Kardiyak Cerrahi İlişkili Akut Böbrek Hasarı

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Giriş

Frontiers in Research Review:
Kidney Oxygenation in Health and Disease

Haemodynamic influences on kidney oxygenation: Clinical implications of integrative physiology

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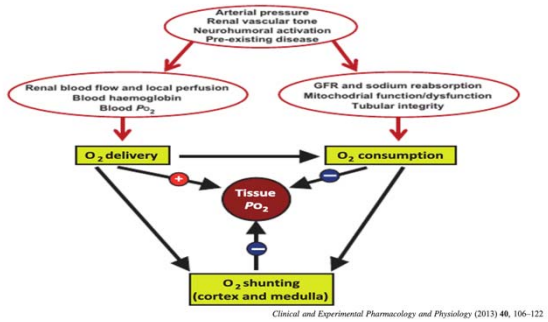
Clinical and Experimental Pharmacology and Physiology (2013) **40**, 106–122



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Akut böbrek hasarı (ABH)

Böbrek fonksiyonlarının son 48 saat içinde akut olarak bozulması

- sCr >0.3mg/dL veya bazal değerinden %50 oranda artış veya 1.5 kat artış
- İdrar <0.5ml/kg/h

ABH Tanımlama Skorlamaları

	Grade I	Grade II	Grade III
RIFLE score	Increase creatinine x1.5 or GFR decreases >25% from baseline in 7 days or UO <0.5 mL/kg/hr for 6–12 hrs	Increase creatinine x2–2.9 or GFR decreases >50% from baseline in 7 days or UO <0.5 mL/kg/hr for >12 hrs	Increase creatinine >x3 or GFR decreases >75% from baseline in 7 days or creat >4 (with an acute rise of >0.5 mg/dL) or UO <0.3 mL/kg/hr for 24 hrs or anuria for >12 hrs
AKIN score	Increase creatinine x1.5 or by ≥0.3 mg/dL (≥26.5 μmol/L) from baseline in 48 hrs or UO <0.5 mL/kg/hr for 6–12 hrs	Increase creatinine x2-2.9 in 7 days from baseline or UO <0.5 mL/kg/hr for >12 hrs	Increase creatinine >x3 from baseline in 7 days or creatinine >4 (with an acute rise of >0.5 mg/dL) or UO <0.3 mL/kg/hr for 24 hrs or anuria for >12 hrs or initiation of RRT
KDIGO score	Increase creatinine by ≥0.3 mg/dL (≥26.5 μmol/L) in 48 hrs, or increase creatinine x1.5–1.9 from baseline within 7 days or UO <0.5 mL/kg/hr for 6–12 hrs	Increase creatinine x2-2.9 in 7 days from baseline or UO <0.5 mL/kg/hr for >12 hrs	Increase creatinine >x3 from baseline in 7 days or creatinine >4 (with no need for an acute rise of >0.5 mg/dL) or eGFR <35 mL/min if age <18 years old or UO <0.3 mL/kg/hr for 24 hrs or anuria for >12 hrs or initiation of RRT

Kardiyak cerrahi ilişkili ABH

- Kalp cerrahisi sonrası ABH İnsidans %2 - %30
- Renal replasman ihtiyacı (RRT) insidansı %1-5
- RRT gereksinimi olan hastalarda mortalite %60

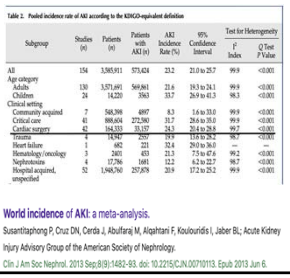


Table 2. Pooled incidence rate of AKI according to the KDIGO-equivalent definition

