Genu varus deformity

The correction of genu varum for patients with medial compartment osteoarthritis is a well-established treatment with the goal of reducing knee pain and slowing the development of knee arthritis. A full correction of varus and even overcorrection is necessary to achieve these goals. The use of osteotomy in patients with genu varum to prevent arthritis ever occurring is more controversial. The following case will present the story of an elite soldier whose job requires him to be in peak physical condition. His experience of restructuring surgery and ability to recover and surpass his pre op athleticism will be described. Short clinical history: This is a 33-year-old man who is part of United Sate's special forces who began experiencing medial knee pain with running and other high-power activities. He had bilateral genu varum since childhood and attributed the pain to this deformity. He was found to have varus deformity limited to the coronary artery that involved the right proximal tibia and left proximal tibia and distal femur. He was eagerly anatomically reducing the deformities with external fixation with the goal of returning to high-power activities that surpassed his pre op function. Preoperative ProblemList Bilateral symptomatic genu varum without arthritis High level exercise treatment strategy Plan was to correct the left side first including both femoral and tibial osteotomy. The osteotomy of the femur was done with an acute method of correction with the help of static external fixation. Osteoplastics of ipsilateral tibia with external fixation were performed simultaneously. The tibia deformity was corrected gradually to ensure a perfect mechanical axis adjustment. The right side was corrected 6 weeks later. This gave the left side sufficient time to heal. The left then became the strong side and supported the newly-run right. Right side correction required only tibial osteotomy and a uniplanar fixator.

Basic principles of Femoral osteotomy with external fixation can be done percutaneously, with minimal blood loss and allowing immediate post op weight storage. Femoral osteotomy with a plate requires an open approach to the femur, is associated with greater blood loss, and requires protective weight stock. Opening wedge osteotomy with plating also requires bone graft. Gradual correction of tibial deformity is achieved with external fixation. Uniplanar deformity is addressed with a monolateral frame, while multiplanar and oblique plan deformities are more effectively corrected with circular fixation. Hydroxyapatite-coated, tapered, 6 mm semi-needles provide excellent fixation. Patients perform adjustments at home after a short wait. The deformity correction continues at 1mm per day and takes from 10-21 days. The adjustment is adjusted until the desired mechanical axis is achieved measured on 51 standing X-rays. Technical beads: The use of needleed semistick insertion technique has made the application of one-sided more accurate. A wire is used to find the ideal insertion point for the first half pin. A canned drill slipped over the wire and both cortics are drilled. The half stick is then placed in the borehole. Monolateral fixers are extremely unforgiving, and this method has made the application easier. Avoiding and dealing with problems In active patients, tibial fractures through a pin hole are a concern such as the collapse of the newly formed regenerate leg. Although these complications are extremely rare, they remain a concern immediately after removal of frames. The protocol used after image removal includes the use of a hinged knee support with a maximum of 50% weight bearing for 2 weeks. Patients are then allowed to cancel support and proceed to full weight after receiving a new X-ray. The patient can then resume low-power exercises. Running and sports are allowed 3 months after removal of frames. References and Suggested Reading 1. Ashfaq K, Fragomen AT, Nguyen JT, Rozbruch SR. Correction of proximal tibia varus with external fixation. L Knee Surg. 2012 Nov;25(5):375-84 2. Fragomen AF, Rozbruch SR. Proximal Tibial Osteotomy for Medial Compartment osteoarthritis of the knee using Taylor Spatial Frame Techniques in knee surgery 2005;4(3):173-18 3. Rozbruch SR, Fragomen A, Ilizarov S. Correction of tibial deformity with the use of Ilizarov / Taylor Spatial Frame. JBJS-Am 88-A 2006, Suppl. 