

Literatur zum Beitrag

Daniel Paech, Erhan Basad, Laurent Kintzelé:

Radiologische Diagnostik und Klassifikationen femuropatellarer Dysplasien

1. Dejour, H., et al., Factors of patellar instability: an anatomic radiographic study. *Knee Surgery, Sports Traumatology, Arthroscopy*, 1994. 2(1): p. 19–26.
2. Kim, Y.-M., Y.-B. Joo, Patellofemoral osteoarthritis. *Knee surgery & related research*, 2012. 24(4): p. 193.
3. Schmeling, A., Aktuelle Aspekte der patellofemorale Instabilität. 2010: Stiftung zur Förderung der Arthroskopie.
4. Berruto, M., et al., Patellofemoral instability: classification and imaging. *Joints*, 2013. 1(2): p. 7.
5. Koëter, S., et al., Minimal rotation aberrations cause radiographic misdiagnosis of trochlear dysplasia. *Knee Surgery, Sports Traumatology, Arthroscopy*, 2006. 14(8): p. 713–717.
6. Lippacher, S., et al., Observer agreement on the Dejour trochlear dysplasia classification: a comparison of true lateral radiographs and axial magnetic resonance images. *The American journal of sports medicine*, 2012. 40(4): p. 837–843.
7. Insall, J., E. Salvati E, Patella position in the normal knee joint. *Radiology*, 1971. 101(1): p. 101–104.
8. Laukenmann, S., Messverfahren und Klassifikationen in der muskuloskeletalen Radiologie Waldt, Eiber, Wörtler Thieme Verlag, 2011
9. Shabshin, N., et al., MRI criteria for patella alta and baja. *Skeletal Radiology*, 2004. 33(8): p. 445–450.
10. Waldt, S., Rummeny E, Bildgebung der patellofemorale Instabilität. *Der Radiologe*, 2012. 52(11): p. 1003–1011.
11. Laurin, C.A., et al., The abnormal lateral patellofemoral angle: a diagnostic roentgenographic sign of recurrent patellar subluxation. *The Journal of bone and joint surgery. American volume*, 1978. 60(1): p. 55–60.
12. Wiberg, G., Roentgenographic and anatomic studies on the femoropatellar joint. With special reference to chondromalacia patellae. *Acta orthop scand*, 1941. 12: p. 319–410.
13. Baumgartl, F., Das Kniegelenk: Erkrankungen, Verletzungen und ihre Behandlung mit Hinweisen für die Begutachtung. 2013: Springer-Verlag.
14. Strobl, W., F. Grill, Die Patellaluxation. *Der Orthopäde*, 1998. 27(3): p. 197–205.
15. Schaer, H, Die Patella partita, in Ergebnisse der Chirurgie und Orthopädie: Siebenundzwanzigster Band, E. Payr and M. Kirschner, Editors. 1934, Springer Berlin Heidelberg: Berlin, Heidelberg. p. 1–53.
16. Bennett, G.E., Operation for hypertrophied patella. *JBSJ*, 1922. 4(3): p. 593–599.
17. Scott, J, W.S. Taor, The "small patella" syndrome. *The Journal of bone and joint surgery. British volume*, 1979. 61(2): p. 172–175.
18. Dejour, D, Le Coultre, B, Osteotomies in patello-femoral instabilities. *Sports medicine and arthroscopy review*, 2018. 26(1): p. 8–15.
19. Dejour, D., Saggin P, The sulcus deepening trochleoplasty—the Lyon's procedure. *International orthopaedics*, 2010. 34(2): p. 311–316.
20. Goutallier, D., Bernageau J, Lecudonnet, B, The measurement of the tibial tuberosity. Patella groove distanced technique and results (author's transl). *Revue de chirurgie orthopédique et réparatrice de l'appareil moteur*, 1978. 64(5): p. 423–428.
21. Schoettle, P.B., et al., The tibial tuberosity–trochlear groove distance; a comparative study between CT and MRI scanning. *The Knee*, 2006. 13(1): p. 26–31.
22. Williams, A.A., et al., The relationship between tibial tuberosity–trochlear groove distance and abnormal patellar tracking in patients with unilateral patellar instability. *Arthroscopy: The Journal of Arthroscopic & Related Surgery*, 2016. 32(1): p. 55–61.

Literatur zum Beitrag

Felix Zimmermann, Peter Balcarek:

