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Session Title: What's New in Pediatric Sports Medicine

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What's new in Pediatric Sports Medicine Symposium, AAOS 2025

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Handouts

What's new in Pediatric ACL

1. Graft Failure in Pediatric Patients After Bone-Patellar Tendon-Bone, Hamstring Tendon, or Quadriceps Tendon Autograft ACLR: A Systematic Review and Meta-analysis.

   Petit CB, Hussain ZB, McPherson A, Petushek EJ, Montalvo AM, White MS, Slone HS, Lamplot JD, Xerogeanes JW, Myer GD. Orthop J Sports Med. 2024 Nov 21;12(11):23259671241289140. PMID: 39583150

   While the HT remains a common choice for ACLR, the current aggregate data indicate that BPTB and QT demonstrated significantly lower failure rates than HT ACLR in adolescent athletes ≤18 years old. The QT demonstrated the lowest failure rate in adolescents but also the lowest proportion of patients represented due to a paucity of published QT data, indicating a need for future studies with larger sample sizes that include QT autografts, reduced risk of bias, and consistent reporting on skeletal maturity and surgical technique to better determine the ideal autograft for active athletic populations ≤18 years old.

2. Prevalence and Risk Factors for Medial Meniscus Ramp Lesions (MMRL) in the Setting of Pediatric Anterior Cruciate Ligament Injuries: A Systematic Review and Meta-analysis.

   Moran J, Lee MS, Fong S, LaPrade C, Kunze KN, Fabricant PD, Chahla J, Jimenez AE, LaPrade RF. J Pediatr Orthop. 2025 Jan 22. Online ahead of print. PMID: 39840766

   The overall pooled prevalence of MMRLs was 16.4% in pediatric patients undergoing ACLR. Significant risk factors for pediatric MMRLs included the presence of concomitant Anterolateral Ligament injuries on MRI, identification of MMRLs on MRI, posteromedial tibia plateau bone marrow edema, and concomitant lateral meniscus tears at the time of surgery. Skeletal maturity, male sex, or collateral ligament injury were not associated with MMRLs in pediatric ACL tears.

3. Assessing the Impact of Psychological Readiness on Performance and Symmetry in Functional Testing After ACL Reconstruction in Pediatric and Adolescent Patients.

   Mercurio AM, Scott EJ, Sugimoto D, Christino MA, Coene RP, Gossman EC, Cook DL, Kocher MS, Kramer DE, Yen YM, Micheli LJ, Milewski MD. Orthop J Sports Med. 2024 Sep 27;12(9):23259671241274768. PMID: 39359482

   Higher psychological readiness for return to sport was associated with better performance and greater symmetry on hop testing 6 months after ACLR, suggesting a potential link between physical and psychological recovery.

4. Revision Anterior Cruciate Ligament Reconstruction in Pediatric and Adolescent Patients Yields Low Rates of Graft Failure and Good Functional Scores, but Low Rates of Return to Sport: A Systematic Review.

   Paschos NK, Reikersdorfer K, Jayne C, McGauley C, Brodeur J, Medina G, Cote M. Arthroscopy. 2024 Online ahead of print. PMID: 39209072

   Five studies with a total of 239 knees in 234 patients were included. Failure of the revision ACLR ranged from 9% to 21%. Return to previous level of activity ranged between 27% and 68%. PROMs were variable, with good Lysholm Knee Scoring Scale score (range 84.5-93.7), moderate Tegner Activity Score (range 5.5-9.0), and good International Knee Documentation Committee knee scores (range 79.9-80.0). Allograft was used in 48% of revisions, followed by bone patellar tendon bone autograft in 34%, and hamstrings (HS) autograft in 14%. Meniscus injury and cartilage injury was present in 53.1% to 92.5% and 5.5% to 59.4% of knees, respectively.

5. Quadriceps Tendon Anterior Cruciate Ligament Reconstruction in Skeletally Immature Patients: 3-Year Clinical and Patient-Reported Outcomes.

   Cordasco FA, Hidalgo Perea S, Uppstrom TJ, Chipman DE, Pascual-Leone N, Aitchison AH, Lijesen E, Ann Asaro L, Green DW. Am J Sports Med. 2024 Jul;52(9):2230-2236. PMID: 38877730

   Of 85 adolescent patients aged 11.1 to 17.6 years (mean age, 14.1 ± 1.2 years), 2 patients were determined to be lost to follow-up after 3 failed contact attempts. Of the patients included in this study (N = 83), 26 patients (31%) underwent all-epiphyseal and 57 patients (69%) underwent complete transphyseal ACLR. Additionally, 48 patients (58%) underwent concomitant lateral extra-articular tenodesis using the iliotibial band with a modified Lemaire technique. The mean follow-up time was 3.7 ± 1.2 years (range, 2-7 years). Twenty (24%) patients had subsequent surgical procedures, of which 3 (4%) were due to graft failures. At a mean 3-year follow-up, the mean Pedi-IKDC, HSS Pedi-FABS, and SANE scores were 90, 23, and 94 respectively; the RTS rate was 100%; and the rate of RTS at the previous level of performance was 93%.

6. Anterior Cruciate Ligament Injury in Skeletally Immature Patients.

   Egger AC, Parikh SN. J Am Acad Orthop Surg. 2024 Oct 9. doi: 10.5435/JAAOS-D-23-00848. Online ahead of print. PMID: 39446090

   Review article focusing on the management of skeletally immature ACL injuries, including relevant anatomy, risk factors for injury, assessment of skeletal age, and different treatment options and outcomes.