4:156-174 4. Bae DK, Sang SJ, Kim HJ, Seo JW. Change in limb length after high tibial osteotomy. Knee Surg Sport Traumatol Arthrosc. 2013 Jan;21(1):120-6 5. Paley D, Herzenberg J. Restructuring for mono-compartment osteoarthritis of the knee. Pp479-509. Chapter 16 of principles of deformity correction. Springer-Verlag Berlin 2002 Posted: 7/29/2014 Authors Genu varum (archben) denotes the varus angular deformity of the knee joint, where the leg bends outwards on the knee, while the lower leg is angled medially. Genu varum is physiological in newborns and infants and reaches its peak between 6 and 12 months. During normal growth, the tibiofemoral angle reaches zero between 18 and 24 months, of which it turns into a physiological genu valgus, finally reaching adult configuration at ages 6 to 7 years. Genu varum after the age of 2 is considered to be abnormal 1.2.Common causes: physiological (infants and newborns) rickets (vitamin D deficiency or refractory, caused by hypophosphataemia) bendysplasia (e.g. achondroplasia) asymmetrically arrested growth of medial distal femur and proximal tibia (e.g. osteoarthritis, fracture, tumor) Blount disease (tibia vara) osteoarthritis of previous trauma Proper radiographic assessment of genu varum necessitates standing AP and LL radiographers to include hip, knee and ankle. In paediatric patients, the growth plates should be carefully evaluated. In physiological genu varum, the bones show normal structure, while e.g. rickets will show thickened physics, enlarged epiphyses, coarse bone cortical bone density 1. Varus deformity can be quantified by hip-knee-ankle angle (HKA), which measures the angle between the mechanical axis of the femur and the center of the ankle joint at the AP, full length, weight-bearing X-rays. The first line is drawn between the middle of the thigh head and the femoral intercondylar point, while the second line runs from the tibial interspinous point to the tibial mid-plafond point. The angle between these lines determines HKA. The normal range varies due to the physiological varus angle in infants, but is usually 1-1.5° in healthy adults 3.The management of genu varum focuses primarily on the treatment of the underlying condition (e.g. vitamin D supplementation in rickets). if conservative therapy (e.g. invigorating, splints) fails, surgical treatment (valgus osteotomy of the tibia) can be considered 1.1. Espandar, Ramin, Mortazavi, Seyed Mohammad-Javad, Baghdadi, Taghi. Angular deformities in the lower leg in children. (2010) Asian Journal of Sports Medicine. 1 (1): 46. Doi:10.5812/asjsm.34871 - Pubmed 2. Jugesh I. Cheema, Leslie E. Grissom, H. Theodore Harcke. Radiographic properties of the lower extremities bowing in children1. (2003) RadioGraphics. 23 (4): 871-80. doi:10.1148/rg.234025149 - Pubmed 3. Sheehy L, Felson D, Zhang Y, Niu J, Lam YM, Segal N, Lynch J, Cooke TD. Does the measurement of anatomical axis consistently predict hip-knee-ankle angle (HKA) for knee adjustment studies in osteoarthritis? Analysis of langlem radiographers from the multicenter osteoarthritis (MOST) study. (2011) Osteoarthritis and cartilage. 19 (1): 58-64. Doi:10.1016/j.joca.2010.09.011 - Pubmed 1. Chantrain A. Knee joints in football players: osteoarthritis and axis deviation. With Sci Sport Exerc. 1985;17:434–9. [PubMed] [Google Scholar] 2. Brouwer GM, Van Tol AW, Bergink AP, et al. Correlation between valgus and varus alignment and development and progression of radiographic osteoarthritis of the knee. Arthritis Rheum. 2007;56:1204–11. [PubMed] [Google Scholar] 3. Sharma L, Song J, Felson DT, et al. The role of knee adjustment in disease progression and functional decrease in knee osteoarthritis. Jama. 2001;286:188–95. [PubMed] [Google Scholar] 4. Wu DD, Burr DB, Boyd RD, Radin EL. Bone and cartilage changes after experimental varus or valgus tibialangulation. In 1990, 1990–800,000 people were voted out. [PubMed] [Google Scholar] 5. Bradway JK, Class RA, Peterson HA. Blount disease: a review of the English literature. J Pediatr Orthop. 