SAĞLIK BİLİMLERİ ÜNİVERSİTESİ

ÖDEM TEDAVİSİ

Dr Gülizar Şahin

02.11.2024

ÖDEM

- ✓ Ödem interstisyel alanda serbest sıvı miktarının artmasıdır

- ✓ Kapiller hemodinamide sıvının damar dışına çıkmasına neden olan değişiklikler ödeme sebep olur

  1. Hidrostatik basınçta artma
  2. Onkotik basınçta azalma
  3. Kapiller geçirgenlikte artma

- ✓ Klinik aşikar ödem gelişimi için interstisyel volumun 2.5-3L olması gerekli

ÖDEM NEDENLERİ

Kapiller hidrostatik basınç artışı

Renal Na retansiyonuna bağlı hipervolemi

Kalp yetmezliği -Cor pulmonale

Primer renal Na retansiyonu

- Böbrek h, nefrotik sdr
- İlaçlar:
  NSAİD,ks,glitazonlar,insülin, östrojen, progestin, androjenler,tamoksifen hidralazin,KKB
- Erken hepatik siroz
- Refeeding ödem

Gestasyonel, premenstürel ödem

İdyopatik ödem

Venöz obtrüksiyon - yetmezlik

Siroz veya hepatik venöz obstrüksiyon

Akut pulmoner ödem

Lokal venöz obstrüksiyon

- Venöz tromboz
- Venöz stenoz

Kronik venöz yetmezlik – Post-trombotik sendrom

Arterioler vazodilatasyon

İlaçlar:* Sık – Vasodilatorler (hidralazin, minoxidil, diazoxid), dihidropiridine KKB

Daha az sıklık– alpha1 blokerler, sempatolitikler (metildopa), nondihidropiridine KKB

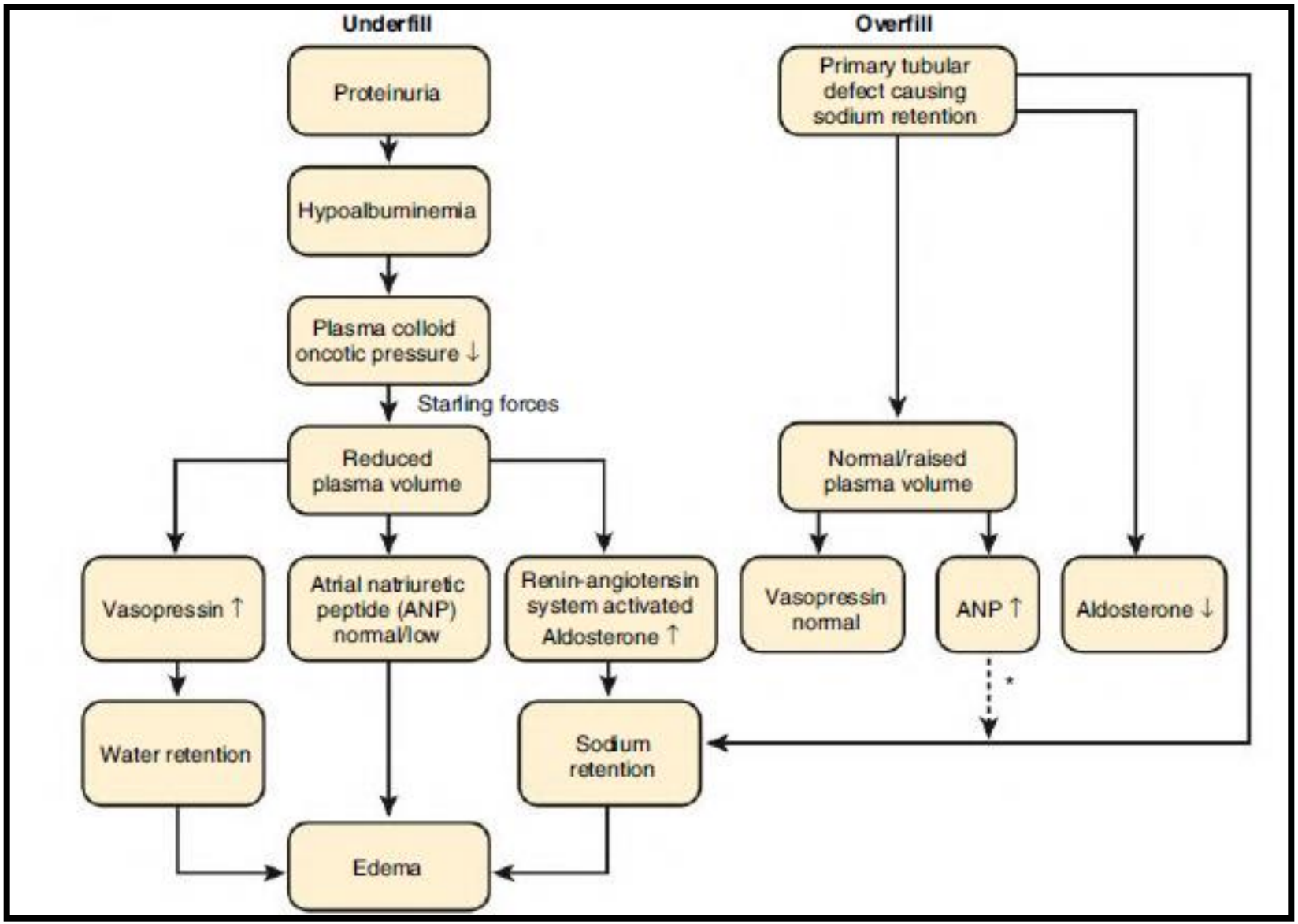
İdyopatik ödem

ÖDEM NEDENLERİ

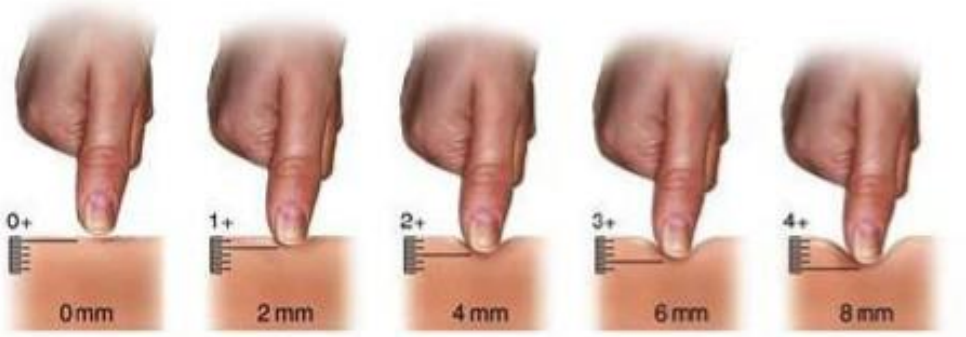
Hipoalbuminemi
Protein kaybı
Nefrotik sendrom
Protein-kaybettiren enteropatiler
Albumin sentezinde azalma
KC hastalığı
Malnutrisyon
Kapiller permeabilite artışı
Idiopatik ödem
Yanık
Travma
Inflamasyon veya sepsis
Allerjik reaksiyonlar, angioödem vb
ARDS
Diyabet
Interleukin 2 tedavisi
Malign asitler

Lenfatik obstruksiyon veya artmış interstitial onkotik basınç
Lenf nodu disseksiyonu
Maligniteye bağlı nodal genişleme
Hipotiroidi
Malign asitler
Diğer ilaçlar* (bilinmeyen mekanizma)
Antikonvulzan: Gabapentin, pregabalin
Antineoplastik: Docetaxel, cisplatin
Antiparkinson: Pramipexole, ropinirole

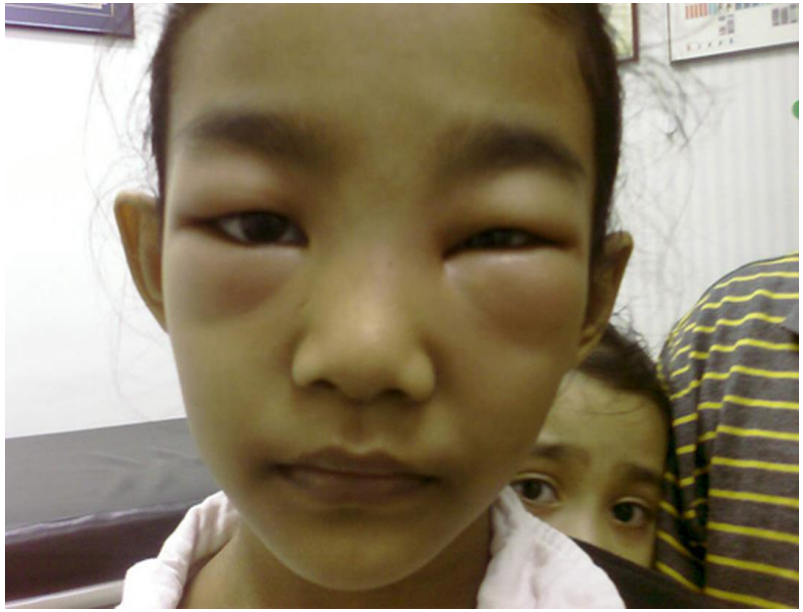
ÖDEM (NEFROTİK ÖDEM)