7. Revision Anterior Cruciate Ligament Reconstruction in Skeletally Immature Patients.

Jildeh TR, Bowen E, Bedi A. J Am Acad Orthop Surg. 2023 Nov 1;31(21):e920-e929. PMID: 37364250

Revision anterior cruciate ligament (ACL) reconstruction in the skeletally immature patient is a challenging procedure for pediatric patients with recurrent instability after primary ACL reconstruction. Complications can include growth disturbances, recurrent graft failure, instability, and secondary chondral and/or meniscal injury. Moreover, identifying the etiology of graft failure is critical for a successful revision. Patients should undergo a complete history and physical examination with a focus on patient physiologic age, physeal status, mechanical axis, tibial slope, collagen status, injury mechanism, concomitant injuries, and previous surgical procedures. The surgeon must be adept at reconstruction with various grafts as well as socket or tunnel preparation and fixation, including over-the-top, all-epiphyseal, transphyseal, extra-articular augmentation, and staging approaches. Reported rates of return to sport are lower than those of primary reconstruction, with higher rates of cartilage and meniscal degeneration.

8. Nonoperative Treatment as an Option for Isolated Anterior Cruciate Ligament Injury: A Systematic Review and Meta-analysis.

   de Jonge R, Máté M, Kovács N, Imrei M, Pap K, Agócs G, Váncsa S, Hegyi P, Pánics G. Orthop J Sports Med. 2024 Apr 8; PMID: 38601190

   Five studies -2 randomized controlled trials (RCTs) and 3 retrospective non-RCTs-were included. There was a moderate risk of bias in 2 studies and a serious risk of bias in 1 study. The quality of evidence was rated low because of the higher risk of bias and inconsistency. Nonoperatively treated knees showed a trend toward lower odds of developing radiological signs of OA (OR, 1.84 [95% CI, 0.90 to 3.75]); however, surgically reconstructed knees had significantly better stability (MD, -2.44 [95% CI, -3.21 to -1.66]) and a trend toward better but clinically not meaningful Lysholm scores (MD, 2.88 [95% CI, -1.09 to 6.85]). The qualitative synthesis showed that surgical reconstruction was protective against subsequent injuries but not superior when returning to previous activity levels or various functional tests.

9. Prevalence and Predictors of Concomitant Meniscal Surgery During Pediatric and Adolescent ACL Reconstruction: Analysis of 4729 Patients Over 20 Years at a Tertiary-Care Regional Children's Hospital.

   Pruneski JA, Tavabi N, Heyworth BE, Kocher MS, Kramer DE, Christino MA, Milewski MD, Yen YM, Micheli L, Murray MM, Garcia Andujar RA, Kiapour AM. Orthop J Sports Med. 2024 Mar 20;12(3): PMID: 38515604

   Of 4729 patients (mean age, 16 ± 2 years; 54.7% female) identified, 2458 patients (52%) underwent concomitant meniscal procedures (55% repair rate). The prevalence of lateral

meniscal (LM) procedures increased in both pediatric and adolescent cohorts, whereas the prevalence of medial meniscal (MM) repair increased in the adolescent cohort (P = .02). In the adolescent cohort, older age was predictive of concomitant medial meniscectomy (P = .031). In the pediatric cohort, female sex was predictive of concomitant MM surgery and of undergoing lateral meniscectomy versus repair (P≤ .029). Female sex was associated with decreased odds of concomitant LM surgery in both cohorts (P≤ .018). Revision ACLR was predictive of concomitant MM surgery and of meniscectomy (medial and lateral) in the adolescent cohort (P < .001). Higher body mass index was associated with increased odds of undergoing medial meniscectomy versus repair in the pediatric cohort (P = .03).

10. Association Between Posterior Tibial Slope and ACL Injury in Pediatric Patients: A Systematic Review and Meta-analysis.

    Farid AR, Pradhan P, Stearns SA, Kocher MS, Fabricant PD. Am J Sports Med. 2024 Sep;52(11):2911-2918. PMID: 38275009

    The current study found that unlike what has been shown in adult populations, increased PTS may not be a significant risk factor for ACL tears in pediatric and adolescent patents. Lateral tibial slope (LTS) was the only measured parameter that neared statistical significance, perhaps suggesting a potential role for this measurement in determining ACL risk if further research is done in this population.

11. Combined Anterior Cruciate Ligament Reconstruction and Modified Lemaire Lateral Extra-articular Tenodesis Better Restores Knee Stability and Reduces Failure Rates Than Isolated Anterior Cruciate Ligament Reconstruction in Skeletally Immature Patients.

    Perelli S, Costa GG, Terron VM, Formagnana M, Bait C, Espregueira-Mendes J, Monllau JC. Am J Sports Med. 2022 Dec;50(14):3778-3785. PMID: 36345894

    Performing a modified Lemaire LET along with an ACL reconstruction with hamstring graft in pediatric patients reduced the cumulative failure rate (14.7% vs 6.3%) and improved objective stability with no increase in intra- or postoperative complications. No significant difference was found between the 2 groups in terms of patient-reported outcomes or in the return-to-sports activity.

What's new in Tibial Spine Fracture

1. Si Heng Sharon T, Fadzil K, Andrew Kean Seng L, James Hoipo H. Surgical management of tibial eminence avulsion fractures: a systematic review and meta-analysis. Arch Orthop Trauma Surg. 2024 Jul;144(7):3153-3159. doi: 10.1007/s00402-024-05318-1. Epub 2024 Jun 19. PMID: 38896276.

