

SCHWERPUNKT: Herzinsuffizienz

- **Akute Herzinsuffizienz – Diagnostik und Behandlungsmöglichkeiten (S. 7–13)**

U. Flierl, A. Schäfer, J. Bauersachs

Literatur:

1. Ponikowski P et al. 2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure: The Task Force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC) Developed with the special contribution of the Heart Failure Association (HFA) of the ESC. *Eur Heart J* 2016; 37: 2129–2200
2. Harjola VP et al. Organ dysfunction, injury and failure in acute heart failure: from pathophysiology to diagnosis and management. A review on behalf of the Acute Heart Failure Committee of the Heart Failure Association (HFA) of the European Society of Cardiology (ESC). *Eur J Heart Fail* 2017; 19: 821–836
3. Chang AM et al. Early Treatment in Emergency Department Patients with Acute Heart Failure: Does Time Matter? *Curr Heart Fail Rep* 2019; 16: 12–20
4. Neumann FJ et al. 2018 ESC/EACTS Guidelines on myocardial revascularization. *Eur Heart J* 2019; 40: 87–165
5. Jernberg T et al. Long-Term Effects of Oxygen Therapy on Death or Hospitalization for Heart Failure in Patients With Suspected Acute Myocardial Infarction. *Circulation* 2018; 138: 2754–2762
6. Masip J et al. Indications and practical approach to non-invasive ventilation in acute heart failure. *Eur Heart J* 2018; 39: 17–25
7. Mebazaa A et al. Long-term safety of intravenous cardiovascular agents in acute heart failure: results from the European Society of Cardiology Heart Failure Long-Term Registry. *Eur J Heart Fail* 2018; 20: 332–41
8. Felker GM et al. Diuretic strategies in patients with acute decompensated heart failure. *N Engl J Med* 2011; 364: 797–805
9. Felker GM & Mentz RJ. Diuretics and ultrafiltration in acute decompensated heart failure. *J Am Coll Cardiol* 2012; 59: 2145–2153
10. Testani JM et al. Potential effects of aggressive decongestion during the treatment of decompensated heart failure on renal function and survival. *Circulation* 2010; 122: 265–272
11. Mullens W et al. The use of diuretics in heart failure with congestion – a position statement from the Heart Failure Association of the European Society of Cardiology. *Eur J Heart Fail* 2019; 21: 137–155
12. Costanzo MR. Ultrafiltration in Acute Heart Failure. *Card Fail Rev* 2019; 5: 9–18
13. Bart BA et al. Ultrafiltration in decompensated heart failure with cardiorenal syndrome. *N Engl J Med* 2012; 367: 2296–2304
14. Ho EC et al. Impact of Nitrate Use on Survival in Acute Heart Failure: A Propensity-Matched Analysis. *J Am Heart Assoc* 2016; 5
15. Singh A et al. Agents with vasodilator properties in acute heart failure. *Eur Heart J* 2017; 38: 317–325
16. Metra M et al. Effects of Serelaxin in Patients with Acute Heart Failure. *N Engl J Med* 2019; 381: 716–726
17. Packer M et al. Effect of Ularitide on Cardiovascular Mortality in Acute Heart Failure. *N Engl J Med* 2017; 376: 1956–1964

