RAPID FIRE ABSTRACTS
(PAED ORTHO)

RAPID FIRE 1: HIP AND KNEE

(1232) TREATMENT OF LATE ONSET LEGG CALVE PERTHES DISEASE

Akifusa Wada

Purpose: We report the outcomes of conservative and surgical treatment in patients with late-onset Legg-Calve-Perthes disease (LCPD) whose onset is 9 years of age or older.

Patients and Methods: This study included 31 hips of 30 patients (25 boys and 5 girls) treated since 1995. Of the 31 hips, 27 hips were included in the early group, where treatment was started within 6 months from onset, and 4 hips were included in the delayed group, where treatment was started later than 6 months from onset. The early group was divided into two groups: the Nishio hip abduction brace group (17 hips) and the flexion varus osteotomy (FVO) group (10 hips), and the treatment outcomes between the two groups were compared. In the delayed group with severe femoral head deformity, femoral osteotomy was performed in combination with varus, valgus, derotation, or lengthening osteotomy and lowering of the greater trochanter. Stulberg class I or II was rated as good.

Results: Of the 27 hips in the early group, 3/17 (17%) were good in the Nishio brace group, while 8/10 (80%) were good in the FVO group, which was a significant improvement (p=0.0015). Four hips in the delayed group had poor Stulberg classification results, but hip function much improved.

Conclusion: In late-onset LCPD, surgery is required in most cases. Even if severe femoral head deformity occurs, hip joint function can be improved by appropriately performing surgery according to the deformity.

(715) EVALUATION OF FEMORAL ANTEVERSION USING ULTRASOUND

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Purpose: While plane radiographs are useful for evaluating angulation, it is difficult to assess bone rotation. This study aims to verify the accuracy of using ultrasound to evaluate femoral rotation.

Method: From March to August 2024, we included patients under 16 years diagnosed with coxitis, in-toeing, and growing pains. Ultrasound was used to evaluate the rotation of both femurs. With a spirit-level-attached probe kept parallel to the floor, we assessed the anteversion angle of the femoral neck and the rotational angle of the distal femur, defining these as the femoral anteversion angle in this study. We assumed no difference in anteversion angles between left and right sides and measured femoral rotational angle differences using ultrasound. We evaluated the error rate and intraclass correlation coefficient and assessed consistency using Bland-Altman analysis.

Result: The study included 74 patients (52 boys, 22 girls) with a mean age of 6.9 years (range 2.1–12.4). The mean anteversion was 27.2° for the right femur and 27.8° for the left. The mean error and error rate were 5° (range 0–20°) and 22.6% (range 0–107.1%), respectively, with an intraclass correlation coefficient of 0.91. Bland-Altman analysis showed an error rate under 12% in 95% of cases.

Conclusion: Despite insufficient overall accuracy, the average error of 5° is considered accurate enough for reference in clinical practice.

(1224) LATE PULMONARY EMBOLISM FOLLOWING PAEDIATRIC FEMORAL FRACTURE INTERNAL FIXATION: A CASE REPORT

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Background: Pulmonary embolism (PE) is an uncommon yet potentially fatal complication of orthopedic surgery and is seen in only 0.058% of children presenting with lower extremity trauma. The highest risk of PE can occur within the first 24-48 hours after injury, associated with a long bone fracture. Still, the risk remains elevated for several weeks, called late PE (≥ 4 days), and is associated with more severe injury and immobilization. Late PE is often challenging to diagnose due to non-specific clinical findings, and delayed diagnosis will carry potentially disastrous consequences.

Report: We present the case of a 15-year-old girl with acute chest pain, dyspnea, and other respiratory symptoms eight days following open reduction and internal fixation (ORIF) with plate and screw fixation of a closed segmental comminuted femoral fracture. Diagnostic imaging revealed an acute pulmonary embolism. The case demonstrates the difficulty in diagnosing late PE in children and successful treatment with anticoagulation and supportive care.

Conclusions: Postoperative late PE is an uncommon but severe complication following pediatric orthopedic surgery. This case emphasizes the importance of clinical suspicion, prompt diagnosis, and early intervention to avoid life-threatening consequences.

(1372) OUTCOMES OF COLONNA CAPSULAR ARTHROPLASTY: A SYSTEMATIC REVIEW AND META ANALYSIS

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Background: Colonna capsular arthroplasty represents an option for the management of chronic hip dislocation in young patients with dysplasia. It is a previously abandoned surgical technique in dealing with developmental dysplasia of the hips (DDH) due to reported failure rates and complications. However, these have been largely limited in literature to case reports or case series. Good evidence regarding the failure rates and complications are scarce.

Objective: To systematically evaluate the failure and complication rates of Colonna capsular arthroplasty in patients with developmental dysplasia of the hip (DDH) through a single-arm meta-analysis, providing comprehensive pooled estimates to clarify its long-term outcomes and clinical viability.

Methods: A single-arm meta-analysis of studies reporting on the failure and complication rates of patients undergoing Colonna capsular arthroplasty for DDH was performed. We searched MEDLINE, Embase, Cochrane Library and SCOPUS from inception to 1 Feb 2025. Pooled proportions were obtained with random-effects modelling, 95% confidence intervals estimated using the Clopper-Pearson method, and Dersimonian-and-Laird estimator for between-study variance.

We assessed risk-of-bias using ROBINS-I Tool, and evaluated publication bias through visual inspection of funnel plots and Egger's Test.

Results:
6 studies comprising 326 patients and 342 hips were included. The weighted mean age was 39.5 months (95% CI: 27.2 – 51.8), with a mean follow-up of 208.8 months (136.2 – 281.5) and 18.2% (12.8 – 25.1) male patients. The pooled rates for all-cause failures was 14.4% (95%CI: 5.0-35.0%). For overall complications, pooled proportions were 18.7% (11.6% - 28.7%). Specifically, postoperative stiffness was reported at a pooled rate of 3.4% (0.9% - 11.8%). Perioperative femoral fractures were reported at a pooled rate of 4.6% (2.5% - 8.3%). Significantly, 94.6% of patients developed radiographic evidence of osteoarthritis at final follow-up.

Conclusion: Colonna capsular arthroplasty for DDH is associated with a notable failure rate, complications, and a high prevalence of osteoarthritis over time. Its long-term durability remains uncertain, warranting further research to define its role in contemporary practice.

(692) REDEFINING RISK STRATIFICATION IN DEVELOPMENTAL DYSPLASIA OF THE HIP: A GLOBAL EVIDENCE SYNTHESIS WITH TRIAL SEQUENTIAL ANALYSIS AND GRADE ASSESSMENT OF 991,743 NEWBORNS

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Background: Developmental dysplasia of the hip (DDH) is the most common hip disorder in neonates. While risk-based ultrasound screening is widely practiced, the global evidence certainty and adequacy supporting current risk stratification remains undefined.

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Objective: To evaluate the evidence certainty and adequacy of risk factors used in DDH screening through a comprehensive global evidence synthesis incorporating Trial Sequential Analysis (TSA) and GRADE assessment.

Methodology: We conducted a cohort study with systematic review of ultrasound screening studies for DDH risk factors across multiple continents, encompassing 991,743 newborns. Trial Sequential Analysis assessed evidence adequacy, while GRADE methodology evaluated evidence certainty. Regional variations were analyzed using random-effects meta-analysis with meta-regression.

Results: Analysis revealed significant DDH associations for breech position (OR: 3.03, 95% CI: 2.42-3.79), oligohydramnios (OR: 2.47, 95% CI: 1.19-5.10), and family history (OR: 2.52, 95% CI: 1.95-3.26). Physical examinations demonstrated robust correlations, notably the Barlow test (OR: 53.6, 95% CI: 22.81-125.93) and limited hip abduction (OR: 9.83, 95% CI: 2.46-39.19). TSA confirmed sufficient evidence for breech, family history, multiple gestation, and prematurity, while other risk factors require additional investigation. GRADE assessment indicated predominantly low to moderate evidence certainty, with significant risk pattern variations between East Asia/South America and Europe/West Asia.

Conclusion: While identifying significant risk associations, several risk factors have not reached definitive trial sequential monitoring boundaries, indicating the need for additional well-designed studies. Future screening protocols should consider evidence certainty, trial sequential monitoring boundaries, and regional variations for optimal risk stratification in DDH detection.

(837) A MODIFIED ANGLED PLATE FOR FIXATION OF PROXIMAL FEMORAL VARUS OSTEOTOMY IN NEUROMUSCULAR HIP DISLOCATION: MECHANICAL AND CLINICAL STUDY

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Introduction: Proximal femoral osteotomy is an important step in the management of paralytic hip dislocation. Fixation by the angled plate is demanding and carries the risk of many complications. In this study, we made certain modifications for the angled plate. Does this plate provide a stable fixation for proximal femoral varus osteotomy? The main objective of this study was to assess the results of the modified plate in fixation of proximal femoral varus osteotomy in patients with neuromuscular hip dislocation.

Hypothesis: This new system would offer significant advantages over the existing systems in terms of easy application and stable fixation.

Material and methods: Twenty patients with paralytic hip dislocation were included in this study. The ages ranged from 5 to 15 years with a mean of 8.88 ± 2.92 years. There were 12 boys and 8 girls. Seventeen patients had cerebral palsy and 3 had meningocele disease. Preoperative radiographs were done, and the migration percentage (MP), acetabular index (AI), and neck-shaft angle (NSA) were measured. All patients were treated with open reduction, pelvic osteotomy, and proximal femoral varus osteotomy. The femoral osteotomy was fixed by the modified angled plate in all cases.

Results: The osteotomy sites united in all patients and the mean time of union was 2.9 ± 0.65 months. The acetabular index, migration percentage, and neck-shaft angle were reduced postoperatively. This reduction was statistically significant. The hips remained stable throughout the period of follow-up in all patients. No cases were complicated by non-union or implant failure.

Conclusion: The modified angled plate (canulated interlocking blade Plate 90°) is a good method for the fixation of proximal femoral varus osteotomy in the management of neuromuscular hip dislocation. It provides a stable fixation. Level of evidence: IV; case series

(1321) COMPARATIVE ANALYSIS OF ANTERIOR VS. MEDIAL APPROACHES FOR OPEN REDUCTION OF HIP IN SURGICAL TREATED DEVELOPMENTAL DYSPLASIA OF THE HIP: AN INDIVIDUAL PATIENT DATA META ANALYSIS

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Background: Developmental dysplasia of the hip (DDH) is a complex condition, at times requiring surgical intervention. While both anterior approach (AAOR) and medial approach open reduction (MAOR) of the hip are widely used, there is limited high-quality evidence comparing their radiographic outcomes, functional improvements, and complication rates. This Individual Patient Data (IPD) meta-analysis evaluates the effectiveness of both techniques to guide surgical decision-making.

Methodology: The systematic review used the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRSIMA) guidelines. All studies reporting the outcomes of AAOR or MAOR in children with surgically treated DDH were included. Preoperative and postoperative radiographic measures included Acetabular Index (AI) and Center Edge Angle (CEA). Functional and complication outcomes, including avascular necrosis (AVN), recurrent instability, and gait abnormalities, were assessed. Independent t-tests and chi-square analyses were used to compare outcomes, with significance set at $p < 0.05$.

Results: A total of 49 publications, with 2,461 patients, were included in the review. 795 and 1567 patients underwent AAOR and MAOR respectively.

Patients undergoing AAOR were older on average compared to MAOR (16.57 months vs. 12.66 months; $p < 0.001$). Both approaches had significant post-operative improvements in radiological outcomes. MAOR led to greater reduction in AI (-17.14° vs. -15.97°; $p = 0.028$) and a greater improvement in CEA (-11.14° vs. -8.07°; $p < 0.001$). However, MAOR was associated with higher complication rates compared to AAOR, including increased incidence of AVN ($p < 0.001$), and instability which included subluxation and dislocation ($p < 0.001$ and $p = 0.033$, respectively).

There were no significant differences in rates of infection, trendelenburg gait, limb length discrepancy, or fractures between the two approaches ($p > 0.05$).

Conclusion: Overall, despite MAOR demonstrating superior radiographic correction, it carried a significantly higher risk of AVN and recurrent instability. AAOR, was associated with fewer complications and better overall stability. Pre-operative assessment of optimal radiographic correction and careful patient selection should be considered when determining the optimal surgical approach for DDH.

(747) SEASONAL VARIATION IN NEWBORN HIP DYSPLASIA: UNRAVELING THE IMPACT OF WEATHER ON HIP DEVELOPMENT

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Background: Babies born in winter have greater incidence of developmental dysplasia of the hip (DDH) and related surgeries. How weather conditions impact hip development and how screening program reacts weather issue remain unknown.

Objective: This study tests a hypothesis that winter born babies have more newborn acetabular dysplasia and laxity that is responsible of later DDH.

Methodology: Retrospective data from newborns who had hip ultrasonography in the first 3 days of life were analyzed. The Graf type IIc, III, IV (shallow acetabulum) and type D (laxity) were classified as abnormal. The association and risks of an abnormal hip were analyzed with gender, gestational age, fetal presentation, parity and external temperature of birth month and the last 3 months before birth using the Pearson chi-square test and logistic regression.

