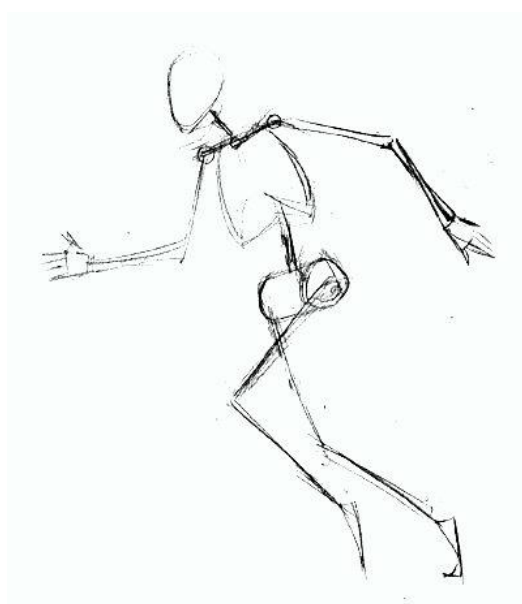


Trauma & Orthopaedics

Evidence Update



May 2017 (Quarterly)

Respecting everyone
Embracing change
Recognising success
Working together
Our hospitals.



Training Calendar 2017

All sessions are one hour

May	(13.00)
Fri 26 th	Interpreting Statistics
Wed 31 st	Critical Appraisal
June	(12.00)
Thurs 1 st	Literature Searching
Thurs 8 th	Interpreting Statistics
Tues 13 th	Critical Appraisal
Thurs 29 th	Literature Searching
July	(13.00)
Mon 3 rd	Interpreting Statistics
Wed 12 th	Critical Appraisal
Fri 21 st	Literature Searching
Wed 26 th	Interpreting Statistics


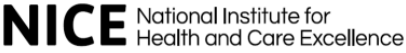

Your Outreach Librarian: Jo Hooper

Whatever your information needs, the library is here to help. As your outreach librarian I offer **literature searching services** as well as training and guidance in **searching the evidence** and **critical appraisal** – just email me at library@uhbristol.nhs.uk

OUTREACH: Your Outreach Librarian can help facilitate evidence-based practise for all in the Orthopaedics team, as well as assisting with academic study and research. We can help with **literature searching, obtaining journal articles and books**, and setting up individual **current awareness alerts**. We also offer one-to-one or small group training in **literature searching, accessing electronic journals, and critical appraisal**. Get in touch: library@uhbristol.nhs.uk

LITERATURE SEARCHING: We provide a literature searching service for any library member. For those embarking on their own research it is advisable to book some time with one of the librarians for a one-to-one session where we can guide you through the process of creating a well-focused literature research and introduce you to the health databases access via NHS Evidence.

Contents

Your Outreach Librarian.....	2
 UpToDate®	4
 NICE National Institute for Health and Care Excellence	4
 Cochrane Library	5
Current Awareness Database Articles related to Orthopaedics.....	6
Journal Tables of Contents.....	6
Journal of Bone and Joint Surgery.....	6
Journal of Orthopaedic Trauma	6
Injury	6
Strategies in Trauma and Limb Construction.....	6
Clinical Orthopaedics and Related Research	6
Exercise: Heterogeneity.....	35
Library Opening Times	36

Updates

UpToDate®

OpenAthens login required. Register here: <https://openathens.nice.org.uk/>

Severe extremity injury in the adult patient

- [Open fracture grading](#)
- [Hard signs of arterial injury](#)
- [Summary and recommendations](#)

Posterior cruciate ligament injury

- [Indications for orthopedic consult or referral](#)
- [Summary and recommendations](#)

Anesthesia for orthopedic trauma

- [Anesthesia for lower extremity trauma](#)
- [Proximal upper extremity fractures](#)
- [Summary and recommendations](#)

NICE National Institute for
Health and Care Excellence

Systematic review: Early versus late dangling after free flap reconstruction of the lower limb

Source: [PubMed](#) - 07 May 2017 - Publisher: Journal Of Plastic, Reconstructive & Aesthetic Surgery : Jpras

[Read Summary](#)

Osteosarcoma and Malignant Fibrous Histiocytoma of Bone Treatment (PDQ®)–Health Professional Version

Source: [National Cancer Institute, USA](#) - 20 June 2017

Antimicrobial Prophylaxis Guidance for Bomb Blast Victims [PDF]

Source: [Public Health England](#) - 26 May 2017 - Publisher: Public Health England

This guidance is for teams responding to bomb blasts incidents.

[Read Summary](#)

Long and short intramedullary nails for fixation of intertrochanteric femur fractures (OTA 31-A1, A2 and A3): a systematic review and meta-analysis

Source: [PubMed](#) - 22 May 2017 - Publisher: Orthopaedics & Traumatology, Surgery & Research : Otsr
[Read Summary](#)

[Intramedullary nails versus sliding hip screws for AO/OTA 31-A2 trochanteric fractures in adults: A meta-analysis](#)

Source: [PubMed](#) - 23 May 2017 - Publisher: International Journal Of Surgery (London, England)
[Read Summary](#)

[Extramedullary versus intramedullary femoral alignment technique in total knee arthroplasty: a meta-analysis of randomized controlled trials](#)

Source: [PubMed](#) - 05 June 2017 - Publisher: Journal Of Orthopaedic Surgery And Research



[Peripheral nerve blocks for hip fractures](#)

Joanne Guay, Martyn J Parker, Richard Griffiths, Sandra Kopp

Online Publication Date: May 2017

Journal Tables of Contents

The most recent issues of the following journals:

- [Journal of Bone and Joint Surgery](#)
- [Journal of Orthopaedic Trauma](#)
- [Injury](#)
- [Strategies in Trauma and Limb Construction](#)
- [Clinical Orthopaedics and Related Research](#)

Click on the hyperlinked journal title or image (+Ctrl) for the most recent tables of contents. If you would like any of these papers in full text then get in touch: library@uhbristol.nhs.uk

[Journal of Bone and Joint Surgery](#)

July 2017, Volume 99, Issue 13

[Journal of Orthopaedic Trauma](#)

July 2017, Volume 31, Issue 7

[Injury](#)

July 2017, Volume 48, Issue 7

[Strategies in Trauma and Limb Construction](#)

April 2017, Volume 12, Issue 1 (triannual)

[Clinical Orthopaedics and Related Research](#)

July 2017, Volume 475, Issue 7

Current Awareness Database Articles related to Orthopaedics

Below is a selection of articles related to orthopaedics recently added to the healthcare databases:

NHSLA litigation in hip fractures: Lessons learnt from NHSLA data

Author(s): Ring J.; Talbot C.; Cross C.; Hinduja K.

Source: Injury; 2017

Publication Type(s): Article In Press

Abstract: Hip fractures are a major cause of trauma related death, usually occurring in vulnerable elderly patients. There are an estimated 70,000 hip fractures in the UK per year with numbers set to rise. The estimated annual cost to the healthcare economy is in the region of 2 billion. A 17-year review examining litigation related to hip fractures was undertaken. Under a freedom of information request, data was obtained relating to all orthopaedic claims made to the NHS Litigation Authority (NHSLA) between 1995 and 2012. Data was filtered to identify cases involving hip fractures examining litigation trends related to this specific area. 10263 NHSLA orthopaedic cases were identified, of which 13.3% (n = 1364) cases related to the hip and femur. Hip fractures made up 16.7% (n = 229). The total cost of hip fracture litigation was over 7 million with an average cost per case of 32,700. The commonest reasons for litigation were diagnostic errors (30.6%), issues with care (24.9%) alleged incompetent surgery (15.7%) and development of pressure sores (5.7%). This study highlights the main causes of litigation in patients sustaining hip fractures, with diagnosis in the emergency department and ward presenting a significant problem. In addition, the data identifies a range of care related issues, as well as several surgical factors and highlights the importance of pressure area care. We discuss these and make suggestions on how to improve practice in this area with the aim of improving patient care and reducing litigation. Copyright © 2017 Elsevier Ltd.

Endometrial adenocarcinoma recurrence presenting with tibial metastasis: Report of a case

Author(s): Soylemez M.S.; Kemah B.; Soylemez U.P.O.; Kilic B.; Ozkan K.

Source: International Journal of Surgery Case Reports; 2017; vol. 36 ; p. 15-17

Publication Type(s): Article

Abstract: Introduction Metastatic bone disease at extremities is mostly associated with lung, liver, prostat, thyriod or breast malignancies. There for surgeons generally tends to seek for a primary tumor originating from these organs. Herein a case of endometrial adenocarcinoma recurrence that presented with symptoms of tibial pain is described. Presentation of case 59 year-old woman was admitted to our orthopaedic oncology unit with pain, swelling and tenderness at right cruris for two weeks without any trauma history. Her medical history revealed that she had a total abdominal hysterectomy and bilateral salpingo-oophorectomy. During follow-ups no recurrence had been detected. Initial X-rays of the right tibia showed a lytic and expansile mass located at the shaft of the tibia suggesting metastasis. A wide resection of the lesion with clear margins was performed two weeks after first admittance. Resected area was replaced by fresh frozen femoral shaft allograft. At postoperative 17th month. X-rays obtained at last follow-up demonstrated full healing and

integration of allograft. Discussion Endometrial adenocarcinoma is a disease of postmenopausal women with 95% of the cases occurring after the age of 40 years. Patients with advanced or recurrent endometrial cancer often have distant metastases found within the lymph nodes, liver, and/or lung. Conclusion Recurrence of endometrial cancer as a solitary bone lesion is a rare situation. Wide resection and reconstruction with an allograft or an intercalar prosthesis might be an option to increase survival and possible cure of the patient. Copyright © 2017 The Author(s)

Tissue engineered vascularized periosteal flap enriched with MSC/EPCs for the treatment of large bone defects in rats

Author(s): Nau C.; Henrich D.; Seebach C.; Marzi I.; Frank J.; Schroder K.; Barker J.H.

Source: International Journal of Molecular Medicine; 2017; vol. 39 (no. 4); p. 907-917

Publication Type(s): Article

Available in full text at [International journal of molecular medicine \[Int J Mol Med\] NLMUID: 9810955](#) - from EBSCOhost

Abstract: Vascularized periosteal flaps are used for complex cases if the reconstruction of large bone defects is necessary in modern trauma and orthopedic surgery. In this study, we combined this surgical procedure with beta-TCP scaffold and mesenchymal stem cells (MSCs) + endothelial progenitor cells (EPCs) as a tissue engineering approach to obtain optimum conditions for bone healing in rats. A critical size femoral defect was created in 80 rats allocated into 4 groups. Defects were treated according to the following protocol: i) vascularized periosteal flap alone; II) vascularized periosteal flap + beta-TCP scaffold; III) vascularized periosteal flap + beta-TCP scaffold + ligated vascular pedicle; and) vascularized periosteal flap + beta-TCP scaffold + MSCs/EPCs. After 8 weeks, femur bones were extracted and analyzed for new bone formation, vascularization, proliferation and inflammatory processes and strength. Bone mineral density (BMD) and biomechanical stability at week 8 were highest in group 4 (flap + beta-TCP scaffold + MSCs/EPCs) compared to all the other groups. Stability was significantly higher in group 4 (flap + beta-TCP scaffold + MSCs/EPCs) in comparison to group 3 (ligated flap + beta-TCP scaffold). BMD was found to be significantly lower in group 3 (ligated flap + beta-TCP scaffold) compared to group 1 (flap) and group 4 (flap + beta-TCP scaffold + MSCs/EPCs). The highest density of blood vessels was observed in group 4 (flap + beta-TCP + MSCs/EPCs) and the values were significantly increased in comparison to group 3 (ligated flap), but not to group 1 (flap) and group 2 (flap + beta-TCP). The highest amounts of proliferating cells were observed in group 4 (flap + beta-TCP scaffold + MSC/EPCs). The percentage of proliferating cells was significantly higher in group 4 (flap + beta-TCP scaffold + MSCs/EPCs) in comparison to all the other groups after 8 weeks. Our data thus indicate that critical size defect healing could be improved if MSCs/EPCs are added to beta-TCP scaffold in combination with a periosteal flap. Even after 8 weeks, the amount of proliferating cells was increased. The flap blood supply is essential for bone healing and the reduction of inflammatory processes.

Predicting acute compartment syndrome (PACS): The role of continuous monitoring

Author(s): Schmidt A.H.; Bosse M.J.; Frey K.P.; MacKenzie E.J.; O'Toole R.V.; Stinner D.J.; Scharfstein D.O.; Zipunnikov V.; Allen L.E.; Carlini A.R.; Castillo R.C.; Collins S.; Ha G.K.