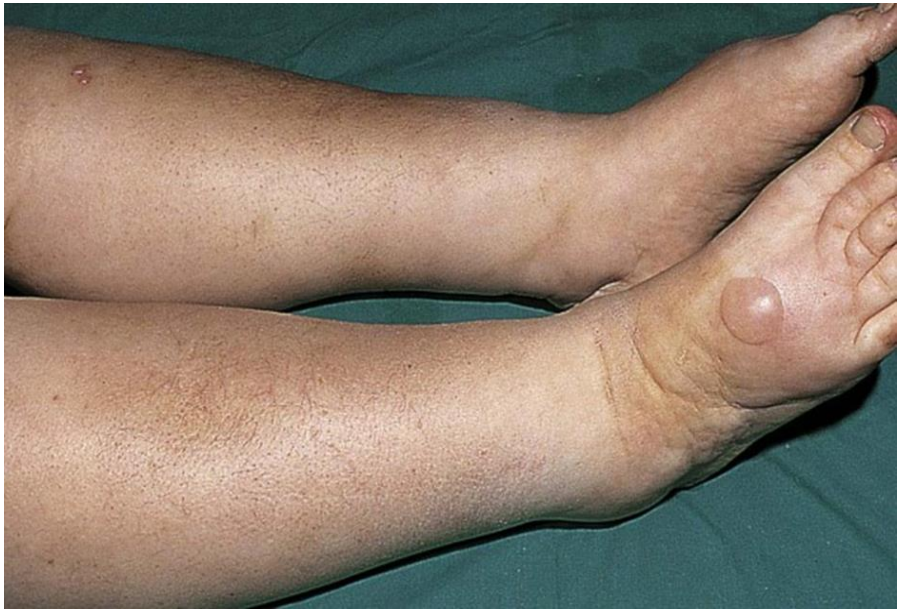


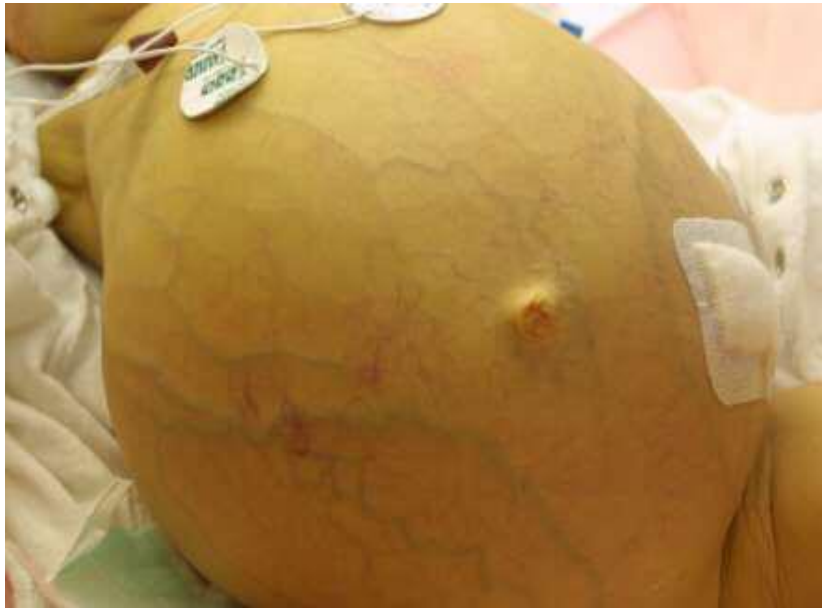
ÖDEM

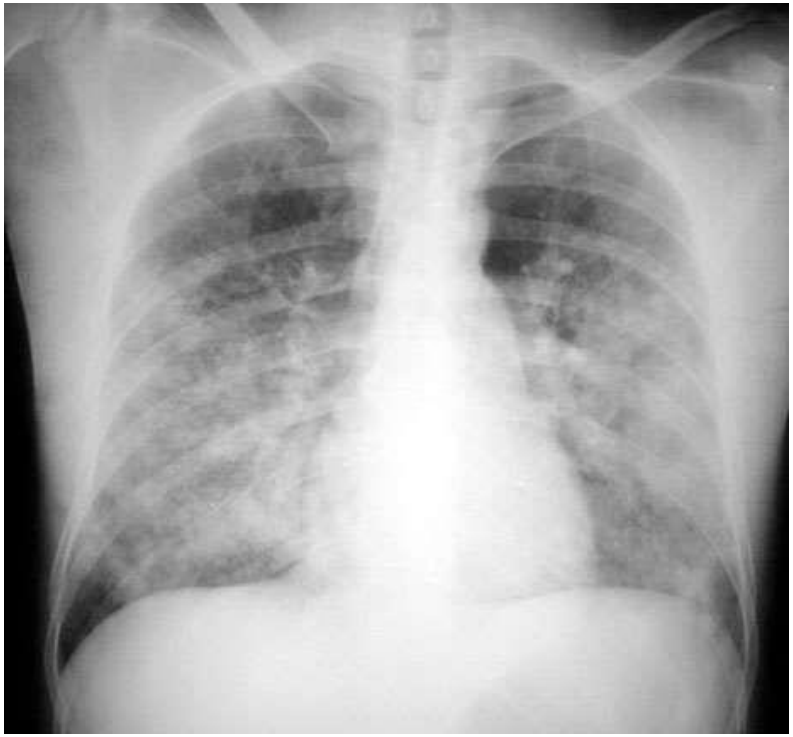


- 1 + Hafif çukur bırakır (2 mm). Hızla kaybolur
- 2 + 4 mm çukur oluşur. 10-15 sn'de kaybolur
- 3 + 6 mm çukur oluşur. 1 dakikadan uzun sürebilir
- 4 + 8 mm çukur oluşur. Ciddi ödem vardır. 2 dk'dan uzun sürebilir



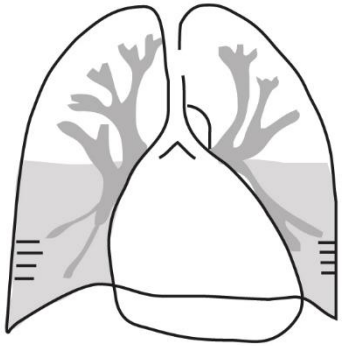


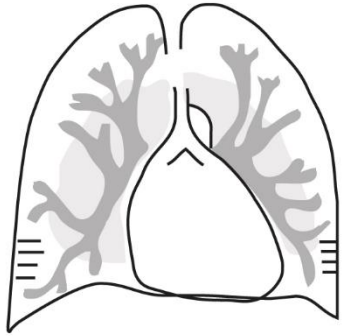


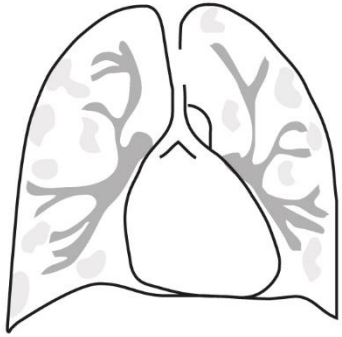


AC ÖDEMİ

Signs	Cardiac	Renal	Lung Injury
Heart size	Enlarged	Normal	Normal
Blood flow	Inverted	Balanced	Normal
Kerley lines	Common	Common	Absent
Edema	Basilar	Central: Butterfly	Diffuse
Air bronchograms	Not common	Not common	Very common
Pleural effusions	Very common	Common	Not common







ÖDEM TEDAVİ

- ✓ Ödeme yol açan primer hastalığın tedavisi
- ✓ Pulmoner ödem dışında acil değil
- ✓ Tedaviye genelde loop diüretiği ile başlanır ➜ kombinasyon tedaviler
- ✓ Tuz kısıtlama
- ✓ Ödemden sorumlu faktör ilaçsa kesilmeli

ÖDEM TEDAVİ

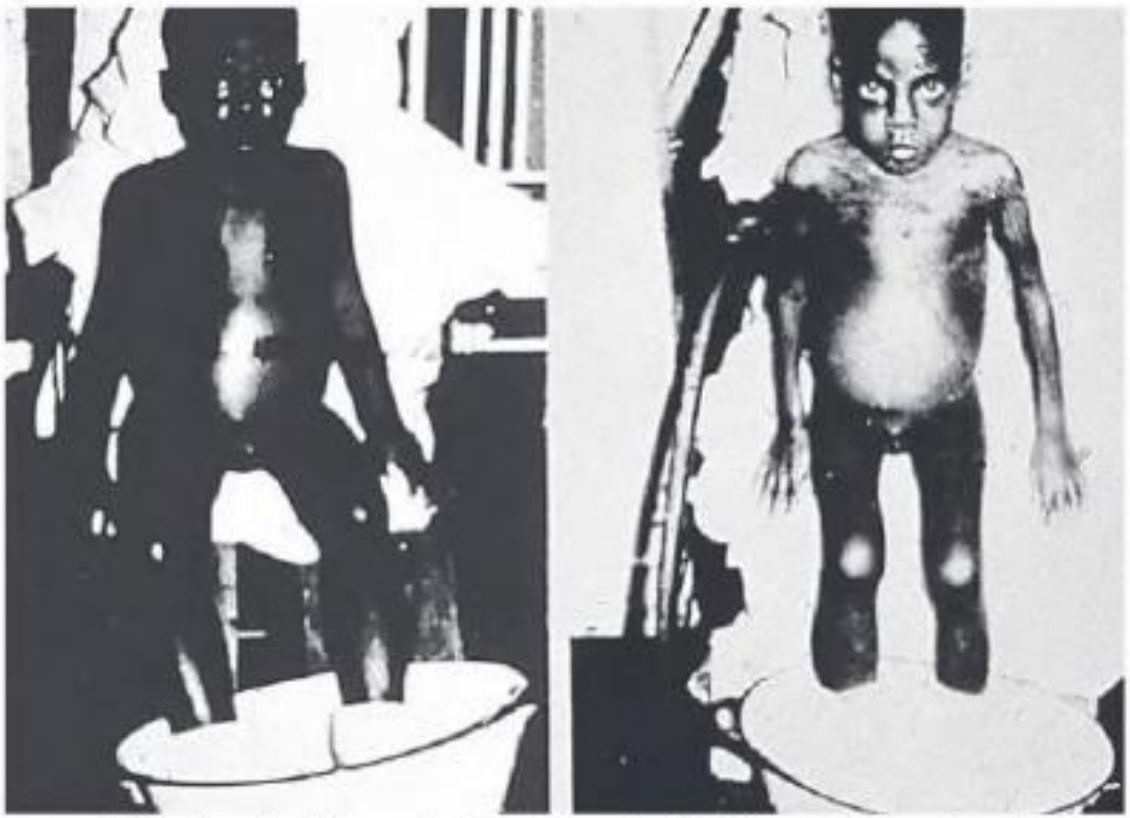


Fig. 16.14 Treatment of Nephrotic Edema before the Availability of Diuretics. Edema in nephrotic syndrome was very difficult to treat. In 1953 this child with anasarca stands in a bowl while edema fluid drips out through small tubes placed through needles in the skin of the feet. Nevertheless, this was effective treatment. The two pictures of the same child were taken 4 days apart, during which time the child lost 4.5 kg (10 lb), or 18% of body weight. (Courtesy Dr. Robert Vernier.)