Results: A total of 10962 newborns participated hip ultrasound exams voluntarily in nurseries from 2016 to 2022. Distribution of babies with Graf type I, IIa, IIc, D, III/IV hips were 88.8%, 10%, 0.5%, 0.6%, and 0.1%, respectively. Female was the most significant factor for congenital shallow acetabulum (3.8x) and hip laxity (4x) compared to male ($p<0.001$). Preterm babies had a borderline lower risk of abnormal hips (0.4x, $p=0.05$). Winter season is not associated with newborn abnormal hips ($p=0.36$, statistical power = 80%), but a positive correlation was noted between external temperature and incidence of abnormal hips ($r=0.62$, $p=0.03$). Cold weather does not have a direct internal effect in acetabular dysplasia or hip laxity at birth.

Conclusions: Babies who were born in winter were not associated with acetabular dysplasia and hip laxity at birth but had greater risks of late-diagnosed DDH and surgeries. The postnatal effects from weather should be addressed by public awareness campaign, and hip screening may not be limited on the neonatal stage.

RAPID FIRE 1: HIP AND KNEE

(1366) CORRELATION BETWEEN GAIT ANALYSIS, RADIOLOGICAL AND FUNCTIONAL OUTCOMES OF DEVELOPMENTAL DYSPLASIA OF THE HIP PATIENTS AGED 2 4 YEARS AFTER PELVIC RECONSTRUCTION SURGERY AT CIPTO MANGUNKUSOMO HOSPITAL JAKARTA

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Introduction: Developmental Dysplasia of the Hip (DDH) is hip development disorder in children related to proximal femur dan acetabulum morphology. Walking age DDH needs complex hip reconstruction. Stable and concentric reduction lead to a good radiological, functional and gait outcome. There is no research about post operative DDH gait analysis in Indonesia.

Methods: This is an analytic cross setional study to evaluate post operative gait deviation and the correlation between radiological and functional outcome in the children between 2 until 4 years old in RSUPN Cipto Mangunkusumo Jakarta. This study took place in Orthopaedic and Traumatologi Polyclinic and Gait Analysis Laboratorium Physical and Rehabilitation Medicine Departement from March to September 2024.

Results: This study include 9 patients/11 hips. There are deviation in spatiotemporal parameter : decrease of cadence, increase gait cycle time, decrease swing phase, increase stance phase time, and decrease single limb support compare with normal parameter. There are kinematic parameter deviation : ankle angle initial contact dan terminal stance, knee angle midstance dan preswing, hip angle midstance, preswing dan initial swing. It shown strong and positive correlation between spatiotemporal single limb support with acetabular index, strong and negative correlation between korelasi kinematic knee angle midstance with Modified McKay dan Modified Harris Hip Score.

Conclusion: Despite of a good radiologic and functional outcome in 2-4 years old patient with DDH post operatively, there are deviation in spatiotemporal and kinematic gait parameter. Post operative rehabilition is the important phase to get a excellent clinical outcome after reconstructive hip surgery.

Keyword : DDH; Gait analysis; CEA; AI; AVN; Modified McKay and Harris Hip Score.

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(639) DO CHILDREN <3YEARS AT INDEX SURGERY FOR DDH HAVE A BETTER OUTCOME AT MIDTERM FOLLOW-UP IN COMPARISON TO CHILDREN >3YEARS AT INDEX SURGERY? A PROSPECTIVE COMPARATIVE STUDY.

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Background: Diagnosis and management of developmental dysplasia of hip (DDH) in underdeveloped regions is frequently delayed, potentially impacting final outcomes.

Objective: to answer the question, “Do children < 3 years at index surgery for DDH have a better outcome at 5-year follow-up in comparison to children > 3 years at index surgery?”

Methodology: Between 2016 and 2021, all walking-age children with DDH were prospectively enrolled in the study. The study cohort was divided into 2groups: Group 1 ≤3years of age, and Group2 included children >3years old. Intra-operative decisions determined the need for addition of femoral or pelvic osteotomy to the open reduction(OR). Follow-up assessment and group comparison included Acetabular-index(AI), proximal femoral growth disturbances(PFGD), and outcomes based on Severin's criteria. Subgroup analysis also compared re-dislocated hips with stable hips post-surgery. Children with follow-ups <3 years were excluded.

Results: 45 hips in 38 children analysed (31-Group 1 and 14-Group 2). Group 1 had higher pre-op AI(p=0.0489). More hips in Group 2 underwent OR with femoral osteotomy (p=0.0016). Re-dislocation occurred in 6(19%) in group 1 and 2(14%) in group 2. Subgroup analysis revealed higher index post-operative AI in re-dislocated hips (p=0.0001). At the final follow-up, AI was similar between groups1 & 2 (p=0.27). Overall, satisfactory outcomes were comparable between groups1 & 2 (p=0.21). PFGD changes were significantly higher in group2 (p=0.028) and in re-dislocated hips (p=0.004). Satisfactory outcomes were found in 89% of non-re-dislocated hips and 75% of re-dislocated hips.

Conclusion: At an average follow-up of 5years, children above and below 3 years at index procedure for DDH show similar outcomes but older ones need femoral osteotomy more frequently. Osteonecrosis risk rises with increasing age at index surgery and after re-operations but its impact isn't clear in mid-term.

RAPID FIRE 2: HIP AND KNEE

(1200) INFLUENCE OF SHELF ACETABULOPLASTY ON THE OUTCOMES OF THE HIP DYSPLASIA IN CHILDREN

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Objective: This study aims to evaluate the indications and effectiveness of the shelf acetabuloplasty technique in stabilizing hip joint function in children with hip-related conditions.

Methods: A retrospective analysis was conducted on cases that underwent surgery using the shelf acetabuloplasty technique in the Pediatric Orthopedic Department from 2017 to 2023. The surgical techniques included the Staheli technique and free bone graft acetabuloplasty following the modified Bosworth method. Data on patient demographics, surgical indications, techniques, and post-surgical outcomes were analyzed.

Results: Forty-two cases were analyzed (mean age: 10.1 years, male-to-female ratio: 9:33). Dislocated hip cases had a mean age of 9.7 years, and femoral head necrosis cases averaged 11.5 years. Surgical methods included the Staheli technique (10 cases) and modified Bosworth (32 cases). Primary indications were developmental dysplasia of the hip (36 cases) and femoral head necrosis (6 cases). Five cases were bilateral, and some were associated with cerebral palsy (4), arthrogryposis multiplex congenita (1), and spinal deformity (1). Four cases required revision surgery due to redislocation.

Long-term follow-up (1–5 years) in 27 cases showed 17 improved limping, 6 with mild limping, and 4 with persistent significant limping. Pain was absent in 24 cases and mild in 3. Squatting ability was normal in 12 cases, limited in 6, and absent in 9. Family satisfaction was high, with 26 of 27 families reporting positive postoperative outcomes.

Conclusion: Shelf acetabuloplasty serves as an effective salvage procedure for stabilizing hip joint function in cases of old dislocations and femoral head necrosis in older children. Most patients exhibited significant improvements in walking posture, pain reduction, and functional abilities, contributing to high family satisfaction rates.

(1074) BILATERAL OBLIQUE PELVIC OSTEOTOMY WITH PELVIC EXTERNAL FIXATOR IN CLOACAL EXSTROPHY

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Background: Cloacal exstrophy (CE) is an extensive congenital abdominal wall defect which encompasses of exstrophy of the bladder, omphalocele and lower abdominal wall defect. These patients born with these soft-tissue defects have accompanying pelvic abnormalities, such as an incomplete pelvic ring attributable to a wide diastasis of the pubic rami an exposed bladder plate and wide diastasis of the pubic rami. Different types of pelvic osteotomy have been described to facilitate relaxation of the abdominal wall during closure of exstrophy and to improve the outcome of genitourinary reconstruction.

Report: A 4-year-old Indian boy born term at 37 weeks via emergency cesarian section due to bleeding placenta previa. At day 4 of life, he underwent colostomy for imperforate anus. Other abnormalities noted at birth includes meningocele and septal defect. Otherwise, his immunization history and development history are up to age. He is under pediatric urology follow up for cloacal exstrophy. First stage surgery was done in December 2019 where pediatric surgical team did laparotomy, end stoma and conversion of bladder exstrophy. Second stage was planned through a multidisciplinary team discussion involving pediatric surgical, pediatric orthopedic, pediatric orthopedic, pediatric medical, pediatric anesthetist and intensivist. The operation was successfully carried out in July 2024 with combine effort from all the teams mentioned above. Post operatively patient was transferred to pediatric ICU for 2 days for close monitoring. Subsequently he was transferred to normal ward. Pelvic external fixator was kept for 6 weeks, and close monitoring of the pin site is done via pin site dressing. The rods placement was taken care as well so that there is a gap of minimum 2 finger breadth for stoma care.

Conclusions: Cloacal exstrophy and bladder exstrophy management involves a multidisciplinary team approach which in such case planning between a pediatric orthopedic surgeon and pediatric urologist was done in advance. Bilateral oblique pelvic osteotomy is essential in aiding the closure of anterior abdominal wall following a successful bladder reconstruction in which these osteotomies together with pelvic external fixation reduces soft tissue tension, thus helps in healing and prevent failure of the repair.

(1399) EARLY INTERVENTION WITH NON VASCULARIZED FIBULAR GRAFTING FOR FEMORAL HEAD PRESERVATION IN OSTEONECROSIS SECONDARY TO PROLONGED STEROID THERAPY: A CASE REPORT

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Background: Osteonecrosis is a well-recognized complication of prolonged usage of corticosteroid therapy, with the hip and knee joints being the most commonly affected. The progressive joint pain and damage can result in considerable clinical morbidity and a loss of function for patients. Hence, an early diagnosis is crucial for the feasibility of joint preserving procedures. In early stage;small, pre collapse, non-vascularized fibula bone grafting is a viable option in preserving the structural integrity of the head of femur.

Report: A 15-year-old boy with underlying acute lymphoblastic leukemia presented with fixed flexion and adduction deformities of both hips. Bilateral adductor tenotomy was performed, allowing him to ambulate without assistance. He had also undergone a bone marrow transplant and was on long-term corticosteroid therapy. Imaging revealed flattened bilateral femoral head, but there was no disruption of the articular cartilage or collapse of the femoral head. Therefore, he is scheduled for bilateral femoral head restoration using a non-vascularized fibular strut graft via the trapdoor technique on April 2025. We aim to achieve a pain free outcome and prevent/delay the need for total hip arthroplasty.

Conclusion: Mont et al. concluded that the usage of non-vascularized bone graft via the trapdoor technique can delay the progression of osteonecrosis and the need for early total hip arthroplasty. Early diagnosis and treatment prior to femoral head collapse are key to successful femoral head preservation.

(717) THE RELATIONSHIP BETWEEN GLUTEUS MEDIUS AND MINIMUS MUSCLE VOLUMES AND HIP DEVELOPMENT IN DEVELOPMENTAL DYSPLASIA OF THE HIP

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(753) MANAGEMENT OF PATELLAR DISLOCATION IN CHILDREN: ROLE OF MRI

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Background: Understanding of the relevant risk factors for patellar dislocation and the clinical and radiographic tests is necessary to determine optimal treatment.

Objective: This study is to evaluate the role of MRI in treatment of patellar dislocation in children.

Methodology: 33 patients (7-16yrs of age) with 35 knees were operated according to flow chart including first dislocations with loose body, recurrent dislocations, and habitual dislocations. Periods of follow-up were 2-10yrs (avg. 5.5yrs). The procedures comprised medial reefing ± lateral release, reconstruction of medial patellofemoral ligament (MPFL) ± lateral release, quadriceps lengthening according to MRI indices as location of MPFL injury, trochlear dysplasia, axial position of patella, C-D index, TT-TG distance. Results of follow-up were relapse, complication, and functional result with Kujala score.

Results: Among 35 knees, there were 2 (5.7%) first dislocations, 30 (85.7%) recurrent dislocations, and 3 (8.6%) habitual dislocations; lateral release 27/35 (77.1%), medial reefing 23/35 (65.7%), reconstruction of MPFL 12/35 (34.3%). The essential complication was a knee of extensive stiffness after medial reefing + lateral release. Relapses were in 4/35 (11.4%) of knees; not correlated to lateral release ($p = 0,21$), medial reefing or reconstruction of MPFL ($p = 0.07$), but correlated to C-D index ($p = 0.025$). The final functional results according to Kujala were 88-100 (avg. 95.5).

Conclusion: This study showed the role of MRI in treatment of patellar dislocation according to the flowchart. C-D index should be focused on for Quadriceps lengthening.

RAPID FIRE 2: HIP AND KNEE

(929) TWO STAGE SURGERY FOR NEGLECTED DISTAL PHYSEAL FEMORAL FRACTURE

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Background: Neglected distal physeal femoral fractures are uncommon but still reported in developing countries. There are still few reports about the treatment options and the results. The objective of this study is to propose treatment options for this challenging case.

Report: There are 6 cases of neglected distal physeal femoral fracture in 2023-2024 in our hospital. The mean age of the patients is 14,6 years and the mean treatment time is 3,8 months. Most of the injuries were Salter Harris type II, and we found superficial infection in 3 patients. All fractures were managed by two-stage surgery (n:6). The first surgery consisted of debridement (n:3), open osteoclasis, soft tissue release and skeletal traction application (n:6), and the second stage was reduction and fixation of the fracture. On 6 months follow up despite an acceptable reduction and union (n:6), we still found limitations on knee range of motion in 3 patients.