1987;7:472–80. [PubMed] [Google Scholar] 6. Lun V, Meeuwisse H, Stergiou P, Stefanyshyn D. The ratio of running injuries to static lower limb alignment inrecreational runners. Brit J Sports Med. 2004;38:576–80. [PMC free article] [PubMed] [Google Scholar] 7. Messier SP, Davis SE, Curl WW, Lowery RB, Pack RJ. Etiological factors associated with patelofemoral pain in runners. With Sci Sport Exerc. 1991;23:1008–15. [PubMed] [Google Scholar] 8. Taunton JE, Ryan MB, Clement DB, Mc Kenzie Lloyd Smith DR, Zumbo BD. A retrospective case-control analysis of 2002 running injuries. Br J Sports Med. 2002;36:95–101. [PMC free article] [PubMed] [Google Scholar] 9. van Mechelen W. Running injuries. A review of epidemiological literature. 1992–1992:14:320–35. [PubMed] [Google Scholar]10. Wen DY, Puffer JC, Schmalzried TP. Injuries in runners: a prospective study of adjustment. Clin J Sport Med. 1998;8:187–94. [PubMed] [Google Scholar]11. Arazi M, Oğün TC, Memik R. Normal development of the tibiofemoral angle in children: a clinical study of 590 normal people from 3 to 17 years of age. J Pediatr Orthop. 2001;21:264–7. [PubMed] [Google Scholar]12. Gordon CM, Feldman HA, Sinclair L, et al. The prevalence of vitamin D deficiency among healthy infants and toddlers. Erke pediatr ungdoms med. 2008;162:505–12. [PMC free article] [PubMed] [Google Scholar]13. Christie DP. The spectrum of radiographic bone changes in children with fluores res res and more. Radiology. 1980;136:85–90. [PubMed] [Google Scholar]14. Bajpai A, Bardia A, Mantan M, et al. Non-azotemic refractory rickets in Indian children. Indian pediatrician. 2005;42:23–30. [PubMed] [Google Scholar]15. Kwee TC, Beemer F A, Beek FJ, et al. Knee radiography in the diagnosis of skeletal dysplasia. Pediatr Radiol. 2006;36:8–15. [PubMed] [Google Scholar]16. Desai SS, Shetty GM, Song HR, et al. Effect of foot deformity on conventional mechanical axis deviation and earth mechanical axis deviation during single-leg posture and two bone posture in genu varum. Knee. 2007;14:452–7. [PubMed] [Google Scholar]17. Do TT. Clinical and radiographic evaluation of bowlegs. Curr Opin Pediatr. 2001;13:42–6. [PubMed] [Google Scholar]18. Cheema JI, Grissom L E, Harcke HT. Radiographic properties of the lower extremities succumb in children. Radio graphics. 2003;23:871–80. [PubMed] [Google Scholar]19. Accadbled F, Laville M, J, Harper L. One-stage treatment for developed Blount's disease: four cases and review of the literature. J Pediatr Orthop. 2003;23:747–52. [PubMed] [Google Scholar]20. Manner HM, Radler C, Ganger R, Grill F. Knee deformity in congenital longitudinal deficiencies in the lower limb. In 2006, an article was published in Clin Orthop Relat Res. [PubMed] [Google Scholar]21. Lee ST, Song HR, Mahajan R, et al. Development of genu varum in achondroplasia: relation to fibular overgrowth. J Bone Joint Surg Br. 2007;89:57–61. [PubMed] [Google Scholar]22. Bhavnagri S, Steele N, Massasso D, et al. Meningococcal-associated arthritis: infection versus immune mediated. Intern Med J. 2008;38:71–3. [PubMed] [Google Scholar]23. Misra M, Pacaud D, Petryk A, et al. Drug and Therapeutics Committee of the Lawson Wilkins Pediatric Endocrine Society. Vitamin D deficiency in children and its management: review of current knowledge and recommendations. Pediatrics. 2008;122:398–417. [PubMed] [Google Scholar]24. Lavelle WF, Shovlin J, Drvaric DM. The reliability of metaphyseal-diaphyseal angle in tibia vara measured on digital images by paediatric Surgeons. J Pediatr Orthop. 2008;28:695–8. [PubMed] [Google Scholar]25. Raney EM, Topoleski TA, Yaghoubian R, Guidera KJ, Marshall JG. Orthopedic treatment of infantile tibia vara. J Pediatr Orthop. 1998;18:670–4. [PubMed] [Google Scholar]26. Staheli LT. Torsion - treatment indications. Clin Orthop. Relat Res. 1989;247:61–6. [PubMed] [Google Scholar]27. Kodkani PS. Dome osteotomy of proximal tibia for genu varum treated with a new fixation device. J Knee Surg. 2007;20:111–9. [PubMed] [Google Scholar]28. Castañeda P, Urquhart B, Sullivan E, Haynes RJ. Hemiepiphysiodesis for correction of angular deformity about the knee. J Pediatr Orthop. 