   Arthroscopic and suture fixation had significantly superior outcomes when compared to open and screw fixation. Arthroscopic fixation resulted in significantly improved stability of the knee as compared to open fixation, though no significant difference was identified in terms of functional knee scores and return to activity. Suture fixation resulted in significantly improved stability of the knee and functional knee scores as compared to screw fixation.

2. Jääskelä M, Turati M, Lempainen L, Bremond N, Courvoisier A, Henri A, Accadbled F, Sinikumpu J. Long-term Outcomes of Tibial Spine Avulsion Fractures After Open Reduction With Osteosuturing Versus Arthroscopic Screw Fixation: A Multicenter Comparative Study. Orthop J Sports Med. 2023 Jun 20;11(6):23259671231176991. doi: 10.1177/23259671231176991. PMID: 37359980; PMCID: PMC10286196.

   The mean patient age was 11 years, with a slight male predominance (57%). Open reduction with osteosuturing was associated with a quicker RTP time than arthroscopy with screw implantation (median, 8.0 vs 21.0 weeks; P < .001). Open reduction with osteosuturing was also associated with a lower risk of failure to RTP at preinjury level (adjusted odds ratio, 6.4; 95% CI, 1.1-36.0; P = .035). Postoperative displacement >3 mm increased the risk of failure to RTP at preinjury level regardless of treatment group (adjusted odds ratio, 15.2; 95% CI, 1.2-194.9; P = .037). There was no difference in knee-specific recovery or quality of life between the treatment groups.

3. Chandanani M, Jaibaji R, Jaibaji M, Volpin A. Tibial Spine Avulsion Fractures in Paediatric Patients: A Systematic Review and Meta-Analysis of Surgical Management. Children (Basel). 2024 Mar 14;11(3):345. doi: 10.3390/children11030345. PMID: 38539382; PMCID: PMC10969433.

   Of 38 studies included for review, 13 studies reported outcomes of TSAF patients undergoing screw fixation only, and 12 studies used suture fixation only. In total, 976 patients underwent arthroscopic reduction and internal fixation (ARIF), and 203 patients underwent open reduction and internal fixation (ORIF). The risk of arthrofibrosis with the use of ARIF (p = 0.45) and screws (p = 0.74) for TSAF repair was not significant. There was a

significantly increased risk of knee instability ($p < 0.0001$), reoperation ($p = 0.01$), and post-operative pain ($p = 0.007$) with screw fixation compared to sutures.

4. Shin CH et al. Evaluation of Tibial Slope on Radiographs in Pediatric Patients With Tibial Spine Fractures: An Age- and Sex-Matched Study. Orthop J Sports Med. 2024 Jul 31;12(7):23259671241256445. doi: 10.1177/23259671241256445. PMID: 39100212; PMCID: PMC11295229.

   Posterior tibial slope was not found to be a risk factor for pediatric TSF in female or male patients in this study

5. McGurty SA, Ganley TJ, Kushare I, Leska TM, Aoyama JT, Ellis HB, Johnson B, Baghdadi S, Cruz AI Jr, Fabricant PD, Green DW, Lee RJ, McKay SD, Milbrandt TA, Patel NM, Rhodes JT, Sachleben B, Traver JL, Mistovich RJ, Schmale GA, Cook DL, Yen YM. Anterior Displacement of Tibial Spine Fractures: Does Anatomic Reduction Matter? Orthop J Sports Med. 2023 Aug 22;11(8):23259671231192978. doi: 10.1177/23259671231192978. PMID: 37655244; PMCID: PMC10467414.

   Residual ALD was not associated with posttreatment subjective residual laxity, extension loss, or flexion loss. The results suggest that anatomic reduction of a tibial spine fracture may not be mandatory if knee stability and functional ROM are achieved.

6. Johnstone TM, Baird DW Jr, Cuellar-Montes A, van Deursen WH, Tompkins M, Ganley TJ, Yen YM, Ellis HB, Chan CK, Green DW, Sherman SL, Shea KG. Screws or Sutures? A Pediatric Cadaveric Study of Tibial Spine Fracture Repairs. Am J Sports Med. 2023 Aug;51(10):2589-2595. doi: 10.1177/03635465231181059. Epub 2023 Jun 29. PMID: 37382335.

   Twelve matched pediatric cadaveric knees were tested. Repair groups had identical mean (8.3 years) and median (8.5 years) ages and an identical number of samples of each laterality. Ultimate failure load did not significantly differ between screw (mean ± SD, 143.52 ± 41.9 7 N) and suture (135.35 ± 47.94 N) fixations ($P = .760$). Screws demonstrated increased stiffness and decreased elongation, although neither result was statistically significant at the .05 level (21.79 vs 13.83 N/mm and 5.02 vs 8.46 mm; $P = .076$ and $P = .069$, respectively). Screw fixation and suture fixation of tibial spine fractures in human pediatric tissue were biomechanically comparable.
7. Shimberg JL et al. Is Nonoperative Treatment Appropriate for All Patients With Type 1 Tibial Spine Fractures? A Multicenter Study of the Tibial Spine Research Interest Group. Orthop J Sports Med. 2022 Jun 3;10(6):23259671221099572. doi: 10.1177/23259671221099572. PMID: 35677019; PMCID: PMC9168882.