Conclusion: Two-stage surgery for treatment of neglected distal physeal femoral fracture cases may be a viable option for treatment in this challenging case, although the knee stiffness problem still needs to be treated by vigorous rehabilitation protocols.

(762) Risk Factors For Reoperation After Guided Growth For Genu Varum And Valgum Deformities

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Background: Guided growth using tension band plates is a common treatment for genu varum and valgum deformities in children. Reoperation is a significant adverse event affecting surgical outcomes.

Objective: This study aims to investigate the occurrence of reoperations following guided growth around the knee and identify associated risk factors.

Methodology: This retrospective study reviewed children who underwent guided growth for genu varum and genu valgum deformities between 2012 and 2021. Reoperation was defined as revision surgeries for deformities at the same knee, excluding procedures for implant removal. The endpoint of follow-up was either reoperation, skeletal maturity, or postoperative 5 years. Potential risk factors included age, sex, body mass index, surgical location, implant type, underlying etiology, and knee deformities measured by the mechanical axis deviation (MAD). The t-test, chi-square test, and logistic regression were used to identify risk factors for reoperation.

Results: A total of 126 patients who underwent guided growth on 206 knees were surveyed. Reoperations were performed on 44 knees (21%) in 34 patients (27%). These included reoperations for recurrence of deformity in 26 knees, slow response in 13 knees, overcorrection in 4 knees, and infection in 1 knee. Reoperations were associated with younger age, greater MAD, and non-idiopathic etiologies, such as rickets, Blount disease, physeal injury, hemimelia, and osteochondroma. Logistic regression identified non-idiopathic etiologies (OR 5.7, 95% CI 2.3-14.3) and younger age at the time of surgery (OR 1.3 per younger by 1 year, 95% CI 1.1-1.5) as independent risk factors for reoperation.

Conclusions: Reoperation rate can be as high as 50% in patients with conditions such as rickets, Blount disease, physeal injury, hemimelia, and osteochondroma. This study does not oppose guided growth in younger patients or those with specific underlying etiologies. However, parents should be informed about the potential risks of requiring reoperation.

(782) SLEEVE AVULSION FRACTURE OF THE INFERIOR POLE OF THE PATELLA IN CHILDREN: A CASE REPORT.

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Background: The major bony portion of the patellar, along with a bony fragment from the distal pole are torn off by an extended sleeve of cartilage in a patellar sleeve fracture. This is an uncommon type of fracture in children. Due to its rarity, radiological difficulty and MRI discovery, it presents a complex diagnostic that emergency clinicians sometimes fail to recognize. Patellar sleeve fractures in children are even more uncommon, with a single case previously reported involving a kid under the age of six.

Presentation: We present the first with knee radiographs at 4 weeks, a well-healed fracture, a good knee range of motion at 3 months. That leads to a successful outcome.

Finally, a patellar sleeve fracture is a rare condition that occurs in younger patients owing to rapid knee retraction, particularly in the emergency department. This can be achieved through the recognition of hemorrhagic disease is of considerable case of an eleven years old boy. Our patient suffered a patella fracture and after 5 days fell with a flexed knee onto a broken tile. The case was successfully managed according to the principles of immobilizing adult patella fractures with a tension wire, and using fiber wire Krackow suture repair. The patient had a follow-up importance. Do not miss the diagnosis. We should have a magnetic resonance imaging knee. Fixation with 'K' wire and fiber wire Krackow sutures is an option that can be performed safely.

Conclusion: Patella-sleeve children with patella-sleeve avulsion fractures are not common nowadays. Consequently, when a child engages in a sport activity and experiences a strong quadriceps contraction with the knee flexed, it is easy for doctors to skip checking the case that he can be diagnosed with such fractures, especially with inferior pole and peripheral cartilage. Usually displaced fractures, radiographs and MRIs help diagnose, early surgical open reduction and intervention can produce a good outcome.

Key Words: Patellar fracture, sleeve, fiber wire, Krackow.

(1374) PEDIATRIC SUBTROCHANTERIC FEMUR FRACTURE IS RECON NAIL AN OPTION? A CASE REPORT

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Introduction: Pediatric subtrochanteric femur fractures are rare, and account for 4-10% of all pediatric femoral fractures. These fractures are usually displaced and presented with challenges in stabilizing and aligning the fracture.

Report: A 14-year-old boy presented to our hospital following an accident. The patient complained of pain over his left hip joint with difficulty ambulating. Otherwise, no other complaint. On examination, the patient's left hip joint was in flexion, abduction and external rotation attitude. Associated with marked tenderness in the groin and restricted range of movement (ROM) due to pain. Otherwise, there were no neurovascular deficits. Plain roentgenogram shows a comminuted subtrochanteric left femur fracture extending to proximal femur (32-B2,1 Orthopaedic Trauma Association). Skin traction applied and the patient then admitted to the ward.

Fixation using reconstruction nail to increase stability without compromising the physeal plate and it being available as hospital implant was chosen. Nail followed by two proximal interlocking lag screws directed towards the neck of femur without passing the physeal plate were inserted. Wound was then closed by layers. Check x-ray was acceptable, patient was discharge with partial weight bearing ambulation.

At 6 weeks, the patient was already on full weight bearing ambulation and did not complain of any pain. Wound well healed and he was able to demonstrate full ROM over his left hip and left knee. Repeated radiographs show good callus formation. Union was seen on x rays at 3 month, and the patient was already able to perform routine activities without any difficulty.

Conclusion: Subtrochanteric femur fracture in pediatric age groups challenges us in deciding the appropriate management plan. Based on our case, we believe that reconstruction nails is a good alternative which yields faster recovery and return to activity for pediatric age groups nearing skeletal maturity. It is also easily available as hospital implant.

RAPID FIRE 2: HIP AND KNEE

(636) VALGUS OSTEOTOMY IN NONUNION PAEDIATRIC FEMORAL NECK FRACTURE

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Background: Nonunion of femoral neck fractures in pediatric patients is a rare but challenging condition associated with significant morbidity. It often results from high-energy trauma or delayed treatment and presents a risk of long-term complications such as avascular necrosis, limb length discrepancy, and hip deformity. Valgus osteotomy has emerged as a viable surgical intervention to address these challenges by improving biomechanical stability and promoting fracture union.

Objective: To evaluate the outcomes of valgus osteotomy in the management of nonunion pediatric femoral neck fractures, focusing on fracture union, functional improvement, and associated complications.

Methodology: A case series of 11 patients (age range: 4.3 to 16 years) with nonunion pediatric femoral neck fractures treated with valgus osteotomy was analyzed. Surgical interventions included valgus osteotomy combined with osteosynthesis using devices such as angled blade plates (ABP) or dynamic hip screws (DHS). Preoperative and postoperative outcomes were assessed using parameters like neck-shaft angle, Pauwels angle, Harris Hip Score, fracture union time, and limb length discrepancy. The follow-up period ranged from 16 to 36 months.

Results: Fracture union was achieved in all cases within 9 to 18 weeks postoperatively. The neck-shaft angle improved significantly from a preoperative mean of 89° to a postoperative mean of 132°. Pauwels angle decreased from an average of 60° preoperatively to 30° postoperatively. Functional outcomes, as measured by the Harris Hip Score, improved from a preoperative range of 25-40 to a postoperative range of 45-55. Limb length discrepancy was reduced to less than 1 cm in most cases, except for two patients who developed mild Trendelenburg gait. No major complications were observed.

Conclusion: Valgus osteotomy is an effective and safe surgical option for managing nonunion pediatric femoral neck fractures. It facilitates fracture union, corrects deformities, and improves functional outcomes. Mild complications such as Trendelenburg gait were minimal and manageable, making this technique a valuable addition to the treatment arsenal for these challenging

RAPID FIRE 3: LIMB RECONSTRUCTION / FOOT AND ANKLE

(869) A COMPARATIVE ANALYSIS OF TRANSLATION STEP CUT OSTEOTOMY AND SPIKE TRANSLATION STEP CUT OSTEOTOMY IN PEDIATRIC CUBITUS VARUS DEFORMITY

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Background: Cubitus varus deformity, a common complication of pediatric supracondylar humerus fractures, presents cosmetic and functional challenges. Translation Step Cut Osteotomy and Spike Translation Step Cut Osteotomy are corrective procedures aimed at addressing these deformities.

Objective: To compare the clinical, radiological, and cosmetic outcomes of Translation Step Cut Osteotomy and Spike Translation Step Cut Osteotomy in pediatric patients with cubitus varus deformity.

Methodology: A prospective study involving pediatric patients aged <16 years was conducted at AIIMS Rishikesh. Patients were assigned to either Spike Translation or Step Cut Osteotomy based on their UHID. Key outcomes assessed included carrying angle, Lateral Prominence Index (LPI), cosmetic satisfaction, and results based on Modified Criteria of Oppenheim.

Results:
- Carrying Angle: Spike Translation improved the carrying angle by 16°, compared to 14° for Step Cut ($p = 0.412$).
- LPI Correction: Spike Translation showed a slightly higher mean correction (14.93%) than Step Cut (13.58%), though this difference was not statistically significant ($p > 0.05$).
- Cosmetic Outcomes: Both procedures predominantly yielded "Excellent" outcomes, though Step Cut demonstrated more variability with one "Poor" result.
- Oppenheim Criteria: Both techniques showed comparable "Excellent" results ($p = 0.449$).

Conclusion: Both osteotomy techniques effectively correct cubitus varus deformities. Spike Translation offers slightly greater improvements in carrying angle and LPI correction with consistent cosmetic satisfaction, while Step Cut achieves favourable but more variable outcomes. Further studies with larger cohorts are recommended to confirm these findings.

(1003) TILLAUX AND TRIPLANE FRACTURES IN ADOLESCENTS: A CASE SERIES AND REVIEW OF SURGICAL STRATEGIES

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Background: We detail an arthroscopic technique for transitional fracture reduction and fixation in juvenile Tillaux fracture and two-part triplane fracture, prioritizing minimal soft tissue disruption and superior visualization during reduction and fixation. These fractures are challenging due to their intra-articular nature.This minimally invasive approach aims to optimize reduction and stabilization. We retrospectively analyzed pediatric patients who underwent arthroscopic-assisted ankle transitional fracture reduction and fixation from Oct 2021 to May 2023, all performed by a single fellowship-trained pediatric orthopedic surgeon.

Results: Three patients (2 female, 1 male), aged 12-13, comprising 2 Tillaux fractures and 1 triplane fracture, were followed for ≥6 months. All fractures fully healed within 2 months post-surgery, with no significant complications.

Required equipment: Arthroscopic instruments, a 12G needle, 3mm shaver, image intensifier, 1.6mm K wire, and 4.0mm short thread cannulated screw.

Positioning: Supine with the affected ankle hanging over the table's edge.

Joint Insufflation and Scope Introduction: A 12G needle is used to insufflate the joint with saline through the anteromedial portal, followed by a small incision for scope camera insertion. Process repeated for anterolateral portal.

Debridement and Visualization: A 3mm shaver is used through the anterolateral portal for joint debridement, followed by fracture line identification and clearance of hematoma and soft tissue. A MacDonald's retractor inserted through an anterolateral portal was used for fracture disengagement and mobilization.

Clamp reduction: An 18G needle localizes the supplementary anterolateral portal, followed by dissection to access the AITFL origin and clamp application for fracture reduction.

Fracture fixation: A 1.6mm K-wire guided medially to laterally with a mini image intensifier, then a 4.0mm short thread cannulated screw ensuring full thread passage beyond the lateral fracture line for compression. Reduction integrity and stability confirmed arthroscopically.

Postoperatively: Patients wear a walker boot with non-weight bearing for 4 weeks, then partial weight-bearing for 4 weeks, and achieve full weight-bearing after 8 weeks.

Conclusions: The arthroscopic technique for pediatric Tillaux and two-part triplane fractures offers minimally invasive, highly visual, and accurate reduction and fixation, enhancing patient outcomes.

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(634) SUBTALAR ARTHROEREISIS IMPLANT MIGRATION RATE IN SYMPTOMATIC FLEXIBLE FLAT FEET CHILDREN: A COHORT STUDY OF LONG TERM FOLLOW UP RESULT

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Introduction: Pediatric symptomatic flexible flatfoot can be treated by subtalar arthroeresis. Hence, the sustained evaluation of the treatment results is very crucial. This study aimed to disclose and compare the subtalar arthroeresis implant migration rate from short-term to long-term follow-up.

Methods: Retrospectively examined flatfoot children from 2014 to 2023. Forty-eight children with 88 feet were enrolled in the study. Implant migration index(IMI) is evaluated by ankle AP view. The length from the implant tip to the medial cortex of the talus is "a" , and the transverse diameter of the talus is "b". The IMI is "a/b", and it indicates the position of the arthroereisis implant. The index was recorded on immediate post-OP, post-OP 1 month, post-OP 3 months, post-OP 1 year, and post-OP 5 years.

Results: The IMI of immediate post-OP, post-OP 1st month, post-OP 3rd month, post-OP 1st year, and post-OP 5th year; are 0.393, 0.456, 0.460, 0.470 and 0.466, respectively ($p<0.05$). The mean migration rate between immediate post-OP to post-OP 1st month is 0.063, post-OP 1st month to post-OP 3rd month is 0.004, and post-OP 1st month to post-OP 5th year is 0.010, respectively.

