

SCHWERPUNKT: Sportkardiologie

- **Editorial (S. 5)**

B. Bjarnason-Wehrens, R. Nebel

Literatur:

1. Paffenbarger RS et al. Physical activity, all-cause mortality, and longevity of college alumni New England Journal of Medicine 1986; 314; 605-13
2. S3 – Leitlinie zur kardiologischen Rehabilitation (LL-KardReha) im deutschsprachigen Raum Europas, Deutschland, Österreich, Schweiz (D-A-CH), Langversion - Teil 1, 2019 AWMF Registernummer: 133/001, www.awmf.org
3. Pelliccia A et al. ESC Guidelines on sports cardiology and exercise in patients with cardiovascular disease: The Task Force on sports cardiology and exercise in patients with cardiovascular disease of the European Society of Cardiology (ESC), European Heart Journal, 2021; 42: 17–96
4. Global status report on noncommunicable diseases 2014. 1. Chronic Disease – prevention and control. 2. Chronic Disease – epidemiology. 3. Chronic Disease – mortality. 4. Cost of Illness. 5. Delivery of Health Care. I. World Health Organization. ISBN 978 92 4 156485 4. Geneva, WHO, 2014 (www.who.int)
5. Ambrosetti M et al. Secondary prevention through comprehensive cardiovascular rehabilitation: From knowledge to implementation. 2020 update. A position paper from the Secondary Prevention and Rehabilitation Section of the European Association of Preventive Cardiology. Eur J Prev Cardiol 2020
6. Vanhees L et al. Importance of characteristics and modalities of physical activity and exercise in the management of cardiovascular health in individuals with cardiovascular disease (Part III). Eur J Prev Cardiol. 2012; 19: 1333–56

- **Myokarditis und Sport (S. 8–16)**

T. Schmidt, B. Bjarnason-Wehrens, H.-G. Predel, N. Reiss

Literatur:

7. Bohm P et al. Sports-Related Sudden Cardiac Arrest in Germany. Can J Cardiol 2020 (online ahead of print)
8. Corrado D. Sudden cardiac death in young people with apparently normal heart. Cardiovasc Res 2001; 50: 399–408
9. Halle M et al. Myocarditis in athletes: A clinical perspective. Eur J Prev Cardiol 2020 (online ahead of print)
10. Cooper LT. Myocarditis. N Eng J Med 2009; 360: 1526–38
11. Könemann S et al. Update Myokarditis. Dtsch Med Wochenschr 2020; 145: 166–70
12. Pelliccia A et al. Recommendations for participation in competitive and leisure time sport in athletes with cardiomyopathies, myocarditis, and pericarditis: Position statement of the Sport