Source: Journal of Orthopaedic Trauma; 2017; vol. 31

Publication Type(s): Article

Abstract: The diagnosis of acute compartment syndrome (ACS) is a common clinical challenge among patients who sustain highenergy orthopaedic trauma, largely because no validated criteria exist to reliably define the presence of the condition. In the absence of validated diagnostic standards, concern for the potential clinical and medicolegal impact of a missed compartment syndrome may result in the potential overuse of fasciotomy in "at-risk" patients. The goal of the Predicting Acute

Compartment Syndrome Study was to develop a decision rule for predicting the likelihood of ACS that would reduce unnecessary fasciotomies while guarding against potentially missed ACS. Of particular interest was the utility of early and continuous monitoring of intramuscular pressure and muscle oxygenation using near-infrared spectroscopy in the timely diagnosis of ACS. In this observational study, 191 participants aged 18-60 with high-energy tibia fractures were prospectively enrolled and monitored for up to 72 hours after admission, then followed for 6 months. Treating physicians were blinded to continuous pressure and oxygenation data. An expert panel of 9 orthopaedic surgeons retrospectively assessed the likelihood that each patient developed ACS based on data collected on initial presentation, clinical course, and known functional outcome at 6 months. This retrospectively assigned likelihood is modeled as a function of clinical data typically available within 72 hours of admission together with continuous pressure and oxygenation data. This study will improve our understanding of the natural history of compartment syndrome and examine the utility of early and continuous monitoring of the physiologic status of the injured extremity in the timely diagnosis of ACS. Copyright © 2017 Wolters Kluwer Health, Inc. All rights reserved.

Supplemental perioperative oxygen to reduce surgical site infection after high-energy fracture surgery (OXYGEN study)

Author(s): O'Toole R.V.; Paryavi E.; Joshi M.; Carlini A.R.; Castillo R.C.; Sikorski R.A.; Dagal A.; Agel J.; Murray C.K.; Weaver M.J.; Stall A.C.; Scharfstein D.O.; Zadnik M.; Bosse M.J.; Allen L.E.; Ballreich J.; Collins S.; Hackman A.W.; Huang Y.; MacKenzie E.J.; Taylor T.J.

Source: Journal of Orthopaedic Trauma; 2017; vol. 31

Publication Type(s): Article

Abstract: Supplemental perioperative oxygen (SPO) therapy has been proposed as one approach for reducing the risk of surgical site infection (SSI). Current data are mixed regarding efficacy in decreasing SSI rates and hospital inpatient stays in general and few data exist for orthopaedic trauma patients. This study is a phase III, double-blind, prospective randomized clinical trial with a primary goal of assessing the efficacy of 2 different concentrations of perioperative oxygen in the prevention of SSIs in adults with tibial plateau, pilon (tibial plafond), or calcaneus fractures at higher risk of infection and definitively treated with plate and screw fixation. Patients are block randomized (within center) in a 1:1 ratio to either treatment group (FiO₂ 80%) or control group (FiO₂ 30%) and stratified by each study injury location. Secondary objectives of the study are to compare species and antibacterial sensitivities of the bacteria in patients who develop SSIs, to validate a previously developed risk prediction model for the development of SSI after fracture surgery, and to measure and compare resource utilization and cost associated with SSI in the 2 study groups. SPO is a low cost and readily available resource that could be easily disseminated to trauma centers across the country and the world if proved to be effective. Copyright © 2017 Wolters Kluwer Health, Inc. All rights reserved.

Local antibiotic therapy to reduce infection after operative treatment of fractures at high risk of infection: A multicenter, randomized, controlled trial (VANCO study)

Author(s): O'Toole R.V.; Joshi M.; Carlini A.R.; Allen L.E.; Castillo R.C.; Murray C.K.; Scharfstein D.O.; Gary J.L.; Bosse M.J.; Collins S.; Huang Y.; MacKenzie E.J.; Taylor T.J.; Zadnik M.

Source: Journal of Orthopaedic Trauma; 2017; vol. 31

Publication Type(s): Article

Abstract: A number of clinical studies in the spine literature suggest that the use of local vancomycin powder may substantially reduce surgical site infections (SSIs). These studies are primarily retrospective and observational and few focus on orthopaedic trauma patients. This study is a phase III, prospective, randomized, clinical trial to assess the efficacy of locally administered vancomycin

powder in the prevention of SSI after fracture surgery. The primary goal of the VANCO Study is to compare the proportion of deep SSI 6 months after fracture fixation surgery. A secondary objective is to compare species and antibacterial susceptibilities among study patients who develop SSI. An additional objective is to build and validate a risk prediction model for the development of SSI. The study population consists of patients aged 18-80 years with tibial plateau or pilon (tibial plafond) fractures, at higher risk of infection, and definitively treated with plate and screw fixation. Participants are block randomized (within center) in a 1:1 ratio to either treatment group (local vancomycin powder up to a maximum dose of 1000 mg, placed immediately before wound closure) or control group (standard of care) for each study injury location, and return to the clinic for evaluations at 2 weeks, 3 months, and 6 months after fixation. The targeted sample size for the study is 500 fractures per study arm. This study should provide important information regarding the use of local vancomycin powder during the definitive treatment of lower extremity fractures and has the potential to significantly reduce the incidence of infection after orthopaedic trauma. Copyright © 2017 Wolters Kluwer Health, Inc. All rights reserved.

Longitudinal monitoring of patient limb loading throughout ankle fracture rehabilitation using an insole load monitoring system: A case series

Author(s): Kubiak E.N.; Rothberg D.L.; Stuart A.R.; North K.; Lajevardi-Khosh A.; Petelenz T.J.; Hitchcock R.W.

Source: Current Orthopaedic Practice; 2017; vol. 28 (no. 2); p. 223-230

Publication Type(s): Article

Abstract:Background: The purpose of this prospective, direct observational study was to evaluate limb loading in lower extremity orthopaedic trauma patients using a novel insole sensor, the Ambulatory Tibial Load Analysis System (ATLAS). Methods: Three patients from a level I trauma center, one with a trimalleolar ankle fracture, one with a distal, spiral fracture of the tibia and fibula at the same level, and one with a bimalleolar ankle fracture were observed using an insole load monitoring system to record their weight bearing during standard of care rehabilitation. No clinical decisions were made based on the limb loading data. The primary study measures were limb-loading data provided by the ATLAS and patient reported physical function as measured by the PROMIS Physical Function Computer Adapted Test. Results: The ATLAS provided 8-12 wk of continuous limb loading data, with raw loading data, duration of insole sensor and CAM walker wear, daily step count, median load per day, and periods of static and dynamic loading for three patients with varying ankle fractures. Conclusions: The findings of this case study support the use of the ATLAS sensor in evaluation of limb loading in patients with lower extremity fracture. The data suggest that the current weight bearing prescription may not be sufficient for all patients and that personalized protocols are warranted. Copyright © 2017 Wolters Kluwer Health, Inc.

Ability of ultrasonography in detection of different extremity bone fractures; a case series study

Author(s): Bozorgi F.; Montazer S.H.; Heidari S.F.; Azar M.S.; Chabra A.; Khalilian A.

Source: Emergency; 2017; vol. 5 (no. 1); p. 80-83

Publication Type(s): Article

Abstract:Introduction: Despite radiography being the gold standard in evaluation of orthopedic injuries, using bedside ultrasonography has several potential supremacies such as avoiding exposure to ionizing radiation, availability in pre-hospital settings, being extensively accessible, and ability to be used on the bedside. The aim of the present study is to evaluate the diagnostic accuracy of ultrasonography in detection of extremity bone fractures. Methods: This study is a case series study, which was prospectively conducted on multiple blunt trauma patients, who were 18 years old or older, had stable hemodynamic, Glasgow coma scale 15, and signs or symptoms of a possible

extremity bone fracture. After initial assessment, ultrasonography of suspected bones was performed by a trained emergency medicine resident and prevalence of true positive and false negative findings were calculated compared to plain radiology. Results: 108 patients with the mean age of 44.6 +/- 20.4 years were studied (67.6% male). Analysis was done on 158 sites of fracture, which were confirmed with plain radiography. 91 (57.6%) cases were suspected to have upper extremity fracture(s) and 67 (42.4%) to have lower ones. The most frequent site of injuries were forearm (36.7%) in upper limbs and leg (27.8%) in lower limbs. Prevalence of true positive and false negative cases for fractures detected by ultrasonography were 59 (64.8%) and 32 (35.52%) for upper and 49 (73.1%) and 18 (26.9%) for lower extremities, respectively. In addition, prevalence of true positive and false negative detected cases for intra-articular fractures were 24 (48%) and 26 (52%), respectively. Conclusion: The present study shows the moderate sensitivity (68.3%) of ultrasonography in detection of different extremity bone fractures. Ultrasonography showed the best sensitivity in detection of femur (100%) and humerus (76.2%) fractures, respectively. It had low sensitivity in detection of in intra-articular fractures. Copyright © (2016) Shahid Beheshti University of Medical Sciences.

How High Can You Go?: Retrograde Nailing of Proximal Femur Fractures.

Author(s): Kuhn, Kevin M; Cannada, Lisa K; Watson, J Tracy; Ali, Ashley; Boudreau, John A; Mir, Hassan R; Bauer, Jennifer M; Mullis, Brian; Hymes, Robert; Genova, Renee; Tucker, Michael; Schlatter, Daniel

Source: Journal of surgical orthopaedic advances; 2017; vol. 26 (no. 1); p. 33-39

Publication Type(s): Journal Article

Abstract: There are no data-supported recommendations on how proximal is too proximal for retrograde nailing (RGN). At six level 1 trauma centers, patients with femur fractures within the proximal one-third of the femur treated with RGN were included. This article describes a proximal segment capture ratio (PSCR) and nail segment capture ratio to evaluate RGN of proximal fractures. The study included 107 patients. The average follow-up was 44 weeks. There were two nonunions and three malunions. There was no significant difference between PSCR of 0.3 or less and need for secondary procedures or time to full weight bearing ($p > .05$). In this study, a smaller (< 0.3) PSCR was not associated with an increased number of complications. A higher Orthopaedic Trauma Association classification was predictive of malunion and increased time to union. These data demonstrate that retrograde nailing is safe and effective for the treatment of supraisthmal femur fractures.

Traumatic Anterior Knee Dislocation with Popliteal Artery Injury: The Importance of a Prompt Diagnosis and Treatment to Obtain Lower Limb Salvage

Author(s): Massara M.; Prunella R.; Cito D.; Gerardi P.; Notarstefano S.; Impedovo G.; De Caridi G.; Serra R.

Source: Annals of Vascular Surgery; Oct 2017

Publication Type(s): Article In Press

Abstract: We report a case of traumatic anterior dislocation of the left knee in association with disruption of the soft tissues including knee ligaments, popliteal artery, and common peroneal nerve, resulting in lower limb acute ischemia. All components of this complex trauma were recognized and treated promptly. First, he was submitted to closed reduction of the dislocated knee under general anesthesia; right after he underwent superficial femoro-tibioperoneal trunk bypass using a reversed saphenous contralateral vein recurring to a posterior approach through a popliteal S-shaped incision; rehabilitation program was initiated early; a second and final reconstructive orthopedic operation was carried out in a different center. The present case is important in 2

aspects. First, it reports a very rare occurrence of simultaneous anterior dislocation of the knee associated with vascular insult and common peroneal nerve injury, which was rarely reported in the current literature; second, it highlights that with timely intervention and a team approach, excellent results could be achieved. Copyright © 2017 Elsevier Inc.

Simple mathematical model of sacroiliac screws safe-zone-Easy to implement by pelvic inlet and outlet views

Author(s): Herman A.; Keener E.; Dubose C.; Lowe J.A.