Discussion: The IMI of good implant position should be less than 0.5, all of our cases are satisfied to the guideline. The post-OP 1st month has the highest implant migration rate, and very few changes of the IMI at the following long-term follow-up.

Conclusions: Subtalar arthroereisis is a reliable procedure to treat the pediatric symptomatic flexible flatfoot. The implant migrates the most in the first month postoperatively, and relatively

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(674) EFFICACY OF MODIFIED KIDNER PROCEDURE COMBINED WITH SUBTALAR ARTHROEREISIS TREATING ADOLESCENT TYPE 2 PAINFUL ACCESSORY NAVICULAR WITH FLEXIBLE FLATFOOT

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Purpose: To investigate the clinical efficacy of modified kidner procedure combined with subtalar arthroereisis in the treatment of adolescent type II painful accessory navicular with flexible flatfoot.

Methods: From January 2018 to January 2022, 25 adolescent patients (40 feet) with painful type II accessory navicular and flexible flatfoot admitted to our hospital were enrolled in the study, including 13 males (23 feet) and 12 females (17 feet). All patients underwent modified kidner procedure combined with subtalar joint arthrodesis. The Meary's Angle, the first metatarsal Angle of talus (APTMT), the second metatarsal Angle of talus, Pitch Angle, talus tilt Angle, talonavicular coverage Angle (TCA), talus calcaneal Angle (LTCA), and calcaneal Angle were measured on weight-bearing anteroposterior and lateral x-ray films before operation and at last follow-up. AOFAS midfoot score and visual analogue scale (VAS) were used to evaluate the improvement of foot function and pain.

Results: All patients were followed up for average 17.4 ± 2.6 months (12–24). The incisions of 25 patients healed by first intention. There was no screw withdrawal or secondary operation to remove the screw in all patients. At the last follow-up, VAS score of the affected foot was significantly lower than that before operation

RAPID FIRE 3: LIMB RECONSTRUCTION / FOOT AND ANKLE

(P < 0.01), and AOFAS score was significantly higher than that before operation (P < 0.01). At the last follow-up, the weight-bearing anteroposterior and lateral foot x-ray films showed that: The Meary's Angle, APTMT, the second metatarsal Angle of the talus, Pitch Angle, talar tilt Angle, TCA, LTCA, and calcaneal Angle significantly improved when compared with those before operation (P < 0.01).

Conclusions: Themodified kidner procedure combinedwith subtalar arthroereisis has a good clinical effect in the treatment of adolescent type II painful accessory navicular with flexible flatfoot, which can effectively improve the pain symptoms, improve the foot function and imaging manifestations, and correct the flatfoot deformity.

(689) MINIMALLY INVASIVE DOME OSTEOTOMY VS. CONVENTIONAL METHODS FOR CORRECTING ELBOW DEFORMITIES AFTER PEDIATRIC SUPRACONDYLAR FRACTURES: A COMPARATIVE STUDY

Sungmin Kim

Introduction: Cubitus varus or valgus often follows the treatment of pediatric supracondylar fractures and typically requires surgical correction, as spontaneous remodeling does not occur. While various osteotomy techniques—such as lateral closing wedge, dome, and step-cut—have been developed, traditional methods are frequently associated with complications like neuropraxia, sepsis, and restricted motion. The purposes of this study are 1) to introduce a minimally invasive dome osteotomy technique for correcting elbow deformities and 2) to compare the radiological and clinical results of our minimally invasive approach with those of traditional techniques.

Methods: We reviewed 24 patients who underwent corrective osteotomy for elbow deformities following pediatric supracondylar fractures between January 2011 and January 2023. Patients were divided into two groups: Group A (minimally invasive dome osteotomy with the joystick technique) and Group B (conventional lateral closing wedge method). Surgical procedures included temporary Steinman pin placement, minimal soft tissue dissection, dome osteotomy, alignment correction, and final fixation.

Correction targets were based on AP and lateral comparisons of the contralateral and affected elbows, measuring the humerus-ulnar angle (AP) and the distance from the anterior humeral line to the capitellum (lateral). Postoperative corrections were compared using X-ray measurements. Pain was monitored daily using the Visual Analogue Scale (VAS), and Flynn's grade was assessed and compared between groups two years postoperatively.

Results: Both Group A and Group B consisted of 12 patients, with average ages at the time of correction being 8 and 10.5 years, respectively. Group A achieved significantly more accurate corrections on the anteroposterior (AP) view compared to Group B (0.51 vs.4.28, p<0.001), while no significant difference was observed in the lateral view (-0.26 vs -0.62, p=0.73). Postoperative VAS scores showed no significant difference on the first day (7.0 in Group A vs. 7.16 in Group B). However, pain reduction by half occurred earlier in Group A (3.25 vs. 4.16 days), with a statistically significant difference (p<0.001). There were no cases of nerve palsy in Group A, while two patients in Group B developed postoperative nerve palsy, both resolving within one month. No cases of nonunion were observed in either group.

Conclusion: Overall, the minimally invasive dome osteotomy with the joystick technique not only provided more accurate corrections but also facilitated faster postoperative recovery, including reduced pain and minimal complications. These findings suggest that this approach is a reliable method for correcting elbow deformities following pediatric supracondylar fractures.

This study demonstrates that minimally invasive dome osteotomy with the joystick technique provides more accurate corrections and faster pain reduction, as shown by VAS scores, compared to conventional methods. The earlier pain relief allows quicker recovery, reducing the risk of complications like limited mobility. These findings highlight the clinical benefits of the minimally invasive approach for correcting elbow deformities in children.

(1124) CAT'S TUNNEL: AN INNOVATIVE TECHNIQUE IN MASQUELET PROCEDURE IN PAEDIATRIC PATIENTS

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Background: Treatment of large bone defect has undergone tremendous evolution. Masquelet technique is a viable option in paediatric patients performed to treat extensive bone defect. In paediatric patients, regular pin dressings of external fixators in Masquelet technique are challenging. Once pin tract infection develops patients might require multiple revision surgeries that could potentially cause psychological trauma to the child and prolonged absence from school. We are sharing our technique that involves creating a tunnel (we call it as Cat's tunnel) formed utilizing various sizes of syringes, creating centrally hollowed tube-like spacer to allow passage of k-wire that avoids use of external fixator.

Report: We performed five cases using this technique in treating large bone defect in paediatric cases. Four were osteomyelitis cases; had achieved union and no complication such as infection or implant failure. The last case was a congenital pseudoarthrosis of tibia is currently in the consolidation stage that was complicated by distal migration of the implant where patient had undergone one revision surgery.

Conclusion: In our series, risk of infection was minimized might be due to the wire that was embedded and not exposed to external environment. In addition, local soft tissue dissection that might compromise perfusion and vascularity to the healing bone could be avoided. This approach might prevent cement spillage into the surrounding tissues during the initial cement insertion in the first stage. Furthermore, the tubular shape of the cement enables easy removal in the second stage.

(1248) THE MANAGEMENT OF POSTERIOR STERNOCLAVICULAR INJURIES IN THE PAEDIATRIC POPULATION: 10 YEARS OF EXPERIENCE IN A TERTIARY REFERRAL PAEDIATRIC HOSPITAL

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Background: Sternoclavicular joint (SCJ) injuries in children are rare and comprise around 0.1% of upper limb dislocations. In children, many sternoclavicular joint dislocations may be misdiagnosed and represent physeal injuries ("pseudodislocations") whose management may differ from a true dislocation. Current literature does not provide clarity on optimal management options including indications for surgery or surgical techniques.

Objective: This study reports on the experience of managing posterior sternoclavicular joint (pseudo)dislocations at a large tertiary referral paediatric centre in Australia over ten years. Primary aims include determining the demographic factors, imaging modalities, chronicity of injuries, success rates of differing management options, assess complications and patient outcomes. Secondary aims were to determine the accuracy of CT scans in correctly identifying SH1/2 fractures of the medial clavicle.

Methodology: Institutional ethics was sought and determined to be unnecessary. We conducted a retrospective review of hospital electronic records and interrogated CT scans. Inclusion criteria was all paediatric posterior sternoclavicular joint injuries. Exclusion criteria was medial clavicle diaphyseal fractures (not SH1/2), sternal fractures and anterior SCJ injuries.

Results: A total of 23 SCJ dislocations were identified with an average age of 14.6 years. 91% (n=21) were acute presentations (<48hours). Australian Rules Football was the most common mechanism (n=12, 52.2%). Initial records indicated 19 SCJ dislocations (82.6%) and 4 pseudodislocations (17.4%), although this was then interrogated by a revaluation of initial CT scans revealing a higher rate of the latter. Management included 4 closed reduction (17.4%), 2 closed reductions which required subsequent open reductions (8.6%) and 17 open reductions (73.9%). Of the open reductions, 16 underwent suture fixations. All patients had a full range of movement on final review with completion of Subjective Shoulder Value (SSV) scoring performed.

Conclusion: There is a paucity of evidence for the management of children with posterior SCJ dislocations. This review provides an understanding of the demographics of patients in Victoria, Australia who sustain this injury including the current management modalities employed. It provides a contemporary review of the literature and allows an understanding of factors leading to successful outcomes. We also determine the true rate of pseudodislocations in our paediatric cohort.

RAPID FIRE 3: LIMB RECONSTRUCTION / FOOT AND ANKLE

(1025) BROKEN PRECICE LENGTHENING NAIL: A CASE REPORT

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Background: We report the case of a 17-year-old girl who experienced dissociation between the female and male components of a PRECICE tibial nail during implant removal. The patient presented at 11-years-old with background of posteromedial bowing at birth, managed conservatively with splinting. She was referred for concerns of a 3cm limb length discrepancy in the left leg. At 13-years-old, she underwent left proximal tibial osteotomy and lengthening, with insertion of a PRECICE tibial nail (8.5x155 mm) with proximal and distal interlocking screws placed per standard technique. Post-operative reviews were uneventful, with X-rays showing good alignment and distraction. Implant removal was advised 2 years post-surgery, but follow-ups were missed during the COVID-19 pandemic. Recalled post-pandemic, she was again advised for removal. Intraoperatively, the female (magnetic) component and interlocking screws were successfully removed, but the male (non-magnetic) component remained in the tibia. Attempts to extract the remnant part by pushing nail distally using retrograde techniques failed, and the decision was made to leave the male component in-situ. Post-operative recovery was uneventful.

Report: Lengthening nails, compared to conventional nails, have mechanical weaknesses due to their telescoping design, creating a junction prone to rotational and angular forces, increasing breakage risk. Our patient used the smallest and shortest PRECICE nail available, which may have failed mechanically over time. Techniques for removing broken lengthening nails include creating a distal cortical window to push entrapped nail piece with retrograde force (Rolfing et al.), and unroofing osteotomy (Dharamsi et al.). Decision was made to leave male component in-situ, due to risk of intraoperative fracture after several failed attempts. Nail is usually removed within 2 years following surgery. Delayed removal could have led to osseous ingrowth around the "bell-bottom" design of nail tip, contributing to implant retention. This design is not observed in larger, longer nails with uniform cylindrical tips.

Conclusion: Early removal of telescoping nails is recommended once clinical objectives are met. Surgeons should remain vigilant about nail design features that may complicate implant removal.

RAPID FIRE 4: LIMB RECONSTRUCTION / FOOT AND ANKLE

(1262) RADIOULNAR SYNOSTOSIS SURGICAL TECHNIQUES LEARNED FROM JAPAN: PRACTICES AND OUTCOMES

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Background: Radioulnar synostosis primarily affects the proximal third of the forearm, often fixing it in a pronated position. While elbow flexion and extension remain normal, some patients exhibit increased radiocarpal flexibility, compensating for the limited forearm rotation. Due to this compensation, early diagnosis is often missed. Current evidence indicates that simple separation of the radius and ulna is unsuccessful, and derotational osteotomy is necessary.

Objective: This study aims to evaluate surgical techniques learned from Japan and their clinical outcomes. The focus is on assessing the effectiveness of the procedure in improving forearm rotation while minimizing complications.

Methodology: The procedure involves three key steps: separation of the radius and ulna, biceps tendon transfer to enhance supination torque, and flap transposition to maintain bone separation. Finally, radius derotational osteotomy is performed to correct rotational deformity while minimizing complications. Eleven patients (seven boys, four girls) underwent surgery at Cathay General Hospital between 2020 and 2023. Their mean age was 7.4 years (range: 6–10.5 years). Preoperatively, forearms were fixed in a neutral or pronated position, with a mean pronation of 28.7° (range: 0°–83°).

Results: Postoperatively, mean supination improved to 72.6° (range: 45°–92°), and mean pronation reached 22.8° (range: 0°–50°), resulting in a mean total range of motion of 95.4° (range: 75°–124°). All osteotomy sites healed within a mean duration of 5.5 months (range: 3–11 months). Two cases required additional ulnar osteotomy due to severe preoperative pronation. Complications included two cases of re-synostosis, one posterior interosseous nerve injury, and two instances of delayed wound healing, though no necrosis occurred.

Conclusion: Functional improvements were noted in daily activities such as eating and hygiene, with high patient satisfaction. These preliminary findings suggest that this surgical approach provides promising outcomes. Further studies with larger cohorts and long-term follow-up are needed to validate its effectiveness.