- Cardiology Section of the European Association of Preventive Cardiology (EAPC). Eur Heart J 2019; 40: 19–33
- 13. Eichhorn C et al. Myocarditis in Athletes Is a Challenge: Diagnosis, Risk Stratification, and Uncertainties. JACC Cardiovasc Imaging 2020; 13: 494–507
 - 14. Peretto G et al. Arrhythmias in myocarditis: State of the art Heart Rhythm 2019; 16: 793–801
 - 15. Vio R et al. Myocarditis in the Athlete: Arrhythmogenic Substrates, Clinical Manifestations, Management, and Eligibility Decisions. J Cardiovasc Transl Res 2020; 13: 284–95
 - 16. Maron BJ et al. Eligibility and Disqualification Recommendations for Competitive Athletes With Cardiovascular Abnormalities: Task Force 3: Hypertrophic Cardiomyopathy, Arrhythmogenic Right Ventricular Cardiomyopathy and Other Cardiomyopathies, and Myocarditis: A Scientific Statement From the American Heart Association and American College of Cardiology. Circulation 2015; 132: e273–80
 - 17. Sagar S et al. Myocarditis. Lancet 2012; 379: 738–47
 - 18. Tschöpe C et al. Management of Myocarditis-Related Cardiomyopathy in Adults. Circ Res 2019; 124: 1568–83.
 - 19. Schnell F & Carrè F. Specific Cardiovascular Diseases and Competitive Sports Participation: Myocarditis and Myocardial Fibrosis. In: Pressler A, Niebauer J, editors. Textbook of sports and exercise cardiology. Cham, Switzerland: Springer; 2020. 341–359
 - 20. Gräni C et al. Prognostic Value of Cardiac Magnetic Resonance Tissue Characterization in Risk Stratifying Patients With Suspected Myocarditis. J Am Coll Cardiol 2017; 70: 1964–76
 - 21. Aquaro GD et al. Cardiac MR With Late Gadolinium Enhancement in Acute Myocarditis With Preserved Systolic Function: ITAMY Study. J Am Coll Cardiol 2017; 70: 1977–87.
 - 22. Thompson PD & Dec GW. We need better data on how to manage myocarditis in athletes. Eur J Prev Cardiol 2020 (online ahead of print)
 - 23. Wu C et al. Causes of Troponin Elevation and Associated Mortality in Young Patients. Am J Med 2018; 131: 284–292.e1
 - 24. Ferreira VM et al. Cardiovascular Magnetic Resonance in Nonischemic Myocardial Inflammation: Expert Recommendations. J Am Coll Cardiol 2018; 72: 3158–76
 - 25. Caforio ALP et al. Current state of knowledge on aetiology, diagnosis, management, and therapy of myocarditis: A position statement of the European Society of Cardiology Working Group on Myocardial and Pericardial Diseases. Eur Heart J 2013; 34: 2636–48
 - 26. Walsh NP. Recommendations to maintain immune health in athletes. Eur J Sports Sci 2018; 18: 820–31
 - 27. Simpson RJ et al. Can exercise affect immune function to increase susceptibility to infection? Exerc Immunol Rev 2020; 26: 8–22
 - 28. Peake JM et al. Recovery of the immune system after exercise. J Appl Physiol 2017; 122: 1077–87
 - 29. Campbell JP & Turner JE. Debunking the Myth of Exercise-Induced Immune Suppression: Redefining the Impact of Exercise on Immunological Health Across the Lifespan. Front Immunol 2018; 9: 648
 - 30. Shah N & Phelan D. Myocarditis in the Athlete. 2018. <https://www.acc.org/latest-in-cardiology/articles/2018/01/18/15/00/myocarditis-in-the-athlete>. Accessed 27 Aug 2020
 - 31. Gatmaitan et al. Augmentation of the virulence of murine coxsackie-virus B-3 myocarditis by exercise. J Exp Med 1970; 131: 1121–36
 - 32. Wesslén L et al. An increase in sudden unexpected cardiac deaths among young Swedish orienteers during 1979–1992. Eur Heart J 1996; 17: 902–10
 - 33. Puntmann VO et al. Outcomes of Cardiovascular Magnetic Resonance Imaging in Patients Recently Recovered From Coronavirus Disease 2019 (COVID-19). JAMA Cardiol 2020; 5: 1265–73
 - 34. Phelan D et al. A Game Plan for the Resumption of Sport and Exercise After Coronavirus Disease 2019 (COVID-19) Infection. JAMA Cardiol 2020; 5: 1085–6

35. Bhatia RT et al. Exercise in the Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) era: A Question and Answer session with the experts Endorsed by the section of Sports Cardiology & Exercise of the European Association of Preventive Cardiology (EAPC). *Eur J Prev Cardiol* 2020; 27: 1242–51
 36. Schellhorn P et al. Return to sports after COVID-19 infection. Do we have to worry about myocarditis?. *Eur Heart J* 2020 (online ahead of print)
 37. S3-Leitlinie zur kardiologischen Rehabilitation (LL-KardReha) im deutschsprachigen Raum Europas Deutschland, Österreich, Schweiz, (D-A-CH). https://www.awmf.org/uploads/tx_szleitlinien/133-001I_S3-Kardiologische-Rehabilitation-in-D-A-CH_2020-04.pdf. Accessed 15 Oct 2020
 38. Patriki D et al. A Prospective Pilot Study to Identify a Myocarditis Cohort who may Safely Resume Sports Activities 3 Months after Diagnosis. *J Cardiovasc Transl Res* 2020 (online ahead of print)
 39. Pressler A et al. Myocarditis, myocardial fibrosis and eligibility for competitive sports. *Int J Cardiol* 2011; 152: 131–2
 40. Piepoli MF et al. Exercise training in heart failure: From theory to practice. A consensus document of the Heart Failure Association and the European Association for Cardiovascular Prevention and Rehabilitation. *Eur Heart J* 2011; 13: 347–57
 41. Ambrosetti M et al. Secondary prevention through comprehensive cardiovascular rehabilitation: From knowledge to implementation. 2020 update. A position paper from the Secondary Prevention and Rehabilitation Section of the European Association of Preventive Cardiology. *Eur J Prev Cardiol* 2020 (online ahead of print)
 42. Drezner JA et al. Survival After Exercise-Related Sudden Cardiac Arrest in Young Athletes: Can We Do Better? *Sports Health* 2019; 11: 91–8
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- **Lungenembolie – Standards in Diagnostik und Therapie – Schwerpunkt Rehabilitation und körperliche Aktivität (S. 26–37)**