Source: Journal of Orthopaedic Research; Jul 2017; vol. 35 (no. 7); p. 1478-1484

Publication Type(s): Article

Abstract: Percutaneous sacral screw fixation is the mainstay of posterior pelvic ring fixation. This study quantifies the accuracy of fluoroscopic screw placement using post-operative CT scans and redefines the fluoroscopic safe zone using a mathematical calculation obtained from Inlet and outlet images. The authors hypothesized that a mathematical calculation of screw placement within the ala will improve accuracy of screw placement. A retrospective review of consecutive patients admitted to a level 1 trauma center with pelvic fractures fixed with iliosacral screws from January 2011 to December 2014 was performed. Accuracy of screw placement was determined by comparing fluoroscopy to post-operative CT scans. A mathematical calculation of screw position within the sacral ala was applied to determine assess screw position and compared to CT findings. Ninety-four patients with 156 screws met inclusion criteria, of which 50 (32.0%) had a cortical breach on CT. The sensitivity and specificity of the inlet-outlet safe zone using mathematical calculation were 97.1% and 84.0%, respectively. The positive and negative predictive values were 92.7% and 93.3%, respectively. Overall accuracies of the radiographic inlet-outlet and lateral safe zones were 92.9% and 70.0%, respectively (p-value = 0.004). Sacral dysmorphism was not found to be associated with sacral cortical breach. A Simple mathematical calculation (screw position relative to percentage of bone width) on the inlet-outlet provides an accurate way to predict the accuracy of sacroiliac screws. The method is easy to implement, part of the surgery work-flow, and provides higher accuracy than relying on subjective interpretation of inlet, outlet, and lateral images. © 2016 Orthopaedic Research Society. Published by Wiley Periodicals, Inc. J Orthop Res 35:1478-1484, 2017. Copyright © 2016 Orthopaedic Research Society. Published by Wiley Periodicals, Inc.

Temporal Variation in Ankle Fractures and Orthopedic Resident Program Planning in an Urban Level 1 Trauma Center

Author(s): Wynkoop A.; Ndubaku O.; Walter N.; Atkinson T.

Source: Journal of Foot and Ankle Surgery; Jul 2017; vol. 56 (no. 4); p. 724-729

Publication Type(s): Article

Abstract: Previous studies have described the mechanism of ankle fractures, their seasonal variation, and fracture patterns but never in conjunction. In addition, the cohorts previously studied were either not from trauma centers or were often dominated by low-energy mechanisms. The present study aimed to describe the epidemiology of ankle fractures presenting to an urban level 1 trauma center. The records from an urban level 1 trauma center located in the Midwestern United States were retrospectively reviewed, and the injury mechanism and energy, time of injury, day of week, month, and patient characteristics (age, gender, comorbidities, smoking status) were collected. The fractures were classified using the AO (Arbeitsgemeinschaft für Osteosynthesefragen), Lauge-Hansen, and Danis-Weber systems. Of these systems, the Lauge-Hansen classification system resulted in the greatest number of "unclassifiable" cases. Most ankle fractures were due to high-energy mechanisms, with motor vehicle collisions the most common high-energy mechanism. The review found that most ankle fractures were malleolar fractures, regardless of the mechanism of

injury. The ankle fracture patients had greater rates of obesity, diabetes, and smoking than present in the region where the hospital is located. The fractures were most likely to occur in the afternoon, with more fractures presenting on the weekend than earlier in the week and more fractures in the fall and winter than in the spring and summer. The temporal variation of these fractures should be considered for health services planning, in particular, in regard to resident physician staffing at urban level 1 trauma centers. Copyright © 2017 American College of Foot and Ankle Surgeons

Hexapod Frame Stacked Transport for Tibial Infected Nonunions with Bone Loss: Analysis of Use of Adjunctive Stability

Author(s): Napora J.K.; Weinberg D.S.; Eagle B.A.; Kaufman B.R.; Sontich J.K.

Source: Journal of Orthopaedic Trauma; Jul 2017; vol. 31 (no. 7); p. 393-399

Publication Type(s): Conference Paper

Abstract: Objectives: The stacked hexapod bone transport technique is an effective treatment for infected tibial nonunions with bone loss. The purpose of this study was to evaluate the patients' risk factors and timing for requiring adjunctive stabilization. Design: Retrospective cohort study. Setting: Level 1 trauma center. Patients/Participants: Seventy-five patients with infected posttraumatic nonunions of the tibia. Intervention: Resection of nonunion with application of stacked hexapod frame for bone transport. Main Outcome Measurements: Parameters measured included age, sex, diabetes, smoking, use of a free flap, bone defect size, length in frame, external fixation index, and direction of lengthening. Outcomes recorded: Removal of frame, below knee amputation, or adjunctive stability. Further analysis evaluated location of nonunion, timing of adjunctive stabilization, and type of fixation. Results: The average patient age was 45.7 +/- 12.5 years, 76% patients were men, 11% were diabetic, and 44% were smokers. Forty-two percent had soft tissue defects that required a free flap. Thirty-eight patients had removal of frame, whereas 36 patients required adjunctive stability of the hexapod frame. Patient receiving adjunctive stabilization had a longer length of time in the hexapod frame ($P = 0.026$) and were more likely to require a free flap ($P = 0.053$). Ninety-three percent docking site nonunions occurred after the removal of the frame ($P = 0.032$); whereas 79% regenerate nonunions occurred before the hexapod frame was removed ($P = 0.029$). Conclusions: The use of a hexapod frame for the infected tibial nonunions with bone loss is an effective method for achieving union and eradicating infection in a difficult orthopaedic patient population. Use of adjunctive stabilization is a reasonable technique to address delayed regenerate and docking site nonunions. Copyright © 2017 Wolters Kluwer Health, Inc. All rights reserved.

Intramedullary nail fixation of atypical femur fractures with bone marrow aspirate concentrate leads to faster union: A case-control study

Author(s): Lovy A.J.; Kim J.S.; DI Capua J.; Somani S.; Keswani A.; Shim S.; Hasija R.; Wu Y.; Joseph D.; Ghillani R.

Source: Journal of Orthopaedic Trauma; Jul 2017; vol. 31 (no. 7); p. 358-362

Publication Type(s): Article

Abstract: Objectives: To evaluate bone marrow aspirate concentrate (BMAC) use in the treatment of AFF. Design: Retrospective case control. Setting: Level 1 trauma center. Patients: Complete AFF, defined according to American Society of Bone and Mineral Research (ASBMR) criteria, from September 2009 to April 2015 with minimum 1-year follow-up. Intervention: Operative treatment with antegrade intramedullary nails. Beginning June 2014, BMAC from the ipsilateral iliac crest was added to all AFFs. Main Outcome Measurements: Time to union as determined by a blinded panel of 3 attending orthopaedic surgeons, union rates, complications. Results: Thirty-five patients with 36 AFFs were reviewed, of which 33 AFFs were included and 11 received BMAC. Alendronate was the

most commonly prescribed bisphosphonate, with a similar mean duration of use in controls and BMAC cases (5.6 versus 6 years, $P = 0.79$). BMAC use significantly decreased time to union (3.5 versus 6.8 months, $P = 0.004$). Varus malreduction was associated with a significant delay in union (9.7 versus 4.7 months, $P = 0.04$). Overall, 1 year union rate was 86.2% and nonsignificantly higher in BMAC compared with controls (100.0% versus 77.3%, $P = 0.11$). Multivariate analysis revealed BMAC and varus malreduction as independent predictors of time to union. There were no complications related to BMAC use. Conclusion: Our findings support intramedullary nailing of AFFs as an effective treatment option with a low surgical complication rate and highlight the importance of avoiding varus malreduction. BMAC use significantly reduced time to fracture union without an increase in surgical complication rates. Copyright © 2017 Wolters Kluwer Health, Inc.

Role of Bone Marrow Aspirate in Orthopedic Trauma

Author(s): Schottel P.C.; Warner S.J.

Source: Orthopedic Clinics of North America; Jul 2017; vol. 48 (no. 3); p. 311-321

Publication Type(s): Review

Abstract: Bone marrow aspirate grafting entails mesenchymal stem cell-containing bone marrow harvesting and injection into a fracture site to promote bone formation. Although the use of bone marrow aspirate in orthopedic trauma is not widespread, an increasing number of studies are reporting clinical success. Advantages of using bone marrow aspirate are that it is readily obtainable, has low harvest morbidity, and can be easily and quickly injected. However, no universally accepted role for its use exists. Future studies directly comparing bone marrow aspirate with conventional techniques are needed to define its role in the treatment of orthopedic trauma patients. Copyright © 2017 Elsevier Inc.

Emergency and Trauma of the Ankle

Author(s): Barile A.; Bruno F.; Arrigoni F.; Splendiani A.; Di Cesare E.; Masciocchi C.; Zappia M.; Guglielmi G.

Source: Seminars in Musculoskeletal Radiology; Jul 2017; vol. 21 (no. 3); p. 282-289

Publication Type(s): Article

Abstract: Ankle injuries are very common among patients presenting to emergency departments, affecting patients of both sexes at any age. Management of ankle injuries can be challenging for orthopedic surgeons, given the large range of osteochondral, tendinous, and capsuloligamentous injuries that can occur. An accurate imaging evaluation is therefore of paramount importance to identify the degree and type of injury correctly and to direct the patient to the correct therapeutic management. Radiologic evaluation is the most appropriate initial imaging modality. Cross-sectional imaging (computed tomography, magnetic resonance imaging) has a secondary role in an emergency, primarily as a tool for preoperative planning and as a problem-solving technique in patients with suspected occult fractures or soft tissue injuries. We review the role of imaging in the evaluation of patients with ankle trauma and the main imaging findings occurring in such injuries. Copyright © 2017 by Thieme Medical Publishers, Inc.

A retrospective cohort study of concomitant ipsilateral extra-capsular and intra-capsular fractures of the proximal femur. Are they casual findings or an undervalued reality?

Author(s): Videla-Ces M.; Sales-Perez J.-M.; Giros-Torres J.; Sanchez-Naves R.; Videla S.

Source: Injury; Jul 2017; vol. 48 (no. 7); p. 1558-1564

Publication Type(s): Article

Abstract:Background Fractures of the proximal femur constitute a major public health problem, with an annual incidence in Spain of 7.6 cases per 1000 inhabitants over 65 years of age. Hip fractures are frequent in elderly patients, related to osteoporosis and with low energy trauma, which means that they can be considered a geriatric syndrome. Simultaneous ipsilateral extra- and intra-articular hip fractures are considered as very rare are, and generally speaking, classified as extra- or intra-capsular fractures. Moreover, there is no consensus with regard to treatment of these concomitant fractures. Aim To estimate the incidence of concomitant ipsilateral extra- and intra-capsular fractures of the proximal femur, and to describe the diagnostic process and the clinical characteristics of these concomitant fractures. Patients and methods Retrospective cohort study of patients with hip fractures. The incidence of combined extra- and intra-capsular fractures was estimated, a confidence interval of 95% (95%CI) was calculated and a descriptive analysis was drawn up. Results Between May 2010 (the date on which the Orthopaedic and Trauma Surgery Department of our new Hospital began the surgical activity) and December 2016, 33 (median age, 86 years-old) of the 2625 hip fractures were classified as simultaneous extra- and intra-capsular ipsilateral fractures. The overall cumulative incidence was of 1.3% (95%CI:0.9-1.8%). In 32 (97%) of the patients, the fracture was a consequence of a low energy trauma (ground level fall), while the remainder was due to a medium energy trauma (skating). In all cases the two fracture lines seem to be independent of each other, which suggests different mechanisms of injury from that of isolated subcapital or intrertrochanteric fracture. Conclusion The incidence of concomitant ipsilateral extra- and intra-capsular fractures of the proximal femur must be taken into account in patients over 65 years of age. It is clinically relevant to identify these concomitant fractures in order to arrive at a correct diagnosis, which will facilitate preoperative planning and the choice of the best treatment to achieve a better outcome. Misdiagnosis may cause further problems, such as fixation failures, disability and, in a worst case scenario, an increased risk of death. Therefore, a good and complete preoperative study is important, along with both good quality X-ray projections and 2D and 3D Ct-Scans in case of doubt. Copyright © 2017 Elsevier Ltd

Limb salvage and reconstruction following a zebra attack

Author(s): Carlson J.T.; Yuen J.C.; Smeds M.R.