DİÜRETİKLER

- Tıbbın en yaygın kullanılan ilaçları arasında
- Nefronun değişik bölgelerinde sodyum geri emilimini azaltarak idrarla sodyum ve su atılımını ↗

DİÜRETİKLERİN SINIFLAMASI

Asetazolamid ve mannitol:
proksimal tubulus

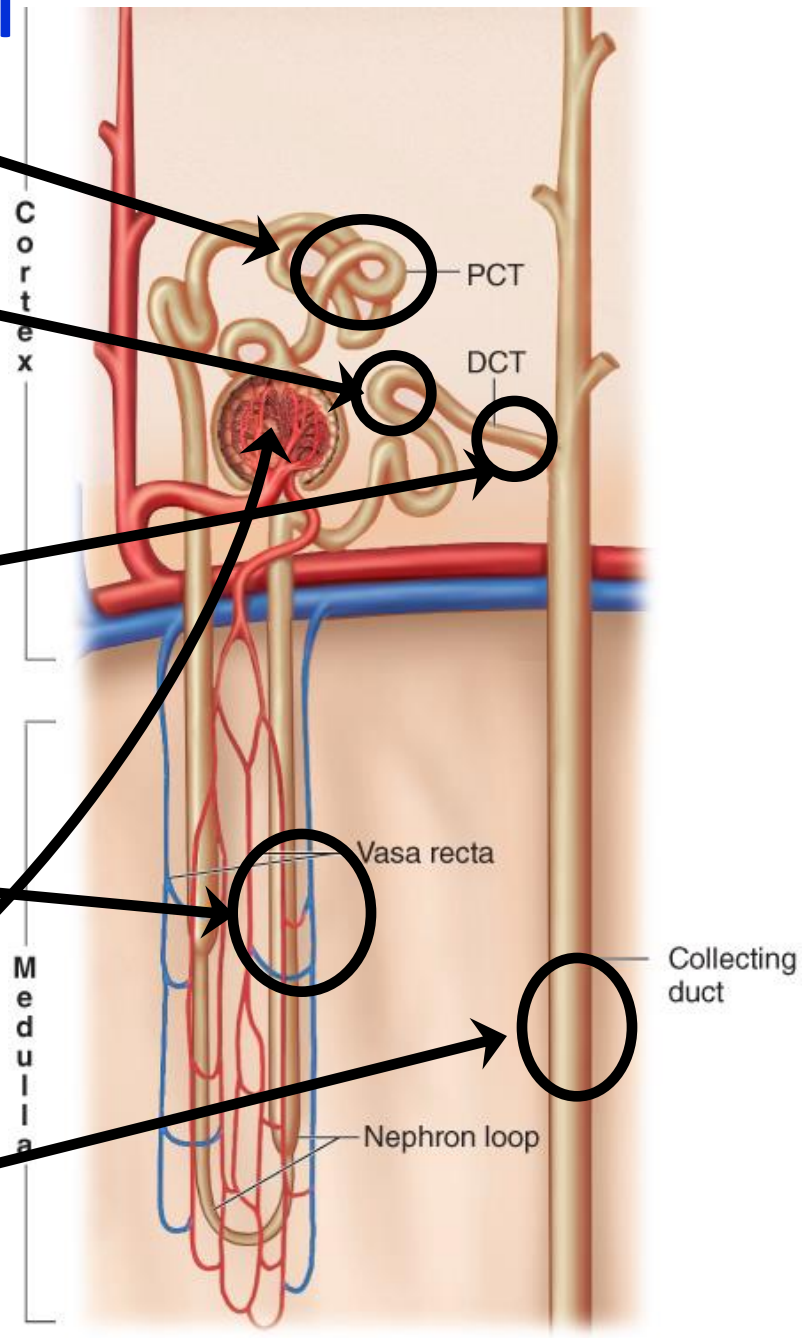
Tiyazid-tipi diüretikler:
Distal tubulus ve birleştirici segment

K^+-koruyan diüretikler:
Kortikal kollektör tubulusun aldosterona duyarlı temel hücreleri

Loop diüretikleri:
Henle'nin çıkan kalın kolu

Osmotik diüretikler:
Glomerul

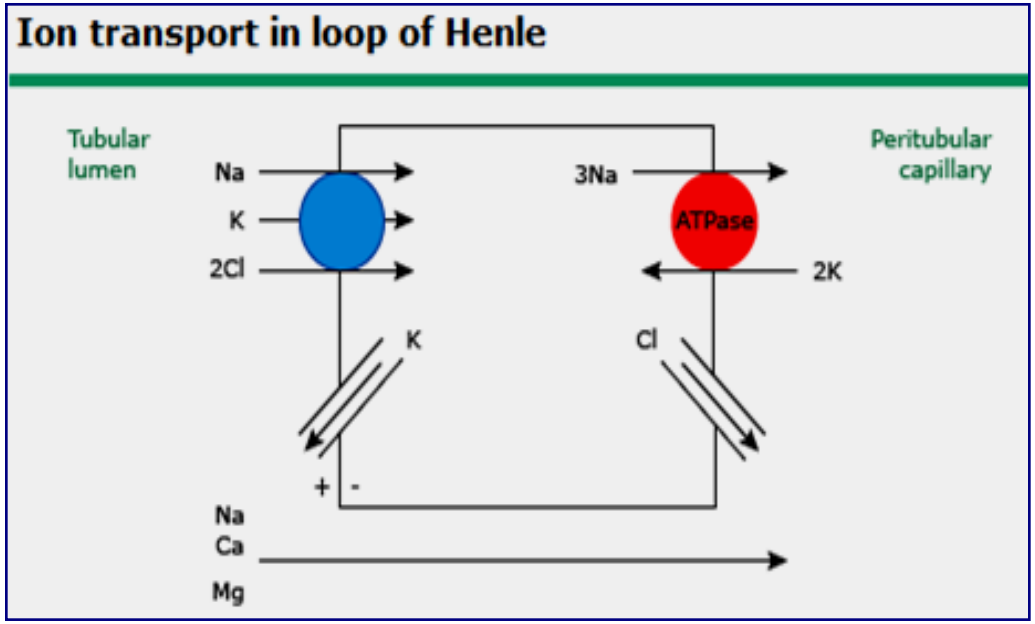
ADH antagonistleri:
Kollektör kanal



LOOP DİÜRETİKLERİ

(furosemide, bumetanide, torasemide ve ethacrynic acid)

- Maksimum dozlarda filtre olan Na'un %20-25'inin itrahı
- Henle'nin çıkan kolunda Na-K-2Cl taşıyıcısının inhibisyonu



- NaCl emilimi ↘ paralel Ca emilimi↘ (Hiperkalsiüri)
- Hiperkalsemi tedavisi
- Nefrokalsinoz riski

Diüretiklerin Farmakokinetiği

Table 1. Pharmacokinetics of Diuretics

Diuretic	Bioavailability	Equivalent Dose, mg	Metabolism (Kidney/Liver)	Elimination $t_{1/2}$, h			
				Normal	CKD	CHF	ESLD
Loop							
Furosemide	50%-60% (10%-100%)[a]	40	100%/0%	1.5-2	2.6-2.8	2.7	2.5
Bumetanide	80%-100%	1	50%/50%	1	1.6	1.3	2.3
Torsemide	68%-100%	20	20%/80%	3-4	4-5	6	8
Thiazide							
HCTZ	65%-75%	25	100%/0%	6-15	↑	↔	↔
Chlorthalidone	60%-72%	12.5	100%/0%	40-60	↑	↔	↔
Metolazone	65%-90%	2.5	70%-95%/5%-30%	14-20	↑	↔	↔
Distal							
Amiloride	50%	10	50%/–[b]	6-26	100	?	↔
Triamterene	52%-80%	100	20%/80%	2-5	↑	?	–[c]
Spironolactone	>90%	25	0%/100%	>15[d]	↔	?	↔

DİÜRETİK KULLANIMI

Etkinlik:

- Diüretiğin etki yeri, etki süresi, diyetle tuz alımı
- Furosemide ilk 6 saatte çok etkili; sonra saliürez/diürez ↘↘
- Emilimi çok değişken (%10-100); doz bireyselleştirilmeli
- Normal tuzlu diyet ➔ Na geri emilimi ↗
- Yapılması gereken:
  - İleri tuz kısıtlaması
  - Diüretiğin günde 2-3 defada verilmesi

Diüretik dozunun artırılması

DİÜRETİK KULLANIMI

Kronik kullanım:

- İlk 4 haftada sürekli volüm kaybı
- Bu sırada komplikasyonlar çok sık
- Daha sonra kompansatris mekanizmalar ile (daha hipovolemik bir konumda stabilleşme

- Günlük 1-2 kg düşüş hedeflenmeli
- KKY, nefrotik sdr, anazarka ödem 2-3kg/gün
- Siroz-izole asitli hastalarda 0.5kg/gün (HRS riski)
- Yaşlılarda, DM ve HT gibi durumlarda ABH riski

KALP YETERSİZLİĞİ

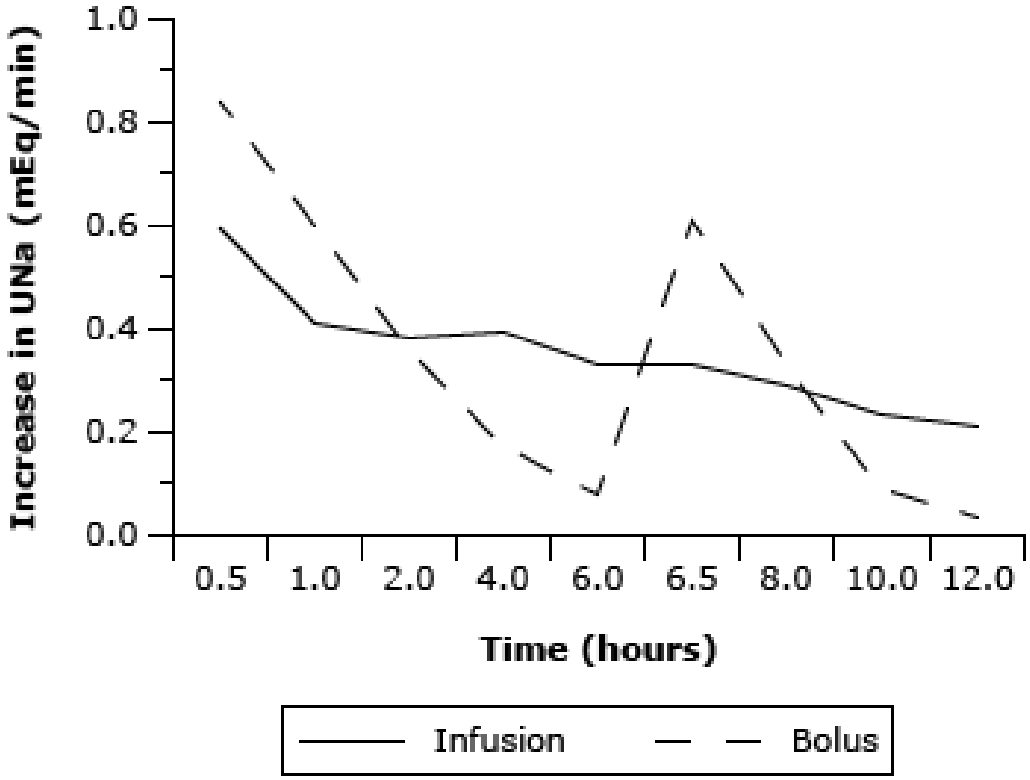
- **Kalp yetm** → sempatik aktivasyon ve → RAAA ↗
  → Na ve su retansiyonu → hipervolemi
  → periferik ödem → akciğer ödemi

