

Current Concepts of **Orthopaedic Physical Therapy**

Independent Study Course 26.2.10

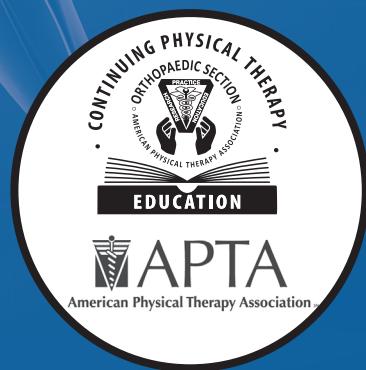
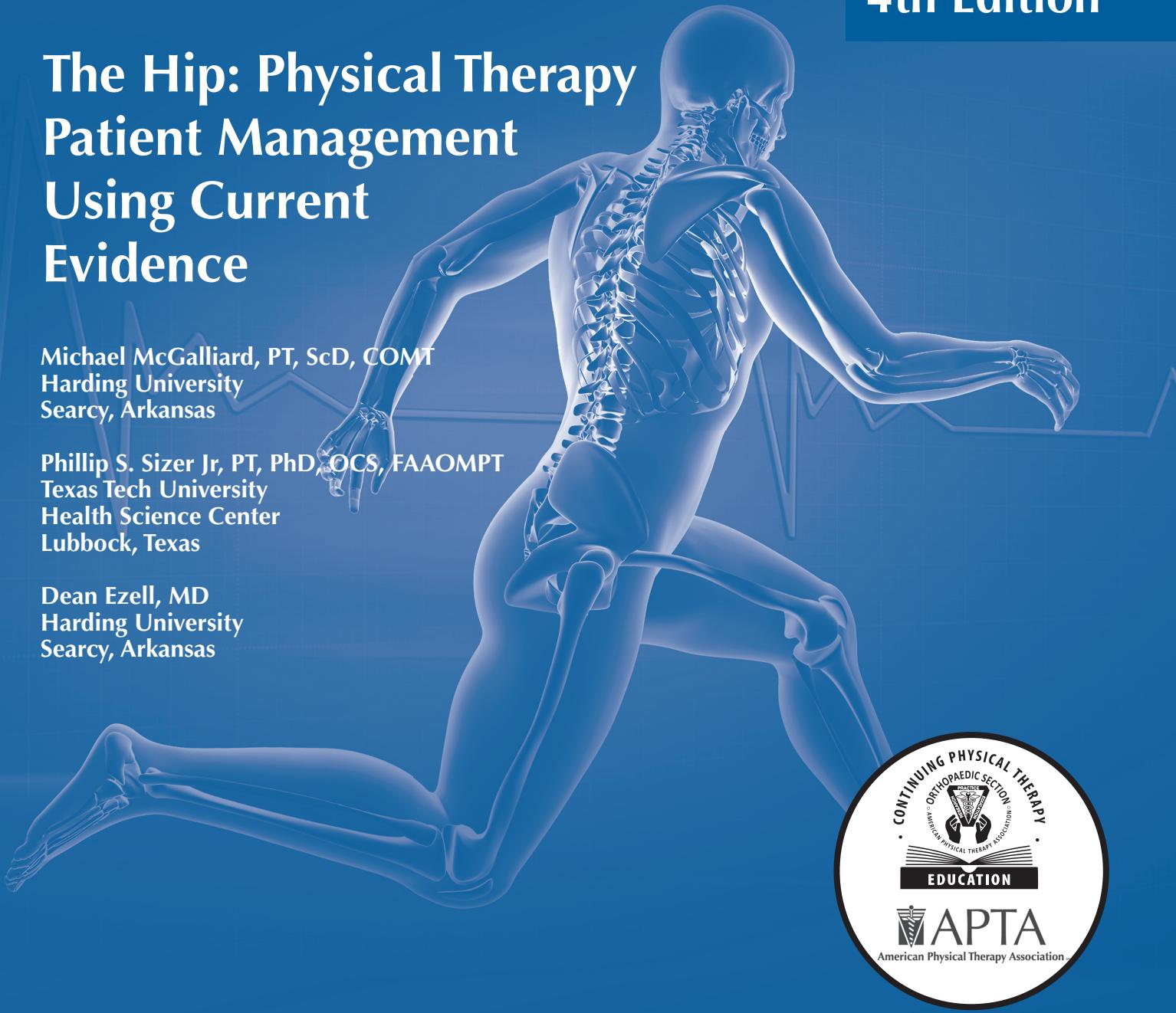
4th Edition

The Hip: Physical Therapy Patient Management Using Current Evidence

Michael McGilliard, PT, ScD, COMT
Harding University
Searcy, Arkansas

Phillip S. Sizer Jr, PT, PhD, OCS, FAAOMPT
Texas Tech University
Health Science Center
Lubbock, Texas

Dean Ezell, MD
Harding University
Searcy, Arkansas



REFERENCES

1. Schache AG, Blanch PD, Rath DA, Wrigley TV, Starr R, Bennell KL. A comparison of overground and treadmill running for measuring the three-dimensional kinematics of the lumbo-pelvic-hip complex. *Clin Biomech (Bristol, Avon)*. 2001;16(8):667-680.
2. Ellison JB, Rose SJ, Sahrman SA. Patterns of hip rotation range of motion: a comparison between healthy subjects and patients with low back pain. *Phys Ther*. 1990;70(9):537-541.
3. Muscato M, Lim-Dunham J, Demos TC, Lomasney LM. Avulsion fracture of the apophysis of the ischial tuberosity. *Orthopedics*. 2001;24(12):1127, 1198-1200.
4. Ridgeway BM, Arias BE, Barber MD. Variation of the obturator foramen and pubic arch of the female bony pelvis. *Am J Obstet Gynecol*. 2008;198(5):546.e1-4. doi: 10.1016/j.ajog.2008.01.055.
5. Handa VL, Lockhart ME, Fielding JR, et al. Racial differences in pelvic anatomy by magnetic resonance imaging. *Obstet Gynecol*. 2008;111(4):914-920. doi: 10.1097/AOG.0b013e318169ce03.
6. Von Bodman C, Matikainen MP, Yunis LH, et al. Ethnic variation in pelvimetric measures and its impact on positive surgical margins at radical prostatectomy. *Urology*. 2010;76(5):1092-1096. doi: 10.1016/j.urology.2010.02.020.
7. Albers SL, Spritzer CE, Garrett WE, Meyers WC. MR findings in athletes with pubalgia. *Skeletal Radiol*. 2001;30(5):270-277.
8. Winkel D, Aufemkampe G, Matthijs O, Meijer O, Phelps V. *Diagnosis and Treatment of the Spine: Nonoperative Orthopaedic Medicine and Manual Therapy*. Gaithersburg, MD: Aspen Publishers Inc; 1997
9. McGaugh JM, Brismée JM, Dedrick GS, Jones EA, Sizer PS. Comparing the anatomical consistency of the posterior superior iliac spine to the iliac crest as reference landmarks for the lumbopelvic spine: a retrospective radiological study. *Clin Anat*. 2007;20(7):819-825.
10. Vleeming A, Pool-Goudzwaard AL, Hammudoglu D, Stoeckart R, Snijders CJ, Mens JM. The function of the long dorsal sacroiliac ligament: its implication for understanding low back pain. *Spine*. 1996;21(5):556-562.
11. Gambacorta D, Lunghi V, Buontempo R, et al. Catheterization via caudal puncture of the epidural space with a 5F angiography catheter and a coaxial steerable 0.038" guidewire for delivery of drugs and adhesiolysis. *Neuroradio J*. 2008;21(2):255-260.
12. Mavcic B, Slivnik T, Antolic V, Iglic A, Kralj-Iglic V. High contact hip stress is related to the development of hip pathology with increasing age. *Clin Biomech (Bristol, Avon)*. 2004;19(9):939-943.
13. Horii M, Kubo T, Inoue S, Kim WC. Coverage of the femoral head by the acetabular labrum in dysplastic hips: quantitative analysis with radial MR imaging. *Acta Orthop Scand*. 2003;74(3):287-292.
14. Afroke NY, Byers PD, Hutton WC. The incongruous hip joint. A casting study. *J Bone Joint Surg Br*. 1980;62-B(4):511-514.
15. Adeeb SM, Sayed Ahmed EY, Matyas J, Hart DA, Frank CB, Shrive NG. Congruency effects on load bearing in diarthrodial joints. *Comput Methods Biomed Engin*. 2004;7(3):147-157.
16. Köhnelein W, Ganz R, Impellizzeri FM, Leunig M. Acetabular morphology: implications for joint-preserving surgery. *Clin Orthop Relat Res*. 2009;467(3):682-691. doi: 10.1007/s11999-008-0682-9.
17. Portinaro NM, Murray DW, Benson MK. Micro-anatomy of the acetabular cavity and its relation to growth. *J Bone Joint Surg Br*. 2001;83(3):377-383.
18. Maruyama M, Feinberg JR, Capello WN, D'Antonio JA. The Frank Stinchfield Award: Morphologic features of the acetabulum and femur: anteversion angle and implant positioning. *Clin Orthop Relat Res*. 2001;(393):52-65.
19. Nelitz M, Guenther KP, Gunkel S, Puhl W. Reliability of radiological measurements in the assessment of hip dysplasia in adults. *Br J Radiol*. 1999;72(856):331-334.
20. Buller LT, Rosneck J, Monaco FM, Butler R, Smith T, Barsoum WK. Relationship between proximal femoral and acetabular alignment in normal hip joints using 3-dimensional computed tomography. *Am J Sports Med*. 2012;40(2):367-375. doi: 10.1177/0363546511424390.
21. Fishkin Z, Armstrong DG, Shah H, Patra A, Mihalko WM. Proximal femoral physis shear in slipped capital femoral epiphysis--a finite element study. *J Pediatr Orthop*. 2006;26(3):291-294.
22. Huang SC, Kuo KN. Relationship of anatomic classifications to degenerative changes in untreated developmental dysplasia of the hip. *J Formos Med Assoc*. 2005;104(5):349-353.
23. Heller MO, Bergmann G, Deuretzbacher G, Claes L, Haas NP, Duda GN. Influence of femoral anteversion on proximal femoral loading: measurement and simulation in four patients. *Clin Biomech (Bristol, Avon)*. 2001;16(8):644-649.
24. Leunig M, Beck M, Woo A, Dora C, Kerboull M, Ganz R. Acetabular rim degeneration: a constant finding in the aged hip. *Clin Orthop Relat Res*. 2003;(413):201-207.

25. Schaeffeler C, Eiber M, Holzapfel K, Gollwitzer H, Rummeny EJ, Woertler K. The epiphyseal torsion angle in MR arthrography of the hip: diagnostic utility in patients with femoroacetabular impingement syndrome. *AJR Am J Roentgenol.* 2012;198(3):W237-243. doi: 10.2214/AJR.11.6656.
26. Kurrat HJ, Oberländer W. The thickness of the cartilage in the hip joint. *J Anat.* 1978;126(Pt 1):145-155.
27. Rushfeldt PD, Mann RW, Harris WH. Improved techniques for measuring in vitro the geometry and pressure distribution in the human acetabulum. II Instrumented endoprosthesis measurement of articular surface pressure distribution. *J Biomech.* 1981;14(5):315-323.
28. McLeish RD, Charnley J. Abduction forces in the one-legged stance. *J Biomech.* 1970;3(2):191-209.
29. Bergmann G, Deuretzbacher G, Heller M, et al. Hip contact forces and gait patterns from routine activities. *J Biomech.* 2001;34(7):859-871.
30. Rushfeldt PD, Mann RW, Harris WH. Influence of cartilage geometry on the pressure distribution in the human hip joint. *Science.* 1979;204(4391):413-415.
31. Brinckmann P, Hoefert H, Jongen HT. Sex differences in the skeletal geometry of the human pelvis and hip joint. *J Biomech.* 1981;14(6):427-430.
32. Day WH, Swanson SA, Freeman MA. Contact pressures in the loaded human cadaver hip. *J Bone Joint Surg. Br.* 1975;57(3):302-313.
33. Steppacher SD, Tannast M, Werlen S, Siebenrock KA. Femoral morphology differs between deficient and excessive acetabular coverage. *Clin Orthop Relat Res.* 2008;466(4):782-790. doi: 10.1007/s11999-008-0141-7.
34. Beck M, Woo A, Leunig M, Ganz R. Gluteus minimus-induced femoral head deformation in dysplasia of the hip. *Acta Orthop Scand.* 2001;72(1):13-17.
35. Byrd JW, Jones KS. Traumatic rupture of the ligamentum teres as a source of hip pain. *Arthroscopy.* 2004;20(4):385-391.
36. Seldes RM, Tan V, Hunt J, Katz M, Winiarsky R, Fitzgerald RH. Anatomy, histologic features, and vascularity of the adult acetabular labrum. *Clin Orthop Relat Res.* 2001;(382):232-240.
37. Ferguson SJ, Bryant JT, Ganz R, Ito K. An in vitro investigation of the acetabular labral seal in hip joint mechanics. *J Biomech.* 2003;36(2):171-178.
38. Mann RW. Comments on the influence of the acetabular labrum on hip joint cartilage consolidation: a poroelastic finite element model. *J Biomech.* 2002;35(1):147-149.
39. Dwyer MK, Jones HL, Hogan MG, Field RE, McCarthy JC, Noble PC. The acetabular labrum regulates fluid circulation of the hip joint during functional activities. *Am J Sports Med.* 2014;42(4):812-819. doi: 10.1177/0363546514522395.
40. Narvani AA, Tsiridis E, Kendall S, Chaudhuri R, Thomas P. A preliminary report on prevalence of acetabular labrum tears in sports patients with groin pain. *Knee Surg Sports Traumatol Arthrosc.* 2003;11(6):403-408.
41. Narvani AA, Tsiridis E, Tai CC, Thomas P. Acetabular labrum and its tears. *Br J Sports Med.* 2003;37(3):207-211. doi: 10.1136/bjsm.37.3.207.
42. Kelly BT, Shapiro GS, Digiovanni CW, Buly RL, Potter HG, Hannafin JA. Vascularity of the hip labrum: a cadaveric investigation. *Arthroscopy.* 2005;21(1):3-11.
43. Petersen W, Petersen F, Tillmann B. Structure and vascularization of the acetabular labrum with regard to the pathogenesis and healing of labral lesions. *Arch Orthop Trauma Surg.* 2003;123(6):283-288.
44. Mintz DN, Hooper T, Connell D, Buly R, Padgett DE, Potter HG. Magnetic resonance imaging of the hip: detection of labral and chondral abnormalities using noncontrast imaging. *Arthroscopy.* 2005;21(4):385-393.
45. McCarthy JC, Noble PC, Schuck MR, Wright J, Lee J. The Otto E. Aufranc Award: The role of labral lesions to development of early degenerative hip disease. *Clin Orthop Relat Res.* 2001;(393):25-37.
46. Malagelada F, Tayar R, Barke S, Stafford G, Field RE. Anatomy of the zona orbicularis of the hip: a magnetic resonance study. *Surg Radiol Anat.* 2015;37(1):11-18. doi: 10.1007/s00276-014-1300-z.
47. Hewitt JD, Glisson RR, Guilak F, Vail TP. The mechanical properties of the human hip capsule ligaments. *J Arthroplasty.* 2002;17(1):82-89.
48. Dennis DA, Komistek RD, Northcut EJ, Ochoa JA, Ritchie A. "In vivo" determination of hip joint separation and the forces generated due to impact loading conditions. *J Biomech.* 2001;34(5):623-629.49. Dienst M, Gödde S, Seil R, Hammer D, Kohn D. Hip arthroscopy without traction: In vivo anatomy of the peripheral hip joint cavity. *Arthroscopy.* 2001;17(9):924-931.
50. Li T, Zhang M, Wang H, Wang Y. Absence of Ligamentum Teres in Developmental Dysplasia of the Hip. *J Pediatr Orthop.* 2014. Epub ahead of print. doi: 10.1097/BPO.0000000000000349.
51. Bardakos NV, Villar RN. The ligamentum teres of the adult hip. *J Bone Joint Surg. Br.* 2009;91(1):8-15. doi: 10.1302/0301-620X.91B1.21421.
52. Martin HD, Savage A, Braly BA, Palmer IJ, Beall DP, Kelly B. The function of the hip capsular ligaments: a quantitative report. *Arthroscopy.* 2008;24(2):188-195. doi: 10.1016/j.arthro.2007.08.024.
53. Wagner FV, Negrão JR, Campos J, et al. Capsular ligaments of the hip: anatomic, histologic, and