Source: Trauma Case Reports; Jun 2017; vol. 9 ; p. 5-9

Publication Type(s): Article

Abstract:Animal bites are fairly rare events but can cause devastating traumatic injuries to the victim. In addition to the soft tissue, vascular, and orthopedic trauma inflicted by these occurrences, bite injuries also have the potential to introduce an inoculum of microbes, which may progress to an infection if not treated properly and expeditiously. We present the case of a healthy male who sustained multiple bite wounds from a domestic zebra to his left upper extremity. This attack caused severe damage, including devascularization of the arm at the brachial artery, disruption of the distal biceps and brachialis, stripping of the forearm nerves, and shearing of the overlying soft tissue. The patient was taken emergently to the operating room for revascularization of the extremity utilizing a vein bypass graft. The soft tissue injuries were addressed with numerous irrigation and debridement procedures, during which coverage of the vein bypass graft was obtained using a variety of techniques, including skin flaps, musculocutaneous advancements, and the application of an acellular dermal matrix (AlloDerm) and a collagen-glycosaminoglycan matrix (Integra). Wound cultures obtained intra-operatively during the irrigation and debridement procedures were notable for the growth of multiple microbes, including *Rhodococcus* spp., which have been documented to cause infection in immunocompromised patients. The patient in this case was treated with a prolonged course of antibiotics, and wound cultures negative for microbial growth were eventually obtained prior to final closure of his wound. The patient then underwent successful biceps reconstruction with a pedicled latissimus dorsi muscle transfer. This case documents the extraordinary multidisciplinary approach provided in the salvage, management, and eventual

reconstruction of a mangled left upper extremity that had sustained devastating traumatic injuries resulting from a rather unusual source. Copyright © 2017

Etude des connaissances, attitudes et pratiques des medecins urgentistes et orthopediques en matiere d'utilisation des blocs nerveux peripheriques
A survey of emergency medicine and orthopaedic physicians' knowledge, attitude, and practice towards the use of peripheral nerve blocks

Author(s): Zewdie A.; Debebe F.; Azazh A.; Salmon M.; Salmon C.

Source: African Journal of Emergency Medicine; Jun 2017; vol. 7 (no. 2); p. 79-83

Publication Type(s): Article

Abstract: Introduction Peripheral nerve blocks (also known as regional anaesthesia) are currently used by many anaesthesiologists and emergency physicians for perioperative and procedural pain management. Methods This is a cross sectional descriptive study conducted to evaluate knowledge, attitudes, and current practice towards use of peripheral nerve blocks for lower extremity injuries at Black Lion Hospital, a tertiary trauma centre in Addis Ababa. Results A standardised survey was conducted with 64 participants working in emergency medicine [30/64 (46.9%)] and orthopaedics [34/64 (53.1%)]. Twenty-three of 64 (35.9%) respondents had received formal training. Knowledge was acquired from didactic/workshop format for 15/23 (65.2%), followed by peer training 6/23 (39.1%). The majority, 62/64 (96.9%), believed that knowledge of general anatomy and nerve blocks are very important. Thirty-one of 64 (48%) of the respondents did not routinely perform peripheral nerve blocks. A majority, 27/31 (87.1%) stated they lacked the required skills. Ultrasound guidance of the femoral nerve 16/33 (48.5%) was the most commonly performed peripheral nerve block, followed by ankle block using anatomic landmarks 15/33 (45.5%). Almost all (15/16) ultrasound-guided nerve blocks were done by emergency medicine providers, while all anatomic land mark guided blocks were done by orthopaedic teams. A majority of the respondents (93.8%) (n = 60) were optimistic that their practice on peripheral nerve blocks would increase in future. A highly significant association was found between previous training on peripheral nerve blocks and the number of peripheral nerve blocks performed in a month; p value - 0.006. Discussion This study indicates peripheral nerve blocks are likely underutilised due to lack of training. There was a positive attitude towards peripheral nerve blocks but gaps on knowledge and practice. Copyright © 2017 African Federation for Emergency Medicine

Autologous Blood Transfusion as a Life Saving Measure for a Trauma Patient with Fracture Femur and Drug Induced Hemolytic Anemia: A Case Report

Author(s): Vishwakarma S.; Subramanian A.; Chaurasia R.; Chatterjee K.; Trikha V.

Source: Indian Journal of Hematology and Blood Transfusion; Jun 2017; vol. 33 (no. 2); p. 293-297

Publication Type(s): Letter

Abstract: A positive direct antiglobulin test has been reported in 1:1000 to 1:14,000 blood donors and 1-15 % of hospital patients. Drugs may cause a positive direct antiglobulin test result and/or immune-mediated haemolysis with an incidence of approximately 1 in a 1 million population. Our aim is to highlight the importance of following strict transfusion protocols and management insight in a direct antiglobulin test positive patient showing incompatibility with multiple units possibly due to drug induced immune haemolytic anaemia (DIIHA). We also aim to highlight importance of autologous blood transfusion in an orthopaedic procedure in which homologous transfusion may be needed. We are presenting case of a 36 year old male with alleged h/o of road traffic accident with comminuted intra-articular fracture of the distal femur. He had h/o of ankylosing spondylitis since last 20 years on medication with indomethacin and methotrexate. A review of the literature was performed which showed use of drug methotrexate as an uncommon clinical entity for DIIHA;

sporadic reports exist in the medical literature to support this view. The review of the literature in combination with our own data showed methotrexate can be a cause of DIIHA. We therefore advocate proper immunohaematological work up and use of autologous blood for management of at-risk-patients of DIIHA. Copyright © 2016, Indian Society of Haematology & Transfusion Medicine.

Open tibia shaft fractures and soft-tissue coverage: The effects of management by an orthopaedic microsurgical team

Author(s): Vandenberg J.; Osei D.; Boyer M.I.; Gardner M.J.; Ricci W.M.; Spraggs-Hughes A.; McAndrew C.M.

Source: Journal of Orthopaedic Trauma; Jun 2017; vol. 31 (no. 6); p. 339-344

Publication Type(s): Article

Abstract: Objectives: To compare the timing of soft-tissue (flap) coverage and occurrence of complications before and after the establishment of an integrated orthopaedic trauma/microsurgical team. Design: Retrospective cohort study. Setting: A single level 1 trauma center. Patients: Twenty-eight subjects (13 pre- and 15 post-integration) with open tibia shaft fractures (OTA/AO 42A, 42B, and 42C) treated with flap coverage between January 2009 and March 2015. Intervention: Flap coverage for open tibia shaft fractures treated before ("preintegration") and after ("postintegration") implementation of an integrated orthopaedic trauma/microsurgical team. Main Outcome Measure: Time from index injury to flap coverage. Results: The unadjusted median time to coverage was 7 days (95% confidence interval, 5.9-8.1) preintegration, and 6 days (95% confidence interval, 4.6-7.4) postintegration (P = 0.48). For preintegration, 9 (69%) of the patients experienced complications, compared with 7 (47%) postintegration (P = 0.23). Conclusions: After formation of an integrated orthopaedic trauma/microsurgery team, we observed a 1-day decrease in median days to coverage from index injury. Complications overall were lowered in the postintegration group, although statistically insignificant. Level of Evidence: Therapeutic Level III. See Instructions for Authors for a complete description of levels of evidence. Copyright © 2017 Wolters Kluwer Health, Inc.

Patient comprehension and compliance survey to assess postoperative pain regimens in the orthopaedic trauma population

Author(s): Gangavalli A.K.; Nwachuku C.O.; Malige A.; Rehman S.

Source: Journal of Orthopaedic Trauma; Jun 2017; vol. 31 (no. 6)

Publication Type(s): Article

Abstract: Objective: This study aims to determine the groups of patients who are at risk for noncompliance and misunderstanding of their pain regimen. Design: Survey-based cohort study. Setting: Suburban Level-I trauma center. Patients/Participants: A total of 171 patients between the ages of 18-89 years who underwent surgical fixation of fractures involving the pelvis, long bones, or periarticular regions of the knee, ankle, elbow, and wrist. Main Outcome Measurements: Patients who cannot accurately reproduce their prescribed pain medication list and patients who modify this pain medication regimen were analyzed by age, employment status, income level, education level, time between surgery and follow-up, and whether pain interfered with activities of daily living. Results: Overall, 147 patients completed the survey. Seventy percent (n = 114) of patients could not accurately reproduce their pain medication regimen, regardless of age, employment status, income level, education level, time between surgery and follow-up, and whether pain interfered with activities of daily living. Patients (61.2%; n = 90), regardless of the 6 aforementioned demographic factors, also admitted to modifying their pain medication regimen with non-prescribed medications, with 55.8% (n = 82) of patients adding over-the-counter medications to surgeon-prescribed narcotic medications. Conclusions: Misunderstanding and noncompliance of surgeon-prescribed pain

regimens are prevalent across all patient demographics. Knowledge of the potential effects these augmentative medications can have on fracture healing and any drug-drug interactions that may arise is an important aspect of patient postoperative care. Surgeons must be wary of these trends and screen for any unintended side effects a patient's pain regimen may have. Level of Evidence: Prognostic Level IV. See Instructions for Authors for a complete description of levels of evidence. Copyright © 2017 Wolters Kluwer Health, Inc.

Orthoplastic surgical collaboration is required to optimise the treatment of severe limb injuries: A multi-centre, prospective cohort study

Author(s): Boriani F.; Baldini T.; Granchi D.; Baldini N.; Ul Haq A.; Tarar M.; Urso R.; Tigani D.; Khan U.

Source: Journal of Plastic, Reconstructive and Aesthetic Surgery; Jun 2017; vol. 70 (no. 6); p. 715-722

Publication Type(s): Article

Abstract: Open fractures are severe, complex, limb-threatening and high-energy injuries, often involving lesions of both bone and soft tissues. Traditionally, treatment has been piecemeal by orthopaedic and plastic surgeons. This study aimed to prospectively investigate whether combining orthopaedic and plastic surgery in treating these injuries is more effective than the conventional orthopaedic care. A prospective multi-centre cohort study was conducted. Differences in the type of approach to severe limb trauma allowed a comparison between combined orthoplastic and traditional exclusively orthopaedic treatment. Time for fracture and soft tissue healing and the recovery of limb function were the main outcome measures studied. All patients suffering from a severe open tibial fracture were prospectively included between January 2012 and December 2013 and followed until December 2014. Recruiting units were as follows: (1) an established orthoplastic centre, (2) a unit without experience in the orthoplastic approach and (3) a unit where the orthoplastic approach has been recently introduced in a developing country (Pakistan). A total of 160 patients were included in the study. Of these, 70% were treated with an orthoplastic approach, whereas 30% were treated by an orthopaedic team. All outcome measures were statistically improved by the orthoplastic approach. A coordinated, combined pathway to both the bony and the soft tissue components of open tibial fractures through orthoplastic surgery can be successfully delivered with attention to important timelines to achieve better patient outcomes in different socio-economic settings. Copyright © 2017 British Association of Plastic, Reconstructive and Aesthetic Surgeons

Complications of intramedullary nailing-Evolution of treatment

Author(s): Wahnert D.; Gehweiler D.

Source: Injury; Jun 2017; vol. 48

Publication Type(s): Article

Abstract: Intramedullary nailing of diaphyseal long bone fractures is a standard procedure in today's trauma and orthopedic surgery due to the numerous advantages (e.g. minimal invasive, limited soft tissue damage, load stability). In the last decade indications have been extended to the metaphyseal region. This was associated with problems and complications due to the reduced bone-implant interface. The changed anatomical conditions lead to decreased implant anchorage. Newly developed locking solutions overcome most of these problems. First, the number and also the orientation of the locking screws were adapted to allow a multiplanar locking. This results in increased implant anchorage in the soft metaphyseal bone, thus construct stability significantly improved. Additional options like angular stable locking have been introduced and furthermore enhanced construct stability especially in poor bone stock. As a perspective locking screw augmentation shows promising results in first biomechanical testing. Copyright © 2017 Elsevier Ltd

Staged minimally invasive plate osteosynthesis of proximal tibial fractures with acute compartment syndrome

Author(s): Kim J.-W.; Oh C.-W.; Kyung H.-S.; Park K.-H.; Kim H.-J.; Jung J.-W.; Jung Y.-S.; Oh J.-K.

Source: Injury; Jun 2017; vol. 48 (no. 6); p. 1190-1193

Publication Type(s): Article

Abstract: Purpose High-energy proximal tibial fractures often accompany compartment syndrome and are usually treated by fasciotomy with external fixation followed by secondary plating. However, the initial soft tissue injury may affect bony union, the fasciotomy incision or external fixator pin sites may lead to postoperative wound infections, and the staged procedure itself may adversely affect lower limb function. We assess the results of staged minimally invasive plate osteosynthesis (MIPO) for proximal tibial fractures with acute compartment syndrome. Methods Twenty-eight patients with proximal tibial fractures accompanied by acute compartment syndrome who underwent staged MIPO and had a minimum of 12 months follow-up were enrolled. According to the AO/OTA classification, 6 were 41-A, 15 were 41-C, 2 were 42-A and 5 were 42-C fractures; this included 6 cases of open fractures. Immediate fasciotomy was performed once compartment syndrome was diagnosed and stabilization of the fracture followed using external fixation. After the soft tissue condition normalized, internal conversion with MIPO was done on an average of 37 days (range, 9-158) after index trauma. At the time of internal conversion, the external fixator pin site grades were 0 in 3 cases, 1 in 12 cases, 2 in 10 cases and 3 in 3 cases, as described by Dahl. Radiographic assessment of bony union and alignment and a functional assessment using the Knee Society Score and American Orthopedic Foot and Ankle Society (AOFAS) score were carried out. Results Twenty-six cases achieved primary bony union at an average of 18.5 weeks. Two cases of nonunion healed after autogenous bone grafting. The mean Knee Society Score and the AOFAS score were 95 and 95.3 respectively, at last follow-up. Complications included 1 case of osteomyelitis in a patient with a grade IIIC open fracture and 1 case of malunion caused by delayed MIPO due to poor wound conditions. Duration of external fixation and the external fixator pin site grade were not related to the occurrence of infection. Conclusions Staged MIPO for proximal tibial fractures with acute compartment syndrome may achieve satisfactory bony union and functional results, while decreasing deep infections and soft tissue complications. Copyright © 2017 Elsevier Ltd

Interosseous membrane imaging in traumatic forearm injuries

Author(s): Rudel A.; Andreani O.; Raffaelli C.-P.; Barret H.; Moreau B.; Amoretti M.-E.; Amoretti N.