- **Diüretikler kısa dönemde → hipervolemiyi ↘**
- **Geç dönemde → vazodilatasyon → afterload ↘**

- KKY tedavisinde diüretikleri çok aşırı dozda kullanmamalı → kardiyak output ↘

- Hastanın durumuna göre furosemid, tiyazidler veya spironolakton

Diuresis in continuous versus bolus loop diuretic therapy



Rudy DW
Ann Intern Med 1991

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 MARCH 3, 2011 VOL. 364 NO. 9

Diuretic Strategies in Patients with Acute Decompensated Heart Failure

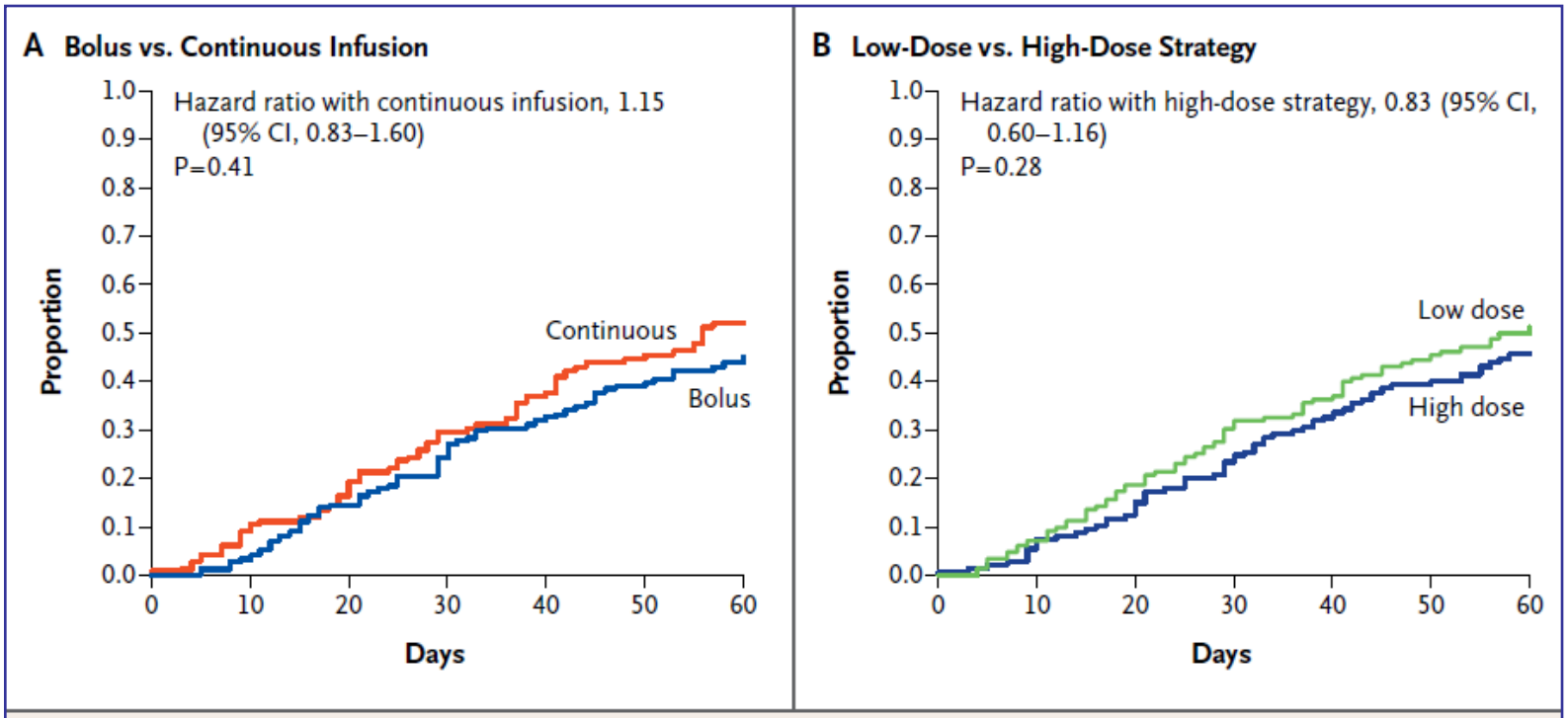


Figure 3. Kaplan–Meier Curves for the Clinical Composite End Point of Death, Rehospitalization, or Emergency Department Visit.

CONCLUSIONS

Among patients with acute decompensated heart failure, there were no significant differences in patients' global assessment of symptoms or in the change in renal function when diuretic therapy was administered by bolus as compared with continuous infusion or at a high dose as compared with a low dose. (Funded by the

Ödem tedavisinde Loop Diüretik dozları

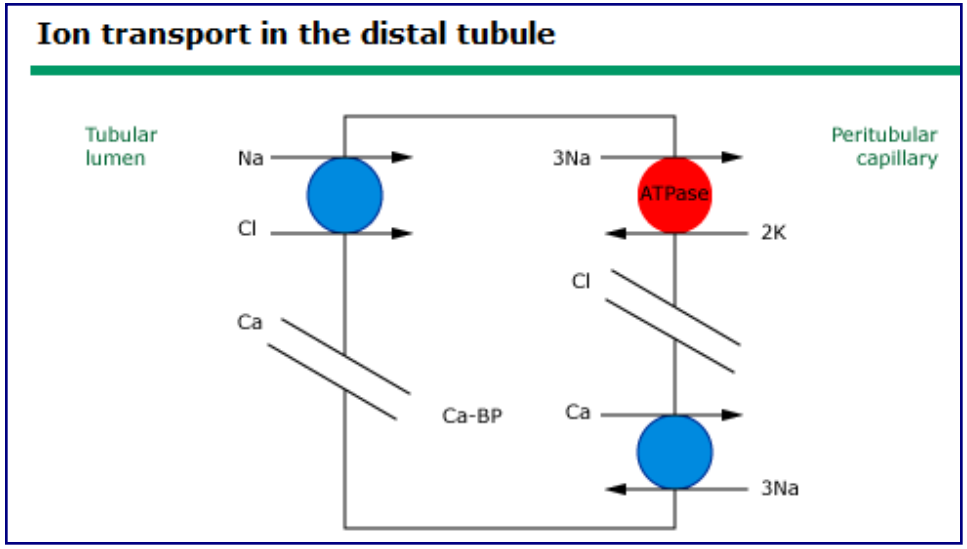
	Starting dose (oral or intravenous*)			Maximum effective dose¶ (higher individual doses or more frequent dosing intervals are unlikely to produce substantial additional diuresis)Δ			Maximal recommended daily dose¶ (greater daily total doses are associated with a risk for toxicity)		
	Furosemide	**Bumetanide**	**Torsemide**	**Furosemide**	**Bumetanide**	**Torsemide**	**Furosemide**	**Bumetanide**	**Torsemide**
Heart failure◇	20 mg once or twice daily	0.5 mg once or twice daily	10 mg once daily	80 mg 3 times daily	3 mg 3 times daily	50 mg twice daily	600 mg	10 mg	200 mg
Cirrhotic ascites§	40 mg once or twice daily	1 mg once or twice daily	10 mg once daily	40 mg 3 times daily	1 mg 3 times daily	20 mg twice daily	160 mg	4 mg	40 mg
Nephrotic syndrome	40 mg once or twice daily	1 mg once or twice daily	10 mg once daily	120 mg 3 times daily	3 mg 3 times daily	50 mg twice daily	600 mg	10 mg	200 mg
Chronic kidney disease¥	ǂ	ǂ	ǂ	200 mg 3 times daily	10 mg 3 times daily	100 mg twice daily	600 mg	10 mg	200 mg
Acute kidney injury	80 mg once or twice daily	2 mg once or twice daily	20 mg once daily	500† mg once	Not reported	Not reported	600 mg	Not reported	Not reported

Mullens W. Eur J Heart fail 2019

TİYAZİD DİÜRETİKLER

[Chloro(hydrochloro)thiazide, hydroflumethiazide; chlorthalidone, indapamide, metolazone]

- Maksimum dozda filtre olan Na^+'un %3-5'inin itrahı
- Distal tubulusta Na-Cl "co-transporter" inhibisyonu

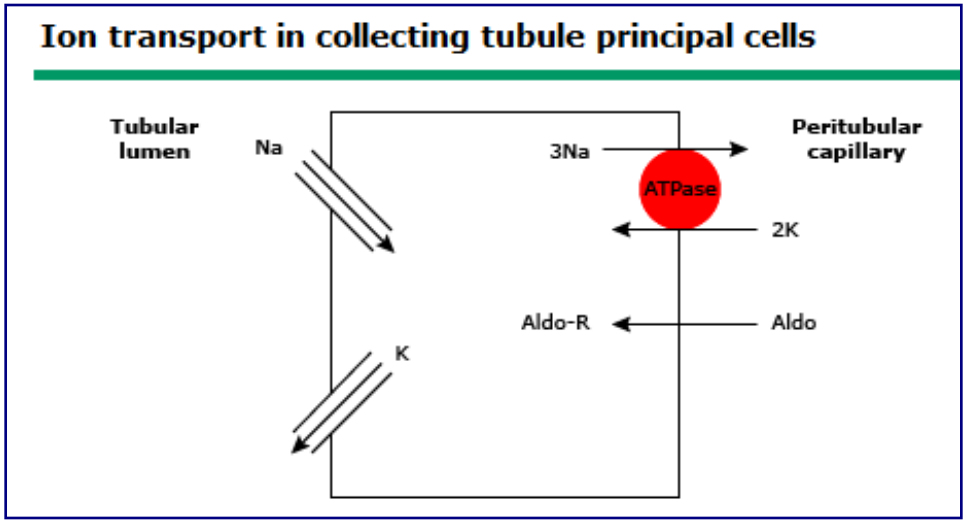


- Distal tubulusta aktif Ca geri emi. ↗; hiperkalsiüri tedavisi
- Hiperkalsemi riski
- Ödem tedavisinde az etkili, HT tedavisinde tercih ilacı