Der patellofemorale Schmerz. Ursachen und Diagnostik

1. Barton CJ, Bonanno D, Levinger P, Menz HB: Foot and Ankle Characteristics in Patellofemoral Pain Syndrome: a Case Control and Reliability Study. *J Orthop Sports Phys Ther* 2010; 40: 286–296
2. Barton CJ, Levinger P, Menz HB, Webster KE: Kinematic Gait Characteristics Associated with Patellofemoral Pain Syndrome: a Systematic Review. *Gait & Posture* 2009; 30: 405–416
3. Becher C, Attal R, Balcarek P, et al.: Validierung der deutschsprachigen Version des Banff Patellofemorales Instabilitäts-Instrument 2.0. *Arthroscopie* 2018; 31: 157–164
4. Boden, Pearsall, Garrett, Feagin: Patellofemoral Instability: Evaluation and Management. *J Am Acad Orthop Surg* 1997; 5: 47–57
5. Boling M, Padua D, Marshall S, Guskiewicz K, Pyne S, Beutler A: Gender Differences in the Incidence and Prevalence of Patellofemoral Pain Syndrome. *Scand J Med Sci Sports* 2010; 20: 725–730
6. Callaghan MJ, Selfe J: Has the incidence or prevalence of patellofemoral pain in the general population in the United Kingdom been properly evaluated?: *Physical Therapy in Sport* 2007; 8: 37–43
7. Caton J, Deschamps G, Chambat P, Lerat JL, Dejour H: Les rotules basses. A propos de 128 observations: Les rotules basses. *Rev Chir Orthop Reparatrice Appar Mot* 1982; 68: 317–325
8. Cowan SM, Crossley KM, Bennell KL: Altered hip and trunk muscle function in individuals with patellofemoral pain. *Br J Sports Med* 2009; 43: 584–588
9. Crossley KM, van Middelkoop M, Callaghan MJ, Collins NJ, Rathleff MS, Barton CJ: 2016 Patellofemoral Pain Consensus Statement from the 4th International Patellofemoral Pain Research Retreat, Manchester. Part 2: Recommended Physical Interventions (Exercise, Taping, Bracing, Foot Orthoses and Combined Interventions). *Br J Sports Med* 2016; 50: 844–852
10. Crossley KM, Zhang W-J, Schache AG, Bryant A, Cowan SM: Performance on the Single-Leg Squat Task Indicates Hip Abductor Muscle Function. *Am J Sports Med* 2011; 39: 866–873
11. Dammerer D, Liebensteiner MC, Kujala UM, et al.: Validation of the German Version of the Kujala Score in Patients with Patellofemoral Instability: a Prospective Multi-Centre Study. *Arch Orthop Trauma Surg* 2018; 138: 527–535
12. Davis IS, Powers CM: Patellofemoral pain syndrome: proximal, distal, and local factors, an international retreat, April 30-May 2, 2009, Fells Point, Baltimore, MD. *J Orthop Sports Phys Ther* 2010; 40: A1–16
13. Dejour D, Reynaud P, Lecoultrre B: Douleurs et instabilité rotulienne. Essai de classification. *Med Hyg (Geneve)* 1998: 1466–1471
14. Dickschas J, Harrer J, Pfefferkorn R, Strecker W: Operative Treatment of Patellofemoral Maltracking with Torsional Osteotomy. *Arch Orthop Trauma Surg* 2012; 132: 289–298
15. Dowling GJ, Murley GS, Munteanu SE, et al.: Dynamic Foot Function as a Risk Factor for Lower Limb Overuse Injury: a Systematic Review. *J Foot Ankle Res* 2014; 7: 53
16. Dye SF: The Pathophysiology of Patellofemoral Pain: a Tissue Homeostasis Perspective. *Clin Orthop Relat Res* 2005: 100–110
17. Eijkenboom JFA, Waarsing JH, Oei EHG, Bierma-Zeinstra SMA, van Middelkoop M: Is Patellofemoral Pain a Precursor to Osteoarthritis?: Patellofemoral Osteoarthritis and Patellofemoral Pain Patients Share Aberrant Patellar Shape Compared with Healthy Controls. *Bone Joint Res* 2018; 7: 541–547
18. Engelhardt M., Grim C., Neher S.: *Das Sportlerknie*. Georg Thieme Verlag KG Stuttgart New York, 2020
19. Ford KR, Myer GD, Hewett TE: Valgus Knee Motion During Landing in High School Female and Male Basketball Players. *Med Sci Sports Exerc* 2003; 35: 1745–1750
20. Franciozi CE, Ambra LF, Albertoni LJB, et al.: Increased Femoral Anteversion Influence over Surgically Treated Recurrent Patellar Instability Patients. *Arthroscopy* 2017; 33: 633–640
21. Fucentese SF, Roll A von, Koch PP, Epari DR, Fuchs B, Schottle PB: The Patella Morphology in Trochlear Dysplasia—a Comparative MRI Study. *Knee* 2006; 13: 145–150
22. Gose JC, Schweizer P: Iliotibial Band Tightness. *J Orthop Sports Phys Ther* 1989; 10: 399–407
23. Hand CJ, Spalding TJW: Association Between Anatomical Features and Anterior Knee Pain in a „Fit“ Service Population. *J R Nav Med Serv* 2004; 90: 125–134
24. Herbst KA, Barber Foss KD, Fader L, et al.: Hip Strength Is Greater in Athletes Who Subsequently Develop Patellofemoral Pain. *Am J Sports Med* 2015; 43: 2747–2752
25. Holme TJ, Henckel J, Hartshorn K, Cobb JP, Hart AJ: Computed Tomography Scanogram Compared to Long Leg Radiograph for Determining Axial Knee Alignment. *Acta Orthop* 2015; 86: 440–443
26. Huberti HH, Hayes WC: Patellofemoral Contact Pressures. the Influence of Q-Angle and Tendofemoral Contact: Patellofemoral contact pressures. *J Bone Joint Surg Am* 1984; 66: 715–724
27. Hudson Z, Darthuy E: Iliotibial Band Tightness and Patellofemoral Pain Syndrome: a Case-Control Study. *Man Ther* 2009; 14: 147–151
28. Hughston JC: Subluxation of the patella. *J Bone Joint Surg Am* 1968; 50: 1003–1026
29. Kaiser P, Schmoelz W, Schoettle P, Zwierzina M, Heinrichs C, Attal R: Increased Internal Femoral Torsion Can Be Regarded as a Risk Factor for Patellar Instability – a Biomechanical Study. *Clin Biomech (Bristol, Avon)* 2017; 47: 103–109
30. Kaya D, Citaker S, Kerimoglu U, et al.: Women with Patellofemoral Pain Syndrome Have Quadriceps Femoris Volume and Strength Deficiency. *Knee Surg Sports Traumatol Arthrosc* 2011; 19: 242–247
31. Kaya D, Doral MN: Is There Any Relationship Between Q-Angle and Lower Extremity Malalignment? *Acta Or-*