A total of 48 patients met inclusion criteria; 40 were in the TT1 group, while 8 were in the T1+ group, indicating less than universal agreement in the classification of these fractures. Overall, 12 (25%) underwent surgical treatment, and 12 (25%) had concomitant injuries. Also, 8 patients required additional surgical management including ACL reconstruction (n = 4), lateral meniscal repair (n = 2), lateral meniscectomy (n = 1), freeing an incarcerated medial meniscus (n = 1), and medial meniscectomy (n = 1). The classification of type 1 fractures can be challenging. Contrary to prior thought, a substantial number of patients with these fractures (>20%) were found to have concomitant injuries. Overall, surgical management was performed in 25% of patients in our cohort.

8. Smith HE, Cruz AI Jr, Mistovich RJ, Leska TM, Ganley TJ, Aoyama JT, Ellis HB, Kushare I, Lee RJ, McKay SD, Milbrandt TA, Rhodes JT, Sachleben BC, Schmale GA, Patel NM. What Are the Causes and Consequences of Delayed Surgery for Pediatric Tibial Spine Fractures? A Multicenter Study. Orthop J Sports Med. 2022 Mar 7;10(3):23259671221078333. doi: 10.1177/23259671221078333. PMID: 35284586; PMCID: PMC8905066.

   Patients who underwent delayed surgery for TSFs were found to have a higher rate of concomitant meniscal injury, longer procedure duration, and more postoperative arthrofibrosis when the surgery length was >2.5 hours. Those who experienced delays in diagnosis or MRI, saw multiple clinicians, and had public insurance were more likely to have a delay to surgery.

9. O'Donnell R, Bokshan S, Brown K, Aoyama JT, Ganley TJ, Fabricant PD, Patel NM, Ellis HB Jr, Green DW, Kushare I, Lee RJ, McKay S, Rhodes J, Sachleben B, Sargent C, Schmale GA, Yen YM, Mistovich RJ, Cruz AI Jr. Anterior Cruciate Ligament Tear Following Operative Treatment of Pediatric Tibial Eminence Fractures in a Multicenter Cohort. J Pediatr Orthop. 2021 May-Jun 01;41(5):284-289. doi: 10.1097/BPO.0000000000001783. PMID: 33654026.

   Ipsilateral ACL tears following operatively treated pediatric tibial eminence fractures in a large multicenter cohort occurred at a rate of 2.6%. However, in those with at least 2 years of follow-up, the incidence was 21.7%. Subsequent ACL tear was more likely in those with completely displaced (type III or IV) tibial eminence fractures and older patients.

10. Shimberg JL, Aoyama JT, Leska TM, Ganley TJ, Fabricant PD, Patel NM, Cruz AI Jr, Ellis HB Jr, Schmale GA; Tibial Spine Research Interest Group; Green DW, Jagodzinski JE, Kushare I, Lee RJ, McKay S, Rhodes J, Sachleben B, Sargent C, Yen YM, Mistovich RJ. Tibial Spine Fractures: How Much Are We Missing Without Pretreatment Advanced Imaging? A Multicenter Study. Am J Sports Med. 2020 Nov;48(13):3208-3213. doi: 10.1177/0363546520957666. Epub 2020 Sep 24. PMID: 32970957.

Patients with pretreatment MRI had a statistically significantly higher rate of concomitant injury identified. Pretreatment MRI should be considered in the evaluation of tibial spine fractures to improve the identification of concomitant injuries, especially in patients who may otherwise be treated nonoperatively or with closed reduction. Further studies are necessary to refine the indications for MRI in patients with tibial spine fractures, determine the characteristics of patients at highest risk of having a concomitant injury, define the sensitivity and specificity of MRI in tibial spine fractures, and investigate patient outcomes based on pretreatment MRI status.

What's new in Knee OCD

1. Muchintala R, Coladonato C, Perez A, Kellish A, Mumtaz S, Sutton W, Wilson S, Cohen S, Tjoumakaris FP, Freedman KB. Return to Sport After Treatment of Stable Osteochondritis Dissecans Lesions of the Knee in Adolescents: A Systematic Review. Am J Sports Med. 2025 Jan 8:3635465241272464. doi: 10.1177/03635465241272464. Epub ahead of print. PMID: 39772951

   The current literature demonstrates favorable short-term RTS outcomes after the nonoperative and operative management of stable OCD lesions of the knee in young athletes. When successful, nonoperative management demonstrated high RTS rates, and further research should investigate prognostic factors for successful nonoperative management. The operative management of stable OCD lesions resulted in high rates of RTS and return to the same level of sport, improvements in patient-reported outcomes, and minimal complications, which raises the question of the appropriate duration of nonoperative management in this patient population.

2. Johnstone T, Espiritu J, Tompkins M, Milewski MD, Nissen C, Shea KG; ROCK Group:; Nelson B, Egger A, Anderson C, Lee Pace J, Polousky J, Ellemann J, Meenen N, Edmonds E, Ellis H, Fabricant P, Krych A, Myer G, Kocher M, Carrey J. Which Osteochondritis Dissecans Lesions Will Heal Nonoperatively? An Application of Machine Learning to the ROCK Prospective Cohort. Orthop J Sports Med. 2024 Dec 16;12(12):23259671241297145. doi: 10.1177/23259671241297145. PMID: 39697601; PMCID: PMC11653340.

   Lesion location in the posterior aspect of the condyle on sagittal MRI and lesion location in the medial-most or lateral-most locations on coronal MRI were identified as statistically significant predictors of increased nonoperative treatment success on multivariate analysis. Machine learning models can predict which OCD lesions will heal with nonoperative management with superior accuracy compared with previously published models.