- positional study in cadaveric specimens with MR arthrography. *Radiology*. 2012;263(1):189-198. doi: 10.1148/radiol.12111320.
54. Villar RN, Sheikh AM, Arora A. Hill-Sachs type lesion of the femoral head in a case of hip instability. *Arthroscopy*. 2000;16(8):858-859.
 55. Mofidi A, Sankar R, Kutty S, Kaar K, Curtin W. Traumatic dislocation of hip joint following low-velocity trauma, similarities to glenohumeral instability. *Eur J Orthop Surg Traumatol*. 2002;12(2):108-114.
 56. McCrory P, Bell S. Nerve entrapment syndromes as a cause of pain in the hip, groin and buttock. *Sports Med*. 1999;27(4):261-274.
 57. Cleland J. *An Evidence-Based Approach for Physical Therapists*. Carlstadt, NJ: Icon Learning Systems; 2005.
 58. Yildiz C, Aydin T, Yildiz Y, Kalyon TA, Basbozkurt M. Anterior inferior iliac spine apophyseal avulsion fracture. *J South Orthop Assoc*. 2003;12(1):38-40.
 59. Ryan JM, Harris JD, Graham WC, Virk SS, Ellis TJ. Origin of the direct and reflected head of the rectus femoris: an anatomic study. *Arthroscopy*. 2014;30(7):796-802. doi: 10.1016/j.arthro.2014.03.003.
 60. Hosalkar HS, Pennock AT, Zaps D, Schmitz MR, Bomar JD, Bittersohl B. The hip antero-superior labral tear with avulsion of rectus femoris (HAL-TAR) lesion: does the SLAP equivalent in the hip exist? *Hip Int*. 2012;22(4):391-396.
 61. Pierannunzii L. Comment on: "The hip antero-superior labral tear with avulsion of rectus femoris (HAL-TAR) lesion: does the SLAP equivalent in the hip exist?" by Hosalkar et al. *Hip Int*. 2012;22(6):690.
 62. Kagan A. Rotator cuff tears of the hip. *Clin Orthop Relat Res*. 1999;(368):135-140.
 63. Vleeming A, Pool-Goudzwaard AL, Stoeckart R, van Wingerden JP, Snijders CJ. The posterior layer of the thoracolumbar fascia. Its function in load transfer from spine to legs. *Spine (Phila Pa 1976)*. 1995;20(7):753-758.
 64. Barker PJ, Hapuarachchi KS, Ross JA, Sambaeiw E, Ranger TA, Briggs CA. Anatomy and biomechanics of gluteus maximus and the thoracolumbar fascia at the sacroiliac joint. *Clin Anat*. 2014;27(2):234-240. doi: 10.1002/ca.22233.
 65. Weißgraeber P, V D Wall H, Khabbazeh S, Kroker AM, Becker W. Effect of the lateral rotators on load transfer in the human hip joint revealed by mechanical analysis. *Ann Anat*. 2012;194(5):461-466.
 66. LaBan MM, Weir SK, Taylor RS. "Bald trochanter" spontaneous rupture of the conjoined tendons of the gluteus medius and minimus presenting as a trochanteric bursitis. *Am J Phys Med Rehabil*. 2004;83(10):806-809.
 67. Kandemir U, Bharam S, Philippon MJ, Fu FH. Endoscopic treatment of calcific tendinitis of gluteus medius and minimus. *Arthroscopy*. 2003;19(1):E4.
 68. Connell DA, Bass C, Sykes CAJ, Young D, Edwards E. Sonographic evaluation of gluteus medius and minimus tendinopathy. *Eur Radiol*. 2003;13(6):1339-1347.
 69. Walsh G, Archibald CG. MRI in greater trochanter pain syndrome. *Australas Radiol*. 2003;47(1):85-87.
 70. Kingzett-Taylor A, Tirman PF, Feller J, et al. Tendinosis and tears of gluteus medius and minimus muscles as a cause of hip pain: MR imaging findings. *AJR Am J Roentgenol*. 1999;173(4):1123-1126.
 71. Kiyoshige Y, Watanabe E. Fatty degeneration of gluteus minimus muscle as a predictor of falls. *Arch Gerontol Geriatr*. 2015;60(1):59-61. doi: 10.1016/j.archger.2014.07.013.
 72. Dunn T, Heller CA, McCarthy SW, Dos Remedios C. Anatomical study of the "trochanteric bursa." *Clin Anat*. 2003;16(3):233-240.
 73. Woodley SJ, Mercer SR, Nicholson HD. Morphology of the bursae associated with the greater trochanter of the femur. *J Bone Joint Surg Am*. 2008;90(2):284-294. doi: 10.2106/JBJS.G.00257.
 74. Pfirrmann CW, Chung CB, Theumann NH, Trudell DJ, Resnick D. Greater trochanter of the hip: attachment of the abductor mechanism and a complex of three bursae--MR imaging and MR bursography in cadavers and MR imaging in asymptomatic volunteers. *Radiology*. 2001;221(2):469-477.
 75. Akisue T, Yamamoto T, Marui T, et al. Ischiogluteal bursitis: multimodality imaging findings. *Clin Orthop Relat Res*. 2003;(406):214-217.
 76. Tatou L, Parratte B, Vuillier F, Diop M, Monnier G. Descriptive anatomy of the femoral portion of the iliopsoas muscle. Anatomical basis of anterior snapping of the hip. *Surg Radiol Anat*. 2001;23(6):371-374.
 77. McCormick JJ, Demos TC, Lomasney LM. Radiologic case study. Iliopsoas bursitis. *Orthopedics*. 2003;26(11):1106, 1171-1174.
 78. Ross JJ, Hu LT. Septic arthritis of the pubic symphysis: review of 100 cases. *Medicine (Baltimore)*. 2003;82(5):340-345.
 79. Lavignolle B, Vital JM, Senegas J, et al. An approach to the functional anatomy of the sacroiliac joints in vivo. *Anat Clin*. 1983;5(3):169-176.
 80. Smidt GL, Wei SH, McQuade K, Barakatt E, Sun T, Stanford W. Sacroiliac motion for extreme hip positions. A fresh cadaver study. *Spine (Phila Pa 1976)*. 1997;22(18):2073-2082.
 81. Zafero J, Devanna R, Mulligan E, Wang-Price S. Hip stiffness patterns in lumbar flexion- or extension-based movement syndromes. *Arch Phys Med Rehabil*. 2015;96(2):292-297. doi: 10.1016/j.apmr.2014.09.023.

82. Li H, Wang Y, Oni JK, et al. The role of femoral neck anteversion in the development of osteoarthritis in dysplastic hips. *Bone Joint J.* 2014;96-B(12):1586-1593. doi: 10.1302/0301-620X.96B12.33983.
83. Ng KCG, Rouhi G, Lamontagne M, Beaulé PE. Finite element analysis examining the effects of cam FAI on hip joint mechanical loading using subject-specific geometries during standing and maximum squat. *HSS J.* 2012;8(3):206-212. doi: 10.1007/s11420-012-9292-x.
84. Genda E, Konishi N, Hasegawa Y, Miura T. A computer simulation study of normal and abnormal hip joint contact pressure. *Arch Orthop Trauma Surg.* 1995;114(4):202-206.
85. Nishii T, Sugano N, Sato Y, Tanaka H, Miki H, Yoshikawa H. Three-dimensional distribution of acetabular cartilage thickness in patients with hip dysplasia: a fully automated computational analysis of MR imaging. *Osteoarthritis Cartilage.* 2004;12(8):650-657.
86. Tibor LM, Sekiya JK. Differential diagnosis of pain around the hip joint. *Arthroscopy.* 2008;24(12):1407-1421. doi: 10.1016/j.arthro.2008.06.019.
87. Torstveit MK, Sundgot-Borgen J. The female athlete triad exists in both elite athletes and controls. *Med Sci Sports Exerc.* 2005;37(9):1449-1459.
88. Joy EA, Campbell D. Stress fractures in the female athlete. *Curr Sports Med.* 2005;4(6):323-328.
89. Sakamoto J, Morimoto Y, Ishii S, et al. Investigation and macroscopic anatomical study of referred pain in patients with hip disease. *J Phys Ther Sci.* 2014;26(2):203-208. doi: 10.1589/jpts.26.203.
90. Berthelot J, Potaux F, Alliaume C, Prost A, Maugars Y. A case of hip rotator cuff tear revealed by refractory gluteus medius tendinosis. *Joint Bone Spine* 2001;68:360-363. doi:10.1016/S1297-319X(01)00280-9
91. Nirschl R. Tennis elbow tendinosis: Pathoanatomy, nonsurgical and surgical management. In: Gordon S, Blair S, Fine L, National Institute of Arthritis and Musculoskeletal and Skin Diseases (US) eds. *Repetitive Motion Disorders of the Upper Extremity.* Rosemont, IL: American Academy of Orthopaedic Surgeons; 1995:467-478.
92. Hawkins A, Sum JC, Kirages D, Sigman E, Sahai-Srivastava S. Pelvic osteomyelitis presenting as groin and medial thigh pain: a resident's case problem. *J Orthop Sports Phys Ther.* 2015;45(4):306-315. doi: 10.2519/jospt.2015.5546.
93. Gialanella B, Prometti P, Ferlucci C. Low back pain radiating to the leg: an atypical cause. *Clin Ter.* 2013;164(5):417-420. doi: 10.7417/CT.2013.1606.
94. Jung JH, Kim HI, Shin DA, et al. Usefulness of pain distribution pattern assessment in decision-mak-
- ing for the patients with lumbar zygapophyseal and sacroiliac joint arthropathy. *JKorean Med Sci.* 2007;22(6):1048-1054.
95. de Schepper EIT, Damen J, Bos PK, Hofman A, Koes BW, Bierma-Zeinstra SM. Disk degeneration of the upper lumbar disks is associated with hip pain. *Eur Spine J.* 2013;22(4):721-726. doi: 10.1007/s00586-012-2559-6.
96. Homesley HD, Minnich JM, Parvizi J, Hozack WJ. Total hip arthroplasty revision: a decade of change. *Am J Orthop (Belle Mead NJ).* 2004;33(8):389-392.
97. Aizawa Y, Kumaki K. [The courses and the segmental origins of the cutaneous branches of the thoracic dorsal rami]. *Kaibogaku Zasshi.* 1996;71(3):195-210.
98. Khapchik V, O'Donnell RJ, Glick JM. Arthroscopically assisted excision of osteoid osteoma involving the hip. *Arthroscopy.* 2001;17(1):56-61.
99. Schaefer MP, Smith J. The diagnostic and therapeutic challenge of femoral head osteoid osteoma presenting as thigh pain: a case report. *Arch Phys Med Rehabil.* 2003;84(6):904-905.
100. Stankovic R, Johnell O, Maly P, Willner S. Use of lumbar extension, slump test, physical and neurological examination in the evaluation of patients with suspected herniated nucleus pulposus. A prospective clinical study. *Man Ther.* 1999;4(1):25-32.
101. Jönsson B, Strömqvist B. Symptoms and signs in degeneration of the lumbar spine. A prospective, consecutive study of 300 operated patients. *J Bone Joint Surg Br.* 1993;75(3):381-385.
102. Woodhall B, Hayes GJ. The well-legraising test of Fajersztajn in the diagnosis of ruptured lumbar intervertebral disc. *J Bone Joint Surg Am.* 1950;32 A(4):786-792.
103. Edgar MA, Park WM. Induced pain patterns on passive straight-leg raising in lower lumbar disc protrusion. A prospective clinical, myelographic and operative study in fifty patients. *J Bone Joint Surg. Br.* 1974;56-B(4):658-667.
104. Xin SQ, Zhang QZ, Fan DH. Significance of the straight-leg-raising test in the diagnosis and clinical evaluation of lower lumbar intervertebral-disc protrusion. *J Bone Joint Surg Am.* 1987;69(4):517-522.
105. Majlesi J, Togay H, Unalan H, Toprak S. The sensitivity and specificity of the Slump and the Straight Leg Raising tests in patients with lumbar disc herniation. *J Clin Rheumatol.* 2008;14(2):87-91.
106. Jönsson B, Strömqvist B. Motor affliction of the L5 nerve root in lumbar nerve root compression syndromes. *Spine (Phila Pa, 1976).* 1995;20(18):2012-2015.
107. van den Hoogen HJ, Koes BW, Devillé W, van Eijk JT, Bouter LM. The inter-observer reproducibility of Lasègue's sign in patients with low back pain in general practice. *Br J Gen Pract.* 1996;46(413):727-730.