(755) COMPARISON OF TWO METHODS FOR SCREW PLACEMENT IN PERCUTANEOUS EPIPHYSIODESIS USING TRANSPHYSEAL SCREWS: CROSSED VERSUS NON INTERSECTING

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Background: There are two methods for placing transphyseal screws in percutaneous epiphysiodesis using transphyseal screws (PETS) to treat limb length discrepancy (LLD): crossed and non-intersecting.
Objective: This study aimed to compare the effectiveness, safety, and operation time between the crossed and non-intersecting methods of placing transphyseal screws in PETS.

Methodology: We retrospectively included 101 patients with LLD due to congenital hemihyperplasia who underwent PETS and subsequent screw removal. Thirty-three femora and 54 tibiae had crossed-type PETS, while 60 femora and 18 tibiae had non-intersecting-type PETS. We calculated the percentage correction of LLD by measuring the change in LLD before and after PETS and dividing it by pre-operative short leg length. The correction rate was determined by dividing the percentage correction of LLD by the duration of screw placement. The efficacy of PETS was assessed using the formula (predicted length – final length)/(predicted length – pre-operative length) divided by the amount of growth responsible at each growth plate (71% for distal femur; 55% for proximal tibia). Additionally, we collected data on complications and operation times for both PETS and screw removal.

Results: The demographic data, percentage correction of LLD, correction rate, efficacy of PETS, and operation time for PETS were not different between the two groups. However, difficulties in removing screws, such as screw breakage, were more frequent in the crossed group (9%) compared to the non-intersecting group (0%) (p=0.042) for the femur. For the tibia, 4% of patients in the crossed group underwent difficulties in removing screws, but none in the non-intersecting group (p=1.000). No patients in either group experienced other complications. The operation time for screw removal was longer in the crossed group (56.9 ± 42.5 minutes) than in the non-intersecting group (30.8 ± 11.5 minutes) (p=0.004).

Conclusion: Both methods of placing screws for PETS effectively correct LLD. However, the non-intersecting PETS may result in fewer difficulties and shorter operation times compared to the crossed-type PETS when removing screws. Surgeons need to be aware of the potential challenges associated with removing crossed-type screws.

(770) COMPARATIVE OUTCOMES BETWEEN OPEN AND ARTHROSCOPIC TARSAL COALITION RESECTION: A SYSTEMATIC REVIEW AND META ANALYSIS

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Background: In regards with arthroscopic and the gold standard of open tarsal coalition resection, comparative evidence is still missing.

Objective: This systematic review and meta-analysis were aimed to evaluate the differences of postoperative outcomes between these two techniques.

Methods: A systematic review was conducted following the Preferred reporting items of systematic review and meta-analysis (PRISMA). By searching from PubMed and Scopus databases from inception to November 3, 2024, clinical studies involving tarsal coalition; reported either open or arthroscopic resection with at least one postoperative outcome (pain, functional scores, complications, and recurrence) were recruited. Two reviewers independently performed study selection, data extraction, and risk of bias assessment. I2 statistic tests for heterogeneity, pooled mean difference (MD) and 95% confidence interval (CI) were estimated across the studies.

Results: A total of 38 articles (26 open, 11 arthroscopic case series, and 1 compared both surgeries) with 750 and 216 feet in respects to open and arthroscopic resection were included. Nineteen studies (50%) had low to moderate risk of bias. By applying a random-effects model for heterogeneity, open surgery (MD 34.73, 95%CI 27.53, 41.93) improved the American Orthopaedic Foot and Ankle Society (AOFAS) score more than arthroscopic excision (MD 23.83, 95%CI 16.82, 30.84). Open technique (0.05, 95%CI 0.02, 0.08) also had lower probability of having complications when compared to arthroscopy (0.07, 95%CI -0.02, 0.16). Besides insufficient data pooling for arthroscopic resection, open surgery solely reduced 10-point pain score after treatment (MD -5.60, 95%CI -7.09, -4.11, p < 0.001, I2 92.31%) with probability of recurrence (0.05, 95%CI 0.02, 0.07, p = 0.01, I2 = 49.10%).

Conclusion: Open surgery for tarsal coalition demonstrated better functional score, and pain improvement without significant differences when compared to arthroscopic excision. Further high-quality research, particularly on arthroscopy is needed to improve the precision.

(718) BONE MORPHOGENETIC PROTEIN CAN PROMOTE RAPID MINERALIZATION OF LENGTHENED BONE SEGMENTS DURING LIMB LENGTHENING IN CHILDREN

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Background: Osteotomy and lengthening with external fixation can correct limb length discrepancy and malformation in children. Long bone mineralization duration of limbs may cause complications such as infection, fracture, affecting limb lengthening effect.

RAPID FIRE 4: LIMB RECONSTRUCTION / FOOT AND ANKLE

Objective: To evaluate whether lengthened segment injection of human recombinant bone morphogenetic protein-2 (rhBMP-2) could promote rapid bone mineralization process.

Methodology: After external fixation (monolateral or circular fixation) installed, osteomy was carried in limbs (femur, tibia, ulna, humerus) . One week later, the target bone segment was extended by about 1mm per day (dived into 3-4 times every day). Reaching correction goal, stop lengthning and wait for mineralization . If X-ray showed extended segment thin and absorption possibility, BMP solution (1ml BMP+1ml sterile water) was injected into the middle (1ml) and two ends (0.5ml each) of the extended segment.

The patients in our hospital from 2017 to 2021 were divided into BMP Group (8 cases:4 boys+4 girls) and Control Group (29 cases:18 boys+11 girls).

Define speed index for each lengthening stage. Lengthening Index (EI)(d/cm): the number of days required for extending 1cm, which from the start to stop of extension. Bone healing index (BHI)(d/cm): the unit time required for mineralization (the duraiton from lengthening end to external fixation removal divided by lengthening length). External fixation index (EHI)(d/cm) : the unit time required for the entire fixation process (total external fixation duration divided by lengthening length). The speed index were compared in two groups.

Results: There was no significant difference in average operation age between BMP Group (10.7-yeal-old, range 6.8~14.0-year-old) and Control Group (9.3-year-old, range 31.1~14.2-year-old) (P=0.289, P>0.05), and in EI between two groups before BMP injection (11.03d/cm vs. 13.6d/cm, P=0.119). However, BHI after BMP injection was significantly lower and faster in BMP Group than Control Group (26.6d/cm vs. 41.3d/cm, P=0.008), and EFI was also significantly lower and faster in BMP Group than Control Group (38.9d/cm vs. 56.3d/cm, P=0.005).

Conclusion: In cildren, BMP-2 injection into the lengthened bone segment could promote rapid bone mineralization process, shorten external fixation duration, realize lengthenin plan as soon as possible.

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(839) FOOT LENGTHENING

Ibrahim Abuomira

The trauma after vascular disease is the most common indication for amputation in patients under the age of fifty. Amputations due to traumatic lacerations have a number of unique characteristics not found in vascular disease. The remaining stump often has an excellent blood supply and the patient is usually young and in good general condition and is expected to regain a high level of function , The use of prothesis has many complications, irritation and skin Issues, general fatigue, reduced mobility, poor balance, instability, or a fear of falling, current prosthetic not meeting your needs, back pain and intact limb pain. The Ilizarov method is a reliable method for the lengthening foot stump. The technique of distraction osteogenesis can also be used to improve the quality of life of patients with short foot amputation stumps by giving them a better mechanical stump that is more effective than prosthetic use, and for the function of the adjacent joint.

Material and methods: Between 2008 and 2022 a total of seven patients with short amputated foot stump, 4 female patients and 3 male patients. The average age of the patients was 30 (range, 15 to 45) years. All cases were treated with classic ring Ilizarov fixator. In all cases observed foot-length discrepancy ranged from 8 to 10 cm (the mean was 9 cm).

Discussion: The use of prothesis with short foot amputation stumps has many complications. The technique of distraction osteogenesis can also be used to improve the quality of life of patients with short amputated feet stumps by giving them a better mechanical stump that is more effective than prosthetic use, and for the function of the adjacent joint. the main area of concern in amputation stump lengthening is the soft tissue. To prevent these skin problems resulting in new debridements and reamputation, skin and soft tissue should be in optimal condition prior to any lengthening. To this purpose tissue expanders may be used to produce a pocket for bone growth, or vascularized myocutaneous flaps. Lengthening of short amputated feet stumps is the long treatment time.
In the literature.

Result: The mean length gain was 6 cm (5 and 7) but the consolidation time was very long (healing index 1.8 month/centimeter). The final outcome was excellent in all cases. but was unsatisfactory in one case, repetitive skin breakdown and ulcerations.

Conclusion: The technique of distraction osteogenesis can also be used to improve the quality of life of patients with short amputation stumps by giving them a better mechanical stump that is more effective than prosthetic use, and for the function of the adjacent joint.

(1081) MINIMALLY INVASIVE CORRECTIVE OSTEOTOMY AND PLATING IN TIBIA DEFORMITY OF CHILDREN

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Background: Tibial deformities in children has been treated by gradual correction using external fixator, since acute corrective osteotomy often associates soft tissue problems and infection. However, it is challenging to apply in children, because of long term wearing of external fixator until the healing.

Objective: The goal of this study was to investigate radiographic and clinical results after minimally invasive corrective osteotomy and plating in various deformities of pediatric tibia.

Methodology: We retrospectively reviewed 20 patients (26 cases) of tibia deformity in children between 4 and 16 years of age (mean, 9 years-old). There were 13 patients with valgus osteotomy, 6 with varus osteotomy, and 7 with rotational osteotomy. Osteotomy was performed with the minimal incision over the expected area. After correction of deformity, locking plate was fixed on the medial side through the percutaneous tunnel. Bone graft was performed in 3 cases of valgus opening wedge osteotomy. Radiographic result was evaluated, including the angle of correction and the time to union. Clinical result was evaluated including complications.

Results: There were 14 patients of unilateral involvement, 5 patients of bilateral involvement, and 1 patient with two times of surgery. Average gain of correction angle was 17.2 degrees. All of 26 cases healed in average of 10.5 weeks. In complications, there was one case of deep infection, which healed after the removal of plate after healing of osteotomy. Otherwise, there was no significant complications which needed major surgery or revision.

Conclusion: In treating tibia deformities in children, acute correction with minimally invasive osteotomy and plating can be a reasonable solution. This technique may provide early motion and favorable function with minimal risk of soft tissue complications.

(1242) TALO CALCANEAL COALITION COMBINED WITH PLANOVALGUS FOOT MANAGED WITH COALITION RESECTION AND ARTHROERESIS: A CASE REPORT

Shu Hsin Yao

Background: alocalcaneal coalition is the most common cause of rigid flatfoot in adolescents. Diagnosis typically occurs at the onset of symptoms, which often coincides with the ossification of the coalition during the second decade of life. For patients with symptoms unresponsive to non-operative treatment, surgical intervention is generally recommended, though the optimal management approach remains a topic of debate. We present a case of bilateral talocalcaneal coalitions successfully treated with coalition resection and arthroeresis.

Reports: A 13-year-old girl presented with bilateral foot pain, particularly during walking. She was diagnosed with bilateral talocalcaneal coalition and rigid flatfoot. Treatment involved resection of the coalitions and arthroeresis. The calcaneal pitch (right/left) was 5.5/4.5 preoperatively and improved to 9/8 postoperatively. The talocalcaneal angle (right/left) was 42/50 and improved to 25/17.5. The preoperative AOFAS score was 65, which significantly improved to 94 postoperatively. The patient demonstrated favorable clinical and radiographic outcomes.

Conclusions: Historically, surgeons have focused on isolated coalition resection in cases of symptomatic tarsal coalition with concomitant rigid flatfoot. However, a review of the literature suggests that rigid planovalgus foot treated with resection alone is often associated with persistent disability and deformity. The arthroeresis is a simple surgical procedure to manage the flexible flatfoot and correct the hind foot alignment. According to our case, coalition resection combined arthroeresis lead to favorable outcome.

RAPID FIRE 4: LIMB RECONSTRUCTION / FOOT AND ANKLE

(1391) MULTIFACETED SURGICAL APPROACH FOR LEFT LOWER LIMB DIMELIA IN A 13 MONTH OLD GIRL WITH SUSPECTED GALLOP WOLFGANG SYNDROME: A CASE REPORT

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Introduction: Limb dimelia is a rare congenital anomaly characterized by limb duplication, leading to significant functional and aesthetic challenges. This case report highlights the diagnosis and surgical management of a 13-month-old girl with left lower limb dimelia, suspected to be associated with Gallop-Wolfgang syndrome.

Case Presentation: A 13-month-old girl presented with a left lower limb deformity, including one femur, one knee, two lower legs, and ten toes, along with an omphalocele. The deformity was undetected prenatally. Postnatally, the limb grew without pain but showed limited function. Examination revealed tibial-side muscle hypotrophy and a restricted yet functional tibial-side ankle. Developmental milestones were normal, and no family history of genetic conditions was noted. Surgical intervention involved Achilles tendon, tibialis posterior, and FHL lengthening, tibial and fibular shortening osteotomies, talus and calcaneus reduction, and wire fixation. A skin flap was used for coverage. Post-operative imaging confirmed successful fixation, and the patient demonstrated improved stability and alignment.

Discussion: Limb dimelia, particularly when linked to Gallop-Wolfgang syndrome, often escapes prenatal detection. A multidisciplinary, single-stage surgical approach effectively addressed structural and functional abnormalities, reducing the need for future surgeries. Long-term follow-up is essential to monitor growth and functional recovery.