POTASYUM KORUYUCU DİÜRETİKLER

(amiloride, triamterene, spironolactone, eplerenone)

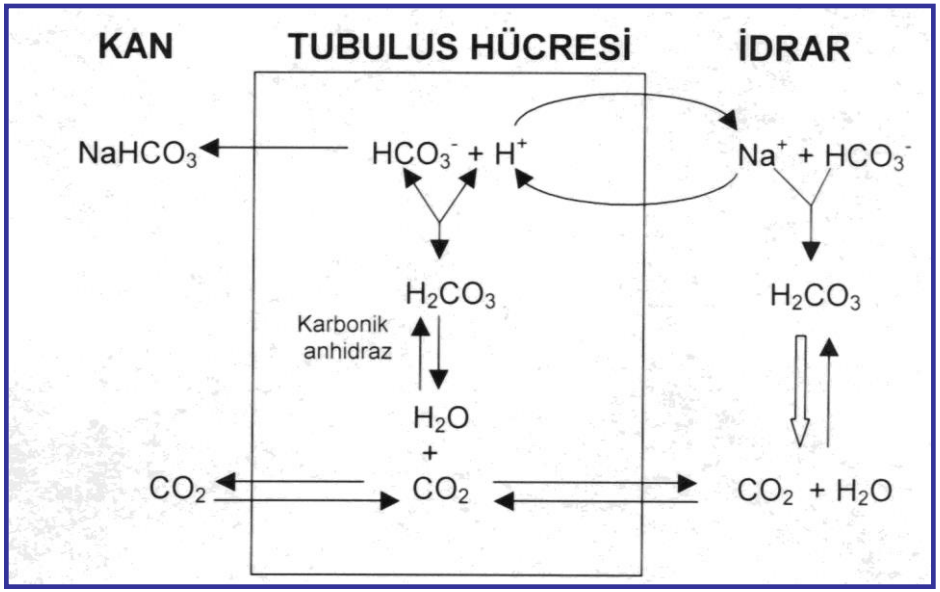
- Filtre olan Na^{+}'un %1-2'sinin itrahı
- Spironolakton MK reseptörü için aldosteron ile yarışmaya girer



- Genelde loop veya tiyazid diüretikler ile kombinasyon
- Primer hiperaldosteronizm, KKY, sirozda indike
- Triamteren nefrotoksik➔ kristalüri ve silendir oluşumu
- Hiperpotasemi; metabolik asidoz riski

ACETAZOLAMİDE

- Zayıf bir diüretik
- Proksimal tubulus karbonik. anhidraz (NaHCO3, NaCl emilimi) inh



- Metabolik alkalozlu, ödemli hastalarda
- Hiperkapneik KOAH'lı hastalarda
- KKY

Acetazolamide in Decompensated Heart failure with Volume OveRload trial

ADVOR

N = 519

Double-blind, randomized

30 Hospitals in Belgium

Acute heart failure with volume overload

Maintenance loop diuretics for at least 1 month

NTproBNP > 1000 pg/ml

Stratified according to LVEF

High dose loop diuretics + Acetazolamide 500 mg IV

High dose loop diuretics + Matching placebo

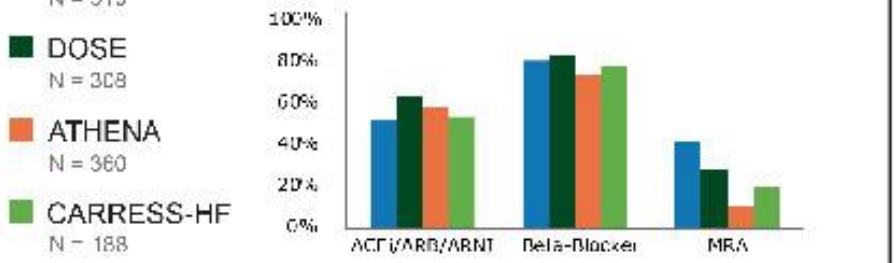
Baseline characteristics: elderly heart failure population, well-treated, with a severe degree of volume overload.

Mean age 78 years
63% men
57% LVEF > 40%

Significant degree of volume overload: 78% oedema up to knee or above

Median NT-proBNP 6173 pg/mL

Overall high baseline heart failure medication prescription, comparable to other large diuretic trials in AHF



ADVOR is the largest diuretic trial in AHF with succesful decongestion as a primary endpoint.
The elderly enrolled population provides a good reflection of the real-world AHF patients in daily clinical practice.

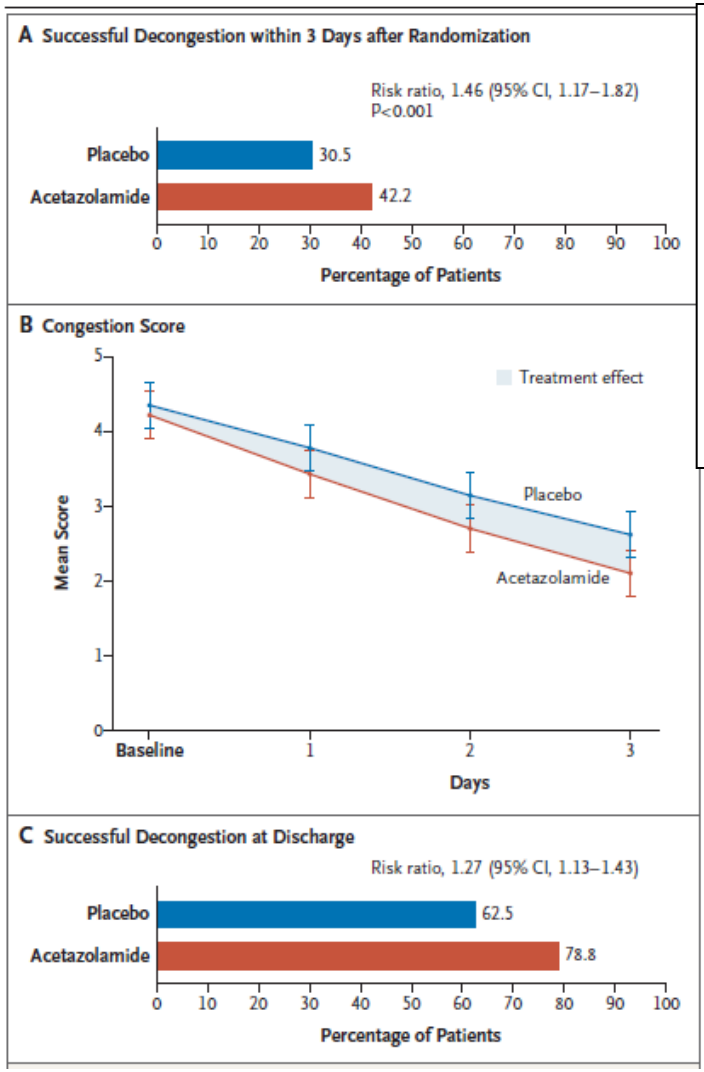
European Journal of Heart Failure (2022) 24, 1601–1610

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Acetazolamide in Acute Decompensated Heart Failure with Volume Overload

W. Mullens, J. Dauw, P. Martens, F.H. Verbrugge, P. Nijst, E. Meekers, K. Tartaglia, F. Chenot, S. Moubayed, R. Dierckx, P. Blouard, P. Troisfontaines, D. Derthoo, W. Smolders, L. Bruckers, W. Droogne, J.M. Ter Maaten, K. Damman, J. Lassus, A. Mebazaa, G. Filippatos, F. Ruschitzka, and M. Dupont, for the ADVOR Study Group*



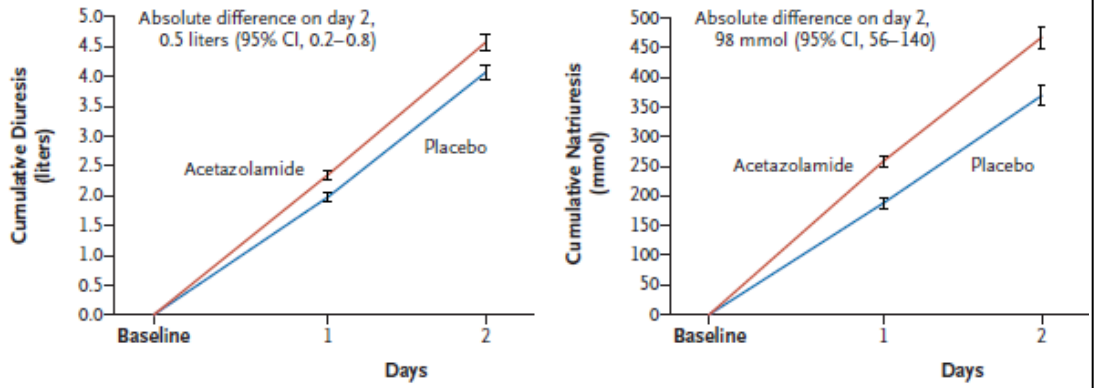


Figure 3. Diuresis and Natriuresis According to Trial Group.

