysis time
Summary: how to deal with IDH?

*Third line interventions:*

- Consider frequent HD (some consider it first line, but ask the patient and the SVK...)
- Consider modality change
Questions?

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