Source: Skeletal Radiology; Jun 2017; vol. 46 (no. 6); p. 857-858

Publication Type(s): Conference Abstract

Abstract: Purpose: Purpose Knowing the biomechanic features and three locks concept of forearm Understanding forearm interosseous membrane anatomy Being able to diagnose lesions of the interosseous membrane by radiological means Knowing the involvement of lesions of the interosseous membrane in the surgical treatment Upload file (PNG, JPG or GIF) Methods and Materials: A group of 14 patients have been studied here. While retaining the forearm biomechanical concept as well as the anatomy of the interosseous membrane, radiological explorations both at the time of the trauma and a few months after were performed on each one of them. These have been conducted at the request of orthopaedic surgeons whenever interosseous membrane lesions were suspected. They consisted for each patient in a standard X Ray, CT scan and either a MRI and/or an US. Results: Depending on the use of either x ray or MRI/US, lesions of the interosseous membrane were detected indirectly or directly respectively. Radiological diagnose using MRI or US appears more efficient but can be sometimes difficult to perform due to technical restrictions. Conclusion: The presence of post-traumatic lesions of interosseous membrane

can be demonstrated by means of radiological tools. This can lead to different treatment aiming at the best functional recovery possible.

Great exSPECT-CTations: Hybrid imaging in traumatic wrist injuries

Author(s): Dalili D.; Ilyas H.; Adamson K.; Ul-Hassan F.; Eccles A.; Isaac A.

Source: Skeletal Radiology; Jun 2017; vol. 46 (no. 6); p. 857

Publication Type(s): Conference Abstract

Abstract: Purpose: To establish the added value of SPECT/CT in wrist trauma. Reflecting on a decade of practice, we compare and correlate the significance of SPECT/CT with routine cross-sectional, sonographic and conventional radiographic imaging. Methods and Materials: We analysed consecutive SPECT/CT wrist studies performed in cases with a documented history of trauma between September 2007 and January 2017. A 16-slice Philips Precedence SPECT/CT camera and local protocol Technetium 99m doses were utilised. In addition, dose adjusted CT acquisition allowed us to produce diagnostic studies in line with ALARP (as low as reasonably practicable) principles. Blood pool, delayed static and SPECT/CT of the wrists with whole body planar imaging were acquired. SPECT/CT results were obtained using a departmental database and correlated with electronic patient records. Data collected included demographics, indications for imaging, previous interventions and imaging, dose saving results and the referral pathway. Studies were dual reported by specialist Nuclear Medicine and Musculoskeletal consultant radiologists. Findings were then correlated with recorded clinical outcomes; consisting of up to 10 years follow up. Results: Of 333 consecutive SPECT/CT studies performed, 71 studies followed a clear history of trauma. Hand/wrist specialists made all referrals: Orthopaedic or plastic surgeons. The mechanism of injuries included: road traffic accidents, fall onto outstretched hand, hyperextension, overuse injuries related to specific sports (golf wrists, martial arts, tennis), de-gloving injuries. Indications included: claustrophobia (precluding MRI imaging), occult fractures, partial union, non-union, osteonecrosis, mechanical response, loosening (periprosthetic), bone cysts, secondary arthropathy, complex regional pain syndrome, capsular injuries and periosteal avulsions, TFCC injuries, biomechanical stress around a prosthesis, bossing and abutment secondary to acquired positive ulnar variance, calcific peri-arthritis, VISI/DISI, post operative surgical bed uptake or metabolically active healed fractures.. Incidental findings on whole body images included: rib fractures, femoral bony contusions, old scaphoid fractures, osteoarthritis in neighbouring or distant joints, clavicle fractures, shin-splint syndrome, sternoclavicular dislocation, unexpected avulsions or over-use injuries. Conclusion: Hybrid SPECT/CT is an excellent problem-solving tool best used as an adjunct to conventional imaging modalities, offering supplementary diagnostic value. It has a role in traumatic injuries, specifically in complex joints such as the wrist, where physiological information and anatomical detail allow a better understanding of the causes of patients' pain.

When Surgical Resources are Severely Constrained, Who Receives Care? Determinants of Access to Orthopaedic Trauma Surgery in Uganda.

Author(s): Stephens, Trina; Mezei, Alexander; O'Hara, Nathan N; Potter, Jeffrey; Mugarura, Rodney; Blachut, Piotr A; O'Brien, Peter J; Beyeza, Tito; Slobogean, Gerard P

Source: World journal of surgery; Jun 2017; vol. 41 (no. 6); p. 1415-1419

Publication Type(s): Journal Article

Abstract: BACKGROUND In low- and middle-income countries, the volume of traumatic injuries requiring orthopaedic intervention routinely exceeds the capacity of available surgical resources. The objective of this study was to identify predictors of surgical care for lower extremity fracture patients at a high-demand, resource-limited public hospital in Uganda. METHODSSkeletally mature patients admitted with the intention of definitive surgical treatment of an isolated tibia or femur

fractures to the national referral hospital in Uganda were recruited to participate in this study. Demographic, socioeconomic, and clinical data were collected through participant interviews at the time of injury and 6 months post-injury. Social capital (use of social networks to gain access to surgery), financial leveraging, and ethnicity were also included as variables in this analysis. A probit estimation model was used to identify independent and interactive predictors of surgical treatment. RESULTS Of the 64 patients included in the final analysis, the majority of participants were male (83%), with a mean age of 40.6, and were injured in a motor vehicle accident (77%). Due to resource constraints, only 58% of participants received surgical care. The use of social capital and femur fractures were identified as significant predictors of receiving surgical treatment, with social capital emerging as the strongest predictor of access to surgery ($p < 0.05$). CONCLUSION Limited infrastructure, trained personnel, and surgical supplies rations access to surgical care. In this environment, participants with advantageous social connections were able to self-advocate for surgery where demand for these services greatly exceeded available resources.

Risk Factors for Tear Progression in Symptomatic Rotator Cuff Tears: A Prospective Study of 174 Shoulders.

Author(s): Yamamoto, Nobuyuki; Mineta, Mitsuyoshi; Kawakami, Jun; Sano, Hiroataka; Itoi, Eiji

Source: The American journal of sports medicine; Jun 2017 ; p. 363546517709780

Publication Type(s): Journal Article

Abstract: BACKGROUND The risk factors for tear progression in symptomatic rotator cuff tears have not been clarified yet. It is important for orthopaedic surgeons to know the natural course of tear progression when nonoperative management is to be chosen. HYPOTHESIS Tears in younger patients, high-activity patients, or heavy laborers would progress in size more than those in older patients, low-activity patients, or light laborers. STUDY DESIGN Case-control study; Level of evidence, 3. METHOD Two hundred twenty-five consecutive patients with symptomatic rotator cuff tears visited our institute between 2009 and 2015. Of these, 174 shoulders of 171 patients (mean age, 66.9 years) who underwent at least 2 magnetic resonance imaging (MRI) examinations were prospectively enrolled. The mean follow-up was 19 months. Tear progression was defined as positive when the tear size increased by ≥ 2 mm. The demographic factors that were analyzed by multivariate analysis included age, sex, hand dominance, smoking, alcohol drinking, hypercholesterolemia, sports participation, job type, tear size, and tear type (full or partial thickness). RESULTS Of the 174 shoulders, 82 shoulders (47%) showed tear progression. The mean (\pm SD) tear length and width in the progression group on final MRI were 23.1 ± 12.5 mm and 17.3 ± 9.6 mm, respectively; the tear size progressed by a mean 5.8 ± 5.6 mm in length and 3.1 ± 5.2 mm in width. The mean propagation speed was 3.8 mm/y in length and 2.0 mm/y in width. The size of full-thickness tears significantly increased compared with that of articular-sided partial-thickness tears ($P = .0215$). The size of medium tears significantly increased compared with that of other tears ($P < .0001$). According to the logistic regression analysis, smoking was significantly correlated with tear progression ($P = .026$). Subgroup analyses showed that male sex, hand dominance, and trauma were correlated with tear progression. Age, alcohol drinking, hypercholesterolemia, sports participation, and job type did not show any correlation with tear progression. CONCLUSION The tear size of symptomatic rotator cuff tears progressed in 47% of the shoulders during a mean of 19 months, and the speed of progression was 3.8 mm/y in length and 2.0 mm/y in width. The risk factors for tear progression were (1) a medium-sized tear, (2) a full-thickness tear, and (3) smoking.

"Direct vision" operation of posterior atlantoaxial transpedicular screw fixation for unstable atlantoaxial fractures: A retrospective study.

Author(s): Cao, Liangliang; Yang, Erzhu; Xu, Jianguang; Lian, Xiaofeng; Cai, Bin; Liu, Xiaokang; Zhang, Guowang

Source: Medicine; Jun 2017; vol. 96 (no. 25); p. e7054

Publication Type(s): Journal Article

PubMedID: 28640081

Abstract:BACKGROUNDThe posterior screw fixation in atlas via posterior arch and lateral mass, also called C1 "pedicle" screw, combined with C2 pedicle screw fixation has shown better biomechanical stability in unstable atlantoaxial fractures. However, its popularization has to fulfill the limitation imposed by anatomical characteristics. The aim of this study was to explore the manipulation, effect, and safety of the atlantoaxial transpedicular screw fixation under "direct vision" for the treatment of unstable atlantoaxial fracture.METHODSAll the patients diagnosed with unstable atlantoaxial fracture, who received surgery treatment of C1,C2 internal fixation from January 2012 to December 2014 were reviewed. Only these patients that were diagnosed with atlantoaxial instability secondary to trauma and were treated with atlantoaxial transpedicular screw fixation under "direct vision" and iliac autograft were included. The safety of transpedicular screw placement, postoperative outcome, atlantoaxial stability, autograft fusion, and complications was observed and analyzed retrospectively. The pain visual analog scale (VAS) and the Japanese Orthopedic Association (JOA) score were used as surgical curative effect evaluation standards.RESULTSWe reviewed a total of 92 patients diagnosed with unstable atlantoaxial fracture, who received surgery treatment of C1,C2 internal fixation from January 2012 to December 2014, and 87 patients were treated with atlantoaxial transpedicular screw fixation under "direct vision" and were included this analysis. A total of 306 transpedicular screws in atlas and axis were placed successfully. All cases were followed-up >12 months. The overall breach rate was 11.36%. None of the breaches resulted in new-onset neurological sequela. The neurological status in cases with bilateral upper extremities numbness and lower extremities weakness had improved after surgery. At the latest follow-up, the neck VAS and JOA scores were significantly improved ($P < .01$) than those preoperatively. No cases demonstrated implantation failure and bone graft absorption on the postoperative x-ray films and CT scans.CONCLUSIONAtlantoaxial transpedicular screw fixation under "direct vision" and iliac autograft for the treatment of unstable atlantoaxial fracture has shown simple manipulation and efficient performance. Thus, the technique of C1-C2 fixation is feasible in treating unstable atlantoaxial fracture.

No difference in prevalence of radiographic subspinal impingement of the hip between symptomatic and asymptomatic subjects.