Conclusion: Early, comprehensive surgical intervention for rare congenital limb deformities like dimelia improves alignment, functionality, and quality of life. Continued research is necessary to refine treatment strategies and assess long-term outcomes.

Keywords: Limb dimelia, Gallop-Wolfgang syndrome, Pediatric orthopedic surgery, Case report

RAPID FIRE 5: TECHNOLOGICAL ADVANCEMENT / FUTURE DIRECTIONS

(682) NEW RADIOLOGICAL CLASSIFICATION AND CUSTOMIZED SURGICAL TREATMENT OF SPRENGEL DEFORMITY, A SINGLE CENTRE EXPERIENCE

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Background: Sprengel deformity (SD) is a rare congenital condition characterized by a high-riding scapula, which often leads to functional limitations and cosmetic concerns. Current surgical approaches lack a standardized classification system to guide individualized treatment strategies.

Objective: This study aims to improve functional and cosmetic outcomes in children with SD by developing a novel radiographic classification system and applying individualized surgical strategies.

Methodology: A retrospective analysis was conducted on 37 patients with SD who underwent surgery after 2015. Patients with previous scapular or upper thoracic spine surgeries or a follow-up period of less than one year were excluded. The cohort had an average age of 5 years and 5 months. A new radiographic classification system was established, and patients were assigned to specific surgical techniques, including clavicle osteotomy and scapular repositioning, based on their classification. Preoperative and postoperative clinical and radiographic evaluations were conducted.

Results: Postoperative outcomes revealed 31 patients achieved Cavendish grade I, 9 achieved grade II, and 2 achieved grade III. The average shoulder abduction amplitude improved by 50 degrees. No significant changes in appearance or range of motion were observed during the one-year follow-up, and no recurrence of deformity was noted.

Conclusion: A novel radiographic classification system combined with individualized surgical strategies is effective in enhancing the functional and cosmetic outcomes for children with SD. Postoperative external fixation and early functional training play a critical role in maintaining these outcomes.

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(841) CLINICAL EVALUATION USE OF CALCIUM SULPHATE IMPREGNATED WITH VANCOMYCIN AND TOBRAMYCIN IN THE TREATMENT OF CHRONIC OSTEOMYELITIS IN CHILDREN

Ibrahim Abuomira

Background: In the treatment of chronic osteomyelitis, the common methods in primary stage are debriding, draining and lavaging, but the clinical outcomes are not always satisfactory1. Despite the variety of available treatment options of chronic osteomyelitis in children, including surgical procedures and antimicrobial therapy, bone infections are still a medical challenge as they are difficult to treat and cure.

Aim of the work: The goals of this treatment protocol are to eradicate infection, heal the ulceration/abscess/wound, and reduce or eliminate the need for intravenous antibiotics in the treatment of osteomyelitis and complex infections of the skin and soft tissue structures.

Patients and methods: From March 2012 to October 2015 a series of 17 chronic osteomyelitis in childern procedures were performed. All patients underwent surgical debridement followed by application of synthetic pure dissolvable calcium sulphate beads impregnated with antibiotics were employed.

Results and conclusion: The clinical outcome after six months amounted to successful treatment assessed as eradication of infection in 17 patients over the time of observation.

Key words: calcium sulphate, vancomycin, tobramycin, stimulan , children and chronic osteomyelitis.

(1151) AN INTELLIGENT COMPOSITE PREDICTION MODEL INCORPORATING GLOBAL, REGIONAL X RAYS AND CLINICAL PARAMETERS TO FACILITE AIS CURVE PROGNOSTICATION AND POPULATION SCREENING

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Background: Adolescent idiopathic scoliosis (AIS) affects up to 5% of the population. The efficacy of school-aged screening remains controversial since it is uncertain which curvatures will progress following diagnosis and require treatment. Patient demographics, vertebral morphology, skeletal maturity, and bone quality represent individual risk factors for progression but have yet to be integrated towards accurate prognostication.

Objective: The objective of this work was to develop composite machine learning-based prediction model to accurately predict AIS curves at-risk of progression.

Methodology: 1870 AIS patients with remaining growth potential were identified. Curve progression was defined by a Cobb angle increase in the major curve of ≥6° between first visit and skeletal maturity in curves that exceeded 25°. Separate prediction modules were developed for i) clinical data, ii) global/regional spine X-rays, and iii) hand X-rays. The hand X-ray module performed automated image classification and segmentation tasks towards estimation of skeletal maturity (DRU grading) and bone mineral density [2MCI (2nd metacarpal index)]. A late fusion strategy integrated these domains towards the prediction of progressive curves at first clinic visit.

Results: 2MCI scores adjusted by logistic regression for gender, age and DRU staging indicated that it was an independent factor for curve progression. Composite model performance achieved an accuracy of 83.2% (79.3-83.6%, 95% confidence interval), sensitivity of 80.9% (78.2-81.9%), specificity of 83.6% (78.8-84.1%) and an AUC of 0.84 (0.81-0.85), outperforming single modality prediction models (AUC 0.65-0.78).

Conclusion: The composite prediction model achieved a high degree of accuracy. Upon incorporation into school-aged screening programs, patients at-risk of progression may be prioritized to receive urgent specialist attention, more frequent follow-up, and pre-emptive treatment.

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(990) A THREE YEAR LONGITUDINAL COHORT STUDY ON THE PERIPUBERTAL CHANGES IN BONE QUALITIES AND MICROARCHITECTURE PHENOTYPE TRAJECTORY AND ITS CLINICAL IMPLICATIONS IN GIRLS WITH ADOLESCENT IDIOPATHIC SCOLIOSIS

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Background: Our previous study has clustered three bone microarchitecture phenotypes in girls with adolescent idiopathic scoliosis (AIS) based on HR-pQCT generated bone parameters: Phenotype-1 (normal phenotype); Phenotype-2 (low bone volume and high cortical bone density phenotype); and Phenotype-3 (low cortical and trabecular bone density and impaired trabecular microarchitecture phenotype). The clustered phenotypes were found to have significantly differentiated risk of curve progression and progression to surgical threshold in AIS girls.

Objective: The present study focused on prospective and longitudinal follow-up of a cohort of AIS girls during the peripubertal peak height velocity (PHV) with different initial phenotype clusters aiming to determine whether their phenotype cluster membership could change during this period.

Methodology: AIS girls (Cobb angle 10 ° – 20 °) with maturity staging at Thumb Ossification Composite Index (TOCI) stage 4 – 6 corresponding to time of peripubertal PHV (Sanders SMSS stage 2 – 5) were recruited at their first presentation. The bone microarchitecture profile was assessed with HR-pQCT and clustered into 1 of the 3 bone microarchitecture phenotypes. These patients were longitudinally followed up clinically, radiologically and with annual DXA and HR-pQCT scans for 3 consecutive years.

Results: 46 AIS girls (11.8 ± 0.9 years old, body height velocity 5.5 ± 2.3 cm/year) were included. Patients was Phenotype-3 had significantly lower areal BMD, total volumetric BMD, trabecular volumetric BMD, cortical area, cortical thickness, trabecular bone fraction, trabecular number, and trabecular thickness, and significantly higher trabecular separation during the 3-year follow-up. In Finite Element Analysis, Phenotype-3 was shown to be associated with significantly lower bone failure load and bone stiffness. 81.2% of patients with Pheneotype-3 had persistent phenotype during the 3-year follow-up.

RAPID FIRE 5: TECHNOLOGICAL ADVANCEMENT / FUTURE DIRECTIONS

Conclusions: This study confirms quantitative differences between the three phenotype clusters, and, without intervention, the microarchitecture phenotype trajectory persists without change in membership during the peripubertal growth period. These findings coupled with our previous studies on curve progression risk could have significant clinical prognostic implication in the management of AIS at the initial presentation.

(1134) PREDICTORS FOR TENOTOMY OF THE TENDOACHILLES IN THE TREATMENT OF IDIOPATHIC CLUBFOOT BY THE PONSETI METHOD: A SINGLE CENTER STUDY

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Background: The Ponseti method is the gold standard for treating idiopathic clubfoot, guided by Pirani scoring to tailor treatment and monitor outcomes. Percutaneous tenotomy is typically performed for persistent equinus after correction. Identifying predictors of tenotomy can help clinicians optimize treatment and implement preventive measures.

Objective: This study aims to determine the prevalence and predictors of tenotomy in children under 2 years with idiopathic clubfoot treated using the Ponseti method in a single-center tertiary hospital.

Methodology: A retrospective study was conducted. The records of 54 idiopathic clubfeet patients treated by the Ponseti method and scored by the Pirani system between April 2019 to April 2024 were analyzed. The demographic profile and clinical factors were compared between the tenotomy and non-tenotomy groups, including their association with tenotomy.

Results: Of the 54 feet studied, 33 (61%) required tenotomy. While higher odds for tenotomy were observed in patients older than 12 months, males, those from low-income households, and parents having a high school education, none were statistically significant (p>0.05). A high initial Pirani score (>4.5) and hindfoot score (≥2.5) also showed increased odds for tenotomy but were statistically insignificant (p>0.05). Although a midfoot score >1 was significantly associated with tenotomy (p=0.012), logistic regression did not confirm this association (p>0.05). Cast requirements, cast slips, and follow-up compliance similarly showed higher odds but no statistically significant associations with the need for tenotomy (p>0.05).

Conclusion: Patients with higher midfoot scores (≥1) were more likely to undergo tenotomy (p=0.012). Other factors, including initial Pirani score, hindfoot score, cast slips, cast requirements, follow-up compliance, age, sex, parental education, and economic status, showed no significant differences between the tenotomy and non-tenotomy groups.

Keywords: Idiopathic clubfoot, Pirani score, Ponseti method, Predictors, Tenotomy

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(728) Submuscular Plating Of Pediatric Femoral Shaft Fractures With Assistance Of External Fixation – Is It Reproducible?

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Background: Among the various fixation methods of pediatric femoral shaft fractures, submuscular plating (SP) is known to have an excellent outcome with a decreased rate of postoperative surgical events. However, this technique is a technically demanding procedure which may require a longer exposure time of intraoperative radiation to achieve an acceptable reduction.

Objective: The goal of this retrospective study was to investigate radiographic and functional outcomes including rotational alignment, after submuscular plating (SP) of pediatric femoral shaft fracture with assistance of external fixation(Ex-Fix).

Methodology: We retrospectively reviewed 28 patients of pediatric femoral shaft fractures between 5 and 16 years of age (mean, 9.5 years-old), excluding bilateral fractures or insufficient follow-up. Two 4- or 5-mm diameter Schanz pins were inserted at the anterior femur: one at the proximal segment and the other at the distal segment. Under the image intensifier, adequate reduction was achieved and maintained, and the proximal and distal pins were temporarily held by an external fixator. After making lateral submuscular tunnel, SP was performed using locking compression plate, followed by the removal of Ex-Fix. Radiographic outcome was evaluated, including coronal and sagittal alignments, rotational alignment, leg length discrepancy, and time to union. Functional outcome was evaluated according to the Flynn's criteria.

Results: Twenty-seven of 28 cases healed in average of 11.3 weeks, except one case of nonunion which needed additional bone graft. In coronal or sagittal planes, all cases showed acceptable alignment less than 10 degrees of angulation. In rotational alignment, 25 showed an insignificant change while 3 showed a significant change between 15 and 25 degrees (mean difference of rotation: -3.1 degrees). There was one case of significant leg length discrepancy over 20 mm (mean LLD: 4.4 mm overgrowth). In final follow-up, all patients achieved an excellent or satisfactory outcome according to Flynn's criteria.

Conclusion: In treating pediatric femoral shaft fracture, Ex-Fix assisted SP produced a reproducible radiographic and functional outcome with low complication rates of malunion or nonunion.

(1016) TRAPDOOR TECHNIQUE WITH ADJUVANT DEHYDRATED ALCOHOL AND CRYOABLATION FOR MONOSTOTIC FIBROUS DYSPLASIA

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Background: Monostotic fibrous dysplasia (MFD) involving the upper extremity is typically amenable to conservative treatment. However, surgery may be indicated in the presence of fragility fractures. While curettage with bone grafting is often used, graft resorption and local recurrence are common.

Objective: Hence, there is a need for advancement in treatment methods and technology in the treatment of MFD.

Methodology: This is a case series of 3 patients with MFD who underwent curettage with autograft cancellous bone chips, using a trapdoor technique with adjuvant dehydrated alcohol and cryoablation.

Results: The patients had a mean age of 11.5 years at initial presentation, with average age of operation at 13.7 years. The mean follow-up of all patients included was 1.7 years. All 3 patients showed excellent improvement in function and good bone remodelling. There was no recurrence or refracture.

Conclusion: Recurrence can be minimised using adjuvants such as cryoablation and dehydrated alcohol, over curettage alone. Our technique of cryoablation using dry nitrogen chip packing over traditional liquid nitrogen is also safer for the patient and surgeon. This is the first description of the use of the trapdoor technique or adjuvant dehydrated alcohol for fibrous dysplasia in the literature. This novel combination technique can be adopted effectively in both skeletally mature and immature patients showing great remodelling potential without growth arrest.