108. George SZ. Characteristics of patients with lower extremity symptoms treated with slump stretching: a case series. *J Orthop Sports Phys Ther.* 2002;32(8):391-398.
109. Smith SA, Massie JB, Chesnut R, Garfin SR. Straight leg raising. Anatomical effects on the spinal nerve root without and with fusion. *Spine (Phila Pa 1976).* 1993;18(8):992-999.
110. Kobayashi S, Shizu N, Suzuki Y, Asai T, Yoshizawa H. Changes in nerve root motion and intraradicular blood flow during an intraoperative straight-leg-raising test. *Spine (Phila Pa 1976).* 2003;28(13):1427-1434.
111. Johnson EK, Chiarello CM. The slump test: the effects of head and lower extremity position on knee extension. *J Orthop Sports Phys Ther.* 1997;26(6):310-317.
112. Lew PC, Morrow CJ, Lew AM. The effect of neck and leg flexion and their sequence on the lumbar spinal cord. Implications in low back pain and sciatica. *Spine (Phila Pa 1976).* 1994;19(21):2421-2424; discussion 2425.
113. Lew PC, Briggs CA. Relationship between the cervical component of the slump test and change in hamstring muscle tension. *Man Ther.* 1997;2(2):98-105.
114. Laslett M, Williams M. The reliability of selected pain provocation tests for sacroiliac joint pathology. *Spine (Phila Pa 1976).* 1994;19(11):1243-1249.
115. Laslett M, Young SB, Aprill CN, McDonald B. Diagnosing painful sacroiliac joints: A validity study of a McKenzie evaluation and sacroiliac provocation tests. *Aust J Physiother.* 2003;49(2):89-97.
116. Laslett M, Aprill CN, McDonald B, Young SB. Diagnosis of sacroiliac joint pain: validity of individual provocation tests and composites of tests. *Man Ther.* 2005;10(3):207-218.
117. Young S, Aprill C, Laslett M. Correlation of clinical examination characteristics with three sources of chronic low back pain. *Spine J.* 2003;3(6):460-465.
118. Ozgocmen S, Bozgeyik Z, Kalcik M, Yildirim A. The value of sacroiliac pain provocation tests in early active sacroiliitis. *Clin Rheumatol.* 2008;27(10):1275-1282. doi: 10.1007/s10067-008-0907-z.
119. Szadek KM, van der Wurff P, van Tulder MW, Zuurmond WW, Perez RS. Diagnostic validity of criteria for sacroiliac joint pain: a systematic review. *J Pain.* 2009;10(4):354-368. doi: 10.1016/j.jpain.2008.09.014.
120. Blower PW, Griffin AJ. Clinical sacroiliac tests in ankylosing spondylitis and other causes of low back pain--2 studies. *Ann Rheum Dis.* 1984;43(2):192-195.
121. McCombe PF, Fairbank JC, Cockersole BC, Pynsent PB. 1989 Volvo Award in clinical sciences.
122. Kristiansson P, Svärdsudd K. Discriminatory power of tests applied in back pain during pregnancy. *Spine (Phila Pa 1976).* 1996;21(20):2337-2343; discussion 2343-2344.
123. Levangie PK. The association between static pelvic asymmetry and low back pain. *Spine (Phila Pa 1976).* 1999;24(12):1234-1242.
124. Freburger JK, Riddle DL. Measurement of sacroiliac joint dysfunction: a multicenter intertester reliability study. *Phys Ther.* 1999;79(12):1134-1141.
125. Mens JMA, Vleeming A, Snijders CJ, Koes BW, Stam HJ. Validity of the active straight leg raise test for measuring disease severity in patients with posterior pelvic pain after pregnancy. *Spine (Phila Pa 1976).* 2002;27(2):196-200.
126. Mens JM, Vleeming A, Snijders CJ, Koes BW, Stam HJ. Reliability and validity of the active straight leg raise test in posterior pelvic pain since pregnancy. *Spine (Phila Pa 1976).* 2001;26(10):1167-1171.
127. Mens JM, Vleeming A, Snijders CJ, Stam HJ, Ginai AZ. The active straight leg raising test and mobility of the pelvic joints. *Eur Spine J.* 1999;8(6):468-473.
128. Cowan SM, Schache AG, Brukner P, et al. Delayed onset of transversus abdominus in long-standing groin pain. *Med Sci Sports Exerc.* 2004;36(12):2040-2045.
129. O'Sullivan PB, Beales DJ, Beetham JA, et al. Altered motor control strategies in subjects with sacroiliac joint pain during the active straight-leg-raise test. *Spine (Phila Pa 1976).* 2002;27(1):E1-8.
130. Major NM, Helms CA. Absence or interruption of the supra-acetabular line: a subtle plain film indicator of hip pathology. *Skeletal Radiol.* 1996;25(6):525-529.
131. Dominguez S, Liu P, Roberts C, Mandell M, Richman PB. Prevalence of traumatic hip and pelvic fractures in patients with suspected hip fracture and negative initial standard radiographs--a study of emergency department patients. *Acad Emerg Med.* 2005;12(4):366-369.
132. Lecouvet FE, Vande Berg BC, Malghem J, et al. MR imaging of the acetabular labrum: variations in 200 asymptomatic hips. *AJR Am J Roentgenol.* 1996;167(4):1025-1028.
133. Farjo LA, Glick JM, Sampson TG. Hip arthroscopy for acetabular labral tears. *Arthroscopy.* 1999;15(2):132-137.
134. Caruso FA, Toney MA. Trochanteric bursitis. A case report of plain film, scintigraphic, and MRI correlation. *Clin Nucl Med.* 1994;19(5):393-395.
135. Lubovsky O, Liebergall M, Mattan Y, Weil Y, Mosheiff R. Early diagnosis of occult hip fractures MRI versus CT scan. *Injury.* 2005;36(6):788-792.
136. Borrelli J, Ricci WM, Steger-May K, Totty WG, Goldfarb C. Postoperative radiographic assess-

- ment of acetabular fractures: a comparison of plain radiographs and CT scans. *J Orthop Trauma*. 2005;19(5):299-304.
137. Greenwood MJ, Erhard RE, Jones DL. Differential diagnosis of the hip vs. lumbar spine: five case reports. *J Orthop Sports Phys Ther*. 1998;27(4):308-315.
 138. Klässbo M, Harms-Ringdahl K, Larsson G. Examination of passive ROM and capsular patterns in the hip. *Physiother Res Int*. 2003;8(1):1-12.
 139. Bijl D, Dekker J, van Baar ME, et al. Validity of Cyriax's concept capsular pattern for the diagnosis of osteoarthritis of hip and/or knee. *Scand J Rheumatol*. 1998;27(5):347-351.
 140. Sutlive TG, Lopez HP, Schnitker DE, et al. Development of a clinical prediction rule for diagnosing hip osteoarthritis in individuals with unilateral hip pain. *J Orthop Sports Phys Ther*. 2008;38(9):542-550. doi: 10.2519/jospt.2008.2753.
 141. Yeargan SA 3rd, Perry JJ, Kane TJ 3rd, Richardson AB. Hematogenous septic arthritis of the adult hip. *Orthopedics*. 2003;26(8):771-776.
 142. Joassin R, Vandemeulebroucke M, Nisolle J-F, Hanson P, Deltombe T. Adhesive capsulitis of the hip: three case reports. *Ann Readapt Med Phys*. 2008;51(4):301-314. doi: 10.1016/j.anrmp.2008.03.008.
 143. Chard MD, Jenner JR. The frozen hip: an under-diagnosed condition. *BMJ*. 1988;297(6648):596-597.
 144. Looney CG, Raynor B, Lowe R. Adhesive capsulitis of the hip: a review. *J Am Acad Orthop Surg*. 2013;21(12):749-755. doi: 10.5435/JAAOS-21-12-749.
 145. Lowe R. Adhesive capsulitis of the hip: a case report: an entity in question. *Man Ther*. 2013;18(6):594-597. doi: 10.1016/j.math.2012.08.006.
 146. Khan AM, McLoughlin E, Giannakas K, Hutchinson C, Andrew JG. Hip osteoarthritis: where is the pain? *Ann R Coll Surg Engl*. 2004;86(2):119-121.
 147. Leunig M, Sledge JB, Gill TJ, Ganz R. Traumatic labral avulsion from the stable rim: a constant pathology in displaced transverse acetabular fractures. *Arch Orthop Trauma Surg*. 2003;123(8):392-395.
 148. Dürr HD, Martin H, Pellengahr C, Schlemmer M, Maier M, Jansson V. The cause of subchondral bone cysts in osteoarthritis: a finite element analysis. *Acta Orthop Scand*. 2004;75(5):554-558.
 149. Rogers J, Shepstone L, Dieppe P. Is osteoarthritis a systemic disorder of bone? *Arthritis Rheum*. 2004;50(2):452-457.
 150. Zhang W, Likhodii S, Zhang Y, et al. Classification of osteoarthritis phenotypes by metabolomics analysis. *BMJ Open*. 2014;4(11):e006286. doi: 10.1136/bmjopen-2014-006286.
 151. Croft P, Lewis M, Wynn Jones C, Coggon D, Cooper C. Health status in patients awaiting hip replacement for osteoarthritis. *Rheumatology (Oxford)*. 2002;41(9):1001-1007.
 152. D'Ambrosia RD. Epidemiology of osteoarthritis. *Orthopedics*. 2005;28(2 Suppl):s201-205.
 153. Danielsson L, Lindberg H. Prevalence of coxarthrosis in an urban population during four decades. *Clin Orthop Relat Res*. 1997;(342):106-110.
 154. Kamimura M, Nakamura Y, Uchiyama S, Ikegami S, Mukaiyama K, Kato H. The Pathophysiology and Progression of Hip Osteoarthritis Accompanied with Joint Pain are Potentially Due to Bone Alterations - Follow-up Study of Hip OA Patients. *Open Rheumatol J*. 2014;8:46-53. doi: 10.2174/1874312901408010046.
 155. Hoeksma HL, Dekker J, Ronday HK, et al. Comparison of manual therapy and exercise therapy in osteoarthritis of the hip: a randomized clinical trial. *Arthritis Rheum*. 2004;51(5):722-729.
 156. Hoeksma HL, Dekker J, Ronday HK, Breedveld FC, Van den Ende CHM. Manual therapy in osteoarthritis of the hip: outcome in subgroups of patients. *Rheumatology (Oxford)*. 2005;44(4):461-464.
 157. Romeo A, Parazza S, Boschi M, Nava T, Vanti C. Manual therapy and therapeutic exercise in the treatment of osteoarthritis of the hip: a systematic review. *Reumatismo*. 2013;65(2):63-74. doi: 10.4081/reumatismo.2013.63.
 158. Tak E, Staats P, Van Hespen A, Hopman-Rock M. The effects of an exercise program for older adults with osteoarthritis of the hip. *J Rheumatol*. 2005;32(6):1106-1113.
 159. Sinusas K. Osteoarthritis: diagnosis and treatment. *Am Fam Physician*. 2012;85(1):49-56.
 160. Dowsey MM, Gunn J, Choong PF. Selecting those to refer for joint replacement: who will likely benefit and who will not? *Best Pract Res Clin Rheumatol*. 2014;28(1):157-171. doi: 10.1016/j.berh.2014.01.005.
 161. Jain S, Giannoudis PV. Arthrodesis of the hip and conversion to total hip arthroplasty: a systematic review. *J Arthroplasty*. 2013;28(9):1596-1602. doi: 10.1016/j.arth.2013.01.025.
 162. Taruc-Uy RL, Lynch SA. Diagnosis and treatment of osteoarthritis. *Prim Care* 2013;40(4):821-836, vii.
 163. Mears DC, Velyvis JH. Primary total hip arthroplasty after acetabular fracture. *Instr Course Lect*. 2001;50:335-354.
 164. Odent T, Journeau P, Prieur AM, Touzet P, Pouliquen JC, Glorion C. Cementless hip arthroplasty in juvenile idiopathic arthritis. *J Pediatr Orthop*. 2005;25(4):465-470.
 165. Zanger P, Gladman DD, Urowitz MB, Bogoch ER. Outcome of total hip replacement for avascular necrosis in systemic lupus erythematosus. *J Rheumatol*. 2000;27(4):919-923.