18. O'Connor CM et al. Effect of nesiritide in patients with acute decompensated heart failure. *N Engl J Med* 2011; 365: 32–43
19. Werdan K et al. Cardiogenic shock due to myocardial infarction: diagnosis, monitoring and treatment: a German-Austrian S3 Guideline. *Dtsch Arztebl Int* 2012; 109: 343–351
20. Cuffe MS et al. Short-term intravenous milrinone for acute exacerbation of chronic heart failure: a randomized controlled trial. *Jama* 2002; 287: 1541–1547
21. Abraham WT et al. In-hospital mortality in patients with acute decompensated heart failure requiring intravenous vasoactive medications: an analysis from the Acute Decompensated Heart Failure National Registry (ADHERE). *J Am Coll Cardiol* 2005; 46: 57–64
22. Tarvasmaki T et al. Current real-life use of vasopressors and inotropes in cardiogenic shock - adrenaline use is associated with excess organ injury and mortality. *Crit care*. 2016; 20: 208.
23. Cholley B et al. Levosimendan in the light of the results of the recent randomized controlled trials: an expert opinion paper. *Crit care*. 2019; 23: 385
24. Fuhrmann JT et al. Levosimendan is superior to enoximone in refractory cardiogenic shock complicating acute myocardial infarction. *Crit Care medicine*. 2008 ;36: 2257-66
25. Leopold V, Gayat E, et al. Epinephrine and short-term survival in cardiogenic shock: an individual data meta-analysis of 2583 patients. *Intensive care Med* 2018; 44: 847–856
26. Levy B et al. Inotropes and vasopressors use in cardiogenic shock: when, which and how much? *Curr Opin Crit Care* 2019; 25: 384–390
27. O'Gara PT et al. 2013 ACCF/AHA guideline for the management of ST-elevation myocardial infarction: executive summary: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. *J Am Coll Cardiol* 2013; 61: 485–510
28. Rihal CS et al. 2015 SCAI/ACC/HFSA/STS Clinical Expert Consensus Statement on the Use of Percutaneous Mechanical Circulatory Support Devices in Cardiovascular Care: Endorsed by the American Heart Association, the Cardiological Society of India, and Sociedad Latino Americana de Cardiologia Intervencion; Affirmation of Value by the Canadian Association of Interventional Cardiology-Association Canadienne de Cardiologie d'intervention. *J Am Coll Cardiol* 2015; 65: e7–e26
29. Burkhoff D. Device therapy: Where next in cardiogenic shock owing to myocardial infarction? *Nat Rev Cardiol* 2015; 12: 383–384
30. Thiele H et al. Intra-aortic balloon counterpulsation in acute myocardial infarction complicated by cardiogenic shock (IABP-SHOCK II): final 12 month results of a randomised, open-label trial. *Lancet* 2013; 382: 1638–1645
31. Michels G et al. Recommendations for extracorporeal cardiopulmonary resuscitation (eCPR): consensus statement of DGIIN, DGK, DGTHG, DGfK, DGNI, DGAI, DIVI and GRC. *Clin Res Cardiol* 2019; 108: 455–464
32. Burkhoff D et al. Hemodynamics of Mechanical Circulatory Support. *J Am Coll Cardiol* 2015; 66: 2663–2674
33. Sieweke JT et al. Mortality in patients with cardiogenic shock treated with the Impella CP microaxial pump for isolated left ventricular failure. *Eur Heart J Acute Cardiovasc Care* 2020; 9: 138–148
34. Schäfer A et al., Influence of timing and predicted risk on mortality in Impella-treated infarct-related cardiogenic shock patients. *Front Cardiovasc Med* 2020; in press.
35. Schrage B et al. Impella Support for Acute Myocardial Infarction Complicated by Cardiogenic Shock. *Circ* 2019; 139: 1249–1258
36. Tongers J et al. Early Escalation of Mechanical Circulatory Support Stabilizes and Potentially Rescues Patients in Refractory Cardiogenic Shock. *Circ Heart Fail* 2020; 13: e005853.

37. Udesen NJ et al. Rationale and design of DanGer shock: Danish-German cardiogenic shock trial. *An Heart J* 2019; 214: 60–68
 38. Dinatolo E et al. Updates in heart failure: what last year brought to us. *ESC Heart Fail* 2018; 5: 989–1007
 39. Schäfer A et al. Clinical scenarios for use of transvalvular microaxial pumps in acute heart failure and cardiogenic shock - A European experienced users working group opinion. *Int J Cardiol* 2019; 291: 96–104
 40. Mebazaa A et al. Recommendations on pre-hospital and early hospital management of acute heart failure: a consensus paper from the Heart Failure Association of the European Society of Cardiology, the European Society of Emergency Medicine and the Society of Academic Emergency Medicine--short version. *Eur Heart Jour* 2015; 36: 1958-66
 41. Sionis A et al. Current Use and Impact on 30-Day Mortality of Pulmonary Artery Catheter in Cardiogenic Shock Patients: Results From the CardShock Study. *J Intensive Care Med* 2019; 885066619828959.
-

- **Implantierbare Geräte bei Herzinsuffizienz mit reduzierter systolischer Funktion (S. 22–28)**

S. Hohmann, D. Duncker, C. Veltmann

Literatur:

1. Ponikowski P et al. 2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure. *Eur Heart J* 2016; 37: 2129–2200
2. Klein L, Hsia H. Sudden cardiac death in heart failure. *Cardiol Clin* 2014; 32: 135–144
3. Moss AJ et al. Prophylactic implantation of a defibrillator in patients with myocardial infarction and reduced ejection fraction. *N Engl J Med* 2002; 346: 877–883
4. Bardy GH et al. Amiodarone or an implantable cardioverter-defibrillator for congestive heart failure. *N Engl J Med* 2005; 352: 225–37
5. Køber L et al. Defibrillator Implantation in Patients with Nonischemic Systolic Heart Failure. *N Engl J Med* 2016; 375: 1221–1230
6. Shen L et al. Declining Risk of Sudden Death in Heart Failure. *N Engl J Med* 2017; 377: 41–51
7. Elming MB et al. Age and Outcomes of Primary Prevention Implantable Cardioverter-Defibrillators in Patients With Nonischemic Systolic Heart Failure. *Circulation* 2017; 136: 1772–1780
8. Stavrakis S et al. Implantable Cardioverter Defibrillators for Primary Prevention of Mortality in Patients with Non-Ischemic Cardiomyopathy: A Meta-Analysis of Randomized Controlled Trials. *J Cardiovasc Electrophysiol* 2017; 28: 659–665
9. Moss AJ et al. Reduction in inappropriate therapy and mortality through ICD programming. *N Engl J Med* 2012; 367: 2275–2283
10. Stiles MK et al. 2019 HRS/EHRA/APHRS/LAHRs focused update to 2015 expert consensus statement on optimal implantable cardioverter-defibrillator programming and testing. *Europace* 2019; 21: 1442–1443
11. Strauss DG et al. Defining left bundle branch block in the era of cardiac resynchronization therapy. *Am J Cardiol* 2011; 107: 927–934
12. Duncker D, Veltmann C. Device therapy in heart failure with reduced ejection fraction –cardiac resynchronization therapy and more. *Herz* 2018; 43: 415–422

13. Auricchio A et al. Long-term clinical effect of hemodynamically optimized cardiac resynchronization therapy in patients with heart failure and ventricular conduction delay. *J Am Coll Cardiol* 2002; 39: 2026–2033
14. Cazeau S et al. Effects of multisite biventricular pacing in patients with heart failure and intraventricular conduction delay. *N Engl J Med* 2001; 344: 873–880
15. Abraham WT et al. Cardiac resynchronization in chronic heart failure. *N Engl J Med* 2002; 346: 1845–1853
16. Moss AJ et al. Cardiac-resynchronization therapy for the prevention of heart-failure events. *N Engl J Med* 2009; 361: 1329–1338
17. Tang ASL et al. Cardiac-resynchronization therapy for mild-to-moderate heart failure. *N Engl J Med* 2010; 363: 2385–2395
18. Bryant AR et al. Association between QRS duration and outcome with cardiac resynchronization therapy: a systematic review and meta-analysis. *J Electrocardiol* 2013; 46: 147–155
19. Gervais R et al. Surface electrocardiogram to predict outcome in candidates for cardiac resynchronization therapy: a sub-analysis of the CARE-HF trial. *Eur J Heart Fail* 2009; 11: 699–705
20. Zareba W et al. Effectiveness of Cardiac Resynchronization Therapy by QRS Morphology in the Multicenter Automatic Defibrillator Implantation Trial-Cardiac Resynchronization Therapy (MADIT-CRT). *Circulation* 2011; 123: 1061–1072
21. Ruschitzka F et al. Cardiac-resynchronization therapy in heart failure with a narrow QRS complex. *N Engl J Med* 2013; 369: 1395–1405
22. Steffel J, Ruschitzka F. Superresponse to cardiac resynchronization therapy. *Circulation* 2014; 130: 87–90
23. Hayes DL et al. Cardiac resynchronization therapy and the relationship of percent biventricular pacing to symptoms and survival. *Heart Rhythm* 2011; 8: 1469–1475
24. Mullens W et al. Insights from a cardiac resynchronization optimization clinic as part of a heart failure disease management program. *J Am Coll Cardiol* 2009; 53: 765–773
25. Daubert J-C et al. Avoiding non-responders to cardiac resynchronization therapy: a practical guide. *Eur Heart J* 2017; 38: 1463–1472
26. Wilton SB et al. Outcomes of cardiac resynchronization therapy in patients with versus those without atrial fibrillation: a systematic review and meta-analysis. *Heart Rhythm* 2011; 8: 1088–1094
27. Lakkireddy D et al. Radiofrequency ablation of premature ventricular ectopy improves the efficacy of cardiac resynchronization therapy in nonresponders. *J Am Coll Cardiol* 2012; 60: 1531–1539
28. Singh JP et al. Left ventricular lead position and clinical outcome in the multicenter automatic defibrillator implantation trial-cardiac resynchronization therapy (MADIT-CRT) trial. *Circulation* 2011; 123: 1159–1166
29. Vijayaraman P et al. His Bundle Pacing. *J Am Coll Cardiol* 2018; 72: 927–947
30. Mar PL et al. His Bundle Pacing in Heart Failure – Concept and Current Data. *Curr Heart Fail Rep* 2019; 16: 47–56
31. Sweeney MO, Hellkamp AS. Heart failure during cardiac pacing. *Circulation* 2006; 113: 2082–2088
32. Khurshid S et al. Incidence and predictors of right ventricular pacing-induced cardiomyopathy. *Heart Rhythm* 2014; 11: 1619–1625
33. Abdelrahman M et al. Clinical Outcomes of His Bundle Pacing Compared to Right Ventricular Pacing. *J Am Coll Cardiol* 2018; 71: 2319–2330
34. Kusumoto FM, et al. 2018 ACC/AHA/HRS Guideline on the Evaluation and Management of Patients With Bradycardia and Cardiac Conduction Delay: A Report of the American College of

Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Heart Rhythm. *Circulation* 2019; 140

35. Shenkman HJ et al. Congestive heart failure and QRS duration: establishing prognosis study. *Chest* 2002; 122: 528–534
36. Lyon AR et al. Cardiac contractility modulation therapy in advanced systolic heart failure. *Nat Rev Cardiol* 2013; 10: 584–598
37. Butter C et al. Enhanced inotropic state of the failing left ventricle by cardiac contractility modulation electrical signals is not associated with increased myocardial oxygen consumption. *J Card Fail* 2007; 13: 137–142
38. Borggrefe MM et al. Randomized, double blind study of non-excitatory, cardiac contractility modulation electrical impulses for symptomatic heart failure. *Eur Heart J* 2008; 29: 1019–1028
39. Kadish A et al. A randomized controlled trial evaluating the safety and efficacy of cardiac contractility modulation in advanced heart failure. *Am Heart J* 2011; 161: 329–337.e2
40. Anker SD et al. Cardiac contractility modulation improves long-term survival and hospitalizations in heart failure with reduced ejection fraction. *Eur J Heart Fail* 2019; 21: 1103–1113
41. Bisognano JD et al. Baroreflex activation therapy lowers blood pressure in patients with resistant hypertension: results from the double-blind, randomized, placebo-controlled rheos pivotal trial. *J Am Coll Cardiol* 2011; 58: 765–773
42. Florea VG, Cohn JN. The autonomic nervous system and heart failure. *Circ Res* 2014; 114: 1815–1826
43. Abraham WT et al. Baroreflex Activation Therapy for the Treatment of Heart Failure With a Reduced Ejection Fraction. *JACC Hear Fail* 2015; 3: 487–496
44. Zile MR et al. S-LBCT01-04: Baroreflex Activation Therapy in Patients with Heart Failure with a Reduced Ejection Fraction. *Hear Rhythm Off J Hear Rhythm Soc* 2019; 16: 964–965

- **Funktionelle Mitralklappeninsuffizienz bei Herzinsuffizienz – wann ist der Clip indiziert (S. 29–34)**

C. Iliadis, S. Baldus, R. Pfister

Literatur:

1. Rossi A et al. Independent prognostic value of functional mitral regurgitation in patients with heart failure. A quantitative analysis of 1256 patients with ischaemic and non-ischaemic dilated cardiomyopathy. *Heart* 2011;97 :1675–1680
2. Goliash G et al. Refining the prognostic impact of functional mitral regurgitation in chronic heart failure. *Eur Heart J* 2018; 39: 39–46.
3. García-Cosío Carmena MD et al. Prognostic Implications of Functional Mitral Regurgitation in Patients With Heart Failure and Reduced Ejection Fraction. *Rev Esp Cardiol (Engl Ed)* 2017; 70: 785–787
4. Magne J, et al. Preoperative posterior leaflet angle accurately predicts outcome after restrictive valve annuloplasty for ischemic mitral regurgitation. *Circulation* 2007;115: 782–791
5. Baumgartner H et al. 2017 ESC/EACTS Guidelines for the management of valvular heart disease. *Eur Heart J* 2017; 38: 2739–2791
6. Nishimura RA et al. 2017 AHA/ACC Focused Update of the 2014 AHA/ACC Guideline for the Management of Patients With Valvular Heart Disease: A Report of the American College of

Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *Circulation* 2017; 135: e1159–e1195

7. Ponikowski P et al. 2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure: The Task Force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC) Developed with the special contribution of the Heart Failure Association (HFA) of the ESC [published correction appears in *Eur Heart J*. 2016 Dec 30]. *Eur Heart J* 2016; 37: 2129–2200
8. Lowes BD et al. Effects of carvedilol on left ventricular mass, chamber geometry, and mitral regurgitation in chronic heart failure. *Am J Cardiol* 1999; 83: 1201–1205
9. Kang DH et al. Angiotensin Receptor Neprilysin Inhibitor for Functional Mitral Regurgitation. *Circulation* 2019; 139: 1354–1365
10. Seneviratne B et al. Effect of captopril on functional mitral regurgitation in dilated heart failure: a randomised double blind placebo controlled trial. *Br Heart J* 1994; 72: 63–68
11. Onishi T et al. Mechanistic features associated with improvement in mitral regurgitation after cardiac resynchronization therapy and their relation to long-term patient outcome. *Circ Heart Fail* 2013; 6: 685–693
12. van Bommel RJ et al. Cardiac resynchronization therapy as a therapeutic option in patients with moderate-severe functional mitral regurgitation and high operative risk. *Circulation* 2011; 124: 912–919
13. Praz F et al. Compassionate use of the PASCAL transcatheter mitral valve repair system for patients with severe mitral regurgitation: a multicentre, prospective, observational, first-in-man study. *Lancet* 2017; 390: 773–780
14. Lim DS et al. Transcatheter Valve Repair for Patients With Mitral Regurgitation: 30-Day Results of the CLASP Study. *JACC Cardiovasc Interv* 2019; 12: 1369–1378
15. Feldman T et al. Percutaneous repair or surgery for mitral regurgitation [published correction appears in *N Engl J Med* 2011; 365: 189. Glower, Donald G [corrected to Glower, Donald D]]. *N Engl J Med* 2011; 364: 1395–1406
16. Iliadis C, Lee S, Kuhr K, et al. Functional status and quality of life after transcatheter mitral valve repair: a prospective cohort study and systematic review. *Clin Res Cardiol*. 2017;106(12):1005–1017. doi:10.1007/s00392-017-1150-x
17. Stone GW et al. Transcatheter Mitral-Valve Repair in Patients with Heart Failure. *N Engl J Med* 2018; 379: 2307–2318
18. Obadia JF et al. Percutaneous Repair or Medical Treatment for Secondary Mitral Regurgitation. *N Engl J Med* 2018; 379: 2297–2306
19. Chhatrwalla AK et al. Operator Experience and Outcomes of Transcatheter Mitral Valve Repair in the United States. *J Am Coll Cardiol* 2019; 74: 2955–2965
20. Puls M et al. One-year outcomes and predictors of mortality after MitraClip therapy in contemporary clinical practice: results from the German transcatheter mitral valve interventions registry. *Eur Heart J* 2016; 37: 703–712
21. Sorajja P et al. Outcomes With Transcatheter Mitral Valve Repair in the United States: An STS/ACC TVT Registry Report. *J Am Coll Cardiol*. 2017; 70: 2315–2327
22. Maisano F et al. Percutaneous mitral valve interventions in the real world: early and 1-year results from the ACCESS-EU, a prospective, multicenter, nonrandomized post-approval study of the MitraClip therapy in Europe. *J Am Coll Cardiol* 2013; 62: 1052–1061
23. Baldus S et al. Interventionelle Therapie von AV-Klappenerkrankungen – Fokus Mitralklappeninsuffizienz. *Kardiologie* 2018;12: 128–144 Positionspapier *Kardiologie* 2018; 12: 128–144

24. Crimi G et al. MitraClip procedure as 'bridge to list', the ultimate therapeutic option for end-stage heart failure patients not eligible for heart transplantation due to severe pulmonary hypertension. *Pulmonary circulation* 2018; 8: 2045894018791871
25. Grayburn PA et al. Proportionate and Disproportionate Functional Mitral Regurgitation: A New Conceptual Framework That Reconciles the Results of the MITRA-FR and COAPT Trials. *JACC Cardiovasc Imaging* 2019; 12: 353–362