(1358) RADIOGRAPHIC MEASUREMENT OF MALROTATION IN PADEIATRIC SUPRACONDYLAR HUMERUS FRACTURE: A CADAVERIC STUDY

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Background: Supracondylar humerus fracture (SCHF) is common in the paediatric population. Distal fragment malrotation may lead to fragment tilt and cubitus varus deformity (CVD). There is no simple method to calculate or estimate the degree of this rotation. Accurate measurement would require CT scan and can be costly, time consuming, with more radiation exposure and not readily available.

Objective: This study attempted to calculate axial plane SCHF malrotation angle on a cadaveric humerus bone using plain radiograph.

Methodology: A paediatric cadaveric humerus bone was prepared. The bone then mounted on a wooden box frame. SCHF was reproduced onto the bone. X-rays were taken at rotation intervals from 0 degree to 90 degrees with 10 degrees sequential increment, in AP and Lateral views. Measurements taken from the radiographs and the data were analysed. Calculated ratio of each set was compared to the actual rotation angle.

RAPID FIRE 5: TECHNOLOGICAL ADVANCEMENT / FUTURE DIRECTIONS

Results: Based on the data and images taken, on AP view, there was no regular trend of increment that allows estimation or calculation of rotation. On lateral view, there was a linear trend upon each increment of rotation observed. A graph was plotted from the Calculated Ratio (PLAT /DLAT) and actual rotation angle of the cadaveric bone. This linear increment can be observed from 0 degrees until 50 degrees of rotation and plateaued beyond that until 90 degrees angle. Actual rotation can be determined by calculating lateral ratio and charting the value on the proposed graph from 0 until 50 degrees of rotation angle.

Conclusion: Malrotation angle in SCHF can be determined using this ratio from a plain lateral elbow radiograph, from 0 until 50 degrees of rotation angle.

(690) PRACTICAL STEPS TO ACHIEVE BETTER SURGICAL PERFORMANCE IN PEDIATRIC SUPRACONDYLAR FRACTURE OF THE HUMERUS

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Background: Even though routine surgical steps have been proposed for pediatric supracondylar fracture of the humerus, many pitfalls are still detected. The practical steps were developed and refined into a new module that needed to be evaluated.

Objective: To assess the effectiveness of the new module for pediatric supracondylar fracture of the humerus in terms of performance and self-confidence.

Methods: A cross-sectional study was conducted at the university hospital. Orthopaedic residents in academic year 2024 were recruited after informed consent. The module was consensus among pediatric orthopaedic staffs in regards with practical steps (patient and fluoroscopic positioning, sterile draping, reduction, pinning technique, and casting). Baseline characteristics (sex, year of training, pediatric orthopaedic rotation), performance score (100 points), and self-confidence score (25 points) were collected before and after studying the module.

Results: From 38 eligible orthopaedic residents, 25 were willing to participate. Among 25 included residents, residency years 1-4 were 8 (32%), 7 (28%), 4 (16%), and 6 (24%), respectively. Nine (36%) were female, and 13 (52%) had already passed pediatric rotation this year. After studying the module, participants significantly improved their performance skills (25.95 points, 95% confidence interval (CI): 19.33-32.57, $p < 0.0001$) and self-confidence (6.24 points, 95%CI: 4.73-7.74, $p < 0.0001$). Years of residency training and recent pediatric rotation experience demonstrated a non-significant association with improved performance skills and self-confidence.

Conclusion: The new module promisingly improved performance skills and self-confidence of orthopaedic residents independent to year of residency training and recent pediatric orthopaedic experiences.
Keywords: orthopaedic residents, self-confidence, reduction technique, pinning, casting

(502) UP IGF-I VIA HIGH-TOUGHNESS ADAPTIVE HYDROGELS FOR REMODELING GROWTH PLATE

Up IGF-I via High-toughness Adaptive Hydrogels for Remodeling Growth Plate

Introduction: The growth plate is essential for skeletal growth and development in children, but few studies have explored effective methods for remodeling growth plate damage and restoring skeletal growth. Addressing this gap could significantly improve treatments for growth-related skeletal conditions.

Objectives: This study aimed to fabricate mechanically adaptive dual-crosslinked hydrogel scaffolds that mimic the hierarchical structure of the growth plate and restore skeletal growth.

Methods: Aldehyde-modified Bacterial Cellulose (DBNC), Methacrylated Gelatin (GelMA), and Sodium Alginate (Alg) were used to create dual-crosslinked hydrogel scaffolds via ionic bonding and Schiff base reactions. The scaffolds were designed to resemble the growth plate and support chondrogenic processes. In vitro studies assessed chondrogenic gene expression (SOX9, ACAN, Col2a1), and osteogenic gene expression (RUNX2, BMP2, OST), with an additional focus on the effects of calcium ion incorporation. In vivo studies evaluated the upregulation of growth plate-related genes (Col10a1, KLF13, BMP2, RUNX3) and the scaffold's impact on cartilage regeneration.

Results: The hydrogel scaffolds effectively upregulated chondrogenic gene expression and suppressed osteogenic gene expression with or without calcium content. In vivo experiments demonstrated that the scaffolds selectively promoted the expression of genes involved in growth plate cartilage regeneration. The scaffolds also created a hypoxic microenvironment, activating IGF-1-related signaling pathways critical for growth plate repair.

Conclusion: The dual-crosslinked hydrogel scaffolds mimicked the structure and function of the growth plate, facilitating bone growth in children by promoting chondrogenesis through IGF-1 signaling.

Key words: Bacterial nanocellulose; Methacrylated Gelatin; Alginate; Children; Growth plate

(1198) APPLICATION OF LIQUID NITROGEN IN LIMB RECONSTRUCTION FOR PEDIATRIC OSTEOSARCOMA: ACHIEVEMENTS, CHALLENGES AND SOLUTIONS

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Background: Osteosarcoma is the most common primary malignant bone tumor in children. Notably, the technique of using autologous bone graft treated with liquid nitrogen to eliminate malignant cells has emerged as a promising limb reconstruction solution for pediatric patients, offering several advantages over other reconstruction methods. Delayed bone union is a therapeutic challenge for this method. We applied the technique of percutaneous autologous bone marrow injection to treat cases of delayed bone union complications, achieving excellent results.

Objectives: The purpose of this study was to assess the results, complications, and treatment solutions of limb reconstruction using liquid nitrogen-treated autologous bone grafts in children with osteosarcoma.

Methodology: From 2022 to 2025, we conducted a study on 12 pediatric patients who underwent bone tumor resection and reconstruction using liquid nitrogen-treated autologous bone grafts. The resected bone segment was structurally preserved, then dipped in liquid nitrogen for 25 minutes, thawed at room temperature for 15 minutes, and subsequently immersed in a betadine-mixed saline solution for 10 minutes. Among these patients, 3 experienced delayed bone union after reconstruction and were treated with percutaneous autologous bone marrow injection, with follow-up for 8 months.

Results: Most reconstructed cases provided good local control and functional outcomes. At a mean follow-up of 22.2 months, no local recurrence was observed. However, 3 cases experienced delayed union. The mean bone healing time was 10.2 months. The mean Musculoskeletal Tumor Society (MSTS) functional score was 86%. For the cases of delayed union, treatment outcomes were evaluated based on clinical and radiological criteria, with excellent results achieved in 100% (3/3) of cases.

Conclusion: Liquid nitrogen-treated autologous bone grafting is a viable option for reconstructing biologically deficient bone after tumor resection, particularly in areas where prosthetic reconstruction is challenging. This technique provides satisfactory outcomes with low rates of local recurrence, contributing to cost-effectiveness. Percutaneous autologous bone marrow injection is an effective method for managing delayed bone union after reconstruction, ensuring positive outcomes without causing complications.

RAPID FIRE 6: TECHNOLOGICAL ADVANCEMENT / FUTURE DIRECTIONS

(866) MEASURING FEMORAL NECK ANTEVERSION ANGLE IN CHILDREN WITH INTOEING GAIT USING FEMORAL PLAIN FILMS

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Background: The femoral anteversion angle (FAA) decreases from about 30° at birth to 15°–25° by adolescence. Increased FAA often causes in-toeing gait, usually resolving spontaneously by age eight. Persistent cases may lead to unsteady gait, falls, and joint pain. FAA is commonly assessed using imaging techniques like CT, which measures the angle between the femoral neck and condyles, but concerns over high radiation exposure highlight the need for safer alternatives.

Objective: Our study interprets 2D plain films to determine FAA.

Methodology: Children with in-toeing gait and positive torsion profiles were included. True anteroposterior and lateral femoral X-rays were analyzed using trigonometric calculations to determine FAA. CT images of the proximal and distal femur were also performed separately to measure the FAA. The FAA measured by CT was compared with that obtained from femoral X-ray.

Results: Twenty patients aged 7-12 were studied. The FAA calculated by CT scan and femoral X-ray for the 20 participants ranged from 25.8 to 35.4 degrees, with differences between the two measurements ranging from 0.2 to 0.5 degrees. The mean difference was 0.365 degrees (SD = 0.107). The paired samples t-test revealed a t-value of 1.52, which did not exceed the critical value at a 0.05 significance level, indicating no statistically significant difference ($p > 0.05$) between the FAA calculated by CT scan and that obtained from femoral plain films.

Conclusion: CT is the gold standards for measuring FAA but high radiation exposure raises concerns about potential harm to children. Calculate the FAA with mathematical method is easy and precise in routine plain films. With specific designed image analysis program, the application of this method is reproducible for our daily practices. Integrating torsion profile data and FAA from CT scans and femoral X-rays shows consistency in clinical and imaging results. This study demonstrates the feasibility of using femoral X-rays to obtain FAA.

(1389) Procedural Outcomes Of G Arm Versus C Arm Fluoroscopy In Patients Undergoing Closed Treatment Of Supracondylar Humeral Fractures In A Tertiary Hospital

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Background: Supracondylar humeral fractures (SHFs) are common in the pediatric population and require closed reduction and percutaneous pinning (CRPP) for treatment. The use of fluoroscopy during CRPP is essential to ensure accurate pin placement and reduce the risk of complications. The choice of fluoroscopy equipment can significantly impact the procedural outcomes in terms of both safety and efficacy. The G-arm and C-arm fluoroscopic systems are both used to guide closed treatment of supracondylar humeral fractures. However, procedural outcomes have not been directly compared in literatures.

Objective: This study determines the procedural outcomes of patients who underwent closed treatment of Supracondylar Fractures using C-arm versus G-arm fluoroscopy in a tertiary hospital

Methodology: The design of the study is prospective cross-sectional in nature. Over a 1-year period, the use of G-arm and C-arm device was evaluated in admitted patients who underwent treatment of Supracondylar Humeral fractures. Randomization of study participants was done. Mean operative duration and surgical time during C-arm fluoroscopy versus G-arm fluoroscopy, functional outcome and post operative complications were recorded.

Results: The G-arm group showed significantly shorter procedure times compared to the C-arm group ($p < 0.05$). No statistically significant difference was recorded in radiation exposure, functional outcome and post operative complications.

Conclusion: The G-arm fluoroscopy system offers improved procedural outcomes in terms of shorter operative time and efficiency in the closed treatment of supracondylar humeral fractures.

(769) Management Of Paediatric Long Bones Fracture With Intramedullary Rush Pins: An Effective Method Of Treatment

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Mode of Presentation: Oral

Introduction: Long bones fracture is common in children. Most frequently fractured bones are both bones forearm followed by shaft of femur, shaft of tibia and shaft of humerus. The trend of management is changing from conservative management by plaster cast to operative management with time. The common methods of operative management are fixation with pin and plaster, k-wires, rush pins, TENS, kuntscher nails and plating.

Methods: We treated 421 long bones fractures with intramedullary rush pins from August 2011 to July 2022 in the Department of Orthopedics, Alive Hospital and Trauma Centre, Bharatpur, Chitwan. They were between 3 to 16 years of age. There were 328 males and 93 females There were 251 both bone forearm fractures, 62 shaft of femur fractures and rest were shaft of tibia fractures and multiple fractures. Left side was involved in 214 cases and right side in 204 of cases.. Primary definitive treatment with intramedullary rush nailing was done within 12 hours of presentation in all cases and immobilized in slab for 6 weeks. Weight bearing and range of motion was allowed at 4 weeks.

Results: All the fractures united in six weeks to three months time. There were no infections, no refracture, no deformity and no any other complications with less morbidity.

Conclusion: Operative treatment with intramedullary rush pins in pediatric long bones fractures especially in multiple and open fractures is effective and safe method of treatment, It has a good outcome with less morbidity.

Key words: Paediatrics long bone , Fracture, Rush Pin

(955) BIOMECHANICAL ASSESSMENT OF KIRSCHNER WIRES INTEGRATED WITH A NOVEL EXTERNAL FIXATION DEVICE FOR TREATMENT OF PEDIATRIC SUPRACONDYLAR HUMERAL FRACTURE: A FINITE ELEMENT ANALYSIS

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Background: Pediatric supracondylar humeral fractures present considerable surgical challenges due to the difficulty of achieving proper fracture alignment and stable fixation while avoiding injury to the ulnar nerve. This study assesses the biomechanical performance of a novel Kirschner wire (K-wire) fixation device (KFD), designed to enhance stability and reduce complications linked to traditional K-wire configurations.