Author(s): Yoo, Jun-Il; Ha, Yong-Chan; Lee, Han-Jun; Lee, Jung-Yeop; Lee, Young-Kyun; Koo, Kyung-Hoi

Source: Knee surgery, sports traumatology, arthroscopy : official journal of the ESSKA; Jun 2017; vol. 25 (no. 6); p. 1951-1957

Publication Type(s): Journal Article

Abstract:PURPOSEThe study determined the prevalence of subspinal impingement (SSI) in symptomatic and asymptomatic individuals, morphologic characteristics in symptomatic patients, and risk factors for SSI.METHODSThe study cohort consisted of 427 patients (427 hips; median age 33.4 years; range 19-50 years) with mechanical symptoms who underwent multi-detector computed tomography arthrography (symptomatic patients) and 259 control (asymptomatic) patients who underwent abdominopelvic three-dimensional CT because of a ureter stone or minor trauma. Two orthopaedic surgeons reviewed the images to evaluate the prevalence of SSI and the relationship with morphologic abnormalities. Radiologic parameters were further compared between the SSI and non-SSI groups in symptomatic patients using the Chi-squared test or two-sample t test. Variables with p values <0.10 (sex and age) were included in the multi-variate analysis. Logistic regression analysis was carried out to identify independent risk factors for SSI.RESULTSThe prevalence of SSI in symptomatic and asymptomatic patients was 65/427 (15.2%) and 40/259 (15.4%), respectively (n.s.).

Structural bony abnormalities in symptomatic patients were not associated with the presence of SSI (n.s.). Binary logistic regression analysis revealed that youth (odds ratio 0.952, 95% CI 0.922-0.984) was the only significant factor for SSI. CONCLUSION SSI had a similar prevalence in symptomatic and asymptomatic patients and was not rare in either group. Therefore, clinical implication of SSI in symptomatic patient should be re-evaluated through further study. LEVEL OF EVIDENCE Level IV.

Fracture of the Pars Interarticularis with or without Spondylolisthesis in an Adult Population in a Developing Country: Evaluation by Multidetector Computed Tomography.

Author(s): Khan, Sohail Ahmed; Sattar, Amjad; Khanzada, Usman; Adel, Hatem; Adil, Syed Omair; Hussain, Munawar

Source: Asian spine journal; Jun 2017; vol. 11 (no. 3); p. 437-443

Publication Type(s): Journal Article

Available in full text at [Asian Spine Journal](#) - from National Library of Medicine

Abstract: STUDY DESIGN Descriptive cross-sectional study. PURPOSE To determine the prevalence of lumbar spondylolysis and spondylolisthesis in a general adult population unrelated to lower back pain as evaluated by multidetector computed tomography. OVERVIEW OF LITERATURE There is a significant paucity of information related to the prevalence of spondylolysis and spondylolisthesis and its degenerative changes in a general adult population unrelated to lower back pain in developing countries. METHOD SA retrospective study was conducted on abdominopelvic computed tomography (CT) scans performed between January 1st 2015 and December 31st 2015 for various clinical indications. Patients with lower back pain, with a history of trauma or road traffic accident, or referred from orthopedic or neurosurgery departments were excluded to avoid any bias. CT scans were reviewed in axial, sagittal, and coronal planes using bone window settings for evaluating spondylolysis and spondylolisthesis. RESULTS Of 4,348 patients recruited, spondylolysis and spondylolisthesis were identified in 266 (6.1%) and 142 (3.3%) patients, respectively. Age was significantly higher in both spondylolysis and spondylolisthesis patients than in those without spondylolysis and spondylolisthesis (47.19 ± 15.45 vs. 42.5 ± 15.96 , $p < 0.018$) and spondylolisthesis ($p = 0.025$) were significantly more prevalent in females. CONCLUSION The prevalence of pars interarticularis fracture observed higher with gradual increase in the prevalence with advancing age. In particular, preponderance was significantly higher among older females.

Spontaneous nonunion of ankylosed spine in a patient with ankylosing spondylitis

Author(s): Mallat Y.; Hamida M.K.B.; Habboubi K.; Hasayri E.; Kherfani A.; Mestiri M.

Source: Global Spine Journal; May 2017; vol. 7 (no. 2)

Publication Type(s): Conference Abstract

Abstract: Introduction: Several spinal complications can occur in a patient with ankylosing spondylitis. Extensive discovertebral destructive lesions are known but rare and may be associated with sagittal imbalance and pain symptoms resistant to medical treatment. We reported through this work a new case of spontaneous spinal nonunion in a patient with ankylosing spondylitis. Methods: This was a 38 year-old patient followed for ankylosing spondylitis for 20 years who consulted for pain in the thoracolumbar junction lasting for 2 years and resistant to medical treatment. A dynamic CT scan showed a totally fused thoracolumbar spine except for the D11-D12 level where there was a posterior vertebral arch and superior endplate disruptions with signs of instability on CT cuts in kyphosis. An additional MRI showed inflammatory spondylitis and an angioma of D11. The patient initially was treated with a thoracolumbar corset without sensible improvement. Surgical treatment was indicated given the persistence of pain. He had a posterior approach with D10-L2 fixation and postero-lateral graft followed by a second procedure through a

retro-peritoneal extra-pleural anterior approach, given access to the endplate nonunion and the interposition of an autologous tri-cortical bony graft. Results: At a last follow-up of 3 years, patient was completely indolent with a circumferential fusion on last CT scan, but a predicted loss of motion. Conclusions: These lesions have been described for the first time in 1937 by Anderson, since then, several theories have been advanced to explain these disco-vertebral damages. It was Wu PC, Ho E et al. who studied first the pathophysiology of this complication and demonstrate the role of articular processes fractures in the genesis of these lesions. Several mechanisms may explain the occurrence of this nonunion: the persistence of a certain disc mobility leads to an escaping phenomenon to the global spinal fusion; a secondary fracture of the articular processes, following a benign spinal trauma; a stress fracture of the posterior articular processes, on an ankylosed and kyphotic spine. Several cases were reported in the literature, the orthopedic treatment hasn't given good results and authors agree on the need for a circumferential vertebral fusion of the articular processes fractures posteriorly and vertebral endplates, anteriorly. Spinal nonunions in patients with ankylosing spondylitis are rare but their ignorance can lead to serious functional complications. Conservative treatment isn't sufficient in the treatment of the spinal nonunions. Only a circumferential graft through a double surgical approach is recommended for this type of injury, for better chances of consolidation.

Cervical spondylolysis over osteopetrotic spine

Author(s): Hamida M.K.B.; Habboubi K.; Bekkay M.A.; Oussama B.; Kherfani A.; Mestiri M.

Source: Global Spine Journal; May 2017; vol. 7 (no. 2)

Publication Type(s): Conference Abstract

Abstract: Introduction: Spondylolysis in the cervical spine is a rare condition. Only few cases were reported in the literature. Its association with osteopetrosis has been described by some authors but remains exceptional; it is most often indicative of the disease. We presented the case of a cervical spondylolysis in a patient with osteopetrosis. Methods: We reported the case of a 20 year-old woman, followed for a left femur stress fracture on osteopetrosis treated conservatively, which consults for bilateral cervicobrachial Neuralgia following accidental hyperextension of the cervical spine. The clinical examination found a paravertebral muscular contracture, associated with painful upper cervical spines spinous processes on palpation. Neurological examination was normal. Radiological assessment by AP and lateral X-rays and a CT scan showed a C2 spondylolysis. In the absence of signs of instability on dynamic X-rays, the patient was treated conservatively. Results: At a 2 years follow-up, there was no signs of cervical instability with the persistence of an intermittent neck pain. Conclusions: Spondylolysis with or without spondylolisthesis is rare in the cervical spine. It was reported for the first time by perlman in 1951 which was described as a defect of the pars interarticularis, in the junction between the upper and lower articular processes. The presence of these lesions in patients suffering from osteopetrosis was recognized by Suzuki and Szapanos since the eighties. The cause of this spondylolysis remains controversial with congenital theory based on the association of embryonic developmental abnormalities in these newborns, however autopsies of patients did not reveal spondylolysis. Only a dozen cases have been reported in the literature. In a series of seven patients published in 1998 by Martin only two had a cervical spondylolysis and a case reported a multiple locations spondylolysis. Clinically, the lesion is usually asymptomatic. It's found incidentally on cervical X-rays after a benign trauma. Treatment can be sufficient with a cervical collar but this treatment can be considered only if there is no signs of instability on dynamic X-rays of the cervical spine, as in our case. A case of posterior C1-C4 fusion has been reported in the series of Martin but with an evolution towards nonunion after a two years follow-up. Osteopetrosis should be recognized as a cause of pathological spondylolysis that may affect the cervical or lumbar spine, especially in children. Orthopedic treatment represent a successful option when there is no signs of instability associated.

Upper cervical spine surgery in the Dzanelidze research institute of emergency medicine

Author(s): Manukovskiy V.; Tamaev T.; Serikov V.; Tulikov K.

Source: Global Spine Journal; May 2017; vol. 7 (no. 2)

Publication Type(s): Conference Abstract

Abstract: Introduction: Surgical treatment patients with upper cervical spine trauma actual problem. Material and Methods: 88 patients with of upper cervical spine injury, treated 2011- 2015. In all cases, surgical treatment was performed using different stabilizing systems. CT performed to all patients with suspected cervical spine injury before and after the operative treatment. Selective angiography of brachiocephalic vessels was carried out according to indications to assess the collateral blood flow. Before surgery, spine was fixed in a "Philadelphia" collar. After surgery on the second day was performed in a soft collar. Reposition was made on the operating table. In 38(43%) cases, was used. only J. Harms technic, performed with 4 and 6, screw structures in C1-C2, C2-C3, C1-C3, C1-C2-C3 segments. In 14(16%) posterior fixation was performed with 2 screws on one level at C1-C1 and C2-C2. Occipitospodylodesis was applied in 30(34%) cases. Frontal fixation was performed 6(7%) times - cannulated screw in odontoid of C2. Control CT was performed in 3, 6, 9 and 12 months after surgery. Results of treatment were estimated by using VAS, ODI, RDQ scales and questionnaires Evaluation of pain was carried out using VAS before the operative treatment, at 1, 5, 10 days, 1, 3, 6, 9 months. It was found that pain rapidly regresses during the first week after surgery: occipitospodylodesis 5-6 points, single- and multi-level fixation 4-5, cannulated screw 3-4 to the end of the first week after surgery. Most satisfied with the quality of life in the early and late postoperative period are patients operated with cannulated screw and single-level fixation. In the remaining groups quality of life improved more quickly than a less extended structure was established. It is worth noting that in these 2 groups (occipitospodylodesis and multilevel fixation) at 1 month after surgery difference in the quality of life was not significant. Catamnesis ranged from 1 to 36 months. Results: Orthopaedic good or excellent results obtained in 100% of cases. Consolidation occurred within the period from 3 till 12 months. Clinically significant complication was in 1 case. In 3 cases were asymptomatic malposition of screws. No mortality and infectious complications. The results of the functional state estimation in the early and late postoperative period on scales ODI and RDQ as follows: patients with occipitospodylodesis gradient of the absolute values in the range of 76% -30% and 5.12 points, respectively; patients with multi-level fixation of 72% -25% and 12-4 points; patients with single-level fixation of 72% -20% and 12-2; patients with cannulated screw 68%- 20% and 12-2. Conclusion: For fractures of the C2 vertebra such as Hangman type, and unstable fractures of C1 monosegmental transpedicular C2-C2 and C1-C1, lateral mass fixation, preserves the physiological properties of the craniocervical transition with sufficient stability in the zone of fracture, for consolidation. An anterior odontoid fixation with cannulated screw is most preferred for fractures of the odontoid process of C2 type 2, because preservation of C1-C2 joint function. In the best long-time quality of life patients with single-level posterior fixation and fixation with cannulated screw.

Posterior transarticular fixation of C1-C2 with endoscopic assistance

Author(s): Lvov I.; Grin A.; Nekrasov M.; Kordonskiy A.; Sytnik A.; Krylov V.