166. Tang WM, Chiu KY. Primary total hip arthroplasty in patients with rheumatoid arthritis. *Int Orthop*. 2001;25(1):13-16.
167. Dudkiewicz I, Covo A, Salai M, Israeli A, Amit Y, Chechik A. Total hip arthroplasty after avascular necrosis of the femoral head: does etiology affect the results? *Arch Orthop Trauma Surg*. 2004;124(2):82-85.
168. Lebel E, Itzchaki M, Hadas-Halpern I, Zimran A, Elstein D. Outcome of total hip arthroplasty in patients with Gaucher disease. *J Arthroplasty*. 2001;16(1):7-12.
169. Jolles BM, Bogoch ER. Surgical approach for total hip arthroplasty: direct lateral or posterior? *J Rheumatol*. 2004;31(9):1790-1796.
170. Barrack RL, Butler RA. Avoidance and management of neurovascular injuries in total hip arthroplasty. *Instr Course Lect*. 2003;52:267-274.
171. Berger RA. Mini-incision total hip replacement using an anterolateral approach: technique and results. *Orthop Clin North Am*. 2004;35(2):143-151.
172. Den Hartog YM, Mathijssen NMC, Hannink G, Vehmeijer SBW. Which patient characteristics influence length of hospital stay after primary total hip arthroplasty in a "fast-track" setting? *Bone Joint J*. 2015;97-B(1):19-23. doi: 10.1302/0301-620X.97B1.33886.
173. Siguier T, Siguier M, Judet T, Charnley G, Brumpt B. Partial resurfacing arthroplasty of the femoral head in avascular necrosis. Methods, indications, and results. *Clin Orthop Relat Res*. 2001;(386):85-92.
174. Waldman BJ. Advancements in minimally invasive total hip arthroplasty. *Orthopedics*. 2003;26(8 Suppl):s833-836.
175. Wenz JF, Gurkan I, Jibodh SR. Mini-incision total hip arthroplasty: a comparative assessment of perioperative outcomes. *Orthopedics*. 2002;25(10):1031-1043.
176. Snow R, Granata J, Ruhil AVS, Vogel K, McShane M, Wasielewski R. Associations between preoperative physical therapy and post-acute care utilization patterns and cost in total joint replacement. *J Bone Joint Surg Am*. 2014;96(19):e165. doi: 10.2106/JBJS.M.01285.
177. Kamimura A, Sakakima H, Tsutsumi F, Sunahara N. Preoperative predictors of ambulation ability at different time points after total hip arthroplasty in patients with osteoarthritis. *Rehabil Res Pract*. 2014;2014:861268. doi: 10.1155/2014/861268.
178. Bodén H, Adolphson P. No adverse effects of early weight bearing after uncemented total hip arthroplasty: a randomized study of 20 patients. *Acta Orthop Scand*. 2004;75(1):21-29.
179. Tugay N, Akarcali I, Kaya D, Tugay BU, Atilla B, Tokgozoglu AM. High independence level in functional activities reduces hospital stay after total hip arthroplasty regardless of pain intensity. *Saudi Med J*. 2004;25(10):1382-1387.
180. Berger RA, Duwelius PJ. The two-incision minimally invasive total hip arthroplasty: technique and results. *Orthop Clin North Am*. 2004;35(2):163-172.
181. Youm T, Maurer SG, Stuchin SA. Postoperative management after total hip and knee arthroplasty. *J Arthroplasty*. 2005;20(3):322-324.
182. Gogia PP, Christensen CM, Schmidt C. Total hip replacement in patients with osteoarthritis of the hip: improvement in pain and functional status. *Orthopedics*. 1994;17(2):145-150.
183. Trudelle-Jackson E, Smith SS. Effects of a late-phase exercise program after total hip arthroplasty: a randomized controlled trial. *Arch Phys Med Rehabil*. 2004;85(7):1056-1062.
184. Trudelle-Jackson E, Emerson R, Smith S. Outcomes of total hip arthroplasty: a study of patients one year postsurgery. *J Orthop Sports Phys Ther*. 2002;32(6):260-267.
185. Walker WC, Keyser-Marcus LA, Cifu DX, Chaudhri M. Inpatient interdisciplinary rehabilitation after total hip arthroplasty surgery: a comparison of revision and primary total hip arthroplasty. *Arch Phys Med Rehabil*. 2001;82(1):129-133.
186. Peak EL, Parvizi J, Ciminiello M, et al. The role of patient restrictions in reducing the prevalence of early dislocation following total hip arthroplasty. A randomized, prospective study. *J Bone Joint Surg Am*. 2005;87(2):247-253.
187. Mahomed NN, Liang MH, Cook EF, et al. The importance of patient expectations in predicting functional outcomes after total joint arthroplasty. *J Rheumatol*. 2002;29(6):1273-1279.
188. Jones CA, Voaklander DC, Johnston DW, Suarez-Almazor ME. Health related quality of life outcomes after total hip and knee arthroplasties in a community based population. *J Rheumatol*. 2000;27(7):1745-1752.
189. Luhmann SJ, Jones A, Schootman M, Gordon JE, Schoenecker PL, Luhmann JD. Differentiation between septic arthritis and transient synovitis of the hip in children with clinical prediction algorithms. *J Bone Joint Surg Am*. 2004;86-A(5):956-962.
190. Laroche M, Moineuse C, Constantin A, Navaux F, Cantagrel A, Mazières B. Do adults develop transient synovitis of the hip? Three case reports. *Joint Bone Spine*. 2000;67(4):350-352.
191. Cook PC. Transient synovitis, septic hip, and Legg-Calvé-Perthes disease: an approach to the correct diagnosis. *Pediatr Clin North Am*. 2014;61(6):1109-1118. doi: 10.1016/j.pcl.2014.08.002.
192. Kim EY, Kwack KS, Cho JH, Lee DH, Yoon SH. Usefulness of dynamic contrast-enhanced MRI in differentiating between septic arthritis and transient synovitis in the hip joint. *AJR Am J Roentgenol*. 2012;198(2):428-433.

193. Fischer SU, Beattie TF. The limping child: epidemiology, assessment and outcome. *J Bone Joint Surg Br.* 1999;81(6):1029-1034.
194. Witbreuk MM, van Royen BJ, Van Kemenade FJ, Witte BI, van der Sluijs JA. Incidence and gender differences of slipped capital femoral epiphysis in the Netherlands from 1998-2010 combined with a review of the literature on the epidemiology of SCFE. *J Child Orthop.* 2013;7(2):99-105. doi: 10.1007/s11832-012-0479-y.
195. Stasikelis PJ, Sullivan CM, Phillips WA, Polard JA. Slipped capital femoral epiphysis. Prediction of contralateral involvement. *J Bone Joint Surg Am.* 1996;78(8):1149-1155.
196. Drehmann F. [Drehmann's sign. A clinical examination method in epiphysiolysis (slipping of the upper femoral epiphysis). Description of signs, aetiopathogenetic considerations, clinical experience (author's transl)]. *Z Orthop Ihre Grenzgeb.* 1979;117(3):333-344.
197. Kamegaya M, Saisu T, Nakamura J, Murakami R, Segawa Y, Wakou M. Drehmann sign and femoro-acetabular impingement in SCFE. *J Pediatr Orthop.* 2011;31(8):853-857. doi: 10.1097/BPO.0b013e31822ed320.
198. Kaewpornsawan K, Sukvanich P, Eamsobhana P, Chotigavanichaya C. The most important risk factors for avascular necrosis and chondrolysis in patients with slipped capital femoral epiphysis. *J Med Assoc Thai.* 2014;97 Suppl 9:S133-138.
199. Mont MA, Jones LC, Einhorn TA, Hungerford DS, Reddi AH. Osteonecrosis of the femoral head. Potential treatment with growth and differentiation factors. *Clin Orthop Relat Res.* 1998;(355 Suppl):S314-335.
200. Wiig O, Svenningsen S, Terjesen T. Evaluation of the subchondral fracture in predicting the extent of femoral head necrosis in Perthes disease: a prospective study of 92 patients. *J Pediatr Orthop B.* 2004;13(5):293-298.
201. Herring JA, Kim HT, Browne R. Legg-Calve-Perthes disease. Part II: Prospective multicenter study of the effect of treatment on outcome. *J Bone Joint Surg Am.* 2004;86-A(10):2121-2134.
202. Herring JA, Kim HT, Browne R. Legg-Calve-Perthes disease. Part I: Classification of radiographs with use of the modified lateral pillar and Stulberg classifications. *J Bone Joint Surg Am.* 2004;86-A(10):2103-2120.
203. Joseph B. Management of Perthes' disease. *Indian J Orthop.* 2015;49(1):10-16. doi: 10.4103/0019-5413.143906.
204. Roposch A, Mayr J, Linhart WE. Age at onset, extent of necrosis, and containment in Perthes disease. Results at maturity. *Arch Orthop Trauma Surg.* 2003;123(2-3):68-73.
205. Grzegorzewski A, Bowen JR, Guille JT, Glutting J. Treatment of the collapsed femoral head by containment in Legg-Calve-Perthes disease. *J Pediatr Orthop.* 2003;23(1):15-19.
206. Martinez AG, Weinstein SL, Dietz FR. The weight-bearing abduction brace for the treatment of Legg-Perthes disease. *J Bone Joint Surg Am.* 1992;74(1):12-21.
207. Carney BT, Minter CL. Nonsurgical treatment to regain hip abduction motion in Perthes disease: a retrospective review. *South Med J.* 2004;97(5):485-488.
208. Yrjönen T. Prognosis in Perthes' disease after noncontainment treatment. 106 hips followed for 28-47 years. *Acta Orthop Scand.* 1992;63(5):523-526.
209. Segev E, Ezra E, Wientroub S, Yaniv M. Treatment of severe late onset Perthes' disease with soft tissue release and articulated hip distraction: early results. *J Pediatr Orthop B.* 2004;13(3):158-165.
210. Skinner H. *Current Diagnosis & Treatment In Orthopedics.* 2nd ed. New York, NY: McGraw Hill Education; 2000.
211. Kuwajima SS, Crawford AH, Ishida A, Roy DR, Filho JL, Milani C. Comparison between Salter's innominate osteotomy and augmented acetabuloplasty in the treatment of patients with severe Legg-Calvé-Perthes disease. Analysis of 90 hips with special reference to roentgenographic specificity and coverage of the femoral head. *J Pediatr Orthop B.* 2002;11(1):15-28.
212. Kitakoji T, Hattori T, Kitoh H, Katoh M, Ishiguro N. Which is a better method for Perthes' disease: femoral varus or Salter osteotomy? *Clin Orthop Relat Res.* 2005;(430):163-170.
213. Than P, Halmai V, Shaikh S, Kránicz J, Bellyei A. Long-term results of derotational femoral varus osteotomy in Legg-Calvé-Perthes disease: 26-year follow-up. *Orthopedics.* 2003;26(5):487-491.
214. Yoo WJ, Choi IH, Chung CY, Cho TJ, Kim HY. Valgus femoral osteotomy for hinge abduction in Perthes' disease. Decision-making and outcomes. *J Bone Joint Surg Br.* 2004;86(5):726-730.
215. Williams P, Stewart C, Dawson T, Roberts A. A comparison of the biomechanical effects of opening and closing wedge varus osteotomies in Perthes' disease. *J Pediatr Orthop B.* 2002;11(3):229-235.
216. Herceg MB, Cutright MT, Weiner DS. Remodeling of the proximal femur after upper femoral varus osteotomy for the treatment of Legg-Calvé-Perthes disease. *J Pediatr Orthop.* 2004;24(6):654-657.
217. Gallinaro P, Massè A. Flexion osteotomy in the treatment of avascular necrosis of the hip. *Clin Orthop Relat Res.* 2001;(386):79-84.
218. Plenk H, Gstettner M, Grossschmidt K, Breitenseher M, Urban M, Hofmann S. Magnetic resonance imaging and histology of repair in femoral head osteonecrosis. *Clin Orthop Relat Res.* 2001;(386):42-53.