Table 2. Primary and Secondary End Points, Sensitivity and Exploratory Analyses, and Adverse Events.*

Variable	Placebo (N=259)	Acetazolamide (N=256)	Treatment Effect (95% CI)	P Value
Primary end point				
Successful decongestion within 3 days after randomization — no. (%)†	79 (30.5)	108 (42.2)	Risk ratio, 1.46 (1.17–1.82)	<0.001
Secondary end points				
Duration of hospital stay (95% CI) — days‡	9.9 (9.1–10.8)	8.8 (8.0–9.5)	0.89 (0.81–0.98)	
Death from any cause or rehospitalization for heart failure during 3 mo of follow-up — no. (%)	72 (27.8)	76 (29.7)	Hazard ratio, 1.07 (0.78–1.48)	
Sensitivity analysis of primary end point				
Successful decongestion within 3 days after randomization, regardless of escalation of therapy — no. (%)§	86 (33.2)	115 (44.9)	Risk ratio, 1.42 (1.15–1.76)	
Exploratory analysis				
Successful decongestion at discharge among patients who were alive — no./total no. (%)	145/232 (62.5)	190/241 (78.8)	Risk ratio, 1.27 (1.13–1.43)	
Death from any cause at 3 mo — no. (%)	31 (12.0)	39 (15.2)	Hazard ratio, 1.28 (0.78–2.05)	
Rehospitalization for heart failure at 3 mo — no. (%)	45 (17.4)	47 (18.4)	Hazard ratio, 1.07 (0.71–1.59)	

KALP YETMEZLİĞİ – DİÜRETİK TEDAVİLER

LVEF 50% 40%

ADVOR

Acetazolamide (500mg/day) i.v. vs Placebo in acute decompensated HF with congestion

519 patients
Any LVEF

Primary endpoint: decongestion within 3 days after randomization

Successful decongestion
RR, 1.46; 95% [CI], 1.17 to 1.82; $p<0.001$)

EMPA-RESPONSE-AH
(pilot study)

Empagliflozin 10 mg/day vs Placebo in acute WHF within 24 h of presentation

80 patients
Any LVEF

Primary endpoint: Dyspnoea score, diuretic response, change in NTproBNP and length of stay

No difference in the primary endpoint; reduced in-hospital WHF, rehospitalization for HF or death
(10%) vs. (33%); $p=0.014$

TRANSFORM-HF

Torsemide vs Furosemide after discharge from an AHF hospitalization

2859 patients
Any LVEF

Primary endpoint: All-cause mortality

No difference
26.2% (furosemide) vs. 26.1% (torsemide) ($p = 0.77$)

Acute decompensated Heart Failure

Chronic heart failure

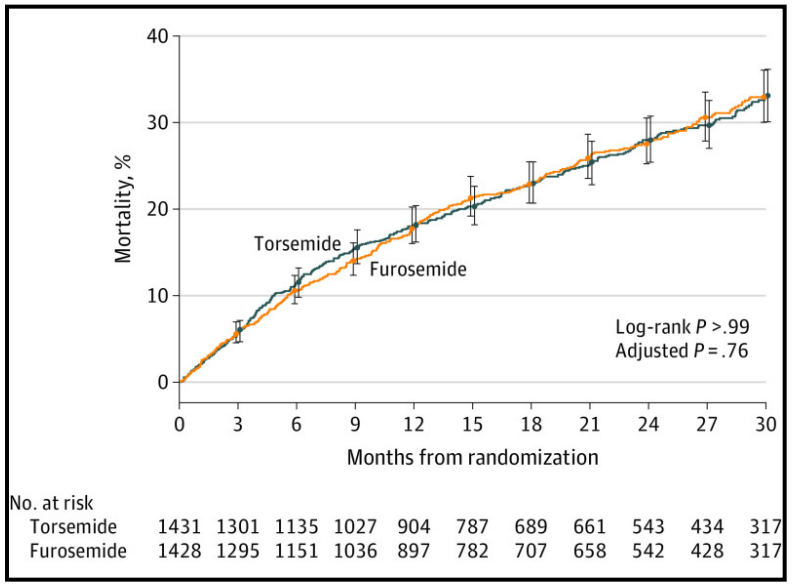


Figure 2 Recent completed trials in patients with heart failure (HF)

ESC Heart Failure 2022; 9: 3667–3693

AKUARETİKLER

(ADH RESEPTÖR ANTAGONİSTLERİ)