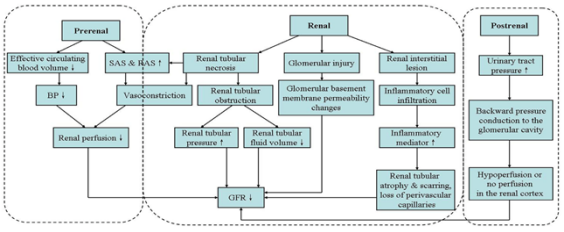
Subgroup	Studies (n)	Patients (n)	Patients with AKI (n)	AKI Incidence Rate (%)	95% Confidence Interval	Test for Heterogeneity I^2 Index	Test for Heterogeneity Q Test P Value
All	154	3,585,911	573,424	23.2	21.0 to 25.7	99.9	<0.001
Age category							
Adults	130	3,571,691	569,861	21.6	19.3 to 24.1	99.9	<0.001
Children	24	14,220	5563	33.7	26.9 to 41.3	98.3	<0.001
Clinical setting							
Community acquired	7	569,398	4897	0.3	1.6 to 33.0	99.9	<0.001
Critical care	41	888,464	272,580	31.7	28.6 to 35.0	99.9	<0.001
Cardiac surgery	42	164,333	33,157	24.3	20.4 to 28.8	99.7	<0.001
Trauma	4	14,947	2057	19.9	13.9 to 28.2	98.2	<0.001
Heart failure	1	682	221	32.4	29.0 to 36.0	—	—
Hematology/oncology	3	2401	453	21.3	7.5 to 47.6	99.2	<0.001
Nephrotoxins	4	17,796	1681	12.2	6.2 to 22.7	98.7	<0.001
Hospital acquired, unspecified	52	1,948,760	257,878	20.9	17.2 to 25.2	99.9	<0.001

World incidence of AKI: a meta-analysis.

Susantitaphong P, Cruz DN, Cerda J, Abulfaraj M, Alqahtani F, Koulouridis I, Jaber BL; Acute Kidney Injury Advisory Group of the American Society of Nephrology.

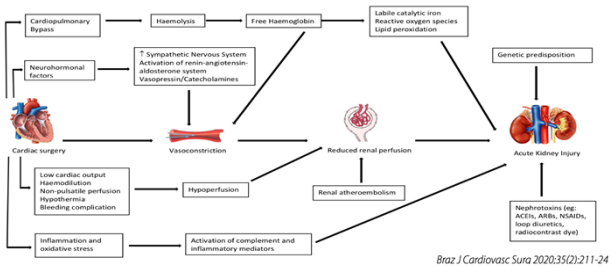
Clin J Am Soc Nephrol. 2013 Sep;8(9):1482-93. doi: 10.2215/CJN.00710113. Epub 2013 Jun 6.

Etyoloji

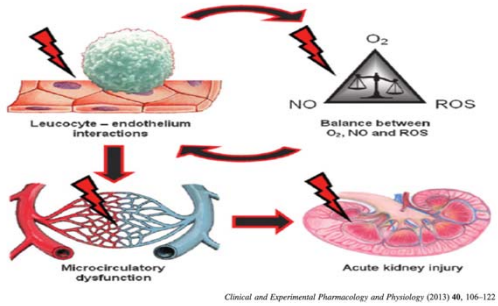


Braz J Cardiovasc Surg. 2019 May-Jun; 34(3): 352–360.

Patofizyoloji



Braz J Cardiovasc Sura 2020;35(2):211-24
Clin J Am Soc Nephrol. 2009 Jun; 4(6): 1020–1031
Kidney Int. 2015 Oct; 88(4): 823–832.