Source: Global Spine Journal; May 2017; vol. 7 (no. 2)

Publication Type(s): Conference Abstract

Abstract: Introduction. The most common and reliable methods of C1- C2 fusion are the fixation by Harms and by Magerl techniques. The main advantages of Magerl technique are the great opportunities for minimally invasive performing. The two main methods of posterior transarticular stabilization are known: neuronavigated percutaneous technique and open surgery. It is possible to decrease the surgical trauma using lateral transmuscular approach with tubular retractor and

endoscopic assistance in the case of CT navigation absence. **Materials and methods.** Eighty-nine patients with upper cervical fractures were treated from 2011 till 2016. The posterior transarticular fixation with cannulated screws was applied at 31 cases. The open surgical treatment by posterior midline access to C1-C2 was performed in 15 patients who required posterior decompression or additional translaminar fusion. The posterolateral transmuscular approach was used in 16 patients who suffered from reducible atlantoaxial dislocations. Two patients with upper cervical fractures were successfully treated using minimally invasive Magerl technique with endoscopic assistance. **Surgical technique.** The closed reduction and immobilization in Halo were used during the surgical treatment as the first step. The second step included four small skin incisions (15mm) provided minimally invasive technique: two of them were used for endoscopic-assist approaches to facet joints of C2-C3 through the tubular retractors and two - for K-wires and cannulated instruments' ports. Then the entry points at the C2 facets for the K-wires and screws were exposed. Afterwards the K-wire was put through the posterior C2 elements to lateral mass of atlas from each side under the video and X-ray control. Finally we drilled the canals for screws in C1-C2 with following putting the screws over the K-wires. **Results:** The placement of screws was correct according to CT data. There were no postoperative complications in patients with posterolateral transmuscular approach usage. The good orthopedic and clinical outcomes were observed in all these patients. **Conclusions.** The posterior C1-C2 transarticular fixation with endoscopic assistance could be the alternative to open surgery or percutaneous procedures. The usage of this minimal invasive technique is possible for treatment of reducible dislocations in case of normal vertebral artery course. The small skin incisions and surgical corridor as well as the minimal damage of cervical muscles allows decreasing the postoperative complications.

A Comparative Analysis of the Most Common Complications for Patients Undergoing Traumatic Foot and Ankle Surgery

Author(s): Hunter J.G.; Baumhauer J.F.

Source: Techniques in Foot and Ankle Surgery; May 2017; vol. 16 (no. 2); p. 86-90

Publication Type(s): Article

Abstract: Patient safety is protection from adverse outcome through reduction of complications. The purpose of this study is to accurately identify the most common complications after foot and ankle (FA) and traumatic FA surgery and characterize their incidence compared with all other orthopedic procedures. The American Board of Orthopaedic Surgeons (ABOS) database was searched from 2006 to 2010 for all reported orthopedic and FA procedures. The incidence of complications was identified for the following groups: the 10 most common trauma FA procedures, and all FA procedures cumulatively. The incidence of complications for each group were then compared with all other orthopedic procedures reported during that same period. Statistical analysis was performed using a 2-tailed Student t test and w2 with Yates. A total of 56,786 FA codes and their associated complication(s) were compared with 429,358 orthopedic codes and their complication(s). The 10 most commonly reported trauma FA procedures accounted for 51% of all FA CPT codes and 46.3% of FA complications. Procedures reporting at least 1 complication were significantly higher for all FA codes when compared with all orthopedic procedures, 13.7% versus 9.2% (P = 0.001). The most commonly performed trauma FA procedures had a higher complication rate of 13.5% versus 9.2% (P = 0.001). Overall, soft tissue complications (infection, wound dehiscence, and skin ulcer/blister) were each reported significantly more in all FA and trauma FA when compared with other orthopedic procedures (P © Copyright 2017 Wolters Kluwer Health, Inc. All rights reserved.

Fat emboli syndrome and the orthopaedic trauma surgeon: lessons learned and clinical recommendations

Author(s): Dunn R.H.; Jackson T.; Burlew C.C.; Pieracci F.M.; Fox C.; Cohen M.; Campion E.M.; Lawless R.; Mauffrey C.

Source: International Orthopaedics; May 2017 ; p. 1-6

Publication Type(s): Article In Press

Abstract: Purpose: Fat emboli syndrome is a rare but well-described complication of long-bone fractures classically characterised by a triad of respiratory failure, mental status changes and petechial rash. In this paper, we present the case of a patient who sustained bilateral femoral fractures and subsequently developed FES. Our aim was to review and summarise the current literature regarding the pathophysiology and management of fat emboli syndrome (FES) and propose an algorithm for treating patients with bilateral femoral fractures to reduce the risk of FES. Methods: A literature analysis was performed to determine implications in the clinical setting. Results: Currently, there exists little high-quality evidence to guide the orthopaedic surgeon in identifying patients at highest risk of FES or in preventing FES in patients with multiple long-bone fractures. However, the literature does suggest that the risk is directly related to the volume of marrow displaced and inversely related to both the time to fracture stabilisation and the respiratory reserve of the patient. Based on these correlations, we propose an algorithm for treating patients with bilateral femoral fractures, taking into consideration haemodynamic and pulmonary stability. Conclusions: Our algorithm for managing bilateral femoral fractures prioritises early stabilisation with external fixation, staged intramedullary nailing and conversion to plate fixation if FES develops. This protocol is meant to be the basis of future investigations of optimal treatment strategies. Copyright © 2017 SICOT aisbl

Orthopedic trauma surgery and hospital cost analysis in refugees; the effect of the Syrian civil War

Author(s): Duramaz A.; Bilgili M.G.; Bayram B.; Ziroglu N.; Bayrak A.; Avkan M.C.

Source: International Orthopaedics; May 2017; vol. 41 (no. 5); p. 877-884

Publication Type(s): Article

Abstract: Purpose: The aim of this study was to evaluate the musculoskeletal injury types, injury mechanisms, surgical techniques and treatment costs of Syrian refugees. Methods: Totally 158 patients (67 female, 91 male) treated in our clinic in 34 months period between January 2012 and October 2014 were included in the study. The mean age of the patients was 39.3 years (range: 18-82 years). The patients were evaluated for age, gender, mechanism of injury, location and type of fracture, presence of accompanying injuries, injury severity score, surgical technique, complications, mortality/morbidity and treatment cost. Results: The injuries were more frequently reported in lower extremities, upper extremities and axial skeleton, respectively. Blunt trauma was significantly higher in upper extremity injuries compared with the other types of injuries ($p = 0.001$). Fractures were most commonly reported in foot/ankle region and in males, hand/wrist fractures were significantly higher than that of the females. Plate fixation of upper extremity fractures and intramedullary nailing in lower extremity fractures were the most commonly preferred treatment modalities. The mean hospitalization period of patients was 5.6 days and the mean treatment cost was 3844 Turkish Liras (TL). Conclusions: In this study, it was shown that there was a statistically significant increase in the cost of health expenses in patients with fall from heights or gunshot wound, with fractures in axial skeleton or with the ISS score between 16 and 66. The cost rise was associated with worse prognosis, complications, intensive care treatments and prolonged hospitalization periods. Copyright © 2017, SICOT aisbl.

Risk factors including age, gender, osteoporosis in spine or hip, and local osteoporosis for more severe pattern of fracture in proximal humerus fracture

Author(s): Kim J.H.; Koh K.H.; Kim S.-S.

Source: Calcified Tissue International; May 2017; vol. 100 (no. 1)

Publication Type(s): Conference Abstract

Abstract: Objectives: Reduced bone mineral density (BMD) has been shown as one of the significant risk factors for proximal humerus fracture and can be correlated to the severity of fracture. Purpose of this study is to evaluate the correlation of local BMD assessed by plain radiographs with the severity of fracture in proximal humerus fractures. Methods: Fracture of proximal humerus which treated by open reduction and internal fixation with locking plate were consecutively included between 2014 and 2016. Deltoid tuberosity index and cortical bone thickness average (CBTAVG) were measured for evaluation of local BMD. Plain radiographs and additional CT scans of the fracture were evaluated for fracture severity (from 0 to 3; 3 is most severe fracture). It was scored by experienced orthopaedic surgeons according to the radiographic parameters such as metaphyseal comminution, angulation, and medial hinge disruption. Risk factors for fracture severity including demographics, medical comorbidities, BMD of hip and spine, CBTAVG, and deltoid tuberosity index were analyzed using univariate analysis. Multivariate analysis was performed to identify the independent factors affecting the fracture severity. Results: 42 patients were taken surgery for proximal humerus fracture. After exclusion of 5 patients (one patient under the age of 18, 3 arthroscopic reduction and suture fixation, 1 case of delayed union after conservative treatment), a total of 37 were analyzed. There were 6 male and 31 female patients with a mean age of 69.6 years (+/-16). Mean BMI was 24.4 (+/-16.0) Mean T-score in BMD was -2.4 in spine and -2.0 in hip joint at the time of injury (18 osteoporosis, 10 osteopenia, and 9 normal). Ten patients had a prior fragility fracture either in hip, spine, or wrist. 27 patients had medical comorbidities and 34 fractures injured by minor trauma were regarded as fragility fracture. There were twenty 2-part, fourteen 3-part, and three 4-part fractures by Neer classification. Univariate analysis showed age, gender, medical morbidity, CBTAVG less than 6 mm was related to the severity of fracture. In multivariate analysis, age and CBTAVG were the independent risk factors for fracture severity. Summary and Conclusion: Age and local osteoporosis were the independent risk factors for more severe pattern of fracture in proximal humerus fracture. BMD in spine or hip, gender, and other medical morbidities were not independent risk factors for severe form of fracture.

Any Cortical Bridging Predicts Healing of Supracondylar Femur Fractures After Treatment with Locked Plating

Author(s): Strotman P.K.; Karunakar M.A.; Seymour R.; Lack W.D.

Source: Journal of Orthopaedic Trauma; May 2017

Publication Type(s): Article In Press

Abstract: OBJECTIVES:: To determine the accuracy and reliability of radiographic cortical bridging criteria in predicting the final healing of supracondylar femur fractures after treatment with locked plating. DESIGN:: Retrospective review SETTING:: Two level 1 trauma centers PATIENTS/PARTICIPANTS:: We retrospectively reviewed the records at two level 1 trauma centers for patients who presented with supracondylar femur fractures (AO/OTA 33A, C) and were treated with locking plate fixation between 1/1/2004 and 1/1/2011. The final study population included 82 fractures after excluding patients with open physes (n=4), nondisplaced fractures (n=4), early revision for technical failure (n=4), or inadequate follow-up (n=42). INTERVENTION:: Distal femur locking plate fixation MAIN OUTCOME MEASUREMENTS:: Postoperative radiographs until final follow-up were assessed for cortical bridging at each cortex on anterior-posterior (AP) and lateral views. Images were analyzed independently by three orthopaedic traumatologists to allow for assessment of reliability. Final determination of union required both radiographic and clinical confirmation. RESULTS:: Assessment for any cortical bridging was the earliest, accurate predictor of final union (95.1% accuracy at four months postoperatively), when compared to criteria requiring bicortical bridging (93.9% accuracy at 6 months) and tricortical bridging (78% accuracy at 21

months). Any cortical bridging demonstrated a higher interobserver reliability ($\kappa=0.73$) relative to bicortical ($\kappa=0.27$) or tricortical bridging ($\kappa=0.5$). **CONCLUSIONS::** Our results for plate fixation of supracondylar distal femur fractures mirror those previously described for intramedullary nailing of tibia shaft fractures. Any radiographic cortical bridging by four months postoperatively is an accurate and reliable predictor of final healing outcome following locking plate fixation of supracondylar femur fractures. Assessment for bicortical or tricortical bridging is less reliable and inaccurate during the first postoperative year. **LEVEL OF EVIDENCE::** Diagnostic Level III. See Instructions for Authors for a complete description of levels of evidence. Copyright © 2017 Wolters Kluwer Health, Inc. All rights reserved.

The Trajectory of Short and Long Term Recovery of Tibial Shaft Fractures Following Intramedullary Nail Fixation

Author(s): Ko S.J.; O'Brien P.J.; Guy P.; Broekhuysen H.M.; Blachut P.A.; Lefavre K.A.

Source: Journal of Orthopaedic Trauma; May 2017

Publication Type(s): Article In Press

Abstract: **OBJECTIVE::** To determine the trajectory of recovery following tibial shaft fracture treated with intramedullary nail over the first five years, and to evaluate the magnitude of the changes in functional outcome at various time intervals. **DESIGN::** Prospective cohort study. **SETTING::** A level 1 trauma center. **PATIENTS/PARTICIPANTS::** 132 patients with tibial shaft fracture (OTA 42-A,B,C) were enrolled into the Center's prospectively enrolled orthopaedic trauma database between January 2005 and February 2010. Functional outcome data was collected at baseline, 6 months, 1 year, and 5 years. **INTERVENTION::** Enrolled patients were treated acutely with intramedullary nailing of their tibia. **MAIN OUTCOME MEASUREMENTS::** Evaluation was performed using the Short Form-36 and Short Musculoskeletal Function Assessment. **RESULTS::** Mean SF-36 physical component scores improved between 6-12 months ($p = 0.0008$) and between 1-5 years ($p = 0.0029$). Similarly, mean SMFA physical function scores improved between 6-12 months ($p = 0.0254$) and between 1-5 years ($p = 0.0106$). In both scores, the rate or slope of this improvement is flatter between 1-5 years than it is between 6-12 months. Furthermore, SF-36 and SMFA scores did not reach baseline at 5 years (SF-36 p Copyright © 2017 Wolters Kluwer Health, Inc. All rights reserved.