3. Milewski MD, et al. ROCK group. A Simple Clinical Predictive Model for Arthroscopic Mobility of Osteochondritis Dissecans Lesions of the Knee. Am J Sports Med. 2024 Dec;52(14):3543-3550. doi: 10.1177/03635465241296133. Epub 2024 Nov 25. PMID: 39584729.

A total of 407 patients in the prospective cohort met inclusion criteria, and 62% were male. The mean ± SD age was 13.7 ± 2.2 years, height 161.8 ± 5.3 cm, and weight 59.2 ± 42.2 kg. Arthroscopic evaluation yielded 235 immobile and 172 mobile lesions. Multivariable analysis determined that the best model to predict lesion mobility included chronologic age ≥14 years ($P < .001$), effusion on physical examination ($P < .001$), and any loss of range of motion on physical examination ($P = .07$), while controlling for male sex ($P = .38$) and weight >54.4 kg ($P = .12$). In the 25% holdout validation sample (n = 102), a sensitivity of 83%, a specificity of 82%, and an AUC of 0.89 (95% CI, 0.82-0.95) were achieved with these predictive factors. Age, effusion, and loss of motion can predict knee OCD lesion mobility at the time of arthroscopy. Education about lesion mobility can help with surgical planning and patient and family counseling.

4. Klueh MP, Ren BO, Muscatelli SR, Grant JA. Association of Mechanical Axis With Osteochondritis Dissecans of the Femoral Condyle. Am J Sports Med. 2024 Jul;52(9):2270-2277. doi: 10.1177/03635465241255331. Epub 2024 Jul 24. PMID: 39047221.

   This study demonstrated a relationship between lower extremity mechanical weightbearing axis and femoral condylar OCD location. Patients with unilateral medial femoral condylar OCD lesions frequently had asymmetric varus alignment in the affected extremity

5. Kiani SN, Yellin JL, Huffman WH, Guzek RH, Shea KG, Nguyen JC, Ganley TJ. Patella and Trochlea Osteochondritis Dissecans: Demographics and Treatment Paradigms. J Pediatr Orthop. 2024 Feb 1;44(2):e138-e143. doi: 10.1097/BPO.0000000000002588. Epub 2023 Dec 18. PMID: 38108383.

   A total of 68 patients (75 knees) were included-45 (60%) with patellar OCD and 30 (40%) with trochlear. Of the patients, 69% were males. The median age at knee OCD diagnosis was 14 years. At the final follow-up, 62% of knees (n = 44) recovered sufficiently to allow a full RTS and 54% of knees (n = 39) had full pain resolution. Of the 46 knees with radiographic imaging at least 1 year apart, 63% had full healing of the lesion. There was no significant difference in RTS, pain resolution, radiographic healing, or overall success when comparing treatments. This study provides valuable epidemiologic demographic and outcome data regarding the scarcely reported patellar and trochlear OCD. While over half of patients fully returned to sports and reported full pain resolution, a large proportion continued to experience symptoms over a year after presentation. Future research should aim to better define the treatment algorithms for these OCD subtypes.

6. Heyworth BE, et al; ROCK Group; Shea KG. Transarticular Versus Retroarticular Drilling of Stable Osteochondritis Dissecans of the Knee: A Prospective Multicenter Randomized Controlled Trial by the ROCK Group. Am J Sports Med. 2023 May;51(6):1392-1402. doi: 10.1177/03635465231165290. Epub 2023 Apr 11. PMID: 37039536.

   Transarticular drilling showed shorter operative time and fluoroscopy time and superior healing parameters at 6 and 12 months, but no differences were seen in 24-month healing parameters or PROs at all follow-up time points, when compared with retro-articular drilling

7. Husen M, Van der Weiden GS, Custers RJH, Poudel K, Stuart MJ, Krych AJ, Saris DBF. Internal Fixation of Unstable Osteochondritis Dissecans of the Knee: Long-term Outcomes in Skeletally Immature and Mature Patients. Am J Sports Med. 2023 May;51(6):1403-1413. doi: 10.1177/03635465231164410. Epub 2023 Apr 7. PMID: 37026762.

   The long-term results after internal fixation of OCD fragments show high rates of healing and sustainable subjective improvement of knee function and quality of life. A healing rate of 72% was noted at a mean follow-up of 11.3 years. The stage of skeletal maturity had no significant influence on the rate of failure. Lateral femoral condylar lesion location is an independent risk factor for failure in skeletally mature and immature patients.

8. Matthews JR, Sonnier JH, Paul RW, Avendano JP, Saucedo ST, Freedman KB, Tjoumakaris FP. A systematic review of cartilage procedures for unstable osteochondritis dissecans. Phys Sportsmed. 2023 Dec;51(6):497-505. doi: 10.1080/00913847.2022.2082262. Epub 2022 May 31. PMID: 35611658.

   A variety of surgical options for the treatment of unstable osteochondritis dissecans are dicsussed. In skeletally immature patients, internal fixation demonstrated acceptable rates of radiographic union and patient reported outcome measures. In skeletally mature patients with large lesions, MACI and OCA transplantation provided similar patient reported outcomes

What's new in Discoid Meniscus / Meniscus Tear

1. The management of isolated meniscal tears in skeletally immature children. An international expert consensus.

   Hampton M, Ali F, Nicolaou N, Ajuied A; Paediatric Meniscal Working Group.
   Knee Surg Sports Traumatol Arthrosc. 2024 Oct 24. doi: 10.1002/ksa.12493. Online ahead of print. PMID: 39444332

   34 statements were identified exploring three main domains-clinical assessment, management and complex tears (bucket handle, discoid and radial. The areas of no consensus included investigation of painless clicking, the most sensitive clinical test for meniscal pathology, treatment of small radial tears (less than 1/3 width), ability to reduce chronic bucket handle tears and timing of surgery. A valuable level of consensus was reached on the assessment and management of simple and specialist meniscal tears. These consensus statements can both inform clinical practice and be used in the development of further high-quality research studies.