R. Nebel, A. Schlitt, B. Bjarnason-Wehrens

Literatur:

1. Stein PD et al: Silent pulmonary embolism in patients with deep venous thrombosis: a systematic review. *Am J Med* 2010; 123 (5): 426–433
2. Heit JA: Epidemiology of venous thromboembolism. *Nat Rev Cardiol* 2015; 12 (8): 464–74
3. Andersson T & Soderberg S: Incidence of acute pulmonary embolism, related comorbidities and survival; analysis of a Swedish national cohort. *BMC Cardiovasc Disord* 2017; 17 (1): 15
4. Lankeit M et al: Akute Lungenembolie – Update 2018. *Kardio up2date* 2018; 14 (01): 67–78
5. Konstantinides SV et al.: 2019 ESC Guidelines for the diagnosis and management of acute pulmonary embolism developed in collaboration with the European Respiratory Society (ERS). *Eur Heart J* 2020; 41, 543–603
6. Pollack CV et al.: Clinical characteristics, management, and outcomes of patients diagnosed with acute pulmonary embolism in the emergency department: initial report of EMPEROR (Multicenter Emergency Medicine Pulmonary Embolism in the Real World Registry). *J Am Coll Cardiol* 2011; 57 (6): 700–706
7. Chuang LH et al. Health-related quality of life and mortality in patients with pulmonary embolism: a prospective cohort study in seven European countries *Quality of Life Research* 2019; 28: 2111–2124

8. Sista A & Klok F. Late outcomes of pulmonary embolism: The post-PE syndrome. *Thromb. Res.* 2018; 164: 157–162
9. Tavoly M et al. Health-related quality of life after pulmonary embolism: a cross-sectional study. *BMJ Open* 2016; 6: e013086
10. Wilkens H & Held M: Lungenarterienembolie: Status 2018. *Dtsch Arztebl, Supp: Perspektiven der Pneumologie & Allergologie* 2018; 115 (24): 8–14
11. Wells PS et al: Use of a clinical model for safe management of patients with suspected pulmonary embolism. *Ann Intern Med* 1998; 129 (12): 997–1005
12. Squizzato A et al.: Diagnostic accuracy of lung ultrasound for pulmonary embolism: a systematic review and meta-analysis. *J Thromb Haemost* 2013; 11 (7): 1269–1278
13. Jany B & Welte T: Pleuraerguss des Erwachsenen – Ursachen, Diagnostik und Therapie. *Dtsch Arztebl.* 2019; 116: 377–385
14. Jimenez D et al.: Simplification of the pulmonary embolism severity index for prognostication in patients with acute symptomatic pulmonary embolism. *Arch Intern Med* 2010; 170 (15): 1383–1389
15. Zondag W et al: Hestia criteria can discriminate high- from low-risk patients with pulmonary embolism *Eur Respir J* 2013; 41(3): 588–592
16. Dournes Get al.: Dual-energy CT perfusion and angiography in chronic thromboembolic pulmonary hypertension: diagnostic accuracy and concordance with radio-nuclide scintigraphy. *Eur Radiol* 2014; 24(1): 42–51
17. Kreitner KF et al.: Chronic thromboembolic pulmonary hypertension – assessment by magnetic resonance imaging. *Eur Radiol* 2007; 17(1): 11–21
18. Olschewski H: Neue ESC/ERS-Leitlinien für Lungenembolie. *Der Pneumologe* (2020); 17: 365–375
19. Roy PM: HOME-PE - Hospitalisation or Outpatient Management of PE Patients – HESTIA vs. Simplified PESI; vorgestellt bei der HOTLINE III-Session am 31.08.2020 beim ESC Congress 2020 – The Digital Experience
20. Wang KL et al. Management of Venous Thromboembolisms: Part II. The Consensus for Pulmonary Embolism and Updates. *Acta Cardiol Sin* 2020; 36: 562–582
21. Ivarsson B et al. Coping, social support and information in patients with pulmonary arterial hypertension or chronic thromboembolic pulmonary hypertension: a 2-year retrospective cohort study. *SAGE Open Med* 2018; 6: doi: 2050312117749159
22. S3-Leitlinie zur kardiologischen Rehabilitation (LL-KardReha) im deutschsprachigen Raum Europas, Deutschland, Österreich, Schweiz (D-A-CH), Langversion – Teil 1, 2019 AWMF Registernummer: 133/001, www.awmf.org
23. Kahn S et al. Physical activity in patients with deep venous thrombosis: a systematic review. *Thromb Res.* 2008; 122: 763–773
24. S2k-Leitlinie Diagnostik und Therapie der Venenthrombose und der Lungenembolie, 2015 AWMF Registernummer: 065/002, www.awmf.org
25. Xu L et al. The effectiveness of exercise training in treating venous thromboembolism: a systematic review. *Phys Sportsmed.* 2020. Epub ahead of print. PMID: 32643517
26. Lakoski SG et al. The safety and efficacy of early-initiation exercise training after acute venous thromboembolism: a randomized clinical trial. *J Thromb Haemost.* 2015; 13: 1238–1244
27. Noack F et al. Feasibility and safety of rehabilitation after venous thromboembolism. *Vasc Health Risk Manag.* 2015; 11: 397–401
28. Amoury M et al. Prognosis of patients with pulmonary embolism after rehabilitation. *Vascular Health and Risk Management* 2018;14: 183–187
29. Stavrou V et al. Eight Weeks of Pulmonary Rehabilitation in Patients with Pulmonary Embolism: A Preliminary Report (abstract). *Proceedings* 2019; 25: 37