219. Theodorou DJ, Malizos KN, Beris AE, Theodorou SJ, Soucacos PN. Multimodal imaging quantitation of the lesion size in osteonecrosis of the femoral head. *Clin Orthop Relat Res.* 2001;(386):54-63.
220. Tripathy SK, Goyal T, Sen RK. Management of femoral head osteonecrosis: Current concepts. *Indian J Orthop.* 2015;49(1):28-45. doi: 10.4103/0019-5413.143911.
221. Rackwitz L, Eden L, Reppenagen S, et al. Stem cell- and growth factor-based regenerative therapies for avascular necrosis of the femoral head. *Stem Cell Res Ther.* 2012;3(1):7. doi: 10.1186/scrt98.
222. Steinberg ME, Larcom PG, Strafford B, et al. Core decompression with bone grafting for osteonecrosis of the femoral head. *Clin Orthop Relat Res.* 2001;(386):71-78.
223. Kim S-Y, Kim Y-G, Kim P-T, Ihn J-C, Cho B-C, Koo K-H. Vascularized compared with nonvascularized fibular grafts for large osteonecrotic lesions of the femoral head. *J Bone Joint Surg Am.* 2005;87(9):2012-2018.
224. Marciniak D, Furey C, Shaffer JW. Osteonecrosis of the femoral head. A study of 101 hips treated with vascularized fibular grafting. *J Bone Joint Surg Am.* 2005;87(4):742-747.
225. Eisenschenk A, Lautenbach M, Schwetlick G, Weber U. Treatment of femoral head necrosis with vascularized iliac crest transplants. *Clin Orthop Relat Res.* 2001;(386):100-105.
226. Rubinstein RA, Beals RK. The results of treatment of posttraumatic avascular necrosis of the femoral head in young adults: report of 31 patients. *Contemp Orthop.* 1993;27(6):527-532.
227. Zalavras CG, Lieberman JR. Osteonecrosis of the femoral head: evaluation and treatment. *J Am Acad Orthop Surg.* 2014;22(7):455-464. doi: 10.5435/JAAOS-22-07-455.
228. Cuckler JM, Moore KD, Estrada L. Outcome of hemiresurfacing in osteonecrosis of the femoral head. *Clin Orthop Relat Res.* 2004;(429):146-150.
229. Kim YG, Kim SY, Kim SJ, Park BC, Kim PT, Ihn JC. The use of cementless expansion acetabular component and an alumina-polyethylene bearing in total hip arthroplasty for osteonecrosis. *J Bone Joint Surg Br.* 2005;87(6):776-780.
230. Kim YG, Kim SY, Park BC, Kim PT, Ihn JC, Kim ID. Uncemented Harris-Galante total hip arthroplasty in patients with osteonecrosis of the femoral head. A 10-16-year follow-up study. *Acta Orthop.* 2005;76(1):42-48.
231. Xenakis TA, Gelalis J, Koukoubis TA, Zaharis KC, Soucacos PN. Cementless hip arthroplasty in the treatment of patients with femoral head necrosis. *Clin Orthop Relat Res.* 2001;(386):93-99.
232. Nich C, Sariali E-H, Sari Ali E-H, et al. Long-term results of alumina-on-alumina hip arthroplasty for osteonecrosis. *Clin Orthop Relat Res.* 2003;(417):102-111.
233. Bhimani MA, Wenz JF, Frassica FJ. Pigmented villonodular synovitis: keys to early diagnosis. *Clin Orthop Relat Res.* 2001;(386):197-202.
234. González Della Valle A, Piccaluga F, Potter HG, Salvati EA, Pusso R. Pigmented villonodular synovitis of the hip: 2- to 23-year followup study. *Clin Orthop Relat Res.* 2001;(388):187-199.
235. Robinson P, White LM, Kandel R, Bell RS, Wunder JS. Primary synovial osteochondromatosis of the hip: extracapsular patterns of spread. *Skeletal Radiol.* 2004;33(4):210-215.
236. Vastel L, Lambert P, De Pinieux G, Charrois O, Kerboull M, Courpied J-P. Surgical treatment of pigmented villonodular synovitis of the hip. *J Bone Joint Surg Am.* 2005;87(5):1019-1024.
237. Khanna V, Harris A, Farrokhyar F, Choudur HN, Wong IH. Hip arthroscopy: prevalence of intra-articular pathologic findings after traumatic injury of the hip. *Arthroscopy.* 2014;30(3):299-304. doi: 10.1016/j.arthro.2013.11.027.
238. Edmonds EW, Heyworth BE. Osteochondritis dissecans of the shoulder and hip. *Clin Sports Med.* 2014;33(2):285-294. doi: 10.1016/j.csm.2013.11.001.
239. Krebs VE. The role of hip arthroscopy in the treatment of synovial disorders and loose bodies. *Clin Orthop Relat Res.* 2003;(406):48-59.
240. Lucas JH, Quinn P, Foote J, Baker S, Bruno J. Recurrent synovial chondromatosis treated with meniscectomy and synovectomy. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 1997;84(3):253-258.
241. Fukui K, Kaneiji A, Amaya S, Matsumoto T. Synovial osteochondromatosis of the hip with femoroacetabular impingement and osteoarthritis: a case report. *J Orthop Surg (Hong Kong).* 2013;21(1):117-121.
242. Kocher MS, Kim Y-J, Millis MB, et al. Hip arthroscopy in children and adolescents. *J Pediatr Orthop.* 2005;25(5):680-686.
243. Walton NP, Jahromi I, Lewis PL. Chondral degeneration and therapeutic hip arthroscopy. *Int Orthop.* 2004;28(6):354-356.
244. Svoboda SJ, Williams DM, Murphy KP. Hip arthroscopy for osteochondral loose body removal after a posterior hip dislocation. *Arthroscopy.* 2003;19(7):777-781.
245. Cetin C, Sekir U, Yildiz Y, Aydin T, Ors F, Kalyon TA. Chronic groin pain in an amateur soccer player. *Br J Sports Med.* 2004;38(2):223-224.
246. Riccio AI, Wodajo FM, Malawer M. Metastatic carcinoma of the long bones. *Am Fam Physician* 2007;76(10):1489-1494.
247. Goodman, C., Snyder T. *Differential Diagnosis for Physical Therapists: Screening for Referral.* 5th ed. St. Louis, MO: Elsevier Saunders; 2013.
248. Bloem JL, Reidsma II. Bone and soft tissue tumors of hip and pelvis. *Eur J Radiol.* 2012;81(12):3793-3801. doi: 10.1016/j.ejrad.2011.03.101.

249. Cyriax J. *Textbook of Orthopaedic Medicine*. 8th ed. London, UK: Bailliere Tindall; 1982.
250. Gross AE, Rosenberg AG. Tumors in the hip: managing real pathologies. *Orthopedics*. 2007;30(9):754-755.
251. Rybak LD, Khaldi L, Wittig J, Steiner GC. Primary synovial chondrosarcoma of the hip joint in a 45-year-old male: case report and literature review. *Skeletal Radiol*. 2011;40(10):1375-1381. doi: 10.1007/s00256-011-1172-9.
252. Myriokefalitaki E, D'Costa D, Smith M, Ahmed AS. Primary bone metastasis as initial presentation of endometrial cancer (stage IVb). *Arch Gynecol Obstet*. 2013;288(4):739-746. doi: 10.1007/s00404-013-2956-z.
253. Bellabarba C, Sheinkop MB, Kuo KN. Idiopathic hip instability. An unrecognized cause of coxa saltans in the adult. *Clin Orthop Relat Res*. 1998;(355):261-271.
254. Scillia A, Choo A, Milman E, McInerney V, Festa A. Snapping of the proximal hamstring origin: a rare cause of coxa saltans: a case report. *J Bone Joint Surg Am*. 2011;93(21):e1251-1253. doi: 10.2106/JBJS.J.01622.
255. Shur N, Dandachli W, Findlay I, Beech Z, Bankes MJ. A pain in the backside: a case report of coxa saltans occurring at the proximal hamstring origin. *Hip Int*. 2014;24(3):302-305. doi: 10.5301/hipint.5000107.
256. Pelsser V, Cardinal E, Hobden R, Aubin B, Lafortune M. Extraarticular snapping hip: sonographic findings. *AJR Am J Roentgenol*. 2001;176(1):67-73.
257. Brignall CG, Brown RM, Stainsby GD. Fibrosis of the gluteus maximus as a cause of snapping hip. A case report. *J Bone Joint Surg Am*. 1993;75(6):909-910.
258. Janzen DL, Partridge E, Logan PM, Connell DG, Duncan CP. The snapping hip: clinical and imaging findings in transient subluxation of the ilio-psoas tendon. *Can Assoc Radiol*. 1996;47(3):202-208.
259. Dobbs MB, Gordon JE, Luhmann SJ, Szymanski DA, Schoenecker PL. Surgical correction of the snapping iliopsoas tendon in adolescents. *J Bone Joint Surg Am*. 2002;84-A(3):420-424.
260. White RA, Hughes MS, Burd T, Hamann J, Allen WC. A new operative approach in the correction of external coxa saltans: the snapping hip. *Am J Sports Med*. 2004;32(6):1504-1508.
261. Gruen GS, Scioscia TN, Lowenstein JE. The surgical treatment of internal snapping hip. *Am J Sports Med*. 2002;30(4):607-613.
262. Provencher MT, Hofmeister EP, Muldoon MP. The surgical treatment of external coxa saltans (the snapping hip) by Z-plasty of the iliotibial band. *Am J Sports Med*. 2004;32(2):470-476.
263. Anderson K, Strickland SM, Warren R. Hip and groin injuries in athletes. *Am J Sports Med*. 2001;29(4):521-533.
264. Morelli V, Smith V. Groin injuries in athletes. *Am Fam Physician*. 2001;64(8):1405-1414.
265. Beck T, Messmer P, Regazzoni P. [Unilateral apophyseal fracture of the superior anterior iliac crest--a case report]. *Swiss Surgery*. 2003;9(1):31-34.
266. Thanikachalam M, Petros JG, O'Donnell S. Avulsion fracture of the anterior superior iliac spine presenting as acute-onset meralgia paresthetica. *Ann Emerg Med*. 1995;26(4):515-517.
267. Koulouris G, Connell D. Evaluation of the hamstring muscle complex following acute injury. *Skeletal Radiol*. 2003;32(10):582-589.
268. Nanka O, Havránek P, Pesl T, Dutka J. Avulsion fracture of the pelvis: separation of the secondary ossification center in the superior margin of the acetabulum. *Clin Anat*. 2003;16(5):458-460.
269. Meyer NJ, Schwab JP, Orton D. Traumatic unilateral avulsion of the anterior superior and inferior iliac spines with anterior dislocation of the hip: a case report. *J Orthop Trauma*. 2001;15(2):137-140.
270. Takami H, Takahashi S, Ando M. Late sciatic nerve palsy following avulsion of the biceps femoris muscle from the ischial tuberosity. *Arch Orthop Trauma Surg*. 2000;120(5-6):352-354.
271. Weaver JS, Jacobson JA, Jamadar DA, Hayes CW. Sonographic findings of adductor insertion avulsion syndrome with magnetic resonance imaging correlation. *J Ultrasound Med*. 2003;22(4):403-407.
272. Weinstein RN, Kraushaar BS, Fulkerson JP. Adductor tendinosis in a professional hockey player. *Orthopedics*. 1998;21(7):809-810.
273. Karlsson J, Swärd L, Kälebo P, Thomée R. Chronic groin injuries in athletes. Recommendations for treatment and rehabilitation. *Sports Med*. 1994;17(2):141-148.
274. Bencardino JT, Rosenberg ZS, Brown RR, Hassankhani A, Lustrin ES, Beltran J. Traumatic musculotendinous injuries of the knee: diagnosis with MR imaging. *Radiographics*. 2000;20 Spec No:S103-120.
275. Beck M, Leunig M, Parvizi J, Boutier V, Wyss D, Ganz R. Anterior femoroacetabular impingement: part II. Midterm results of surgical treatment. *Clin Orthop Relat Res*. 2004;(418):67-73.
276. Connell DA, Bass C, Sykes CAJ, Young D, Edwards E. Sonographic evaluation of gluteus medius and minimus tendinopathy. *Eur Radiol*. 2003;13(6):1339-1347.
277. Joseph MF, Taft K, Moskwa M, Denegar CR. Deep friction massage to treat tendinopathy: a systematic review of a classic treatment in the face of a new paradigm of understanding. *J Sport Rehabil*. 2012;21(4):343-353.

278. Davidson CJ, Ganion LR, Gehlsen GM, Verhoeven B, Roepke JE, Sevier TL. Rat tendon morphologic and functional changes resulting from soft tissue mobilization. *Med Sci Sports Exerc.* 1997;29(3):313-319.
279. De Bruin R. Deep transverse friction: its analgesic effect. *Int J Sports Med.* 1984;5:35-36.
280. Gehlsen GM, Ganion LR, Helfst R. Fibroblast responses to variation in soft tissue mobilization pressure. *Med Sci Sports Exerc.* 1999;31(4):531-535.
281. Brosseau L, Casimiro L, Milne S, et al. Deep transverse friction massage for treating tendinitis. *Cochrane Database Syst. Rev.* 2002;(4):CD003528.
282. Reeh ES, elDeeb ME. Referred pain of muscular origin resembling endodontic involvement. Case report. *Oral Surg Oral Med Oral Pathol.* 1991;71(2):223-227.
283. Willis WD. Neurophysiology of nociception and pain in the spinal cord. *Res Publ Assoc Res Nerv Ment Dis.* 1980;58:77-92.
284. Cooper BC, Cooper DL. Recognizing otolaryngologic symptoms in patients with temporomandibular disorders. *Cranio.* 1993;11(4):260-267.
285. Ohnmeiss DD, Vanharanta H, Ekholm J. Relation between pain location and disc pathology: a study of pain drawings and CT/discography. *Clin J Pain.* 1999;15(3):210-217.
286. Saal JS. The role of inflammation in lumbar pain. *Spine.* 1995;20(16):1821-1827.
287. Manchikanti L, Boswell MV, Singh V, Pampati V, Damron KS, Beyer CD. Prevalence of facet joint pain in chronic spinal pain of cervical, thoracic, and lumbar regions. *BMC Musculoskelet Disord.* 2004;5:15.
288. Fukui S, Ohseto K, Shiotani M, Ohno K, Karasawa H, Naganuma Y. Distribution of referred pain from the lumbar zygapophyseal joints and dorsal rami. *Clin J Pain.* 1997;13(4):303-307.
289. Fortin JD, Aprill CN, Ponthieux B, Pier J. Sacroiliac joint: pain referral maps upon applying a new injection/arthrography technique. Part II: Clinical evaluation. *Spine (Phila Pa 1976).* 1994;19(13):1483-1489.
290. Dreyfuss P, Michaelsen M, Pauza K, McLarty J, Bogduk N. The value of medical history and physical examination in diagnosing sacroiliac joint pain. *Spine (Phila Pa 1976).* 1996;21(22):2594-2602.
291. Winkelstein BA, Weinstein JN, DeLeo JA. The role of mechanical deformation in lumbar radiculopathy: an in vivo model. *Spine (Phila Pa 1976).* 2002;27(1):27-33.
292. Yamaguchi K, Murakami M, Takahashi K, Moriya H, Tatsuoka H, Chiba T. Behavioral and morphologic studies of the chronically compressed cauda equina. Experimental model of lumbar spinal stenosis in the rat. *Spine (Phila Pa 1976).* 1999;24(9):845-851.
293. Willén J, Danielson B. The diagnostic effect from axial loading of the lumbar spine during computed tomography and magnetic resonance imaging in patients with degenerative disorders. *Spine (Phila Pa 1976).* 2001;26(23):2607-2614.
294. Garfin SR. Surgical indications for spinal instrumentation in degenerative diseases. *West J Med.* 1995;163(6):571.
295. Harrington JF, Messier AA, Bereiter D, Barnes B, Epstein MH. Herniated lumbar disc material as a source of free glutamate available to affect pain signals through the dorsal root ganglion. *Spine (Phila Pa 1976).* 2000;25(8):929-936.
296. Hitselberger WE, Witten RM. Abnormal myelograms in asymptomatic patients. *J Neurosurg.* 1968;28(3):204-206.
297. Holt EP Jr. The question of lumbar discography. *J Bone Joint Surg Am.* 1968;50(4):720-726.
298. Wiesel SW, Tsourmas N, Feffer HL, Citrin CM, Patronas N. A study of computer-assisted tomography. I. The incidence of positive CAT scans in an asymptomatic group of patients. *Spine (Phila Pa 1976).* 1984;9(6):549-551.
299. Boden SD, Davis DO, Dina TS, Patronas NJ, Wiesel SW. Abnormal magnetic-resonance scans of the lumbar spine in asymptomatic subjects. A prospective investigation. *J Bone Joint Surg Am.* 1990;72(3):403-408.
300. Jensen MC, Brant-Zawadzki MN, Obuchowski N, Modic MT, Malkasian D, Ross JS. Magnetic resonance imaging of the lumbar spine in people without back pain. *N Engl J Med.* 1994;331(2):69-73.
301. Boos N, Rieder R, Schade V, Spratt KF, Semmer N, Aebi M. 1995 Volvo Award in clinical sciences. The diagnostic accuracy of magnetic resonance imaging, work perception, and psychosocial factors in identifying symptomatic disc herniations. *Spine (Phila Pa 1976).* 1995;20(24):2613-2625.
302. Weishaupt D, Zanetti M, Hodler J, Boos N. MR imaging of the lumbar spine: prevalence of intervertebral disk extrusion and sequestration, nerve root compression, end plate abnormalities, and osteoarthritis of the facet joints in asymptomatic volunteers. *Radiology* 1998;209(3):661-666.
303. Borenstein DG, O'Mara JW, Boden SD, et al. The value of magnetic resonance imaging of the lumbar spine to predict low-back pain in asymptomatic subjects : a seven-year follow-up study. *J Bone Joint Surg Am.* 2001;83-A(9):1306-1311.
304. Elgafy H, Semaan HB, Ebraheim NA, Coombs RJ. Computed tomography findings in patients with sacroiliac pain. *Clin Orthop Relat Res.* 2001;(382):112-118.
305. Bellamy N, Newhook L, Rooney PJ, et al. Perception--a problem in the grading of sacro-iliac joint radiographs. *Scand J Rheumatol.* 1984;13(2):113-120.