- thop *Traumatol Turc* 2012; 46: 416–419
32. Liska F, Deimling C von, Otto A, et al.: Distal Femoral Torsional Osteotomy Increases the Contact Pressure of the Medial Patellofemoral Joint in Biomechanical Analysis. *Knee Surg Sports Traumatol Arthrosc* 2019; 27: 2328–2333
33. Lorenz A, Müller O, Kohler P, Wünschel M, Wülker N, Leichtle UG: The Influence of Asymmetric Quadriceps Loading on Patellar Tracking—an in Vitro Study. *Knee* 2012; 19: 818–822
34. Loudon JK, Wiesner D, Goist-Foley HL, Asjes C, Loudon KL: Intrarater Reliability of Functional Performance Tests for Subjects With Patellofemoral Pain Syndrome. *J Athl Train* 2002; 37: 256–261
35. MacIntyre NJ, Hill NA, Fellows RA, Ellis RE, Wilson DR: Patellofemoral Joint Kinematics in Individuals with and Without Patellofemoral Pain Syndrome. *J Bone Joint Surg Am* 2006; 88: 2596–2605
36. MacLachlan LR, Collins NJ, Matthews MLG, Hodges PW, Vicenzino B: The Psychological Features of Patellofemoral Pain: a Systematic Review. *Br J Sports Med* 2017; 51: 732–742
37. Petersen W, Ellermann A, Gösele-Koppenburg A, et al.: Patellofemoral Pain Syndrome. *Knee Surg Sports Traumatol Arthrosc* 2014; 22: 2264–2274
38. Piva SR, Goodnite EA, Childs JD: Strength Around the Hip and Flexibility of Soft Tissues in Individuals with and Without Patellofemoral Pain Syndrome. *J Orthop Sports Phys Ther* 2005; 35: 793–801
39. Powers CM: The Influence of Altered Lower-Extremity Kinematics on Patellofemoral Joint Dysfunction: a Theoretical Perspective. *J Orthop Sports Phys Ther* 2003; 33: 639–646
40. Powers CM, Heino JG, Rao S, Perry J: The influence of patellofemoral pain on lower limb loading during gait. *Clinical Biomechanics* 1999; 14: 722–728
41. Powers CM, Witvrouw E, Davis IS, Crossley KM: Evidence-based framework for a pathomechanical model of patellofemoral pain: 2017 patellofemoral pain consensus statement from the 4th International Patellofemoral Pain Research Retreat, Manchester, UK: part 3. *Br J Sports Med* 2017; 51: 1713–1723
42. Prins MR, van der Wurff P: Females with patellofemoral pain syndrome have weak hip muscles: a systematic review. *Australian Journal of Physiotherapy* 2009; 55: 9–15
43. Salsich GB, Long-Rossi F: Do Females with Patellofemoral Pain Have Abnormal Hip and Knee Kinematics During Gait? *Physiother Theory Pract* 2010; 26: 150–159
44. Sanchis-Alfonso V: Holistic Approach to Understanding Anterior Knee Pain. Clinical Implications. *Knee Surg Sports Traumatol Arthrosc* 2014; 22: 2275–2285
45. Sanchis-Alfonso V, Tey M, Monllau JC: A Novel Association Between Femoroacetabular Impingement and Anterior Knee Pain. *Pain Res Treat* 2015; 2015: 937431
46. Schoettle PB, Zanetti M, Seifert B, Pfirrmann CWA, Fucentese SF, Romero J: The Tibial Tuberosity-Trochlear Groove Distance; a Comparative Study Between CT and MRI Scanning. *Knee* 2006; 13: 26–31
47. Schwane BG, Goerger BM, Goto S, Blackburn JT, Aguilar AJ, Padua DA: Trunk and Lower Extremity Kinematics During Stair Descent in Women with or Without Patellofemoral Pain. *J Athl Train* 2015; 50: 704–712
48. Seitlinger G, Scheurecker G, Högl R, Labey L, Innocenti B, Hofmann S: Tibial tubercle-posterior cruciate ligament distance: a new measurement to define the position of the tibial tubercle in patients with patellar dislocation. *Am J Sports Med* 2012; 40: 1119–1125
49. Silva DdO, Briani RV, Pazzinatto MF, Ferrari D, Aragão FA, Azevedo FMD: Reduced Knee Flexion Is a Possible Cause of Increased Loading Rates in Individuals with Patellofemoral Pain. *Clin Biomech (Bristol, Avon)* 2015; 30: 971–975
50. Souza RB, Powers CM: Predictors of Hip Internal Rotation During Running: an Evaluation of Hip Strength and Femoral Structure in Women with and Without Patellofemoral Pain. *Am J Sports Med* 2009; 37: 579–587
51. Thomas MJ, Wood L, Selfe J, Peat G: Anterior Knee Pain in Younger Adults as a Precursor to Subsequent Patellofemoral Osteoarthritis: a Systematic Review. *BMC Musculoskelet Disord* 2010; 11: 201
52. van Cant J, Pineux C, Pitance L, Feipel V: Hip Muscle Strength and Endurance in Females With Patellofemoral Pain: A Systematic Review with Meta-Analysis. *Int J Sports Phys Ther* 2014; 9: 564–582
53. van Haver A, Roo K de, Beule M de, et al.: The Effect of Trochlear Dysplasia on Patellofemoral Biomechanics: a Cadaveric Study with Simulated Trochlear Deformities. *Am J Sports Med* 2015; 43: 1354–1361
54. Ward SR, Terk MR, Powers CM: Patella Alta: Association with Patellofemoral Alignment and Changes in Contact Area During Weight-Bearing. *J Bone Joint Surg Am* 2007; 89: 1749–1755
55. Wu C-C, Shih C-H: The Influence of Iliotibial Tract on Patellar Tracking. *Orthopedics* 2004; 27: 199–203
56. Zimmermann F, Liebensteiner MC, Balcarek P: The Reversed Dynamic Patellar Apprehension Test Mimics Anatomical Complexity in Lateral Patellar Instability. *Knee Surg Sports Traumatol Arthrosc* 2019; 27: 604–610

Literatur zum Beitrag

Jana Rogoschin, Ingo Volker Rembitzki, Wolfgang Potthast:

Konservative Behandlung patellofemoraler Pathologien

1. Ahtiainen J.P., Pakarinen A., Alen M., Kraemer W.J., Häkkinen K., 2003. Muscle hypertrophy, hormonal adaptations and strength development during strength training in strength-trained and untrained men, *Eur J Appl Physiol* (2003) 89: 555.
2. Akarcali I., Tugay N., Kaya D., Atay A., Doral M.N., The role of high voltage electrical stimulation in the rehabilitation of patellofemoral pain, *The Pain Clinic*, 14:3, 207–212.
3. Barton CJ, Lack S, Hemmings S, Tufail S, Morrissey D. The 'best practice guide to conservative management of patellofemoral pain': incorporating level 1 evidence with expert clinical reasoning. *Br J Sports Med* 2015; 49: 923–934.
4. Bazett-Jones D.M., Huddleston W., Cobb S., O'Connor K., Earl-Boehm J.E., 2017. Acute Responses of Strength and Running Mechanics to Increasing and Decreasing Pain in Patients with Patellofemoral Pain. *J Athl Train.*; 52(5):411–421.
5. Becher C, Schumacher T, Fleischer B, Ettinger M, Smith T, Ostermeier S (2015) The effects of a dynamic patellar realignment brace on disease determinants for patellofemoral instability in the upright weight-bearing condition. *J Orthop Surg Res* 19(10):126.
6. Besier T.F., Draper C.E., Gold G.E., Beaupre G.S., Delp S.L., 2005. Patellofemoral joint contact area increases with knee flexion and weight-bearing. *J Orthop Res.*; 23(2):345–350.
7. Callaghan M.J., Selfe J., 2012. Patellar taping for patellofemoral pain syndrome in adults. *Cochrane Database Syst Rev.*(4):CD006717.
8. Celik D., Argut S.K., Türker N., Kilicoglu O.I., 2019. The effectiveness of superimposed neuromuscular electrical stimulation combined with strengthening exercises on patellofemoral pain: A randomized controlled pilot trial. *J Back Musculoskelet Rehabil.*: 1–7.
9. Chang WD, Chen FC, Lee CL, Lin HY, Ping-Tung Lai PT, 2015. Effects of Kinesio Taping versus McConnell Taping for Patellofemoral Pain Syndrome: A Systematic Review and Meta-Analysis, *Evid Based Complement Alternat Med.*; 2015: 471208.
10. Coburn S.L., Barton C.J., Filbay S.R. et al., 2018. Quality of life in individuals with patellofemoral pain: A systematic review including meta-analysis. *Phys Ther Sport.*; 33:96–108.
11. Collins N., Crossley K., Beller E., Darnell R., McPoil T., Vicenzino B., 2009. Foot orthoses and physiotherapy in the treatment of patellofemoral pain syndrome: randomised clinical trial. *BMC Musculoskelet Disord.*; 9:27.
12. Collins N.J., Barton C.J., van Middelkoop M. et al., 2018. Consensus statement on exercise therapy and physical interventions (orthoses, taping and manual therapy) to treat patellofemoral pain: recommendations from the 5th International Patellofemoral Pain Research Retreat, Gold Coast, Australia, 2017, *Br J Sports Med*; 0: 1–9.
13. Crossley K., Bennell K., Green S., Cowan S., McConnell J., 2002. Physical Therapy for Patellofemoral Pain A Randomized, Double-Blinded, Placebo-Controlled Trial; *THE AMERICAN JOURNAL OF SPORTS MEDICINE*; 30(6), 857–865.
14. Davis IS, Powers CM. Patellofemoral pain syndrome: proximal, distal and local factors, an international retreat, April 30–May 2, 2009, FellsPoint, Baltimore, MD. *J Orthop Sports Phys Ther* 2010; 40: A1–16.
15. Dursun N., Dursun E., Kilic Z., 2001. Electromyographic Biofeedback-Controlled Exercise Versus Conservative Care for Patellofemoral Pain Syndrome, *Arch Phys Med Rehabil*; 82, 1692–1695.
16. Glaviano N.R., Saliba S., 2016. Impairment based rehabilitation for patellofemoral pain patients. *The Physician and sportsmedicine*; 44(3).
17. Glaviano N.R., Marshall A.N., Mangum C., et al. 2019. Impairment-Based Rehabilitation With Patterned Electrical Neuromuscular Stimulation and Lower Extremity Function in Individuals With Patellofemoral Pain: A Preliminary Study. *Journal of Athletic Training*; 54(3):255–269
18. Grelsamer R.P., 2000. Patellar malalignment. *J Bone Joint Surg*; 82:1639–50.
19. Higgins J., Savovic J., Page M. J., Sterne J.A.C. on behalf of the RoB2 Development Group, 2019. Revised Cochrane risk-of-bias tool for randomized trials (RoB 2). <https://sites.google.com/site/riskofbiastool/welcome/rob-2-0-tool/current-version-of-rob-2>, download 29.01.2020.
20. Hoffman J.R., Im J., Rundell K.W. et al., 2003. Effect of muscle oxygenation during resistance exercise on anabolic hormone response. *Med Sci Sports Exerc*; 35(11):1929–34.
21. Kaya D., Yüksel I., Callaghan M.J. et al., 2013. High voltage pulsed galvanic stimulation adjunct to rehabilitation program for patellofemoral pain syndrome: a prospective randomized controlled trial. *Fizyoterapi Rehabilitasyon*; 24(1):01–08.
22. Khayambashi K., Fallah A., Movahedi A., Bagwell J., Powers C., 2014. Posterolateral hip muscle strengthening versus quadriceps strengthening for patellofemoral pain: a comparative control trial. *Arch Phys Med Rehabil*; 95(5):900–7.
23. Lankhorst N.E., Bierma-Zeinstra S.M., van Middelkoop M., 2012. Risk factors for patellofemoral pain syndrome: a systematic review. *Journal of Orthopaedic and Sports Physical Therapy*; 42(2):81–94.
24. Lun V.M., Wiley J.P., Meeuwisse W.H., Yanagawa T.L., 2005. Effectiveness of patellar bracing for treatment of patellofemoral pain syndrome. *Clin J Sport Med.*; 15(4):235–40.
25. Martimbianco ALC1, Torloni MR, Andriolo BN, Porfirio GJ, Riera R., 2017. Neuromuscular electrical stimulation (NMES) for patellofemoral pain syndrome. *Cochrane Database Syst Rev.*; 12: CD011289.
26. McConnell J, 1996. Management of patellofemoral problems. *Man Ther* 1: 60–66.
27. Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group, 2009. Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *PLoS Med* 6(7): e1000097.