2008;28:188–91. [PubMed] [Google Scholar]29. Yoo JH, Choi IH, Cho TJ, et al. Development of tibiofemoral angle in Korean children. J Korean With Sci. 2008;23:714–7. [PMC free article] [PubMed] [Google Scholar]30. Van Gheluwe B, Kirby KA, Hagman F. Effects of simulated genu valgum and genu varum on ground reaction forces and subtalar joint function during gait. J Am Podiatr With Assoc. 2005;95:531–41. [PubMed] [Google Scholar]31. Janakiramanan N, Teichtahl AJ, Wluka AE, et al. Static knee adjustment is associated with the risk of one-partmental knee cartilage defects. J Orthop Res. 2008;26:225–30. [PubMed] [Google Scholar]32. Lichiardopol C, Militaru C. Ellis-van Creveld syndrome. Room J Morfool Embryol. 2006;47:363–6. [PubMed] [Google Scholar]33. Markowitz RI, Zackai E. A pragmatic approach to radiological diagnosis of pediatric syndromes and skeletal dysplasia. 2001;39:791–802. [PubMed] [Google Scholar]34. Palmer DH, Mulhall KJ, Thompson CA, et al. Total knee arthrology in juvenile rheumatoid arthritis. J Bone Joint Surg Am. 2005;87:1510–4. [PubMed] [Google Scholar]35. Manner HM, Radler C, Times R, Grill F. Dysplasia of the cruciate ligaments: radiographic assessment and classification. J Bone Joint Surg Am. 2006;88:130–7. [PubMed] [Google Scholar]36. Noble J, Karaiskos N, Wiltshire WA. Diagnosis and clinical treatment of patients with skeletal class III dysplasia. Generation Dent. 2007;55:543–7. [PubMed] [Google Scholar]37. Guichet JM, Javed A, Russell J, Saleh M. The effect of the foot on mechanical adjustment of the lower limbs. In 2003, an article was published in Clin Orthop Relat Res. [PubMed] [Google Scholar]38. Stevens PM, MacWilliams B, Mohr RA. Gang analysis of staples for genu valgum. J Pediatr Orthop. 2004;24(1):70–4. [PubMed] [Google Scholar]39. Nenopoulos S, Vrettakos A, Chaftikis N, Beslikas T, Dadoukis D. Effect of proximal tibiaal fractures on the limb axis in children. In 2007, an article was published in Acta Orthop Belg. [PubMed] [Google Scholar]40. Tuten HR, Keeler KA, Gabos PG, Zionts LE, MacKenzie WG. Post-traumatic tibia valga in children. A long-term follow-up note. J Bone Joint Surg Am. 1999;81:799–810. [PubMed] [Google Scholar]41. Gautam VK, Anand S. A new test to estimate iliotibial band contracture. J Bone Joint Surg Br. 1998;80:474–5. [PubMed] [Google Scholar]42. Pannier S, Legeai-Mallet L. multiple exhaustes and enchondromatosis. Best Pract Res Clin Rheumatol. 2008;22:45–54. [PubMed] [Google Scholar]43. Jacobson JA, Girish G, Jiang Y, et al. Radiographic evaluation of arthritis: inflammatory conditions. Radiology. 2008;248:378–89. [PubMed] [Google Scholar]44. Greene WB. Genu varum and genu valgum in children: differential diagnosis and guidelines for evaluation. Compr Ther. 1996;22:22–9. [PubMed] [Google Scholar]45. Stevens PM. Guided growth for angular correction: a preliminary series using a tension band plate. J Pediatr Orthop. 2007;27:253–9. [PubMed] [Google Scholar]46. Wang JW, Hsu CC. Distal femoral varus osteotomy for osteoarthritis of the knee. Surgical technique. J Bone Joint Surg Am. 2006;88:100–8. [PubMed] [Google Scholar]47. Wang JW, Hsu CC. Distal femoral varus osteotomy for osteoarthritis of the knee. J Bone Joint Surg Am. 2005;87(1):127–33. [PubMed] [Google Scholar]48. Baghdadi T, Espandar R. Schmid's metaphyseal chondrodysplasia: a case report. Journal of the Faculty of Medicine. 2001;59:18–22. (Persian) [Google Scholar] Page 2Skeltal feelings found as bowlegsApparent genu varumFysiological genu varumKongenital familial tibia varaTibia vara (Blount's disease)Asymmetric growth arrest of the medial part of the distal femur and proximal tibia due to infection, fracture, or tumor Rickets – vitamin D deficiency or refractory (hypophosphataemia)Bendysplasia, such as achondroplasia and metaphyseal dysplasiaFibrocartilagenous dysplasiaKongenital longitudinal deficiency of tibia with relative overgrowth of fibulaLead or fluoride poisoning poisoning