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Risk faktörleri

Preoperative factors
- Renal dysfunction
- Advanced age
- Female gender
- NYHA III
- Cardiac heart failure
- Left main CAD
- Diabetes mellitus
- COPD
- Peripheral vascular disease
- Liver disease
- Low cardiac output states/hypotension (cardiogenic shock from acute MI, mechanical complications of MI)
- Medications that interfere with renal autoregulation (ACE inhibitors, NSAIDs)
- Nephrotoxins (contrast-induced ATN, especially in diabetic vasculopathy), medications (aminoglycosides, metformin)
- Renal atheroembolism (catheterization, IABP)
- Interstitial nephritis (antibiotics, NSAIDs, furosemide)
- Glomerulonephritis (endocarditis)

Intraoperative factors
- Procedure-related
- Type of surgery: Valvular, valvular+coronary, emergency, redo surgery
- Valvular and combined surgery compared to CABG increase risk 2 4 times respectively
- CBP nonpulsatile, low-flow, low-pressure perfusion
- Hypothermic CPB
- Deep hypothermic circulatory arrest
- Duration CBP>100 120 min
- Hemodilution
- Hemolysis and hemoglobinuria from prolonged duration of CPB
- Embolism

Postoperative factors
- Low cardiac output states (decrease contractility, hypovolemia, absent AV synchrony in hypertrophied hearts)
- Hypotension
- Intense vasoconstriction (low-flow states, α-agents)
- Atheroembolism (IABP)
- Sepsis
- Medications (cephalosporins, aminoglycosides, ACE inhibitors)

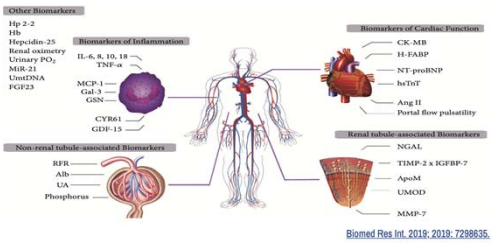
Cardiac surgery-associated acute kidney injury
Ann Card Anaesth. 2016 Oct-Dec; 19(4): 687–698.

Teşhis

- Preoperatif değerlendirme: Riskli hasta
- Serum Kreatinin, GFR, İdrar output
- RIFLE, AKIN, KDIGO
- Yeni Biyomarker
- Renal USG, Renal rezistif İndex, MRI

Guiding AKI Prevention Using Biomarkers
Azra Bihorac, MD, MS, FCCM
Crit Connect. 2015 ; 14(2): 1–11.

Yeni Biyomarkerler



Biomed Res Int. 2019; 2019: 7298835.

Yeni Biyomarkerlar

- NGAL
- IL-18
- Cystatin C
- IGFBP-7 ve TIMP-2

TIMP-2*IGFBP7 (Nephrocheck®) Measurements at Intensive Care Unit Admission After Cardiac Surgery are Predictive for Acute Kidney Injury Within 48 Hours.

Oezkur M, Magyar A, Thomas P, Stork T, Schneider R, Bening C, Störk S, Heuschmann PU, Leyh RG, Wagner M.

Kidney Blood Press Res 2017;42:456-467

ABH Yönetimi (Tedavi ve Önleme)

- Normovolemi
- Normotansiyon
- Normoperfüzyon
- Normooksijenasyon
- Normoglisemi
- Nefrotoksinlerden kaçınma
- Remote iskemik ön koşullandırma
- Erken, Kişiselleştirilmiş Renal replasman tedavisi

Cardiac and Vascular Surgery–Associated Acute Kidney Injury: The 20th International Consensus Conference of the ADQI (Acute Disease Quality Initiative) Group

J Am Heart Assoc. 2018 Jun 5; 7(11): e008834.

Review > Cochrane Database Syst Rev. 2013 Sep 11;2013(9):CD003590. doi: 10.1002/14651858.CD003590.pub4.

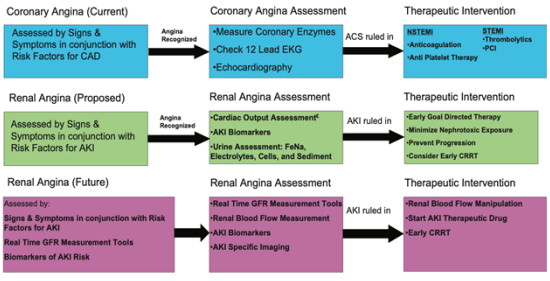
Interventions for protecting renal function in the perioperative period

Mathew Zacharias [1], Mohan Mugawar, G Peter Herbison, Robert J Walker, Karen Hovhannisyan, Pal Sivalingam, Niamh P Conlon

Review > Cochrane Database Syst Rev. 2017 Mar 4;3(3):CD010777. doi: 10.1002/14651858.CD010777.pub2.