Methods: Using finite element analysis (FEA), we evaluated four fixation strategies for treatment of pediatric supracondylar humeral simple transverse fractures: crossed pin fixation, crossed pin fixation with KFD, two lateral pin fixation, and two lateral pin fixation with KFD, under various mechanical loads. The analysis focused on the stress and strain experienced by the K-wires at the fracture site during torsional and bending forces.

Results: FEA revealed that the KFD significantly reduced the stress and strain on the K-wires in all configurations. In both crossed pin and two lateral pin fixation methods, the addition of the KFD showed lower stress and strain levels compared to setups without the KFD.

Conclusion: This study demonstrates the potential of the KFD to enhance fracture stability and reduce mechanical stress at the fracture site, suggesting a promising improvement in the treatment of pediatric supracondylar humeral fractures. This innovation may contribute to safer and more reliable outcomes in pediatric orthopedic surgery.

RAPID FIRE 6: TECHNOLOGICAL ADVANCEMENT / FUTURE DIRECTIONS

(1398) DOES THE TRAJECTORY OF PIN FIXATION IN THE SAGITTAL PLANE WAS AFFECTED TO THE FAILURE OF FIXATION IN SUPRACONDYLAR HUMERAL FRACTURE? : A BIOMECHANICS STUDY

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Background: Supracondylar humeral fractures are the most common elbow fractures in children, often treated with closed reduction and percutaneous pinning. The failure of fixation leading to loss of reduction which occurred in 10-20% of cases. Biomechanical studies showed the importance of pin configuration, size, and entry points. However, the pin trajectory in the sagittal plane remains underexplored. The normal anatomy of distal humerus is tilted anteriorly. We hypothesized that the pin fixation from along the anatomy of distal humerus from anterior to posterior in sagittal planes should be more secure fixation than the pin trajectory from posterior to anterior.

Objective: To compare the stability of pinning constructs between anterior-to-posterior (A-P) and posterior-to-anterior (P-A) trajectories under extension forces.

Materials and Methods: This is a biomechanics study. We used embalmed cadaveric distal humeri and categorized into 2 groups; The A-P group and The P-A group. Eight specimens in each groups were tested. Stability was assessed by measuring "Stiffness (N/mm)" in extension forces at a rate of 0.5 mm/s and 4 mm distance.

Results: The mean stiffness in A-P group = 8.97 ± 1.8 N/mm, and P-A group = 11.3 ± 1.4 N/mm. There were no statistically significant difference between 2 groups in term of stiffness.

Conclusion: The construct stiffness of pin trajectory fixation in the sagittal plane of supracondylar fracture of distal humerus was not met statistically significant difference between 2 groups. Many factors including divergent construct, pin separation in coronal plane may influent to stability of pin fixation of supracondylar fracture of distal humerus.

(723) CLOSED REDUCTION AND PERCUTANEOUS PINNING OF DISLOCATIVE TYPE OF PAEDIATRIC LATERAL CONDYLE FRACTURE OF HUMERUS FOUR CASES REPORT ABSTRACT

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Background: Pediatric lateral condyle fractures of humerus (LCFHs) with posterior elbow dislocation (dislocative type) are rare reported, and the optimal treatment for these cases is unclear. This study aims to determine the feasibility of closed reduction and percutaneous pinning (CRPP) in treating these fractures.

Case presentation: We retrospectively report 4 cases from October 2018 to December 2024 who had dislocative type fractures of LCFHs in skeletally immature children, treated by CRPP. Cosmetic results were described as excellent by all of four patients. There was no superficial infection, no refractures and no incidences of nonunion, growth arrest.

Conclusion: Based on our own experience, we advised closed reduction of the elbow dislocation by a manipulation of traction, then try to stabilization of fractures by CRPP with acceptable position within 2 mm residual displacement. we demonstrated that CRPP is a safe and efficient technique for treating dislocative type fractures, and patients can avoid an incision without complications.

Key words: fracture; elbow dislocation; closed reduction; percutaneous pinning; children

(724) CLOSED REDUCTION OF TWO SUB TYPES OF ROTATED HUMERUS LATERAL CONDYLE FRACTURES ACCORDING TO NEW CLASSIFICATION IN CHILDREN

Background: In recent years, a few studies have mentioned closed reduction and percutaneous pinning (CRPP) of rotated lateral condyle fractures of the humerus in children. In this prospective investigation, the radiographic and clinical results of patients with these fractures that were initially managed with CRPP were newly classified.

Methods: A total of 35 pediatric patients with rotated lateral condyle fractures were identified between Sep. 2021 and Oct. 2024.We classified these fractures into two types according to the degree and pattern of fracture displacement as identified on four radiographic images. In Type I (single rotated type), the fracture is unstable with single rotation of distal fragment; In Type II (rotated and flexible type) with rotation of distal fragment and antero-proximal displacement. We also designed an algorithm for closed reduction of these fractures according to this new classification.

Results: We retrospectively analyzed the radiographic and clinical results of 35 unstable rotated fractures (in 22 boys and 13 girls) that were treated with closed reduction. 17 of 19 (89.5%) type I fractures, which could have been reduced to within 2 mm of residual displacement, were treated with closed reduction and pinning with 2 or 3 Kirschner wires (K wires). 15 of 16 (90.7%) type II fractures were treated with CRPP. There were no complications, such as nonunion, osteonecrosis of the capitellum, superficial or deep infection, malunion, or early physeal arrest.

Conclusion: This prospective study showed that lateral humeral condyle fractures with rotation can be initially treated with CRPP to achieve satisfactory recovery of the elbow.The algorithm, according to the new classification, can effectively enhance the rate of closed reduction. Kirschner wire (K wire) fixation is recommended to avoid reoperation or anesthesia for hardware removal.

Keywords: Fractures; Children; Closed reduction; Kirschner wire; Pinning

(1223) THE USE OF 3 D PRINTED ORTHOSIS IN PAEDIATRIC ORTHOPAEDIC DEFORMITY: A SYSTEMATIC REVIEW

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Background: Three-dimensional (3D) printed orthosis have emerged as a transformative tool in paediatric orthopaedics, which can be used for tailored solutions for children suffering from various orthopaedic deformities. The device will be fabricated using additive manufacturing techniques that enable the precision of customization of the device to meet the unique anatomical and functional requirements of paediatric orthopaedic patients.

Objective: To evaluate the use of 3D-printed orthosis in paediatric orthopaedic deformities on clinical outcomes.

Methodology: Original studies published between 2014 and 2024 describing the use of 3D-printed orthosis in paediatric orthopaedic conditions were sought from Scopus, ProQuest, ScienceDirect, and MEDLINE via Pubmed. Studies were carried out based on the PRISMA 2020 statement. Among the selected publications, study and participant characteristics as well as the type of orthosis and the outcomes were extracted.

Results: Thirteen studies fit the defined criteria after applying the inclusion and exclusion criteria, with 654 paediatric patients involved within 3 to 96 weeks of follow-up. Three-dimensional printed orthoses were mainly used in paediatric spinal conditions (53.9%) to treat adolescent idiopathic scoliosis (AIS) and showed better correction, reduced weight, and improved wearability. Positive outcomes were also found in upper extremity conditions (30.8%), with enhanced effective fracture immobilization, patient comfort, and high satisfaction; and lower extremity conditions (15.3%) showed better pressure distribution with good biomechanical function and compliance.

Conclusion: Three-dimensional printed orthosis offers great promise in paediatric orthopaedic management, combining efficacy with some patient-centered benefits. More research is needed, especially studies of larger series and longer follow-ups to confirm these results and extend these indications clinically.

RAPID FIRE 6: TECHNOLOGICAL ADVANCEMENT / FUTURE DIRECTIONS

(957) MINIMALLY INVASIVE CATHETER WASHOUT FOR TREATMENT OF INTRAMEDULLARY OSTEOMYELITIS IN CHILDREN: SURGICAL TECHNIQUE AND CASE REPORT

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Background: There is no consensus on how to treat intramedullary abscesses for paediatric osteomyelitis of the long bones. We describe here a novel minimally invasive approach in the treatment of intramedullary osteomyelitis in children.

Report: A 4-year old boy with no comorbidities presented to the children's emergency with a 10-day history of pain and swelling of the left ankle associated with fever and difficulty weight bearing. There was no trauma, pain in other joints, numbness, weakness, or other symptoms. On examination, there was mild warmth and swelling over the ankle with tenderness over the distal tibia and pain on ankle range of motion. The skin and distal pulses were intact. Blood investigations showed a white blood cell count of 19.17 x 109, C-reactive protein of 97.7 mg/L, and an erythrocyte sedimentation rate of 69 mm/hr. A left ankle radiograph showed a lucent lesion in the distal tibia metaphysis with a wide zone of transition. An MRI demonstrated osteomyelitis of the left tibia with intramedullary abscesses extending from the distal epiphysis to the proximal metadiaphyseal region. The patient subsequently underwent surgical debridement and washout. Intra-operatively, the proximal tibia physis was identified and protected and anteromedial incision proximally and distally were made. Following distal tibia corticotomy, tissue and bone was sent for cultures. A 2.5 mm Synthes flexible intramedullary nail was subsequently inserted antegrade, passed distally under fluoroscopic guidance, and used to tunnel guide irrigation catheters through the tibia. Extensive irrigation with hydrogen peroxide, chlorhexidine, and iodine was performed, followed by drain insertion and skin closure. Post-operatively, the inflammatory markers downtrended and the patient recovered well. Intra-operative cultures subsequently grew pan-sensitive streptococcus pyogenes. Histopathology demonstrated fibrinopurulent material consistent with osteomyelitis. Infectious diseases advised for six weeks total of intravenous and oral antibiotics. The drain was removed after three days and the patient was discharged for outpatient follow-up.

Conclusion: Minimally invasive debridement and irrigation may be preferable to avoid extensive soft tissue damage associated with open debridement and bony drilling. We found that catheter irrigation using flexible intramedullary nails was effective in drainage of intramedullary osteomyelitis.

(1281) BIOMECHANICAL ANALYSIS OF STIFFNESS IN SCREW FIXATION TECHNIQUE FOR LATERAL HUMERAL CONDYLE FRACTURE

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Background: Lateral humeral condyle fractures in pediatric patients are relatively common injuries that occur in the elbow accounting for up to 20%. It is the second most common injury of the elbow. Surgical management for displaced fracture of >2mm traditionally treated with K-wire fixation. However, this fixation was reported to have higher complications such as infection, insufficient stability, and limited range of motion elbow after treatment. Recently, cannulated screws have been reported to have better stability in fixation. The technique of screw fixation at lateral column has been reported as an optimal screw placement and stable fixation.

Objective: To compare biomechanical stability of two different screw fixation techniques of screw and wire in lateral humeral condyle fracture.

Methodology: This study aims to compare stiffness in between two constructs of screw fixation; first with screw placed at lateral column, and second is screw fixation with K-wire insertion. Thirty-six synthetic humeri bones with Milch Type 2 fractures were fixed with 2 screw fixation techniques. Fractures were reduced and fixed with either single screw that is placed at lateral column, or screw with addition of K-wire that is fixed transversely. Fixed synthetic bones were then mechanically tested simulating in vivo forces in four directions; anterior, posterior, varus, and valgus.

Results: Biomechanical testing shows that construct with fixation screw and K-wire is superior in stiffness, maximum load and energy absorb when compared with single screw fixation.

Conclusion: Fixation method with using screw and K-wire construct provides highest stiffness compared to single screw at lateral column.

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(842) PREOPERATIVE IMAGING PREDICTORS OF TYPE IV PEDIATRIC SUPRACONDYLAR HUMERAL FRACTURES AND EARLY GUIDANCE FOR SURGICAL MANAGEMENT

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Background: Type IV pediatric supracondylar humeral fractures are rare and can only be confirmed through dynamic intraoperative evaluation.

Objectives: To identify predictive preoperative imaging indicators for type IV fractures and provide early guidance for subsequent diagnosis and treatment.

Methodology: Pediatric patients diagnosed with supracondylar humeral fractures and treated surgically at our hospital between January 2019 and January 2023 were included. Preoperative and intraoperative clinical data were collected and analyzed. Intraoperative fracture stability assessment was performed to confirm type IV fractures. Binary and multivariate logistic regression analyses were used to construct a predictive model for type IV fractures, while Lasso regression was applied to identify the most significant predictive features.

Results: A total of 266 children with supracondylar humeral fractures were included in the study, comprising 233 type III cases and 33 type IV cases. There were no statistically significant differences between the two groups in terms of age, sex, affected side, nerve injury, vascular injury, open fractures, or associated fractures ($P > 0.05$). Significant differences were found in intraoperative variables, including conversion from closed to open surgery, leverage reduction, use of medial pins, operative time, and intraoperative blood loss. Regression analysis revealed that an outwardly tilted fracture line, degree of fracture displacement, and lateral displacement of the distal fragment were risk factors. Combined regression analysis indicated that an outwardly tilted fracture line combined with either fracture displacement or lateral displacement of the distal fragment were significant risk factors. Lasso regression identified the outwardly tilted fracture line as the most significant predictor of type IV fractures.

Conclusions: In type III supracondylar humeral fractures with an outwardly tilted fracture line, the probability of type IV fractures increases regardless of the presence of fracture displacement or lateral displacement of the distal fragment. Early intraoperative planning and preparation are recommended for such cases, as type IV fractures are associated with longer operative times, greater blood loss, and a higher likelihood of requiring medial pin fixation compared to type III fractures.