2. Characteristics and Outcomes of Operatively Treated Discoid Lateral Meniscus in Pediatric and Young Adult Patients: A Multicenter Study.

   Sheasley JA, Kirby JC, Niu EL, Gopalan M, Carsen S, Stinson ZS, Finlayson CJ, Nault ML, Lee RJ, Haus BM, Green DW, Schlechter JA, Beck J, Heyworth B, Stavinoha T, Nguyen JC, Schmale GA. Am J Sports Med. 2024 Sep;52(11):2758-2763. PMID: 39222125

   Locking and snapping were common presenting symptoms. Over three-quarters of patients had meniscal tears, which were most often complex and located posteriorly. Seventeen percent of patients experienced complications, and a sixth of patients with complications had >1. Reoperation was typically for persistent symptoms or meniscal retear.

3. Magnetic Resonance Imaging Indirect Signs for Anterior Instability of the Lateral Meniscus in Pediatric and Adolescent Patients.

   Niu EL, Kinnard MJ, Hoyt BW, Zember J, Murphy TP. J Pediatr Orthop. 2024 Aug 1;44(7):e625-e633. doi: 10.1097/BPO.0000000000002699. Epub 2024 Apr 16. PMID: 38622761

   Phantom sign is a novel, reliable and sensitive MRI finding for anterior instability, even in the absence of frank displacement on preoperative MRI. A positive finding should prompt a thorough arthroscopic evaluation of the anterior horn of the LM.

4. Relationship Between Age and Pathology With Treatment of Pediatric and Adolescent Discoid Lateral Meniscus: A Report From the SCORE Multicenter Database.

Silverstein RS, McKay SD, Coello P, Pupa L, Latz K, Craig Kemper W, Adsit E, Wilson PL; Members of the SCORE Quality Improvement Registry; Albright J, Algan S, Beck J, Bowen RE, Brey J, Marc Cardelia J, Clark C, Crepeau A, Edmonds E, Ellington M, Fabricant PD, Frank JS, Ganley TJ, Green DW, Gupta A, Heyworth B, Mansour A, Mayer S, Milewski MD, Niu E, Pacicca DM, Parikh SN, Rhodes J, Saper M, Schmale GA, Schmitz M, Shea K, Storer S, Ellis HB Jr. Am J Sports Med. 2023 Nov;51(13):3493-3501. PMID: 37899536

To preserve physiological "normal" meniscus, a repair may be indicated in >50% of patients <14 years of age but occurred in <50% of those >14 years. Additional resection beyond the physiological rim may be needed in 15% of younger patients and 30% of those aged >14 years.

5. Discoid lateral meniscus instability in children: part I. A new grading system of instability to clarify natural history.

   Simon V, Paul Henri B, Charles F, Hélène B, Nicolas C, Sebastien R, Franck C. Knee Surg Sports Traumatol Arthrosc. 2023 Nov;31(11):4809-4815. PMID: 37563431

   One hundred seven DLMs (94%) showed instability due to edge detachment. Fifteen (13%) knees were stable (grade 0), 2 (2%) were grade 1, 57 (50%) were grade 2, 35 (31%) were grade 3 and 5 (4%) were grade 4. The cause of grade 3 was an extension deficit (26/35) or flexion deficit (9/35). Grade 1 or 2 correlated with limited detachment, unlike grade 3 or 4. The grade of instability never decreased, but rather increased in many knees during the natural history of DLM. A new presentation of DLM is presented: episodic locking phenomenon and blocked knee with flexion deficit. Clinicians should be wary of pseudo-improvement with the recovery of mobility after a period of the blocked knee, which may be due to a progression towards the ultimate degree of instability. Clinical grading of instability has clarified the natural history of DLM-associated tearing.

6. Discoid lateral meniscus instability in children: part II.: Repair first to minimise the saucerisation.

   Bauwens PH, Vandergugten S, Fiquet C, Raux S, Cance N, Chotel F. Knee Surg Sports Traumatol Arthrosc. 2023 Nov;31(11):4816-4823. PMID: 37659011

   In 57 knees (95%), the DLM was unstable, and a suture fixation was performed. After a median follow-up of 41.5 months, the median (range) IKDC score was improved from 55 (10-70) preoperatively to 90 (37.5-100) postoperatively. The median (range) Lysholm score at last follow-up was 93.5 (45-100). The procedure was effective in 49 knees (81.6%) after a single procedure. Eleven patients had a failure with a new meniscal tear after a median (range) delay of 42 months (24-60) after the initial procedure. The patterns of discoid lateral meniscus instability were not found to have a prognostic value for surgical failure since they mainly occurred after sport-related injuries. All the patients with initial repair failures but

one achieved a good clinical outcome after revision repair without any further meniscectomy. In contrast to adult knees, symptomatic discoid lateral meniscus is rarely stable in children (5%). Meniscal repair is effective to preserve the meniscus tissue, but revision repair became necessary in 18% of the cases and was finally successful.