- ADH reseptör antagonizması ➔selektif su diürezi

AVP and Vaptans in Heart Failure — Cardiol Res. 2017;8(3):87-95

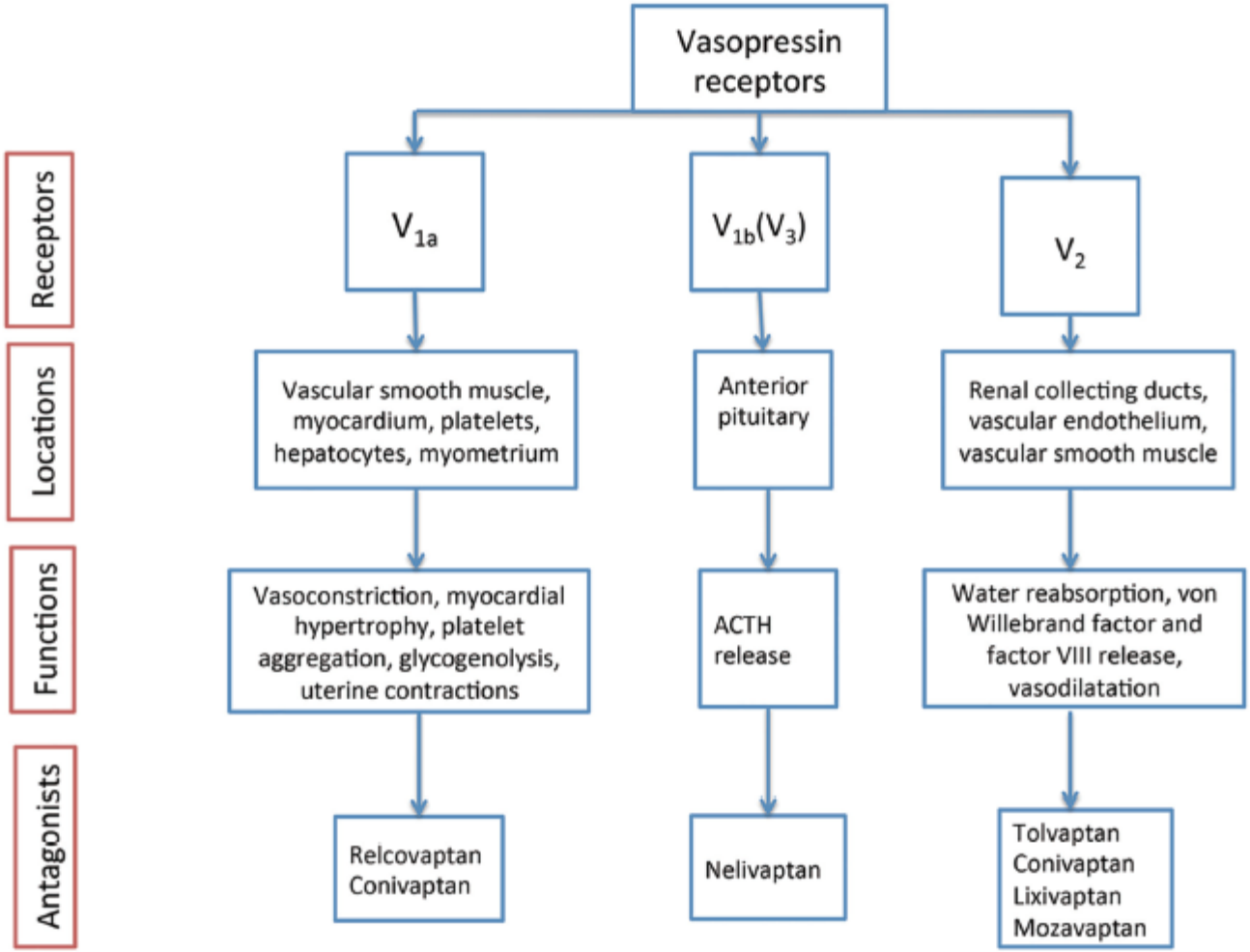


Table 1. Clinical Trials of Vaptans

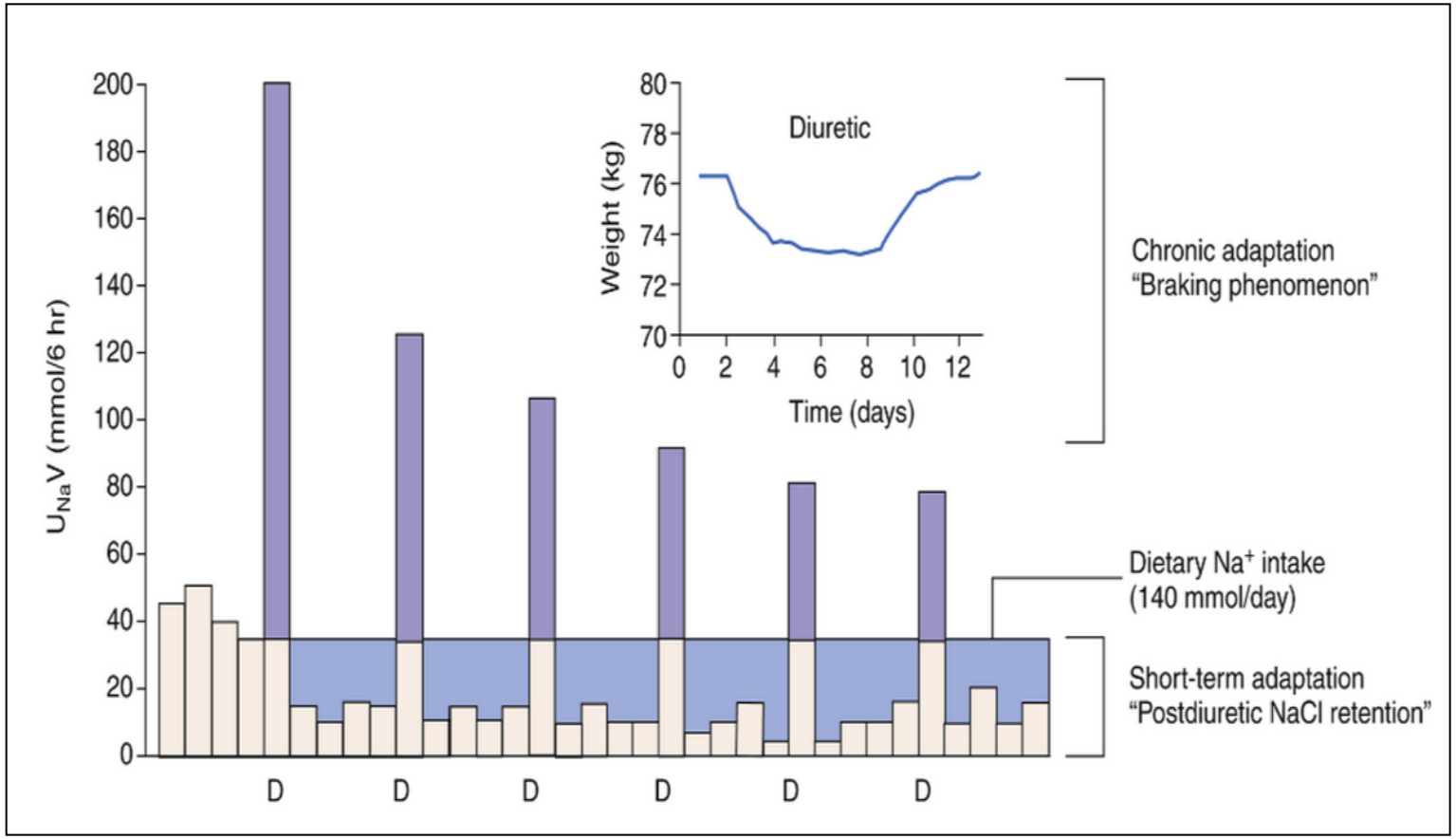
Study	Drug	No. of subjects	Clinical characteristics	Outcome
Udelson et al (2001) [26] Randomized double-blind trial	Conivaptan	Total 142 patients (38 received placebo, 37 received 10 mg, 32 received 20 mg, and 35 received 40 mg)	Symptomatic heart failure, NYHA class III and IV. Baseline serum creatinine 1.1 - 1.3 mg/dL. Patients with serum creatinine > 2.5 mg/dL or creatinine clearance < 30 mL/min were excluded from the study.	Dose dependent diuresis with no change in BP, HR or serum electrolytes. Reduction in PCWP and right atrial pressure due to direct myocardial V_{1a} receptor blockade and diuresis secondary to V_2 receptor.
Palmer et al (2016) [30] Open label multicenter study	Conivaptan	Total 251 patients (37 received 20 mg/day and 214 received 40 mg/day)	Euvolemic or hypervolemic hyponatremia patients (majority are heart failure and SIADH, some are unknown cause). Patients with eGFR < 20 mL/min were excluded from the study.	Both the dose regimens are equally efficacious and well tolerated with infusion site reaction as the common side effect.
Gheorghiade et al (2003) [31] Double-blind placebo controlled trial	Tolvaptan	Total 254 patients (63 received placebo, 64 received 30 mg/day, 64 received 45 mg/day and 63 received 60 mg/day)	Congestive heart failure patients, NYHA class I-IV. Patients with serum creatinine > 3 mg/dL and BUN > 60 mg/dL were excluded from the study.	Increased urine output, restoration of serum Na^+ levels without any change in BP, HR, serum K^+ or renal function when added to standard therapy
Schrier et al (2006) [29] Multicenter, randomized, double-blind, placebo-controlled trials (SALT 1 and SALT 2)	Tolvaptan	Total 448 patients (225 received 15 mg/day and later increased to 30 mg/day and then to 60 mg/day depending on serum Na^+ levels)	Euvolemic or hypervolemic hyponatremia patients (heart failure, cirrhosis, SIADH). Patients with serum creatinine > 3.5 mg/dL were excluded from the study.	Effective dose-dependent correction of hyponatremia when added to standard therapy
Konstam et al (2007) [32] The EVEREST outcome trial. Randomized, double-blind, placebo-controlled trial	Tolvaptan	Total 4,133 patients (2,072 received 30 mg/day and 2,061 received placebo)	Congestive heart failure patients, NYHA class III and IV. Patients with serum creatinine > 3.5 mg/dL were excluded from the study.	No mortality or morbidity benefits when added to standard therapy. Short-term benefits observed were weight loss, improvement in symptoms, and restoration of serum Na^+ levels with no change in renal functions.
Udelson et al (2007) [33] Multicenter, randomized, double-blind, placebo-controlled trial	Tolvaptan	Total 240 patients (120 received 30 mg/day and 120 received placebo)	Heart failure patients, NYHA II and III with EF < 30%. Patients with serum creatinine > 3 mg/dL and BUN > 60 mg/dL were excluded from the study.	Long-term use for a period of one year is safe and well tolerated with better mortality and morbidity rate. No change in renal function or serum electrolytes observed. No effect on ventricular remodeling
Nakada et al (2015) [34] Retrospective study	Tolvaptan	Total 206 patients (26 conventional diuretic resistant patients received tolvaptan and 180 received conventional diuretic therapy)	Acute heart failure patients	Dilated left atrium and inferior vena cava, and severe tricuspid incompetence are frequently associated findings in acute heart failure patients who need tolvaptan therapy.
Tanaka et al (2015) [35] Prospective study	Tolvaptan	Total 20 patients	Volume overload due to CKD. In addition, few patients with heart and liver failure.	Effective diuresis without deterioration in renal functions
Shanmugam et al (2016) [36] Randomized, double-blind, placebo-controlled trial	Tolvaptan for 5 days	Total 51 patients (26 received placebo and 25 received 15 mg/day)	Acute decompensated heart failure with hyponatremia. Patients with serum creatinine > 3 mg/dL were excluded from the study.	Increased urine output and restoration of serum Na^+ levels when added to standard therapy

Diüretikler – elektrolitler-asit baz dengesi

Table 2. Effects of Diuretics on Serum Concentration of Electrolytes, Acid-Base Balance, and Other Parameters

	Serum Concentration						
Class	**K^+**	**Ca^{2+}**	**Mg^{2+}**	**$Urate^-$**	**Na^+**	**H^+**	**Miscellaneous**
Loop	↓	↓	↓	↑	↑	↓	Ototoxicity with AG
Thiazide	↓	↑	↓	↑	↓	↓	Insulin resistance
CAI	↓	↓	↓	↔	↓	↑	CaP stones
K-sparing	↑	↑[a]	↑	↑	↑↓[b]	↑	Androgen blockade
SGLT2i	↔/↑	↔	↑	↓	↑	↔	Euglycemic DKA
Vaptan	↔/↓	↔	↔	↔	↑	↔	–
Osmotic	↑↓[c]	↓	↓	↓	↑↓[c]	↑	–

Diüretiklerin etkinliği zamanla azalır



DİÜRETİK DİRENCİ

- ✓ Günde> 80 mg furosemid ve artan dozlara rağmen konjesyonun devam etmesi
- ✓ Sodyum miktarı filtre edilen yükün <% 0.2
- ✓ 3 gün içinde 2 defa 160 mg furosemid ile atılan sodyum miktarının <90 mmol

Am heart journal 2002
J Cardiovasc Pharmacol1997
Curr Therap Res 1977

DİÜRETİK DİRENCİ

Box 1. Causes of Diuretic Resistance, With Examples

- No volume overload (wrong diagnosis)
  - Venous stasis
  - Lymphedema, lipedema
- Nonadherence
  - Excess salt intake
  - Nonadherence to medication
- Decreased drug delivery
  - Decreased absorption (gut edema)
  - Inadequate dose/frequency
  - Hypoalbuminemia
- Decreased drug secretion
  - Decreased kidney blood flow: AKI/CKD, decreased EABV
  - Tubule transport inhibition: FFAs, bile acids, organic acids, NSAIDs, indoxyl sulfate, *p*-cresyl sulfate
  - Decreased kidney mass
- Decreased kidney response
  - Distal tubule hypertrophy
  - Renin-angiotensin-aldosterone activation