Ischaemic preconditioning for the reduction of renal ischaemia reperfusion injury

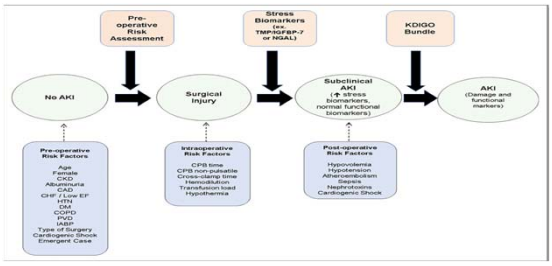
Theo P Menting [1], Kimberley E Wever [1], Denise Md Ozdemir-van Brunschot [1], Daan Ja Van der Vliet [1], Maroeska M Rovers [2], Michiel C Warle [1]



Renal Angina

Stuart L. Goldstein and Lakhmir S. Chawla

CJASN May 2010, 5 (5) 943-949; DOI: https://doi.org/10.2215/CJN.07201009



Cardiac and Vascular Surgery–Associated Acute Kidney Injury: The 20th International Consensus Conference of the ADQI (Acute Disease Quality Initiative) Group

J Am Heart Assoc. 2018 Jun 5; 7(11): e008834.

Sonuç

Preoperative strategies	Intraoperative strategies	Postoperative strategies
-General measures: avoid intravascular volume depletion, optimize cardiac output, avoid nephrotoxic drugs -Aspirin[33,34] -Statins continuation[39] -Iron if Hb <12.5 and ferritin is <100 mg/L -Using exogenous albumin to correct hypoalbuminemia (level of <4 g/dL) in off-pump CABG surgery[35,36]	-Zero-balanced ultrafiltration during CPB for patients with eGFR <60[47] -DO2 >300 ml with MAP >70 mmHg during CPB[48] -Avoid RBC unless Hb <7 g/dL[42] -Volatile anesthesia[69] -Avoid glycemia >180 mg/dL and large glucose variability[49,50] -Program on blood management (TEG-guided transfusion, cell saver and use of tranexamic acid)[44] -rIPC in patients with Cleveland score ≥6, with no use of propofol[70,71] -Levosimendan for CABG if LVEF <40%[83] -Use of vasopressin/terlipressin[85]	-Keep Hb >8 mg/dL[86] -Use of early RRT[88,89] -Avoid ACEi/ARB[87] -Avoid nephrotoxic drugs -Use of dexmedetomidine[84] -Avoid glycemia >180 mg/dL and large glucose variability[49,50] -To optimize hemodynamics individually guided by transpulmonary thermodilution first 2 days[87]

Acute kidney injury after cardiac surgery: prevalence, impact and management challenges.

Vives M, Hernandez A, Parramon F, Estanyol N, Pardina B, Muñoz A, Alvarez P, Hernandez C.

Int J Nephrol Renovasc Dis. 2019 Jul 2;12:153-166. doi: 10.2147/IJNRD.S167477. eCollection 2019.

Prevention of cardiac surgery-associated AKI by implementing the KDIGO guidelines in high risk patients identified by biomarkers: the PrevAKI randomized controlled trial.

Meersch M, Schmidt C, Hoffmeier A, Van Aken H, Wempe C, Gerss J, Zarbock A.

Intensive Care Med. 2017 Nov;43(11):1551-1561. doi: 10.1007/s00134-016-4670-3. Epub 2017 Jan 21.

Teşekkürler