7. Reliability of MRI Interpretation of Discoid Lateral Meniscus: A Multicenter Study.

   Niu EL, Milewski MD, Finlayson CJ, Stinson ZS, Joughin E, Nepple JJ, Schmale GA; PRiSM Meniscus Research Interest Group; Beck JJ. Orthop J Sports Med. 2023 May 30;11(5): PMID: 37275780

   Orthopaedic surgeons reliably interpret MRI scans using the PRiSM Discoid Meniscus Classification for the majority of DLM characteristics but vary in their assessment of height and presence and type of tear. MRI evaluation may be helpful to diagnose discoid by width and identify the presence of instability: 2 major factors in the decision to proceed with surgery. Arthroscopic evaluation should be used in conjunction with MRI findings for complete DLM diagnosis.

8. Arthroscopic Treatment of Symptomatic Discoid Lateral Meniscus and Nondiscoid Meniscus in Adolescent Patients.

   Su L, Bennett A, Combs K, Torrez TW, Pham DC, Jackson NJ, Bowen RE, Beck JJ. Am J Sports Med. 2022 Dec;50(14):3805-3811. doi: 10.1177/03635465221130455. Epub 2022 Nov 7. PMID: 36342468

   Although patients with DLM were younger and had lower body mass index, the IKDC and PAQ scores were not significantly different between the DLM and non-DLM groups. Both groups showed a significant improvement in scores relative to their preoperative scores. Sex and age did not affect IKDC or PAQ scores.

What's new in Pediatric Patellar Instability

1. Kalinterakis G, Vlastos I, Gianzina E, Dimitriadis S, Mastrantonakis K, Chronopoulos E, Yiannakopoulos CK. MPFL Reconstruction in Skeletally Immature Patients: Comparison Between Anatomic and Non-Anatomic Femoral Fixation-Systematic Review. Children (Basel). 2024 Oct 22;11(11):1275. doi: 10.3390/children11111275. PMID: 39594850; PMCID: PMC11592832.

   The findings of this systematic review reveal that there is no significant difference between anatomic (physeal sparing, distal to physis) and non-anatomic (medial-sided pulley) MPFL femoral fixation techniques in terms of patient-reported outcomes and complications. Thus, the choice of surgical technique might be left up to surgeon's preference. Further high-quality, pediatric-oriented studies with long-term follow-up are needed to better guide clinical decision-making.

2. Blackman B, Dworsky-Fried J, Cohen D, Slawaska-Eng D, Gyemi L, Simunovic N, Peterson D, Ayeni OR, de Sa D. Surgical management of first-time patellar dislocations in pediatric patients may lower rates of redislocation compared to conservative management: A systematic review and meta-analysis. Knee Surg Sports Traumatol Arthrosc. 2024 Oct 30. doi: 10.1002/ksa.12524. Epub ahead of print. PMID: 39474842.

   A total of 11 studies and 761 patients were included in this review. The weighted mean post-operative combined rates of redislocation in the surgical group was 25.1%, compared to 46.4% in the conservative group at a mean follow-up of 53.2 months (12-168). The relative risk (RR) of redislocation was 0.82 (95% confidence interval [CI]: 0.65-1.04, I2 = 0%, p = 0.11), favouring surgery compared to conservative management. A subgroup meta-analysis of two recent RCTs with 110 patients demonstrated an RR of redislocation of 0.53 (95% CI: 0.31-0.91, I2 = 0%, p = 0.02), favouring surgery. Kujala scores among three comparative studies showed a mean difference of -2.7 (95% CI: -6.1 to 0.68, I2 = 0%, p = 0.12), favouring conservative treatment. The weighted mean redislocation rate in 131 patients undergoing medial patellofemoral ligament reconstruction (MPFLR) was 3.1%, compared to 39.4% in 203 patients undergoing other surgical procedures, such as lateral release and medial imbrication, Roux-Goldwaith and MPFL repair. Furthermore, the conservative groups experienced a complication rate of 0.9% compared to 2.9% across the surgical groups. Surgical management for first-time patellar dislocations in a paediatric population, particularly MPFLR, may be more beneficial in lowering redislocation rates than conservative management. No significant differences in Kujala scores were found.

3. Dennis ER, Marmor WA, Propp BE, Erickson BJ, Gruber S, Brady JM, Nguyen JT, Shubin Stein BE. Isolated Medial Patellofemoral Ligament Reconstruction for Recurrent Patellar

Instability Regardless of Tibial Tubercle-Trochlear Groove Distance and Patellar Height: Minimum 5-Year Outcomes. Am J Sports Med. 2024 Jul;52(9):2196-2204. doi: 10.1177/03635465241260039. PMID: 39101725.

Midterm outcomes for patients who underwent isolated MPFL reconstruction were favorable and were maintained at 5 years. Outcomes for the expanded cohort of patients with a minimum 2-year follow-up support previously published results.

4. Bachman DR, Phillips D, Veerkamp MW, Chipman DE, Wall EJ, Ellington MD, Friel NA, Schlechter JA, Green DW, Masquijo J, Parikh SN. MPFL Reconstruction and Implant-Mediated Guided Growth in Skeletally Immature Patients With Patellar Instability and Genu Valgum. Am J Sports Med. 2024 Mar;52(3):698-704. doi: 10.1177/03635465231222934. Epub 2024 Feb 13. PMID: 38349668.

   IMGG with plates or screws in the setting of combined MPFL reconstruction improves genu valgum. Children <10 years of age and those with bilateral instability with genu valgum remain difficult subsets to treat with higher complication rates.