28. Mullaney MJ, Fukunaga T., 2018. Current concepts and treatment of patellofemoral compressive issues. *Int J Sports Phys Ther.*; 11(6):891–902.
29. Østerås B., Østerås H., Torstensen T.A., 2013. Long-term effects of medical exercise therapy in patients with patellofemoral pain syndrome: results from a single-blinded randomized controlled trial with 12 months follow-up. *Physiotherapy*; 99(4):311–6.
30. Petersen W, Ellermann A, Rembitzki IV et al., 2014. The Patella Pro study – effect of a knee brace on patellofemoral pain syndrome: design of a randomized clinical trial *BMC Musculoskelet Disord.*; 15: 200.
31. Rathleff M.S., Roos E.M., Olesen J.L., Rasmussen S., 2015. Exercise during school hours when added to patient education improves outcome for 2 years in adolescent patellofemoral pain: a cluster randomised trial. *Br J Sports Med.*; 49(6):406–12.
32. Riva J.J., Malik K.M.P., Burnie S.J., Endicott A.R., Busse J.W., 2012. What is your research question? An introduction to the PICOT format for clinicians. *J Can Chiropr Assoc.*; 56(3): 167–171.
33. Saltychev M, Dutton RA, Laimi K, Beaupré GS, Virolainen P, Fredericson M, 2018. Effectiveness of conservative treatment for patellofemoral pain syndrome: A systematic review and meta-analysis. *J Rehabil Med.*; 50(5):393–401.
34. Sisk D., Fredericson M., 2019. Update of Risk Factors, Diagnosis, and Management of Patellofemoral Pain. *Curr Rev Musculoskelet Med.*; 12(4):534–541.
35. Smith R.M., Boden B.P., Sheehan F.T., 2018. Increased Patellar Volume/Width and Decreased Femoral Trochlear Width Are Associated With Adolescent Patellofemoral Pain. *Clin Orthop Relat Res.*; 476(12):2334–2343.
36. Smith B.E., Hendrick P., Bateman M. et al., 2019. A loaded self-managed exercise programme for patellofemoral pain: a mixed methods feasibility study. *BMC Musculoskelet Disord* 20, 129.
37. Willy R.W., Hoglund L.T., Barton C.J. et al., 2019. Clinical Practice Guidelines Linked to the International Classification of Functioning, Disability and Health From the Academy of Orthopaedic Physical Therapy of the American Physical Therapy Association, *Journal of Orthopaedic & Sports Physical Therapy*; 49(9):9.

Literatur zum Beitrag

Christian Fink, Elisabeth Abermann, Mirco Herbolt:

Minimal invasive Rekonstruktion des medialen patellofemorales Ligaments (MPFL) mit der Quadrizepssehne