306. Algin O, Gokalp G, Baran B, Ocakoglu G, Yazici Z. Evaluation of sacroiliitis: contrast-enhanced MRI with subtraction technique. *Skeletal Radiol.* 2009;38(10):983-988.
307. Damen L, Buyruk HM, Güler-Uysal F, Lotgering FK, Snijders CJ, Stam HJ. The prognostic value of asymmetric laxity of the sacroiliac joints in pregnancy-related pelvic pain. *Spine (Phila Pa 1976)*. 2002;27(24):2820-2824.
308. Buyruk HM, Snijders CJ, Vleeming A, Laméris JS, Holland WP, Stam HJ. The measurements of sacroiliac joint stiffness with colour Doppler imaging: a study on healthy subjects. *Eur J Radiol.* 1995;21(2):117-121.
309. Ostgaard HC, Roos-Hansson E, Zetherström G. Regression of back and posterior pelvic pain after pregnancy. *Spine (Phila Pa 1976)* 1996;21(23):2777-2780.
310. Matsui H, Ohmori K, Kanamori M, Ishihara H, Tsuji H. Significance of sciatic scoliotic list in operated patients with lumbar disc herniation. *Spine (Phila Pa 1976)*. 1998;23(3):338-342.
311. Milette PC. Radiculopathy, radicular pain, radiating pain, referred pain: what are we really talking about? *Radiology*. 1994;192(1):280-282.
312. Bogduk N. *Clinical Anatomy of the Lumbar Spine and Sacrum*. New York, NY: Churchill Livingstone; 1997.
313. Paajanen H, Lehto I, Alanen A, Erkintalo M, Komu M. Diurnal fluid changes of lumbar discs measured indirectly by magnetic resonance imaging. *J Orthop Res*. 1994;12(4):509-514.
314. Garbutt G, Boocock MG, Reilly T, Troup JD. Running speed and spinal shrinkage in runners with and without low back pain. *Med Sci Sports Exerc*. 1990;22(6):769-772.
315. Jamison D, Marcolongo MS. The effect of creep on human lumbar intervertebral disk impact mechanics. *J Biomech Eng*. 2014;136(3):031006.
316. Johannaber K, Fathallah FA. Spinal disc hydration status during simulated stooped posture. *Work*. 2012;41 Suppl 1:2384-2386. doi: 10.3233/WOR-2012-0470-2384.
317. Matsumoto T, Kawakami M, Kuribayashi K, Takenaka T, Tamaki T. Cyclic mechanical stretch stress increases the growth rate and collagen synthesis of nucleus pulposus cells in vitro. *Spine (Phila Pa 1976)*. 1999;24(4):315-319.
318. McMillan DW, Garbutt G, Adams MA. Effect of sustained loading on the water content of intervertebral discs: implications for disc metabolism. *Ann Rheum Dis*. 1996;55(12):880-887.
319. Colachis SC, Strohm BR. Effects of intermittent traction on separation of lumbar vertebrae. *Arch Phys Med Rehabil*. 1969;50(5):251-258.
320. Onel D, Tuzlaci M, Sari H, Demir K. Computed tomographic investigation of the effect of traction on lumbar disc herniations. *Spine (Phila Pa 1976)*. 1989;14(1):82-90.
321. Bridger RS, Ossey S, Fourie G. Effect of lumbar traction on stature. *Spine (Phila Pa 1976)*. 1990;15(6):522-524.
322. Leivseth G, Drerup B. Spinal shrinkage during work in a sitting posture compared to work in a standing posture. *Clin Biomech (Bristol, Avon)*. 1997;12(7-8):409-418.
323. Magnusson ML, Aleksiev AR, Spratt KF, Lakes RS, Pope MH. Hyperextension and spine height changes. *Spine (Phila Pa 1976)*. 1996;21(22):2670-2675.
324. Magnusson ML, Pope MH, Hansson T. Does hyperextension have an unloading effect on the intervertebral disc? *Scand J Rehabil Med*. 1995;27(1):5-9.
325. Matthews J. De waarde van epidurografie bij de beoordeling van de weding van manipulatie en traktie bij lumbale discusproblemen. *Tijdschr Ned Vereniging Orthop* 1981;1:23-43.
326. Komori H, Shinomiya K, Nakai O, Yamaura I, Takeda S, Furuya K. The natural history of herniated nucleus pulposus with radiculopathy. *Spine (Phila Pa 1976)*. 1996;21(2):225-229.
327. Chung TS, Yang HE, Ahn SJ, Park JH. Herniated Lumbar Disks: Real-time MR Imaging Evaluation during Continuous Traction. *Radiology*. 2015;275(3):935. doi: 10.1148/radiol.2015154011.
328. Guechev G, Guechev A. Fast dynamics of voluntary muscle strength and motor evoked potentials after traction therapy in patient with lumbosacral root lesion. *Electromyogr Clin Neurophysiol*. 1996;36(4):195-197.
329. Letchuman R, Deusinger RH. Comparison of sacrospinalis myoelectric activity and pain levels in patients undergoing static and intermittent lumbar traction. *Spine (Phila Pa 1976)*. 1993;18(10):1361-1365.
330. Kamanli A, Karaca-Acet G, Kaya A, Koc M, Yildirim H. Conventional physical therapy with lumbar traction; clinical evaluation and magnetic resonance imaging for lumbar disc herniation. *Bratisl Lek Listy*. 2010;111(10):541-544.
331. Racz G, Heavner J, Raj P. Percutaneous epidural neuroplasty. *Semin Anesth*. 1997;16:302-312.
332. Racz G, Noe C, Heavner J. Selective Spinal Injections for Lower Back Pain. *Curr Rev Pain*. 1999;3(5):333-341.
333. Anderson SR, Racz GB, Heavner J. Evolution of epidural lysis of adhesions. *Pain Physician*. 2000;3(3):262-270.
334. Levin U, Stenström CH. Force and time recording for validating the sacroiliac distraction test. *Clin Biomech (Bristol, Avon)*. 2003;18(9):821-826.
335. Sutton C, Nono L, Johnston RG, Thomson OP. The effects of experience on the inter-reliability of osteopaths to detect changes in posterior superior or iliac spine levels using a hidden heel wedge.

- J Bodyw. Mov Ther.* 2013;17(2):143-150. doi: 10.1016/j.jbmt.2012.07.005.
336. Beales DJ, O'Sullivan PB, Briffa NK. Motor control patterns during an active straight leg raise in pain-free subjects. *Spine (Phila Pa 1976)*. 2009;34(1):E1-8.
 337. Beales DJ, O'Sullivan PB, Briffa NK. Motor control patterns during an active straight leg raise in chronic pelvic girdle pain subjects. *Spine (Phila Pa 1976)*. 2009;34(9):861-870.
 338. Richardson CA, Snijders CJ, Hides JA, Damen L, Pas MS, Storm J. The relation between the transversus abdominis muscles, sacroiliac joint mechanics, and low back pain. *Spine (Phila Pa 1976)*. 2002;27(4):399-405.
 339. Hungerford B, Gillear W, Hodges P. Evidence of altered lumbopelvic muscle recruitment in the presence of sacroiliac joint pain. *Spine (Phila Pa 1976)*. 2003;28(14):1593-1600.
 340. O'Sullivan PB, Beales DJ. Changes in pelvic floor and diaphragm kinematics and respiratory patterns in subjects with sacroiliac joint pain following a motor learning intervention: a case series. *Man Ther.* 2007;12(3):209-218.
 341. Sapsford RR, Hodges PW. Contraction of the pelvic floor muscles during abdominal maneuvers. *Arch Phys Med Rehabil.* 2001;82(8):1081-1088.
 342. Mooney V, Pozos R, Vleeming A, Gulick J, Swenski D. Exercise treatment for sacroiliac pain. *Orthopedics*. 2001;24(1):29-32.
 343. Slipman CW, Lipetz JS, Plastaras CT, et al. Fluoroscopically guided therapeutic sacroiliac joint injections for sacroiliac joint syndrome. *Am J Phys Med Rehabil.* 2001;80(6):425-432.
 344. Forst SL, Wheeler MT, Fortin JD, Vilensky JA. The sacroiliac joint: anatomy, physiology and clinical significance. *Pain Physician.* 2006;9(1):61-67.
 345. Ferrante FM, King LF, Roche EA, et al. Radiofrequency sacroiliac joint denervation for sacroiliac syndrome. *Reg Anesth Pain Med.* 2001;26(2):137-142.
 346. Yin W, Willard F, Carreiro J, Dreyfuss P. Sensory stimulation-guided sacroiliac joint radiofrequency neurotomy: technique based on neuroanatomy of the dorsal sacral plexus. *Spine (Phila Pa 1976)*. 2003;28(20):2419-2425.
 347. Bucknor MD, Steinbach LS, Saloner D, Chin CT. Magnetic resonance neurography evaluation of chronic extraspinal sciatica after remote proximal hamstring injury: a preliminary retrospective analysis. *J Neurosurg.* 2014;121(2):408-414.
 348. Puranen J, Orava S. The hamstring syndrome--a new gluteal sciatica. *Ann Chir Gynaecol.* 1991;80(2):212-214.
 349. Lohrer H, Nauck T, Konerding MA. Nerve entrapment after hamstring injury. *Clin J Sport Med.* 2012;22(5):443-445.
 350. Kujala UM, Orava S. Hamstring Syndrome. *Oper Tech Sports Med.* 1997;5:143-149.
 351. Søgaard I. Sciatic nerve entrapment. Case report. *J Neurosurg.* 1983;58(2):275-276.
 352. Podschun L, Hanney WJ, Kolber MJ, Garcia A, Rothschild CE. Differential diagnosis of deep gluteal pain in a female runner with pelvic involvement: a case report. *Int J Sports Phys Ther.* 2013;8(4):462-471.
 353. Wainner RS, Whitman JM, Cleland JA, Flynn TW. Regional interdependence: a musculoskeletal examination model whose time has come. *J Orthop Sports Phys Ther.* 2007;37(11):658-660.
 354. Papadopoulos EC, Khan SN. Piriformis syndrome and low back pain: a new classification and review of the literature. *Orthop Clin North Am.* 2004;35(1):65-71.
 355. Broadhurst NA, Simmons DN, Bond MJ. Piriformis syndrome: Correlation of muscle morphology with symptoms and signs. *Arch Phys Med Rehabil.* 2004;85(12):2036-2039.
 356. Hughes SS, Goldstein MN, Hicks DG, Pellegini VD. Extrapelvic compression of the sciatic nerve. An unusual cause of pain about the hip: report of five cases. *J Bone Joint Surg Am.* 1992;74(10):1553-1559.
 357. Smoll NR. Variations of the piriformis and sciatic nerve with clinical consequence: a review. *Clin Anat.* 2010;23(1):8-17.
 358. Synek VM. The pyriformis syndrome: review and case presentation. *Clin Exp Neurol.* 1987;23:31-37.
 359. Adibatti M, VS. Study on variant anatomy of sciatic nerve. *J Clin Diagn Res.* 2014;8(8):AC07-09. doi: 10.7860/JCDR/2014/9116.4725.
 360. Laslett M. Bilateral buttock pain caused by aortic stenosis: a case report of claudication of the buttock. *Man Ther.* 2000;5(4):227-233.
 361. Parziale JR, Hudgins TH, Fishman LM. The piriformis syndrome. *Am J Orthop (Belle Mead NJ).* 1996;25(12):819-823.
 362. Fishman LM, Dombi GW, Michaelsen C, et al. Piriformis syndrome: diagnosis, treatment, and outcome--a 10-year study. *Arch Phys Med Rehabil.* 2002;83(3):295-301.
 363. Güvençer M, Akyer P, Iyem C, Tetik S, Naderi S. Anatomic considerations and the relationship between the piriformis muscle and the sciatic nerve. *Surg Radiol Anat.* 2008;30(6):467-474. doi: 10.1007/s00276-008-0350-5.
 364. Gonzalez P, Pepper M, Sullivan W, Akuthota V. Confirmation of needle placement within the piriformis muscle of a cadaveric specimen using anatomic landmarks and fluoroscopic guidance. *Pain Physician.* 2008;11(3):327-331.
 365. Fanucci E, Masala S, Squillaci E, et al. Pyriformis muscle syndrome: CT/MR findings in the percutaneous therapy with botulinic toxin. *Radiol Med.* 2003;105(1-2):69-75.