5. Hurley ET, et al. A modified Delphi consensus statement on patellar instability: part I. Bone Joint J. 2023 Dec 1;105-B(12):1259-1264. doi: 10.1302/0301-620X.105B12.BJJ-2023-0109.R1. PMID: 38037678.

   The statements that reached unanimous consensus were that an assessment of physeal status is critical for paediatric patients with patellar instability. There was also unanimous consensus on early mobilization and resistance training following nonoperative management once there is no apprehension. The statements that did not achieve consensus were on the importance of immobilization of the knee, the use of orthobiologics in nonoperative management, the indications for MPFC repair, and whether a vastus medialis oblique advancement should be performed.

6. Hurley ET et al. A modified Delphi consensus statement on patellar instability: part II. Bone Joint J. 2023 Dec 1;105-B(12):1265-1270. doi: 10.1302/0301-620X.105B12.BJJ-2023-0110.R1. PMID: 38035602.

   Most statements reached some degree of consensus, without any achieving unanimous consensus. There was no consensus on the use of anchors in MPFL reconstruction, and the order of fixation of the graft (patella first versus femur first). There was also no consensus on the indications for trochleoplasty or its effect on the viability of the cartilage after elevation of the osteochondral flap. There was also no consensus on postoperative immobilization or weightbearing, or whether paediatric patients should avoid an early return to sport.

7. Williams BA, Batley MG, Schlechter JA, Redler LH, Yaniv M, Friel NA, Parikh SN, Pace JL, Shubin Stein BE, Waldron S, Logterman SL, Shea K, Bradley KE, Crawford EA, Greenberg E, Hannon J, Kerrigan A, Kuba MHM, Albaugh J. Trochleoplasty Utilization in the Management of Patellofemoral Instability: Results From an International Survey of Surgeons. Orthop J Sports Med. 2025 Jan 13;13(1):23259671241303147. doi: 10.1177/23259671241303147. PMID: 39811153; PMCID: PMC11729416.

   Procedural indications were most commonly felt to be met with Dejour classification of B or D on magnetic resonance imaging. Trochleoplasty was felt by most to be appropriate as a primary surgical intervention for PFI. A majority of surgeons utilized a Bereiter (thin-flap) trochleoplasty technique with suture-based fixation and performed concurrent medial patellofemoral ligament reconstruction, but other concomitant procedures varied. Range-of-motion precautions and bracing practices varied among respondents, and arthrofibrosis was the most frequently cited observed complication. High- and low-volume trochleoplasty surgeons differed in their radiographic and age-based indications for the procedure.

8. Dejour D, Guarino A, Pineda T; ReSurg; Demey G. Sulcus-deepening trochleoplasty grants satisfactory results with minimal patellofemoral arthritis at 23-30 years of follow-up. Knee Surg Sports Traumatol Arthrosc. 2025 Jan;33(1):79-85. doi: 10.1002/ksa.12316. Epub 2024 Jul 5. PMID: 38967273.

   At 23-30 years following sulcus-deepening trochleoplasty in this small series of 10 patients (11 knees), patients had satisfactory clinical scores, only 1 patient reported an episode of traumatic patellar dislocation, and two knees had patellofemoral arthritis of Iwano Grade >2 (22%).
9. Blanchard NP, Moran TE, Manley BJ, Barras LA, Diduch DR. Thick-shell sulcus-deepening trochleoplasty for recurrent patellar dislocation leads to clinically meaningful improvements and high patient satisfaction in adolescents with open physes. J ISAKOS. 2024 Dec;9(6):100315. doi: 10.1016/j.jisako.2024.100315. Epub 2024 Aug 26. PMID: 39197680.

   Thick-shell sulcus-deepening trochleoplasty for addressing recurrent lateral patellar instability in patients with open distal femoral physes and less than two years of growth remaining is safe and provides clinically meaningful improvements in addition to high patient satisfaction when combined with other patellar stabilization procedures.

10. Parikh SN, Lopreiato N, Veerkamp M. 4-in-1 Quadricepsplasty for Habitual and Fixed Lateral Patellar Dislocation in Children. J Pediatr Orthop. 2023 Apr 1;43(4):237-245. doi: 10.1097/BPO.0000000000002351. Epub 2023 Jan 23. PMID: 36727785.

Most patients with habitual and fixed patellar dislocation present during the first decade of life. There are several underlying anatomic risk factors, the most common being trochlear dysplasia and patellar tilt. The 4-in-1 quadricepsplasty technique provides reliable patellar stabilization, satisfactory clinical results, and acceptable patient-reported outcomes at a minimum 2-year follow-up, with a 17.6% redislocation rate.

11. Husen M, Milbrandt TA, Shah V, Krych AJ, Stuart MJ, Saris DBF. Medial Patellofemoral Ligament Reconstruction Using Allografts in Skeletally Immature Patients. Am J Sports Med. 2023 May;51(6):1513-1524. doi: 10.1177/03635465231164400. Epub 2023 Apr 11. Erratum in: Am J Sports Med. 2023 Jul;51(9):NP28. doi: 10.1177/03635465231180414. PMID: 37039562.

Physeal-sparing anatomic reconstruction of the MPFL using an allograft tendon in 79 skeletally immature patients was a safe and effective treatment for patellar instability, regardless of patellar height and trochlear dysplasia. Failure rates decreased when the MPFL reconstruction was performed concomitantly with a tibial tubercle osteotomy.