- Bollier M, Fulkerson J, et al. (2011). Technical failure of medial patellofemoral ligament reconstruction. *Arthroscopy* 27(8): 1153–1159
- Christiansen SE, Jacobsen BW, et al. (2008). Reconstruction of the medial patellofemoral ligament with gracilis tendon autograft in transverse patellar drill holes. *Arthroscopy* 24(1): 82–87
- Fink C, Steensen R, Gföller P, Lawton R. (2018) Quadriceps Tendon Autograft Medial Patellofemoral Ligament Reconstruction. *Curr Rev Musculoskelet Med.* Jun; 11(2):209–220
- Fink C, Veselko M, Herbolt M, Hoser C. (2014) MPFL reconstruction using a quadriceps tendon graft: part 2: operative technique and short term clinical results. *Knee* 21(6):1175–1179
- Fink C, Veselko M, Herbolt M, Hoser C. (2014) Minimally invasive reconstruction of the medial patellofemoral ligament using quadriceps tendon. *Arthrosc Tech* 12; 3(3): 325–329
- Fisher, B., J. Nyland, et al. (2010). Medial patellofemoral ligament reconstruction for recurrent patellar dislocation: a systematic review including rehabilitation and return-to-sports efficacy. *Arthroscopy* 26(10): 1384–1394
- Frosch K-H, Schmeling A (2016) A new classification system of patellar instability and patellar maltracking. *Archives of orthopaedic and trauma surgery* 136:485–497
- Gföller P, Hoser C, Runer A, Abermann E, Wierer G, Fink C (2019) Medial patellofemoral ligament (MPFL) reconstruction using quadriceps tendon autograft provides good clinical, functional and patient-reported outcome measurements (PROM): a 2-year prospective study. *Knee Surg Sports Traumatol Arthrosc* 27(8):2426–2432
- Herbolt M, Hoser C, Domnick C, Raschke MJ, Lenschow S, Weimann A, Kösters C, Fink C (2014) MPFL reconstruction using a quadriceps tendon graft: part 1: biomechanical properties of quadriceps tendon MPFL reconstruction in comparison to the Intact MPFL. A human cadaveric study. *Knee* 21(6):1169–1174
- Herbst E, Hoser C, Hildebrandt C, Raschner C, Hepperger C, Pointner H, Fink C (2015). Functional assessments for decision-making regarding return to sports following ACL reconstruction. Part II: clinical application of a new test battery. *Knee Surg Sports Traumatol Arthrosc* 23(5):1283–1291
- Macura M, Veselko M. (2010) Simultaneous reconstruction of ruptured anterior cruciate ligament and medial patellofemoral ligament with ipsilateral quadriceps grafts. *Arthroscopy* 26(9):1258–1262
- Maeno S, Hashimoto D et al. (2010). Medial patellofemoral ligament reconstruction with hanger lifting procedure. *Knee Surg Sports Traumatol Arthrosc* 18(2): 157–160
- Matthews JJ, Schranz P (2010). Reconstruction of the medial patellofemoral ligament using a longitudinal patellar tunnel technique. *Int Orthop* 34(8): 1321–1325
- Noyes FR, Albright JC (2006). Reconstruction of the medial patellofemoral ligament with autologous quadriceps tendon. *Arthroscopy* 22(8): 904 e901–907
- LeGrand AB, Greis PE et al. (2007). MPFL reconstruction. *Sports Med Arthrosc* 2: 72–77
- Lenschow S, Schliemann B et al. (2013) Medial patellofemoral ligament reconstruction: fixation strength of 5 different techniques for graft fixation at the patella. *Arthroscopy* 29(4):766–773
- Nelitz M, Dornacher D et al. (2011) The relation of the distal femoral physis and the medial patellofemoral ligament. *Knee Surg Sports Traumatol Arthrosc* 19(12):2067–2071
- Schöttle P, Schmeling A et al. (2009). Anatomical reconstruction of the medial patellofemoral ligament using a free gracilis autograft. *Arch Orthop Trauma Surg* 129(3): 305–309
- Schöttle P, Hensler D et al. (2010). Anatomical double-bundle MPFL reconstruction with an aperture fixation. *Knee Surg Sports Traumatol Arthrosc* 18(2): 147–151
- Shah JN, Howard JS et al. (2012) A Systematic Review of Complications and Failures Associated With Medial Patellofemoral Ligament Reconstruction for Recurrent Patellar Dislocation. *Am J Sports Med* 40(8):1916–1923
- Steensen, RN, Dopirak RM, Maurus PB. (2005) A simple technique for reconstruction of the medial patellofemoral ligament using a quadriceps tendon graft. *Arthroscopy* 21(3): 365–370

Literatur zum Beitrag

Lars Victor Engelhardt, Jörg Jerosch:

Indikationen und Technik einer kombinierten MPFL- und Trochleoplastik

- Ahmad CS, McCarthy M, Gomez JA, Shubin Stein BE. The moving patellar apprehension test for lateral patellar instability. *Am J Sports Med* 2009; 37(4):791–796
- Amis AA, Firer P, Mountney J, Senavongse W, Thomas NP. Anatomy and biomechanics of the medial patellofemoral ligament. *Knee* 2003; 10: 215–220
- Amis AA, Oguz C, Bull AM, Senavongse W, Dejour D. The effect of trochleoplasty on patellar stability and kinematics: a biomechanical study in vitro. *J Bone Joint Surg Br* 2008; 90: 864–869
- Arendt EA, Moeller A, Agel J. Clinical outcomes of medial patellofemoral ligament repair in recurrent (chronic) lateral patella dislocations. *Knee Surg Sports Traumatol Arthrosc* 2011; 19: 1909–1914
- Banke IJ, Kohn LM, Meidinger G, et al. Combined trochleoplasty and MPFL reconstruction for treatment of chronic patellofemoral instability: a prospective minimum 2-year follow-up study. *Knee Surg Sports Traumatol Arthrosc* 2014; 22: 2591–2598
- Blønd L. Arthroscopic deepening trochleoplasty for chronic anterior knee pain after previous failed conservative and arthroscopic treatment. Report of two cases. *Int J Surg Case Rep* 2017; 40: 63–68
- Blønd L, Haugegaard M. Combined arthroscopic deepening trochleoplasty and reconstruction of the medial patellofemoral ligament for patients with recurrent patella dislocation and trochlear dysplasia. *Knee Surg Sports Traumatol Arthrosc* 2014; 22: 2484–2490
- Camathias C, Studer K, Kiapour A, Rutz E, Vavken P. Trochleoplasty as a Solitary Treatment for Recurrent Patellar Dislocation Results in Good Clinical Outcome in Adolescents. *Am J Sports Med* 2016; 44: 2855–2863
- Chouteau J. Surgical reconstruction of the medial patellofemoral ligament. *Orthop Traumatol Surg Res* 2016; 102(1): 189–194
- Dejour D, Byn P, Ntagiopoulos PG. The Lyon's sulcus-deepening trochleoplasty in previous unsuccessful patellofemoral surgery. *Int Orthop* 2013; 37: 433–439
- Dejour H, Walch G, Nove-Josserand L, Guier C. Factors of patellar instability: an anatomic radiographic study. *Knee Surg Sports Traumatol Arthrosc* 1994; 2(1): 19–26
- Dhinsa BS, Bhamra JS, James C, Dunnet W, Zahn H. Patella fracture after medial patellofemoral ligament reconstruction using suture anchors. *Knee* 2013; 20: 605–608
- Donell ST, Joseph G, Hing CB, Marshall TJ. Modified Dejour trochleoplasty for severe dysplasia: operative technique and early clinical results. *Knee* 2006; 13: 266–273
- Fucntese SF, Schöttle PB, Pfirrmann CW, Romero J. CT changes after trochleoplasty for symptomatic trochlear dysplasia. *Knee Surg Sports Traumatol Arthrosc* 2007; 15: 168–174
- Fucntese SF, Zingg PO, Schmitt J, Pfirrmann CW, Meyer DC, Koch PP. Classification of trochlear dysplasia as predictor of clinical outcome after trochleoplasty. *Knee Surg Sports Traumatol Arthrosc* 2011; 19: 1655–1661
- Grelsamer RP, Dejour D, Gould J. The pathophysiology of patellofemoral arthritis. *Orthop Clin North Am* 2008; 39: 269–274
- Herschel R, Hasler A, Tscholl PM, Fucntese SF. Visual-palpatory versus fluoroscopic intraoperative determination of the femoral entry point in medial patellofemoral ligament reconstruction. *Knee Surg Sports Traumatol Arthrosc* 2017; 25(8): 2545–2549
- Lippacher S, Dejour D, Elsharkawi M, et al. Observer agreement on the Dejour trochlear dysplasia classification: a comparison of true lateral radiographs and axial magnetic resonance images. *Am J Sports Med* 2012; 40: 837–843
- Lippacher S, Dreyhaupt J, Williams SR, Reichel H, Nelitz M. Reconstruction of the Medial Patellofemoral Ligament: Clinical Outcomes and Return to Sports. *Am J Sports Med* 2014; 42(7): 1661–1668
- Maenpaa H, Lehto MU. Patellofemoral osteoarthritis after patellar dislocation. *Clin Orthop Relat Res* 1997; 339: 156–162
- Metcalfe AJ, Clark DA, Kemp MA, Eldridge JD. Trochleoplasty with a flexible osteochondral flap: results from an 11-year series of 214 cases. *Bone Joint J* 2017; 99: 344–350
- Naendrup JH, Marche B, de Sa D, et al. Vancomycin-soaking of the graft reduces the incidence of septic arthritis following ACL reconstruction: results of a systematic review and meta-analysis. *Knee Surg Sports Traumatol Arthrosc* 2019; Jan 17 [Epub ahead of print]
- Nelitz M, Dreyhaupt J, Lippacher S. Combined trochleoplasty and medial patellofemoral ligament reconstruction for recurrent patellar dislocations in severe trochlear dysplasia: a minimum 2-year follow-up study. *Am J Sports Med* 2013; 41: 1005–1012
- Nelitz M, Dreyhaupt J, Williams SR, Dornacher D. Combined supracondylar femoral derotation osteotomy and patellofemoral ligament reconstruction for recurrent patellar dislocation and severe femoral anteversion syndrome: surgical technique and clinical outcome. *Int Orthop* 2015; 39(12): 2355–2362
- Nelitz M, Williams RS, Lippacher S, Reichel H, Dornacher D. Analysis of failure and clinical outcome after unsuccessful medial patellofemoral ligament reconstruction in young patients. *Int Orthop* 2014; 38: 2265–2272
- Nomura E, Horiuchi Y, Inoue M. Correlation of MR imaging findings and open exploration of medial patellofemoral ligament injuries in acute patellar dislocations. *Knee* 2002; 9: 139–143
- Ren B, Zhang X, Zhang L, et al. Isolated trochleoplasty for recurrent patellar dislocation has lower outcome and higher residual instability compared with combined MPFL- and trochleoplasty: a systematic review. *Arch Orthop Trauma Surg* 2019; 139(11): 1617–1624
- Sanchis-Alfonso V, Coloma-Saiz J, Herrero-Herrero M, Prades-Piñón J,