366. Jabbari B, Machado D. Treatment of refractory pain with botulinum toxins--an evidence-based review. *Pain Med.* 2011;12(11):1594-1606. doi: 10.1111/j.1526-4637.2011.01245.x.
367. Jayaseelan DJ, Moats N, Ricardo CR. Rehabilitation of proximal hamstring tendinopathy utilizing eccentric training, lumbopelvic stabilization, and trigger point dry needling: 2 case reports. *J Orthop Sports Phys Ther.* 2014;44(3):198-205.
368. Malik MHA, Gray J, Kay PR. Early aseptic loosening of cemented total hip arthroplasty: the influence of non-steroidal anti-inflammatory drugs and smoking. *Int Orthop.* 2004;28(4):211-213.
369. Jones DL, Erhard RE. Diagnosis of trochanteric bursitis versus femoral neck stress fracture. *Phys Ther.* 1997;77(1):58-67.
370. Sayegh F, Potoupnis M, Kapetanos G. Greater trochanter bursitis pain syndrome in females with chronic low back pain and sciatica. *Acta Orthop Belg.* 2004;70(5):423-428.
371. Cohen SP, Narvaez JC, Lebovits AH, Stojanovic MP. Corticosteroid injections for trochanteric bursitis: is fluoroscopy necessary? A pilot study. *Br J Anaesth.* 2005;94(1):100-106.
372. Wiese M, Rubenthaler F, Willburger RE, Fennes S, Haaker R. Early results of endoscopic trochanter bursectomy. *Int Orthop.* 2004;28(4):218-221.
373. Slawski DP, Howard RF. Surgical management of refractory trochanteric bursitis. *Am J Sports Med.* 1997;25(1):86-89.
374. Blankenbaker DG, Ullrick SR, Davis KW, De Smet AA, Haaland B, Fine JP. Correlation of MRI findings with clinical findings of trochanteric pain syndrome. *Skeletal Radiol.* 2008;37(10):903-909.
375. Kaltenborn A, Bourg CM, Gutzeit A, Kalberer F. The Hip Lag Sign--prospective blinded trial of a new clinical sign to predict hip abductor damage. *PLoS One.* 2014;9(3):e91560. doi: 10.1371/journal.pone.0091560.
376. Neumann DA. An electromyographic study of the hip abductor muscles as subjects with a hip prosthesis walked with different methods of using a cane and carrying a load. *Phys Ther.* 1999;79(12):1163-1173; discussion 1174-1176.
377. Ebert JR, Bucher TA, Ball SV, Janes GC. A review of surgical repair methods and patient outcomes for gluteal tendon tears. *Hip Int.* 2015;25(1):15-23.
378. Hitora T, Kawaguchi Y, Mori M, et al. Ischiogluteal bursitis: a report of three cases with MR findings. *Rheumatol Int.* 2009;29(4):455-458.
379. Robert R, Prat-Pradal D, Labat JJ, et al. Anatomic basis of chronic perineal pain: role of the pudendal nerve. *Surg Radiol Anat.* 1998;20(2):93-98.
380. Pérez-López FR, Hita-Contreras F. Management of pudendal neuralgia. *Climacteric.* 2014;17(6):654-656.
381. Ramsden CE, McDaniel MC, Harmon RL, Renney KM, Faure A. Pudendal nerve entrapment as source of intractable perineal pain. *Am J Phys Med Rehabil.* 2003;82(6):479-484.
382. Mamlouk MD, vanSonnenberg E, Dehkharghani S. CT-guided nerve block for pudendal neuralgia: diagnostic and therapeutic implications. *AJR Am J Roentgenol.* 2014;203(1):196-200. doi: 10.2214/AJR.13.11346.
383. Locher S, Burmeister H, Böhlen T, et al. Radio logical anatomy of the obturator nerve and its articular branches: basis to develop a method of radiofrequency denervation for hip joint pain. *Pain Med.* 2008;9(3):291-298. doi: 10.1111/j.1526-4637.2007.00353.x.
384. Rhame EE, Levey KA, Gharibo CG. Successful treatment of refractory pudendal neuralgia with pulsed radiofrequency. *Pain Physician.* 2009;12(3):633-638.
385. Trescot AM. Cryoanalgesia in interventional pain management. *Pain Physician.* 2003;6(3):345-360.
386. Carmel M, Lebel M, Tu LM. Pudendal nerve neuromodulation with neurophysiology guidance: a potential treatment option for refractory chronic pelvi-perineal pain. *Int Urogynecology J.* 2010;21(5):613-616. doi: 10.1007/s00192-009-1054-z.
387. Morelli V, Espinoza L. Groin injuries and groin pain in athletes: part 2. *Prim Care.* 2005;32(1):185-200.
388. Morelli V, Weaver V. Groin injuries and groin pain in athletes: part 1. *Prim Care.* 2005;32(1):163-183.
389. Harmon KG. Evaluation of groin pain in athletes. *Curr Sports Med Rep.* 2007;6(6):354-361.
390. Jansen J a. CG, Mens JMA, Backx FJG, Kolfschoten N, Stam HJ. Treatment of longstanding groin pain in athletes: a systematic review. *Scand J Med Sci Sports.* 2008;18(3):263-274. doi: 10.1111/j.1600-0838.2008.00790.x.
391. Verrall GM, Hamilton IA, Slavotinek JP, et al. Hip joint range of motion reduction in sports-related chronic groin injury diagnosed as pubic bone stress injury. *J Sci Med Sport.* 2005;8(1):77-84.
392. Verrall GM, Slavotinek JP, Barnes PG, Fon GT. Description of pain provocation tests used for the diagnosis of sports-related chronic groin pain: relationship of tests to defined clinical (pain and tenderness) and MRI (pubic bone marrow oedema) criteria. *Scand J Med Sci Sports.* 2005;15(1):36-42.
393. Orchard JW, Cook JL, Halpin N. Stress-shielding as a cause of insertional tendinopathy: the operative technique of limited adductor tenotomy supports this theory. *J Sci Med Sport.* 2004;7(4):424-428.
394. Ekberg O, Persson NH, Abrahamsson PA, Westlin NE, Lilja B. Longstanding groin pain in athletes. A multidisciplinary approach. *Sports Med.* 1988;6(1):56-61.
395. Westlin N. Groin pain in athletes from Southern Sweden. *Sports Med Arthrosc Rev.* 1997;5.
396. Renstroem A. Groin injuries: A true challenge in

- orthopaedic sports medicine. *Sports Med Arthrosc Rev.* 1997;5:247-251.
397. Robinson P, Barron DA, Parsons W, Grainger AJ, Schilders EMG, O'Connor PJ. Adductor-related groin pain in athletes: correlation of MR imaging with clinical findings. *Skeletal Radiol.* 2004;33(8):451-457.
 398. Biedert RM, Warnke K, Meyer S. Symphysis syndrome in athletes: surgical treatment for chronic lower abdominal, groin, and adductor pain in athletes. *Clin J Sport Med.* 2003;13(5):278-284.
 399. Garvey JFW, Hazard H. Sports hernia or groin disruption injury? Chronic athletic groin pain: a retrospective study of 100 patients with long-term follow-up. *Hernia.* 2014;18(6):815-823.
 400. Wank R, Miller TT, Shapiro JF. Sonographically guided injection of anesthetic for iliopsoas tendinopathy after total hip arthroplasty. *J Clin Ultrasound.* 2004;32(7):354-357.
 401. Brennan D, O'Connell MJ, Ryan M, et al. Secondary cleft sign as a marker of injury in athletes with groin pain: MR image appearance and interpretation. *Radiology.* 2005;235(1):162-167.
 402. Auerbach B, Heyde C-E, Melzer C. [Chronic groin pain in marathon race: bone apposition at insertion of the m. rectus abdominis at ramus superior ossis pubis -- case report]. *Sportverletz Sportschaden.* 2005;19(2):94-97.
 403. Jain N, Sternberg LB. Symphyseal separation. *Obstet Gynecol.* 2005;105(5 Pt 2):1229-1232.
 404. Hoshino Y, Doita M, Yoshikawa M, Hirayama K, Sha N, Kurosaka M. Unstable pelvic insufficiency fracture in a patient with rheumatoid arthritis. *Rheumatol Int.* 2004;24(1):46-49.
 405. Gardner H, McQueen F. Tophaceous gout of the pubic symphysis: an unusual cause of groin pain. *Ann Rheum Dis.* 2004;63(7):767-768.
 406. Branci S, Thorborg K, Nielsen MB, Hölmich P. Radiological findings in symphyseal and adductor-related groin pain in athletes: a critical review of the literature. *Br J Sports Med.* 2013;47(10):611-619. doi: 10.1136/bjsports-2012-091905.
 407. Cunningham PM, Brennan D, O'Connell M, MacMahon P, O'Neill P, Eustace S. Patterns of bone and soft-tissue injury at the symphysis pubis in soccer players: observations at MRI. *AJR Am J Roentgenol.* 2007;188(3):W291-296.
 408. Whyte J. A 17-year-old girl with severe groin pain and an inability to ambulate during a gymnastics competition. *J Emerg Nurs.* 2004;30(5):504-506.
 409. Konik E, Bauer B, Lee M. 64-year-old male with septic arthritis of the pubic symphysis. *Clin Pract.* 2011;1(3):e76. doi: 10.4081/cp.2011.e76.
 410. Johnson R. Osteitis pubis. *Curr Sports Med Rep.* 2003;2(2):98-102.
 411. Paajanen H, Heikkinen J, Hermunen H, Airo I. Successful treatment of osteitis pubis by using totally extraperitoneal endoscopic technique. *Int J Sports Med.* 2005;26(4):303-306.
 412. Rodriguez C, Miguel A, Lima H, Heinrichs K. Osteitis Pubis Syndrome in the Professional Soccer Athlete: A Case Report. *J Athl Train.* 2001;36(4):437-440.
 413. Grace JN, Sim FH, Shives TC, Coventry MB. Wedge resection of the symphysis pubis for the treatment of osteitis pubis. *J Bone Joint Surg Am.* 1989;71(3):358-364.
 414. Williams PR, Thomas DP, Downes EM. Osteitis pubis and instability of the pubic symphysis. When nonoperative measures fail. *Am J Sports Med.* 2000;28(3):350-355.
 415. Slavotinek JP, Verrall GM, Fon GT, Sage MR. Groin pain in footballers: the association between pre-season clinical and pubic bone magnetic resonance imaging findings and athlete outcome. *Am J Sports Med.* 2005;33(6):894-899.
 416. Topol GA, Reeves KD, Hassanein KM. Efficacy of dextrose prolotherapy in elite male kicking-sport athletes with chronic groin pain. *Arch Phys Med Rehabil.* 2005;86(4):697-702.
 417. Choi H, McCartney M, Best TM. Treatment of osteitis pubis and osteomyelitis of the pubic symphysis in athletes: a systematic review. *Br J Sports Med.* 2011;45(1):57-64.
 418. Paajanen H, Syvähuoko I, Airo I. Totally extraperitoneal endoscopic (TEP) treatment of sportsman's hernia. *Surg Laparosc Endosc Percutan Tech.* 2004;14(4):215-218.
 419. Genitsaris M, Goulimaris I, Sikas N. Laparoscopic repair of groin pain in athletes. *Am J Sports Med.* 2004;32(5):1238-1242.
 420. Meyers WC, Foley DP, Garrett WE, Lohnes JH, Mandlebaum BR. Management of severe lower abdominal or inguinal pain in high-performance athletes. PAIN (Performing Athletes with Abdominal or Inguinal Neuromuscular Pain Study Group). *Am J Sports Med.* 2000;28(1):2-8.
 421. Hemingway AE, Herrington L, Blower AL. Changes in muscle strength and pain in response to surgical repair of posterior abdominal wall disruption followed by rehabilitation. *Br J Sports Med.* 2003;37(1):54-58.
 422. Susmallian S, Ezri T, Elis M, Warters R, Charuzi I, Muggia-Sullam M. Laparoscopic repair of "sportsman's hernia" in soccer players as treatment of chronic inguinal pain. *Med Sci Monit.* 2004;10(2):CR52-54.
 423. Holzheimer RG. Inginal Hernia: classification, diagnosis and treatment--classic, traumatic and Sportsman's hernia. *Eur J Med Res.* 2005;10(3):121-134.
 424. Sheen AJ, Stephenson BM, Lloyd DM, et al. "Treatment of the sportsman's groin": British Hernia Society's 2014 position statement based on the