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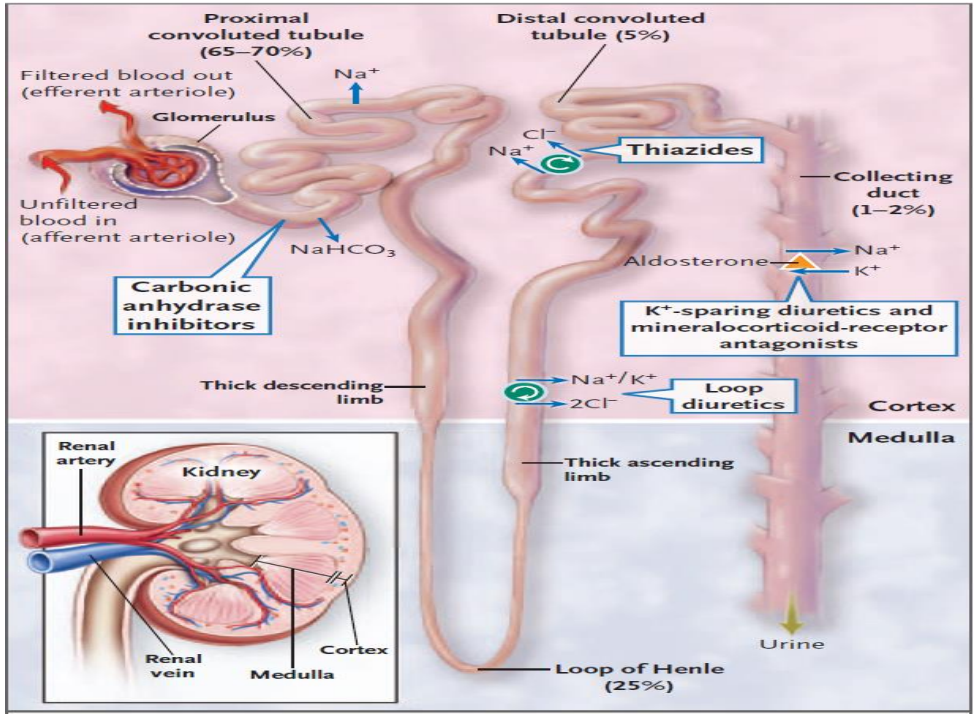
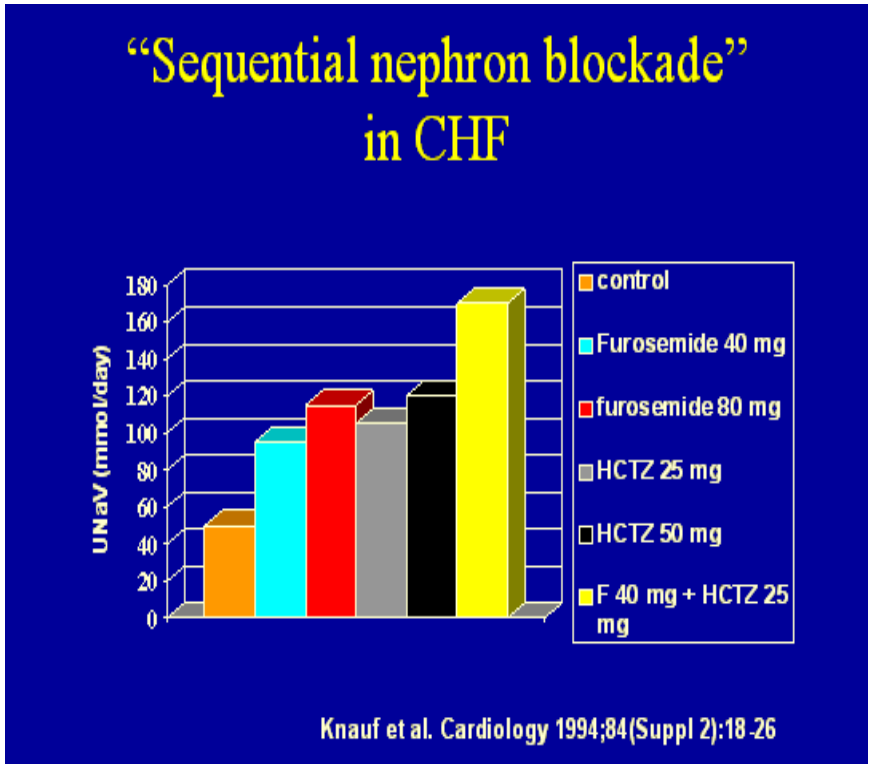
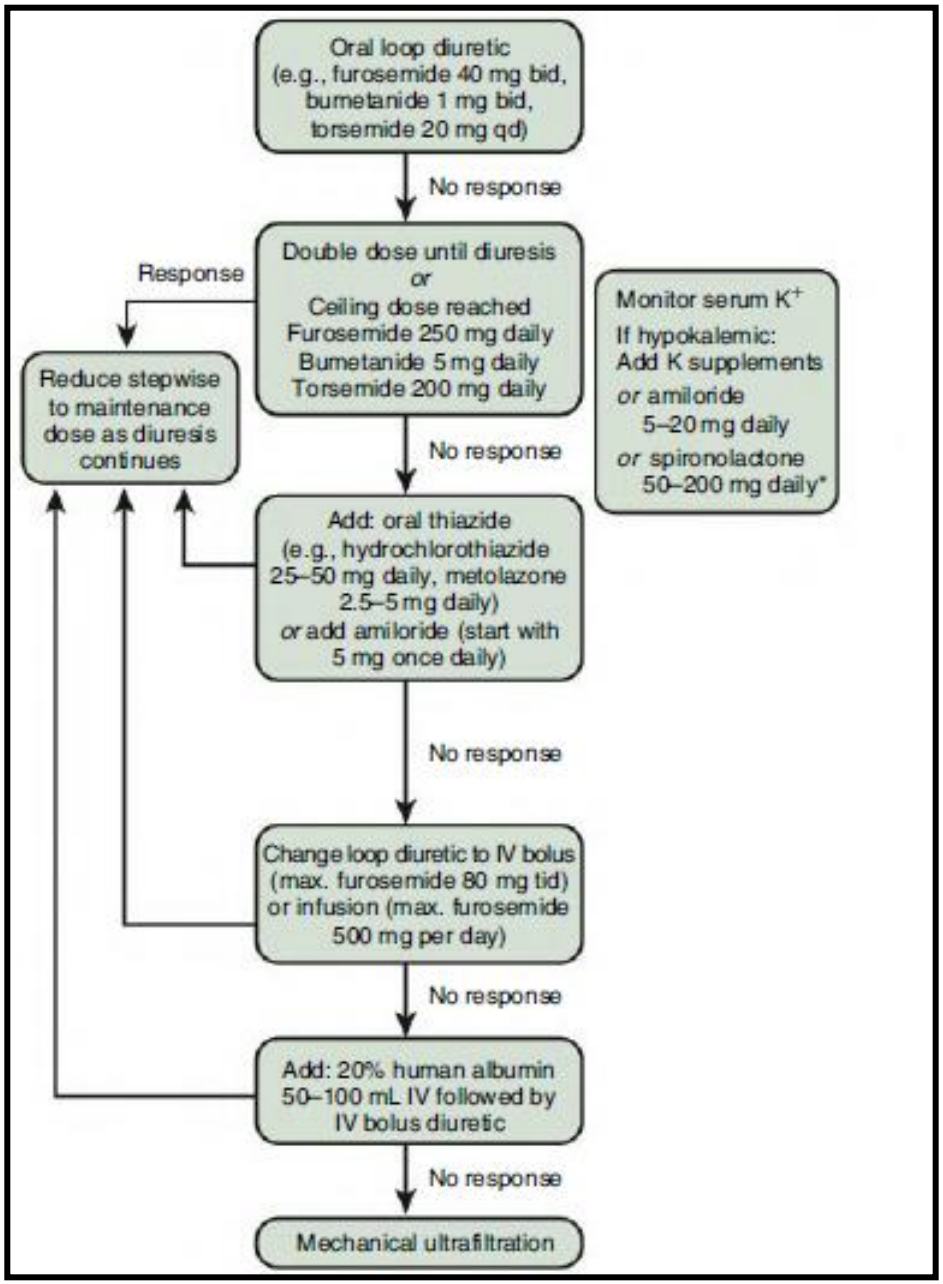
Ardışık nefron blokajı





NEFROTİK SDR ÖDEM TEDAVİSİ



ULTRAFİLTRASYON

- Transmembran basınç gradyanına bağlı olarak yarı geçirgen bir zardan plazma suyunun uzaklaştırılmasını içerir

- Akut kalp yetmezliği olan hastalarda tedavi olarak ultrafiltrasyonun diüretik tedavisinden üstün olduğunu gösteren kanıt bulunmamaktadır

- Günümüzde UF rutin kullanımı önerilmemektedir ve diüretik temelli stratejilere cevap vermeyen hastalarla sınırlı tutulmalıdır

European Heart Journal 2016

KY- ÖDEM TEDAVİ

Loop Diüretikleri	Ultrafiltrasyon
Direkt nörohormonal aktivite	Nörohormonal aktivite yok
Hipotonik idrar atılımı	İzotonik sıvı atılımı
Öngörülemez sodyum ve su atılımı	Kontrollü sıvı atılım imkanı
Uzun kullanımda direnç gelişimi	Diüretik direncinin kırılabilmesi
Hipokalemi ve hipomagnezemi	K ve Mg üzerine etkisi yok
Vasküler yol gereksinimi yok	Venöz yol gereksinimi
Antikoagülasyona gerek yok	Antikoagülasyon gereksinimi
Ekstrakorporal dolaşım yok	Ekstrakorporal dolaşım

Costanza MR et al. J Am Coll Cardiol. 2017

Kalp Yetmezliğinde UF ile ilgili Çalışmalar

UF Clinical Trials: Overview of Study Designs and Key Findings

Study Name, Publication Year (Ref. #)	Study Group	UF Arm	Comparison Arm	Primary Efficacy Endpoint
RAPID-HF, 2005 (40)	N = 40 Hospitalized with HF, 2+ edema and ≥1 additional sign of congestion	Single, 8-h course, median duration 8 h, median volume removed 3,213 ml	Standard HF therapies determined by treating physician	Weight loss 24 h post-consent
UNLOAD, 2007 (33)	N = 200 Hospitalized with HF, ≥2 signs of fluid overload	Aquadex System 100† Mean fluid removal rate 241 ml/h for 12.3 ± 12 h	Standard care: IV diuretic agents. For each 24-h period, at least twice the pre-hospitalization daily oral dose	Weight loss and dyspnea assessment at 48 h after randomization
CARRESS-HF, 2012 (32)	N = 188 Hospitalized with HF, ≥2 signs of congestion, and recent ≥0.3 mg/dl sCr increase	Aquadex System 100† at a fixed rate of 200 ml/h Median duration 40 h	SPT with intravenous diuretic agents dosed to maintain urine output 3–5 l/day	Bivariate response of change in sCr and change in weight 96 h after randomization
CUORE, 2014 (53)	N = 56 NYHA III or IV, LVEF ≤40%, ≥4 kg weight gain from peripheral fluid overload, over 2 months	Dedyca device‡ Mean treatment duration 19 ± 90 h; volume removed 4,254 ± 4,842 ml	Intravenous diuretic agents according to guideline recommendations (standard care)	HF rehospitalization at 1 yr
AVOID-HF, 2016 (56)	N = 224 Hospitalized with HF; ≥2 criteria for fluid overload; receiving daily oral loop diuretic agents	AUF with Aquadex FlexFlow System§; adjustments per protocol guidelines on the basis of vital signs and renal function ‖ Mean fluid removal rate 138 ± 47 ml/h for 80 ± 53 h	ALD with adjustments per protocol-guidelines on the basis of vital signs and renal function¶ Mean furosemide-equivalent dose 271.26 ± 263.06 mg for 100 ± 78 h	Time to first HF event (HF rehospitalization or unscheduled outpatient or emergency treatment with intravenous loop diuretic agents or UF) within 90 days of hospital discharge
ULTRADISCO, 2011 (45)	N = 30 Hospitalized for HF, ≥2+ peripheral edema, ≥1 other criteria for volume overload	PRISMA# Median treatment duration 46 h; cumulative fluid loss 9.7 ± 2.9 l,	Furosemide continuous infusion, initial dose 250 mg/24 h	Change in hemodynamics measured by PRAM

UF’nin riskleri ve dezavantajları

Fazla sıvı çekilmesi hipotansiyona neden olur:

- Renal fonksiyonların kötüleşmesi
- Miyokardiyal stunning
- Serebrovasküler lezyonlar
- İntestinal iskemi

<u>Katater ilişkili komplikasyonlar</u>

- Enfeksiyon
- Tromboz
- Hemoraji
- Vasküler bütünlük kaybı

Maliyet, ekip, lojistik yük

- Sağkalım üzerine kanıtlanmış etki yok
- Kurtarma tedavi

SONUÇLAR

Ödem tedavisi altta yatan nedenin tedavisidir

Pulmoner ödem hayati risk taşır hızla tedavi başlanmalıdır

Diğer durumlarda daha yavaş diürez hızı hedeflenmeli

Çoğunlukla loop diüretikle tedaviye başlanmalı tuz kısıtlanmalı

Diüretik direnci gelişiminde diüretik kombinasyonları uygulanmalı

Medikal tedaviye dirençli olgularda ultrafiltrasyon ödem tedavisinde kullanılabilir