- Ramírez-Fuentes C. Evaluation of anterior knee pain patient: clinical and radiological assessment including psychological factors. *Annals of Joint* 2018; 3: 26
29. Schöttle PB, Fucentes SF, Pfirrmann C, Bereiter H, Romero J. Trochleoplasty for patellar instability due to trochlear dysplasia: A minimum 2-year clinical and radiological follow-up of 19 knees. *Acta Orthop* 2005; 76: 693–698
30. Schöttle PB, Schell H, Duda G, Weiler A. Cartilage viability after trochleoplasty. *Knee Surg Sports Traumatol Arthrosc* 2007; 15(2): 161–167
31. Schöttle PB, Schmelting A, Rosenstiel N, Weiler A. Radiographic landmarks for femoral tunnel placement in medial patellofemoral ligament reconstruction. *Am J Sports Med* 2007; 35(5): 801–804
32. Schuttler KF, Struwer J, Roessler PP, et al. Patellofemoral osteoarthritis after insall's proximal realignment for recurrent patellar dislocation. *Knee Surg Sports Traumatol Arthrosc* 2013; 22: 2623–2628
33. Servien E, Fritsch B, Lustig S, et al. In vivo positioning analysis of medial patellofemoral ligament reconstruction. *Am J Sports Med* 2011; 39(1): 134–139
34. Shah JN, Howard JS, Flanigan DC, Brophy RH, Carey JL, Lattermann C. A systematic review of complications and failures associated with medial patellofemoral ligament reconstruction for recurrent patellar dislocation. *Am J Sports Med* 2012; 40: 1916–1923
35. Steiner TM, Torga-Spak R, Teitge RA. Medial patellofemoral ligament reconstruction in patients with lateral patellar instability and trochlear dysplasia. *Am J Sports Med* 2006; 34(8): 1254–1261
36. Stephen JM, Kaider D, Lumpaopong P, Deehan DJ, Amis AA. The effect of femoral tunnel position and graft tension on patellar contact mechanics and kinematics after medial patellofemoral ligament reconstruction. *Am J Sports Med* 2014; 42(2): 364–372
37. Stuberg W, Temme J, Kaplan P, Clarke A, Fuchs R. Measurement of tibial torsion and thigh-foot angle using goniometry and computed tomography. *Clin Orthop* 1991; 272: 208–212
38. Tanner SM, Garth WP Jr, Soileau R, Lemons JE. A modified test for patellar instability: the biomechanical basis. *Clin J Sport Med* 2003; 13(6): 327–338
39. Thauat M, Erasmus PJ. The favourable anisometry: an original concept for medial patellofemoral ligament reconstruction. *Knee* 2007; 14(6): 424–428
40. Utting MR, Mulford JS, Eldridge JD. A prospective evaluation of trochleoplasty for the treatment of patellofemoral dislocation and instability. *J Bone Joint Surg Br* 2008; 90: 180–185
41. Vollnberg B, Koehlitz T, Jung T, et al. Prevalence of cartilage lesions and early osteoarthritis in patients with patellar dislocation. *Eur Radiol* 2012; 22: 2347–2356
42. von Engelhardt LV, Fuchs T, Weskamp P, Jerosch J. Effective patellofemoral joint stabilization and low complication rates using a hardware-free MPFL reconstruction technique with an intra-operative adjustment of the graft tension. *Knee Surg Sports Traumatol Arthrosc* 2018; 26(9): 2750–2757
43. von Engelhardt LV, Raddatz M, Bouillon B, et al. How reliable is MRI in diagnosing cartilaginous lesions in patients with first and recurrent lateral patellar dislocations? *BMC Musculoskelet Disord* 2010; 11: 149
44. von Engelhardt LV, Weskamp P, Lahner M, Spahn G, Jerosch J. Deepening trochleoplasty combined with balanced medial patellofemoral ligament reconstruction for an adequate graft tensioning. *World J Orthop* 2017; 8(12): 935–945
45. von Knoch F, Bohm T, Burgi ML, von Knoch M, Bereiter H. Trochleoplasty for recurrent patellar dislocation in association with trochlear dysplasia. A 4- to 14-year follow-up study. *J Bone Joint Surg Br* 2006; 88(10): 1331–1335
46. Wagner D, Pfalzer F, Hingelbaum S, Huth J, Mauch F, Bauer G. The influence of risk factors on clinical outcomes following anatomical medial patellofemoral ligament (MPFL) reconstruction using the gracilis tendon. *Knee Surg Sports Traumatol Arthrosc* 2013; 21: 318–324
47. Wasiak J, Feller JA, Richmond AK. Medial patellofemoral ligament reconstruction as an isolated or combined procedure for recurrent patellar instability. *Knee Surg Sports Traumatol Arthrosc* 2014; 22(10): 2470–2476