30. Nopp St et al. Outpatient Pulmonary Rehabilitation in Patients with Persisting Symptoms after Pulmonary Embolism. *J. Clin. Med.* 2020; 9: 1811–1823
 31. Rolving N et al. Effect of a physiotherapist-guided home-based exercise intervention on physical capacity and patient-reported outcomes among patients with acute pulmonary embolism: A randomized clinical trial. *Jama Network Open* 2020; 3: 2
 32. Fukui S et al. Efficacy of cardiac rehabilitation after balloon pulmonary angioplasty for chronic thromboembolic pulmonary hypertension. *Heart* 2016; 102: 1403–1409
 33. Øyvind J et al. Pulmonary Rehabilitation to Improve Physical Capacity After Pulmonary Embolism -a Randomised Controlled Trial - The REHAB Study
<https://clinicaltrials.gov/ct2/show/NCT03405480>, accessed 21 Nov 2020
 34. Xiaojun Z & Xu D: Effects of exercise rehabilitation training on patients with pulmonary hypertension. *Pulmonary Circulation* 2020; 10: 1–8
 35. Zeng X et al. Effectiveness and safety of exercise training and rehabilitation in pulmonary hypertension: a systematic review and meta-analysis. *J Thorac Dis* 2020;12: 2691–2705
 36. Simonneau G et al. Haemodynamic definitions and updated clinical classification of pulmonary hypertension. *Eur Respir J* 2019; 53: 1801913
 37. Ehlken N. et al. Exercise training improves peak oxygen consumption and haemodynamics in patients with severe pulmonary arterial hypertension and inoperable chronic thrombo-embolic pulmonary hypertension: a prospective, randomized, controlled trial. *Eur Heart J* 2016; 37: 35–44
 38. Richter M et al. Effects of exercise training on pulmonary hemodynamics, functional capacity and inflammation in pulmonary hypertension. *Pulmonary Circulation* 2017; 7: 20–37
 39. Morris NR et al. Exercise-based rehabilitation programmes for pulmonary hypertension. *Cochrane Database of Systematic Reviews* 2017, Issue 1. Art. No.: CD011285
 40. McGregor G et al. Supervised pulmonary hypertension exercise rehabilitation (SPHERe): study protocol for a multi-centre randomised controlled trial. *BMC Pulmonary Medicine* 2020; 20:143–156
 41. Kahn S et al. Functional and Exercise Limitations After a First Episode of Pulmonary Embolism. Results of the ELOPE Prospective Cohort Study. *Chest* 2017; 151: 1058–1068
 42. Albaghda MS et al. Cardiopulmonary Exercise Testing in Patients Following Massive and Submassive Pulmonary Embolism. *J Am Heart Assoc* 2018; 7: e00684111
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- **Vorhofflimmern 2021 – Ein Update (S. 38–42)**

L. Bergau, P. Sommer

Literatur:

1. Virani SS et al. Heart Disease and Stroke Statistics-2020 Update: A Report From the American Heart Association. *Circulation* 2020; 141: e139–e596
2. Chugh SS et al. Worldwide epidemiology of atrial fibrillation: a Global Burden of Disease 2010 Study. *Circulation* 2014; 129: 837–847
3. Perez MV et al. Large-Scale Assessment of a Smartwatch to Identify Atrial Fibrillation *N Engl J Med* 2019; 381: 1909–1917
4. Allan V et al. Are cardiovascular risk factors also associated with the incidence of atrial fibrillation? A systematic review and field synopsis of 23 factors in 32 population-based cohorts of 20 million participants *Thromb Haemost* 2017; 117: 837–850

5. Magnussen C et al. Sex Differences and Similarities in Atrial Fibrillation Epidemiology, Risk Factors, and Mortality in Community Cohorts: Results From the BiomarCaRE Consortium (Biomarker for Cardiovascular Risk Assessment in Europe). *Circulation* 2017; 136: 1588–1597
6. Wyse DG et al. A comparison of rate control and rhythm control in patients with atrial fibrillation. *N Engl J Med* 2002; 347: 1825–1833
7. Kirchhof P et al. Early Rhythm-Control Therapy in Patients with Atrial Fibrillation. *N Engl J Med* 2020; 383: 1305–1316
8. Marrouche NF et al. Catheter Ablation for Atrial Fibrillation with Heart Failure. *N Engl J Med* 2018; 378: 417–427
9. Hindricks G et al. 2020 ESC Guidelines for the diagnosis and management of atrial fibrillation developed in collaboration with the European Association of Cardio-Thoracic Surgery (EACTS) Eur Heart J 2020; ehaa612
10. Fenelon G et al. Tachycardiomyopathy: mechanisms and clinical implications *Pacing Clin Electrophysiol* 1996; 19: 95–106
11. Gopinathannair R et al. Arrhythmia-Induced Cardiomyopathies: Mechanisms, Recognition, and Management. *J Am Coll Cardiol* 2015; 66: 1714–1728
12. Csengeri D et al. Alcohol consumption, cardiac biomarkers, and risk of atrial fibrillation and adverse outcomes *Eur Heart J* 2021; ehaa953
13. Poole JE et al. Recurrence of Atrial Fibrillation After Catheter Ablation or Antiarrhythmic Drug Therapy in the CABANA Trial. *Journal of the American College of Cardiology* 2020; 75: 3105–3118
14. Li W & Tiwari N. Amiodarone use in elderly atrial fibrillation patients with preserved ejection fraction is associated with increased short-term mortality *European Heart Journal* 2020; 41
15. Packer DL et al. Effect of Catheter Ablation vs Antiarrhythmic Drug Therapy on Mortality, Stroke, Bleeding, and Cardiac Arrest Among Patients With Atrial Fibrillation: The CABANA Randomized Clinical Trial. *JAMA* 2019; 321: 1261–1274
16. Prabhu S et al. Catheter Ablation Versus Medical Rate Control in Atrial Fibrillation and Systolic Dysfunction: The CAMERA-MRI Study. *J Am Coll Cardiol* 2017; 70: 1949–1961
17. Kowallick JT et al. Reverse left ventricular structural remodeling after catheter ablation of atrial fibrillation in patients with preserved left ventricular function: Insights from cardiovascular magnetic resonance native T1 mapping. *Heart Rhythm* 2019, 16: 424–432
18. Prabhu S et al. Regression of Diffuse Ventricular Fibrosis Following Restoration of Sinus Rhythm With Catheter Ablation in Patients With Atrial Fibrillation and Systolic Dysfunction: A Substudy of the CAMERA MRI Trial. *JACC Clin Electrophysiol* 2018; 4: 999–1007
19. Sohns C et al. Impact of Left Ventricular Function and Heart Failure Symptoms on Outcomes Post Ablation of Atrial Fibrillation in Heart Failure: CASTLE-AF Trial. *Circ Arrhythm Electrophysiol* 2020; 13: e008461
20. Sugumar H et al. Catheter Ablation Versus Medication in Atrial Fibrillation and Systolic Dysfunction. *JACC: Clinical Electrophysiology* 2020; 6: 1721–1731
21. Kuck KH et al. Catheter Ablation Versus Best Medical Therapy in Patients With Persistent Atrial Fibrillation and Congestive Heart Failure: The Randomized AMICA Trial. *Circ Arrhythm Electrophysiol* 2019; 12: e007731
22. Sohns C et al. Catheter ablation for atrial fibrillation in patients with end-stage heart failure and eligibility for heart transplantation. *ESC Heart Fail* 2020