- Manchester Consensus Conference. *Br J Sports Med.* 2014;48(14):1079-1087.
425. Barrick EF. Entrapment of the obturator nerve in association with a fracture of the pelvic ring. A case report. *J Bone Joint Surg Am.* 1998;80(2):258-261.
 426. Yang KH, Han DY, Park HW, Park SJ. Intraarticular entrapment of the obturator nerve in acetabular fracture. *J Orthop Trauma.* 2001;15(5):361-363.
 427. Cardosi RJ, Cox CS, Hoffman MS. Postoperative neuropathies after major pelvic surgery. *Obstet Gynecol.* 2002;100(2):240-244.
 428. Bradshaw C, McCrory P, Bell S, Brukner P. Obturator nerve entrapment. A cause of groin pain in athletes. *Am J Sports Med.* 1997;25(3):402-408.
 429. Kumka M. Critical sites of entrapment of the posterior division of the obturator nerve: anatomical considerations. *J Can Chiropr Assoc.* 2010;54(1):33-42.
 430. Harvey G, Bell S. Obturator neuropathy. An anatomic perspective. *Clin Orthop Relat Res.* 1999;(363):203-211.
 431. Murata Y, Takahashi K, Yamagata M, Takahashi Y, Shimada Y, Moriya H. Origin and pathway of sensory nerve fibers to the ventral and dorsal sides of the sacroiliac joint in rats. *J Orthop Res.* 2001;19(3):379-383.
 432. Mitchell B, McCrory P, Brukner P, O'Donnell J, Colson E, Howells R. Hip joint pathology: clinical presentation and correlation between magnetic resonance arthrography, ultrasound, and arthroscopic findings in 25 consecutive cases. *Clin J Sport Med.* 2003;13(3):152-156.
 433. Mason JB. Acetabular labral tears in the athlete. *Clin Sports Med.* 2001;20(4):779-790.
 434. McCarthy JC, Lee JA. Acetabular dysplasia: a paradigm of arthroscopic examination of chondral injuries. *Clin Orthop Relat Res.* 2002;(405):122-128.
 435. Haene RA, Bradley M, Villar RN. Hip dysplasia and the torn acetabular labrum: an inexact relationship. *J Bone Joint Surg Br.* 2007;89(10):1289-1292.
 436. Malas FU, Kara M, Kerimgo U, Ozçakar L. An underestimated culprit of groin pain: acetabular labrum tear. *Am J Phys Med Rehabil.* 2007;86(8):690.
 437. Byrd JW. Labral lesions: an elusive source of hip pain case reports and literature review. *Arthroscopy.* 1996;12(5):603-612.
 438. Leopold SS, Battista V, Oliverio JA. Safety and efficacy of intraarticular hip injection using anatomic landmarks. *Clin Orthop Relat Res.* 2001;(391):192-197.
 439. Stiris MG. [Magnetic resonance arthrography of the hip joint in patients with suspected rupture of labrum acetabulare]. *Tidsskr Nor Lægeforen.* 2001;121(6):698-700.
 440. Han M, Kim H. Chronic hip instability as a cause of autonomic dysreflexia: successful management by resection arthroplasty: a case report. *J Bone Joint Surg Am.* 2003;85-A(1):126-128.
 441. Sink EL, Gralla J, Ryba A, Dayton M. Clinical presentation of femoroacetabular impingement in adolescents. *J Pediatr Orthop.* 2008;28(8):806-811.
 442. Hase T, Ueo T. Acetabular labral tear: arthroscopic diagnosis and treatment. *Arthroscopy.* 1999;15(2):138-141.
 443. Tanzer M, Noiseux N. Osseous abnormalities and early osteoarthritis: the role of hip impingement. *Clin Orthop Relat Res.* 2004;(429):170-177.
 444. Hodler J, Yu JS, Goodwin D, Haghghi P, Trudell D, Resnick D. MR arthrography of the hip: improved imaging of the acetabular labrum with histologic correlation in cadavers. *AJR Am J Roentgenol.* 1995;165(4):887-891.
 445. Urban M, Hofmann S, Tschauner C, Czerny C, Neuhold A, Kramer J. [MRI arthrography in labrum lesions of the hip joint. Method and diagnostic value]. *Orthopade.* 1998;27(10):691-698.
 446. Chong Y, Kwon JW, Song Y, Park YS. CT-guided aspiration and steroid injection of symptomatic paralabral cysts of the hip. *Jpn J Radiol.* 2015;33(4):229-232.
 447. Byrd JW, Jones KS. Hip arthroscopy in athletes. *Clin Sports Med.* 2001;20(4):749-761.
 448. Suzuki C, Harada Y, Mitsuhashi S, et al. Repair of cartilage defects and torn acetabular labrum in hip joints after conventional osteotomy: evaluation by follow-up arthroscopy. *J Orthop Sci.* 2005;10(2):127-132.
 449. Santori N, Villar RN. Acetabular labral tears: result of arthroscopic partial limbectomy. *Arthroscopy.* 2000;16(1):11-15.
 450. Siebenrock KA, Schoeniger R, Ganz R. Anterior femoro-acetabular impingement due to acetabular retroversion. Treatment with periacetabular osteotomy. *J Bone Joint Surg Am.* 2003;85-A(2):278-286.
 451. Lavigne M, Parvizi J, Beck M, Siebenrock KA, Ganz R, Leunig M. Anterior femoroacetabular impingement: part I. Techniques of joint preserving surgery. *Clin Orthop Relat Res.* 2004;(418):61-66.
 452. Papalia R, Del Buono A, Franceschi F, Maranozzi A, Maffulli N, Denaro V. Femoroacetabular impingement syndrome management: arthroscopy or open surgery? *Int Orthop.* 2012;36(5):903-914.
 453. Ramachandran M, Azegami S, Hosalkar HS. Current concepts in the treatment of adolescent femoroacetabular impingement. *J Child Orthop.* 2013;7(2):79-90.
 454. Steinitz D, Guy P, Passariello A, Reindl R, Harvey EJ. All superior pubic ramus fractures are not created equal. *Can J Surg.* 2004;47(6):422-425.
 455. Hill PF, Chatterji S, Chambers D, Keeling JD. Stress

- fracture of the pubic ramus in female recruits. *J Bone Joint Surg Br.* 1996;78(3):383-386.
456. Wen DY, Propeck T, Singh A. Femoral neck stress injury with negative bone scan. *J Am Board Fam Pract.* 2003;16(2):170-174.
457. Kiuru MJ, Pihlajamaki HK, Ahovuo JA. Fatigue stress injuries of the pelvic bones and proximal femur: evaluation with MR imaging. *Eur Radiol.* 2003;13(3):605-611.
458. Trousdale RT, Cabanela ME, Berry DJ. Anterior iliopsoas impingement after total hip arthroplasty. *J Arthroplasty.* 1995;10(4):546-549.
459. Balkan C, Kavakli K, Karapinar D. Iliopsoas haemorrhage in patients with haemophilia: results from one centre. *Haemophilia.* 2005;11(5):463-467.
460. Petropoulos AS, Sferopoulos NK. [Post traumatic myositis ossificans of the iliopsoas muscle. Apropos of a case with review of the literature]. *Rev Chir Orthop Réparatrice Appar Mot.* 1997;83(8):747-751.
461. Lee CH, Dellon AL. Surgical management of groin pain of neural origin. *J Am Coll Surg.* 2000;191(2):137-142.
462. Kavanagh D, Connolly S, Fleming F, Hill ADK, McDermott EW, O'Higgins NJ. Meralgia paraesthesia following open appendicectomy. *Ir Med J.* 2005;98(6):183-185.
463. Ducic I, Dellon AL. Testicular pain after inguinal hernia repair: an approach to resection of the genital branch of genitofemoral nerve. *J Am Coll Surg.* 2004;198(2):181-184.
464. Hahn L. Treatment of ilioinguinal nerve entrapment - a randomized controlled trial. *Acta Obstet Gynecol Scand.* 2011;90(9):955-960. doi: 10.1111/j.1600-0412.2011.01194.x.
465. Karaeminogullari O, Demirors H, Atabek M, et al. Avascular necrosis and nonunion after osteosynthesis of femoral neck fractures: effect of fracture displacement and time to surgery. *Adv Ther.* 2004;21(5):335-342.
466. Pape HC, Rice J, Wolfram K, et al. Hip dislocation in patients with multiple injuries. A followup investigation. *Clin Orthop Relat Res.* 2000;(377):99-105.
467. Sampson TG. Complications of hip arthroscopy. *Clin Sports Med.* 2001;20(4):831-835.
468. Wu AY, Leo YS, Pwee HS, et al. Early high-dose oral corticosteroids and avascular hip necrosis in renal transplants. *Singapore Med J.* 1986;27(3):204-206.
469. Soucacos PN, Beris AE, Malizos K, et al. Treatment of avascular necrosis of the femoral head with vascularized fibular transplant. *Clin Orthop Relat Res.* 2001;(386):120-130.
470. Dilley A, Hooper WC, Austin H, et al. The beta fibrinogen gene G-455-A polymorphism is a risk factor for Legg-Perthes disease. *J Thromb Haemost.* 2003;1(11):2317-2321.
471. Vandenbussche E, Madhar M, Nich C, et al. Bilateral osteonecrosis of the femoral head after pregnancy. *Arch Orthop Trauma Surg.* 2005;125(3):201-203.
472. Le Parc JM, André T, Helenon O, et al. Osteonecrosis of the hip in renal transplant recipients. Changes in functional status and magnetic resonance imaging findings over three years in three hundred five patients. *Rev Rhum Engl Ed.* 1996;63(6):413-420.
473. Abbott KC, Bucci JR, Agodoa LY. Total hip arthroplasty in chronic dialysis patients in the United States. *J Nephrol.* 2003;16(1):34-39.
474. Bahebeck J, Atangana R, Tech A, et al. Relative rates and features of musculoskeletal complications in adult sicklers. *Acta Orthop Belg.* 2004;70(2):107-111.
475. Koduri PR, Agbemadzo B, Nathan S. Hemoglobin S-C disease revisited: clinical study of 106 adults. *Am J Hematol.* 2001;68(4):298-300.
476. Shinoda S, Hasegawa Y, Kawasaki S, Tagawa N, Iwata H. Magnetic resonance imaging of osteonecrosis in divers: comparison with plain radiographs. *Skeletal Radiol.* 1997;26(6):354-359.
477. Buchel O, Roskams T, Van Damme B, et al. Nodular regenerative hyperplasia, portal vein thrombosis, and avascular hip necrosis due to hyperhomocysteinaemia. *Gut.* 2005;54(7):1021-1023.
478. Chang CC, Greenspan A, Gershwin ME. Osteonecrosis: current perspectives on pathogenesis and treatment. *Semin Arthritis Rheum.* 1993;23(1):47-69.
479. Freeman HJ, Owen D, Millan M. Granulomatous osteonecrosis in Crohn's disease. *Can J Gastroenterol.* 2000;14(11):951-954.
480. Starovoit VV. [Active surgical tactics in the treatment of burns with osteonecrosis]. *Ortop Travmatol Protez.* 1975;(11):73-75.
481. Bellot F, Havet E, Gabrion A, et al. [Core decompression of the femoral head for avascular necrosis]. *Rev Chir Orthop Réparatrice Appar Mot.* 2005;91(2):114-123.
482. La Civita L, Mariani G, Porciello G, et al. Bone involvement in Gaucher's disease: "bone crisis" or disease complication? *Clin Exp Rheumatol.* 1996;14(2):195-198.
483. Horiuchi H, Saito N, Kobayashi S, et al. Avascular necrosis of the femoral head in a patient with Fabry's disease: identification of ceramide trihexoside in the bone by delayed-extraction matrix-assisted laser desorption ionization-time-of-flight mass spectrometry. *Arthritis Rheum.* 2002;46(7):1922-1925.
484. Baksi DP. Treatment of osteonecrosis of the femoral head by drilling and muscle-pedicle bone grafting. *J Bone Joint Surg Br.* 1991;73(2):241-245.
485. Heuck FH, Treugut H. [Femur head necrosis in metabolic and hormonal osteopathies--a

- radiologic-morphologic analysis]. *Radiologe*. 1984;24(7):319-337.
486. Aigner C, Ehall R, Stampfel O. [Osteoradionecrosis of the hip joint]. *Z Orthop Ihre Grenzgeb*. 1995;133(5):467-473.
487. Arlet J, Millet JP, Gédéon A, Ficat P. [Necrosis and ischemia of the femoral head during arteritis of the lower extremities. Survey of 138 patients with arteritis and 159 aortographies]. *Rev Rhum Mal Osteoartic*. 1975;42(6):391-397.
488. Takada J, Nagoya S, Kuwabara H, Kaya M, Yamashita T. Rapidly destructive coxarthropathy with osteonecrosis and osteoporosis caused by Cush-
- ing's syndrome. *Orthopedics*. 2004;27(10):1111-1113.
489. Werner A, Jäger M, Schmitz H, Krauspe R. Joint preserving surgery for osteonecrosis and osteochondral defects after chemotherapy in childhood. *Klin Padiatr*. 2003;215(6):332-337.
490. Ratcliffe MA, Gilbert FJ, Dawson AA, Bennett B. Diagnosis of avascular necrosis of the femoral head in patients treated for lymphoma. *Hematol Oncol*. 1995;13(3):131-137.
491. Gaughan DM, Mofenson LM, Hughes MD, et al. Osteonecrosis of the hip (Legg-Calvé-Perthes disease) in human immunodeficiency virus-infected children. *Pediatrics*. 2002;109(5):E74-74.

NOTES