Literatur zum Beitrag

Jannik Frings, Matthias Krause, Karl-Heinz Frosch:

Komplikationen und Revisionsstrategie nach Trochleoplastik

- Arendt EA, Askenberger M, Agel J, Tompkins MA: Risk of redislocation after primary patellar dislocation: A clinical prediction model based on magnetic resonance imaging variables. *Am J Sports Med* 2018; 46: 3385–3390
- Balcarek P, Oberthur S, Hopfensitz S, Frosch S, Walde TA, Wachowski MM et al.: Which patellae are likely to redislocate? *Knee Surg Sports Traumatol Arthrosc* 2014; 22: 2308–2314
- Banke IJ, Kohn LM, Meidinger G, Otto A, Hensler D, Beitzel K et al.: Combined trochleoplasty and MPFL reconstruction for treatment of chronic patellofemoral instability: a prospective minimum 2-year follow-up study. *Knee Surg Sports Traumatol Arthrosc* 2014; 22: 2591–2598
- Blond L, Haugegaard M: Combined arthroscopic deepening trochleoplasty and reconstruction of the medial patellofemoral ligament for patients with recurrent patella dislocation and trochlear dysplasia. *Knee Surg Sports Traumatol Arthrosc* 2014; 22: 2484–2490
- Camathias C, Studer K, Kiapour A, Rutz E, Vavken P: Trochleoplasty as a solitary treatment for recurrent patellar dislocation results in good clinical outcome in adolescents. *Am J Sports Med* 2016; 44: 2855–2863
- Carstensen SE, Feeley SM, Diduch DR: Manipulation under anesthesia with lysis of adhesions is effective in arthrofibrosis after sulcus-deepening trochleoplasty: a prospectivestudy. *Orthop J Sports Med* 2019; 7: 2325967119864868
- Dejour H, Walch G, Nove-Josserand L, Guier C: Factors of patellar instability: an anatomic radiographic study. *Knee Surg Sports Traumatol Arthrosc* 1994; 2: 19–26
- Frings J, Krause M, Akoto R, Wohlmuth P, Frosch KH: Combined distal femoral osteotomy (DFO) in genu valgum leads to reliable patellar stabilization and an improvement in knee function. *Knee Surg Sports Traumatol Arthrosc* 2018; 26: 3572–3581
- Frings J, Krause M, Wohlmuth P, Akoto R, Frosch KH: Influence of patient-related factors on clinical outcome of tibial tubercle transfer combined with medial patellofemoral ligament reconstruction. *Knee* 2018; 25: 1157–1164
- Frosch KH, Schmeling A: A new classification system of patellar instability and patellar maltracking. *Arch Orthop Trauma Surg* 2016; 136: 485–497
- Fucntese SF, Zingg PO, Schmitt J, Pfirrmann CW, Meyer DC, Koch PP: Classification of trochlear dysplasia as predictor of clinical outcome after trochleoplasty. *Knee Surg Sports Traumatol Arthrosc* 2011; 19: 1655–1661
- Hopper GP, Leach WJ, Rooney BP, Walker CR, Blyth MJ: Does degree of trochlear dysplasia and position of femoral tunnel influence outcome after medial patellofemoral ligament reconstruction? *Am J Sports Med* 2014; 42: 716–722
- Jaquith BP, Parikh SN: Predictors of recurrent patellar instability in children and adolescents after first-time dislocation. *J Pediatr Orthop* 2017; 37: 484–490
- Laidlaw MS, Feeley SM, Ruland JR, Diduch DR: Sulcus-deepening trochleoplasty and medial patellofemoral ligament reconstruction for recurrent patellar instability. *Arthrosc Tech* 2018; 7: e113–e123
- Longo UG, Vincenzo C, Mannering N, Ciuffreda M, Salvatore G, Berton A, et al.: Trochleoplasty techniques provide good clinical results in patients with trochlear dysplasia. *Knee Surg Sports Traumatol Arthrosc* 2018; 26: 2640–2658
- Metcalf AJ, Clark DA, Kemp MA, Eldridge JD: Trochleoplasty with a flexible osteochondral flap: results from an 11-year series of 214 cases. *Bone Joint J* 2017; 99-B: 344–350
- Nelitz M, Dreyhaupt J, Lippacher S: Combined trochleoplasty and medial patellofemoral ligament reconstruction for recurrent patellar dislocations in severe trochlear dysplasia: a minimum 2-year follow-up study. *Am J Sports Med* 2013; 41: 1005–1012
- Nelitz M, Lippacher S, Reichel H, Dornacher D: Evaluation of trochlear dysplasia using MRI: correlation between the classification system of Dejour and objective parameters of trochlear dysplasia. *Knee Surg Sports Traumatol Arthrosc* 2014; 22: 120–127
- Pfirrmann CW, Zanetti M, Romero J, Hodler J: Femoral trochlear dysplasia: MR findings. *Radiology* 2000; 216: 858–864
- Ren B, Zhang X, Zhang L, Zhang M, Liu Y, Tian B, et al.: Isolated trochleoplasty for recurrent patellar dislocation has lower outcome and higher residual instability compared with combined MPFL and trochleoplasty: a systematic review. *Arch Orthop Trauma Surg* 2019; 139: 1617–1624
- Rouanet T, Gougeon F, Fayard JM, Remy F, Migaud H, Pasquier G: Sulcus deepening trochleoplasty for patellofemoral instability: A series of 34 cases after 15-year postoperative follow-up. *Orthop Traumatol Surg Res* 2015; 101: 443–447
- Salonen EE, Magga T, Sillanpaa PJ, Kiekara T, Maenpaa H, Mattila VM: Traumatic patellar dislocation and cartilage injury: a follow-up study of long-term cartilage deterioration. *Am J Sports Med* 2017; 45: 1376–1382
- Schottle PB, Fucntese SF, Pfirrmann C, Bereiter H, Romero J: Trochleoplasty for patellar instability due to trochlear dysplasia: a minimum 2-year clinical and radiological follow-up of 19 knees. *Acta Orthop* 2005; 76: 693–698
- Schottle PB, Romero J, Schmeling A, Weiler A: Anatomical reconstruction of the medial patellofemoral ligament using a free gracilis autograft. *Arch Orthop Trauma Surg* 2008; 128: 479–484
- Song GY, Hong L, Zhang H, Zhang J, Li X, Li Y et al.: Trochleoplasty versus nontrochleoplasty procedures in treating patellar instability caused by severe trochlear dysplasia. *Arthroscopy* 2014; 30: 523–532
- Stefanik JJ, Zumwalt AC, Segal NA, Lynch JA, Powers CM: Association between measures of patella height, morphologic features of the trochlea, and patellofemoral joint alignment: the MOST study. *Clin Orthop Relat Res* 2013; 471: 2641–2648
- van Sambeek JDP, van de Groes SAW, Verdonschot N, Hannink G:

- Trochleoplasty procedures show complication rates similar to other patellar-stabilizing procedures. *Knee Surg Sports Traumatol Arthrosc* 2018; 26: 2841–2857
28. Verdonk R, Jansegers E, Stuyts B: Trochleoplasty in dysplastic knee trochlea. *Knee Surg Sports Traumatol Arthrosc* 2005; 13: 529–533
29. von Knoch F, Bohm T, Burgi ML, von Knoch M, Bereiter H: Trochleoplasty for recurrent patellar dislocation in association with trochlear dysplasia. A 4- to 14-year follow-up study. *J Bone Joint Surg Br* 2006; 88: 1331–1335
30. Zaffagnini S, Previtali D, Tamborini S, Pagliuzzi G, Filardo G, Candrian C: Recurrent patellar dislocations: trochleoplasty improves the results of medial patellofemoral ligament surgery only in severe trochlear dysplasia. *Knee Surg Sports Traumatol Arthrosc* 2019; 27:

Literatur zum Beitrag

Kai Fehske:

Operative Therapie von Patella-Frakturen

1. Bonazza NA, Lewis GS, Lukosius EZ et al. (2018) Effect of Transosseous Tunnels on Patella Fracture Risk After Medial Patellofemoral Ligament Reconstruction: A Cadaveric Study. *Arthroscopy* 34:513–518
2. Bostrom A (1972) Fracture of the patella. A study of 422 patellar fractures. *Acta Orthop Scand Suppl* 143:1–80
3. Carpenter JE, Kasman RA, Patel N et al. (1997) Biomechanical evaluation of current patella fracture fixation techniques. *J Orthop Trauma* 11:351–356
4. Cho JH (2013) Percutaneous cannulated screws with tension band wiring technique in patella fractures. *Knee Surg Relat Res* 25:215–219
5. Ellwein A, Lill H, Deyhazra RO et al. (2019) Outcomes after locked plating of displaced patella fractures: a prospective case series. *Int Orthop* 43:2807–2815
6. Gehr J, Friedl W (2001) Probleme der Zuggurtungsosteosynthese von Patellafrakturen und deren Konsequenzen für weitere Implantatentwicklungen. *Chirurg* 72:1309–1317; discussion 1317–1308
7. John J, Wagner WW, Kuiper JH (2007) Tension-band wiring of transverse fractures of patella. The effect of site of wire twists and orientation of stainless steel wire loop: a biomechanical investigation. *Int Orthop* 31:703–707
8. Konan S, Sandiford N, Unno F et al. (2016) Periprosthetic fractures associated with total knee arthroplasty: an update. *Bone Joint J* 98-B:1489–1496
9. Labitzke R (1977) Laterale Zuggurtung – sofort belastungsstabile Osteosynthese der Patellafraktur. *Arch Orthop Unfallchir* 90:77–87
10. Labitzke R (1997) Zuggurtungen – Richtiges und Falsches am Beispiel der Patellafraktur. *Chirurg* 68:638–642
11. Lazaro LE, Cross MB, Lorich DG (2014) Vascular anatomy of the patella: implications for total knee arthroplasty surgical approaches. *Knee* 21:655–660
12. Lazaro LE, Wellman DS, Pardee NC et al. (2013) Effect of computerized tomography on classification and treatment plan for patellar fractures. *J Orthop Trauma* 27:336–344
13. Lazaro LE, Wellman DS, Sauro G et al. (2013) Outcomes after operative fixation of complete articular patellar fractures: assessment of functional impairment. *J Bone Joint Surg Am* 95:e96 91–98
14. Lebrun CT, Langford JR, Sagi HC (2012) Functional outcomes after operatively treated patella fractures. *J Orthop Trauma* 26:422–426
15. Lennox IA, Cobb AG, Knowles J et al. (1994) Knee function after patellectomy. A 12- to 48-year follow-up. *J Bone Joint Surg Br* 76:485–487
16. Levack B, Flannagan JP, Hobbs S (1985) Results of surgical treatment of patellar fractures. *J Bone Joint Surg Br* 67:416–419
17. Ling M, Zhan S, Jiang D et al. (2019) Where should Kirschner wires be placed when fixing patella fracture with modified tension-band wiring? A finite element analysis. *J Orthop Surg Res* 14:14
18. Lotke PA, Ecker ML (1981) Transverse fractures of the patella. *Clin Orthop Relat Res*:180–184
19. Mc LH (1947) Repair of major tendon ruptures by buried removable suture. *Am J Surg* 74:758–764
20. Mcgreal G, Reidy D, Joy A et al. (1999) The biomechanical evaluation of polyester as a tension band for the internal fixation of patellar fractures. *J Med Eng Technol* 23:53–56
21. Me M, M A, R S (1990) Manual of internal fixation: Techniques recommended by the AO-ASIF. Springer, Heidelberg
22. Mehdi M, Husson JL, Polard JL et al. (1999) Resultats du traitement des fractures de la rotule par haubanage pre-rotulien. Analyse d'une serie de 203 cas. *Acta Orthop Belg* 65:188–196
23. Moore TB, Sampathi BR, Zamorano DP et al. (2018) Fixed angle plate fixation of comminuted patellar fractures. *Injury* 49:1203–1207
24. Muller EC, Frosch KH (2019) Patellafrakturen. *Chirurg* 90:243–254
25. Pesch S, Kirchhoff K, Biberthaler P et al. (2019) Patellafrakturen. *Unfallchirurg* 122:225–237
26. Scolaro J, Bernstein J, Ahn J (2011) Patellar fractures. *Clin Orthop Relat Res* 469:1213–1215
27. Smith ST, Cramer KE, Karges DE et al. (1997) Early complications in the operative treatment of patella fractures. *J Orthop Trauma* 11:183–187
28. Sorensen KH (1964) The Late Prognosis after Fracture of the Patella. *Acta Orthop Scand* 34:198–212
29. Taylor BC, Mehta S, Castaneda J et al. (2014) Plating of patella fractures: techniques and outcomes. *J Orthop Trauma* 28:e231–235
30. Torchia ME, Lewallen DG (1996) Open fractures of the patella. *J Orthop Trauma* 10:403–409
31. Weber MJ, Janecki CJ, Mcleod P et al. (1980) Efficacy of various forms of fixation of transverse fractures of the patella. *J Bone Joint Surg Am* 62:215–220
32. Wild M, Windolf J, Flohé S (2010) Patellafrakturen. *Der Unfallchirurg* 113:401–412
33. Wright PB, Kosmopoulos V, Cote RE et al. (2009) FiberWire is superior in strength to stainless steel wire for tension band fixation of transverse patellar fractures. *Injury* 40:1200–1203
34. Wurm S, Augat P, Bühren V (2015) Biomechanical Assessment of Locked Plating for the Fixation of Patella Fractures. *J Orthop Trauma* 29:e305–308
35. Zderic I, Stoffel K, Sommer C et al. (2017) Biomechanical evaluation of the tension band wiring principle. A comparison between two different techniques for transverse patella fracture fixation. *Injury* 48:1749–1757