Bad to the bone: A rare case of pubic osteomyelitis in a prostate cancer survivor

Author(s): Paulino R.; Apoeso O.; Vapnek J.

Source: Journal of the American Geriatrics Society; May 2017; vol. 65

Publication Type(s): Conference Abstract

Abstract: **Introduction:** Prostate cancer is the second most common cancer in men. Common side effects of prostate cancer treatment and urologic surgery include urinary incontinence, urethral stricture, and erectile dysfunction. Pubic symphysis osteomyelitis is a rare and under recognized complication of prostate cancer treatment, representing less than 1-2% of osteomyelitis cases. **Case:** A 76 year old male with prostate cancer, s/p multiple TURPs following brachytherapy and external beam radiation-induced bladder outlet obstruction requiring frequent self catheterization, was admitted for suprapubic pain. Exam revealed exquisite suprapubic pain and limited hip flexion. Orthopedics recommended obtaining inflammatory markers and MRI of the hip. ESR and CRP peaked at 91 and 194, respectively. MRI showed right hip degenerative arthrosis with an incidental fistulous connection between the urinary bladder and pubic symphysis resulting in acute pubic osteomyelitis. A multidisciplinary approach to treatment was formulated with Urology and Infectious Disease. CT guided aspiration of fluid around the pubic symphysis with concurrent CT arthrogram confirmed a fistula between the pubic symphysis and prostatic urethra. Conservative treatment was initiated with a 6-week course of ampicillin-sulbactam, subsequently transitioned to oral amoxicillin-

clavulanate. Patient was discharged to subacute rehab with a foley catheter to give the fistula a chance to heal. Discussion: Fistula formation after radiation or ablative surgery for prostate cancer can predispose to pubic osteomyelitis. A combination of multiple TURPs, brachytherapy, XRT, and repetitive trauma from frequent catheterization significantly increases risk for developing this rare condition. A multidisciplinary approach involving Urology, Orthopedics, and Infectious disease is essential for proper diagnosis and treatment. Pelvic MRI is an excellent initial imaging study to document the extent of involvement, with confirmation by CT urogram. Debridement and/or antibiotics with possible surgery may be required depending on the extent of disease. Conclusion: Pubic osteomyelitis should be included in the differential diagnosis of pelvic pain in patients with a history of prostate cancer treatment. This rare disease is best approached in a multidisciplinary fashion involving Urology, Orthopedics, and Infectious disease specialties.

Orthopedic injury in electric bicycle-related collisions.

Author(s): Li, Xiaoxuan; Yun, Zhe; Li, Xiaoxiang; Wang, Yucai; Yang, Tongtao; Zheng, Lianhe; Qian, Jixian

Source: Traffic injury prevention; May 2017; vol. 18 (no. 4); p. 437-440

Publication Type(s): Journal Article

Abstract:OBJECTIVEAlthough electric bicycle-related injuries have become the most common reason for hospitalization due to a road crash in China, no study has comprehensively investigated electric bicycle collisions and their impact on orthopedic injuries; such a study may provide evidence to support a new road safety policy.METHODSA retrospective review of orthopedic injuries from electric bicycle collisions was performed in an urban trauma center. We collected variables including age, gender, location of fracture, presence of open or closed fractures, concomitant vascular, and neurologic injuries.RESULTSA total of 2,044 cases were involved in electric bicycle collisions. The orthopedic injury victims were predominantly male and middle aged. The most common orthopedic injury was a femur fracture. Open fractures frequently involved the forearm and tibia/fibula. Male patients were more likely to suffer from multiple fractures and associated injuries than female patients. Fewer patients age 60 years old or older wore helmets at the time of the accident compared to those in other age groups.CONCLUSIONSOrthopedic injuries from electric bicycle-related accidents cause patients substantial suffering that could lead to serious social consequences. Helmet use and protective clothing or similar safety gear, especially for electric bicycle users, should be required to provide greater protection.

Effect of Lymphedema Treatment for Management of Acute Pilon Fractures.

Author(s): Whatley, John M; Lalonde, James A; Greene, Craig C; Riche, Kevin B; Tatum, Danielle M

Source: Orthopedics; May 2017 ; p. 1-7

Publication Type(s): Journal Article

Available in full text at [Orthopedics](#) - from ProQuest

Abstract:Pilon fractures are high-energy injuries that often result in considerable edema and compromise of the soft tissue envelope of the ankle. These injuries are typically staged with an external fixator until the soft tissue is amenable for definitive fixation. This study was conducted to determine the effects of lymphedema treatment for the management of pilon fractures. Patients who underwent open reduction and internal fixation of pilon fractures between 2007 and 2014 at the authors' level II trauma center were identified by Current Procedural Terminology codes indicative of placement of an external fixator (20690) and open reduction and internal fixation of a pilon fracture (27826, 27827, or 27828). The primary efficacy endpoint to determine negative outcomes was 90 days after definitive fixation. Eighty-two patients with 84 pilon fractures met inclusion criteria. Forty-eight ankles (57%) received lymphedema treatment. There were no

significant differences in population demographics between the control and treatment groups. Median times to internal fixation in the control and treatment groups were 20 days (inter-quartile range, 15.5-30 days) and 11 days (interquartile range, 6-18 days), respectively. This difference was statistically significant ($P=.001$). Additionally, there was no significant difference in the overall incidence of wound complications between the control and treatment groups ($P=.246$). Compression wrapping for posttraumatic edema was effective in reducing the time needed for soft tissues to be appropriate for definitive surgical fixation of pilon fractures without increasing the risk of wound complications. These promising results warrant future study. [Orthopedics. 201x; xx(x):xx-xx.].

Arthroscopic treatment of symptomatic calcific peri-arthritis on the medial side of the knee after posterior cruciate ligament reconstruction: Case report and literature review.

Author(s): Jang, Eui-Chan; Lee, Han-Jun; Kim, Seong Hwan; Kwak, Yoon-Ho

Source: Acta orthopaedica et traumatologica turcica; May 2017

Publication Type(s): Journal Article

Available in full text at [Acta orthopaedica et traumatologica turcica \[Acta Orthop Traumatol Turc\]](#)
 NLMUID: 9424806 - from EBSCOhost

Abstract: Calcific peri-arthritis in the distal femur is a rare condition. Forty two year old Asian male visited to the outpatient clinic of orthopedic department with acute excruciating knee pain. The arthroscopic posterior cruciate ligament (PCL) reconstruction was performed 20 years ago with the bonepatellar tendon-bone (BPTB) autograft combined with Trevira (polyethylene terephthalate) artificial ligament. Severe tenderness was noted incidentally over the medial epicondyle area of the distal femur which the cancellous screw was inserted for PCL reconstruction, without any preceding trauma history or medial joint line tenderness due to degenerative change. The poorly defined calcific deposition was found in plain radiograph. The arthroscopic debridement of the calcification and screw removal from the distal femur was performed due to resist to conservative treatment with analgesics. After operation, the symptoms were resolved completely. The arthroscopic debridement of calcific peri-arthritis should be considered in specific cases, such as refractory cases with conservative management during 4-6 weeks. We present the arthroscopic treatment of the symptomatic calcific peri-arthritis on distal femur after PCL reconstruction can be effective.

Analysis of Bony and Internal Organ Injuries Associated With 26,357 Adult Femoral Shaft Fractures and Their Impact on Mortality.

Author(s): Anandasivam, Nidharshan S; Russo, Glenn S; Fischer, Jennifer M; Samuel, Andre M; Oudeck, Nathaniel T; Swallow, Matthew S; Chung, Sophie H; Bohl, Daniel D; Grauer, Jonathan N

Source: Orthopedics; May 2017; vol. 40 (no. 3); p. e506

Publication Type(s): Journal Article

Available in full text at [Orthopedics](#) - from ProQuest

Abstract: The spectrum of injuries associated with femoral shaft fractures and those injuries' association with mortality have not been well delineated previously. Patients in the National Trauma Data Bank who presented with femoral shaft fractures from 2011 to 2012 were analyzed in 3 age groups (18-39, 40-64, and 65+ years). For each group, modified Charlson Comorbidity Index (CCI), mechanism of injury (MOI), injury severity score (ISS), and associated injuries were reported. Multivariate logistic regression was used to identify predictors of mortality. Among the 26,357 patients with femoral shaft fractures, modified CCIs gradually increased with increasing age category and ISS decreased. Motor vehicle accidents were the most common MOI in the younger 2 age groups, whereas falls were the most common MOI in the 65 years and older age group. The top 3 associated bony injuries for the study cohort as a whole were tibia/fibula (20.5%), ribs/sternum

(19.1%), and non-shaft femur (18.9%, of which 5.8% of the total cohort were femoral neck) fractures. The top 3 associated internal organ injuries were lung (18.9%), intracranial (13.5%), and liver (6.2%), injuries. A multivariate mortality analysis showed that increasing age, increasing comorbidity burden, and associated injuries all had independent associations with mortality. The injuries most associated with mortality were thoracic organ injuries (adjusted odds ratio [AOR]=3.53), head injuries (AOR=2.93), abdominal organ injuries (AOR=2.78), and pelvic fractures (AOR=1.80). This study used a large, nationwide sample of trauma patients to profile injuries associated with femoral shaft fractures. Associations between injuries and mortality underscore the importance of these findings. [Orthopedics. 2017; 40(3):e506-e512.].

Open Dislocation of Ankle without Fracture Treated with an External Fixator.

Author(s): Sayit, Emrah; Sayit, Asli Tanrivermis; Zan, Elcin

Source: Orthopaedic surgery; May 2017; vol. 9 (no. 2); p. 247-251

Publication Type(s): Case Reports

Abstract: Ankle dislocations are orthopedic emergencies that require immediate treatment to avoid neurovascular impairment. They are usually accompanied by one or more comminuted fractures of the ankle mortis. In rare circumstances, such as high-energy trauma, the ankle dislocations may not be accompanied by concomitant malleolar fractures and, thus, are named "pure ankle dislocations". We presented a very rare and interesting case of an open medial dislocation of the ankle without associated fracture in an 18-year-old man with no known predisposing risk factors. The patient was admitted to the emergency department after sustaining a catastrophic trampoline accident resulting in severe inversion of the right ankle. The patient was treated with an external fixator and was mobilized early in the post-surgical course. Despite initial presentation that revealed lack of posterior tibial pulse, the post-surgical course was uneventful, with full functional recovery and joint mobility. The primary goals of treatment are immediate reduction of the joint and relief of neurovascular stress. External fixation is a prompt, fairly easy treatment that one should keep in mind in pure ankle dislocations. Nonetheless, ligamentous restoration and early mobilization were the key elements as seen in our case for full functional recovery.

The Combined Use of a Neurocutaneous Flap and the Ilizarov Technique for Reconstruction of Large Soft Tissue Defects and Bone Loss in the Tibia.

Author(s): Xu, Jia; Zhong, Wan-Run; Cheng, Liang; Wang, Chun-Yang; Wen, Gen; Han, Pei; Chai, Yi-Min

Source: Annals of plastic surgery; May 2017; vol. 78 (no. 5); p. 543-548

Publication Type(s): Journal Article

Abstract: BACKGROUND Management of posttraumatic large soft tissue defects and bone loss remains a therapeutic and surgical challenge for orthopedic surgeons. We assessed the use of a neurocutaneous flap and the Ilizarov technique in the reconstruction of severe composite defects in the tibia. METHODS We retrospectively reviewed 18 consecutive patients with trauma-related soft tissue defects and bone loss. The size of the soft tissue defect ranges from 8 × 9 cm to 14 × 18 cm. The mean size of bone loss was 4.5 cm. A great saphenous neurocutaneous flap or sural neurocutaneous flap was created to reconstruct the soft tissue defect. The Ilizarov external fixator was applied to reconstruct bony loss by means of distraction osteogenesis. RESULT The mean follow-up period was 38.8 months. All transferred flaps survived completely. The area covered ranged from 9 × 10 cm to 15 × 20 cm. The mean distraction length and duration of use of the external fixator were 6 cm and 11.4 months, respectively. All patients achieved final union. Complications of superficial pin-tract infections and mild Achilles tendon contracture were observed, but these were resolved over time. All patients were satisfied with the outcome of the surgery. CONCLUSION A well-

vascularized neurocutaneous flap is a safe and effective option in lower extremity reconstruction under a stable mechanical environment, which can be created using the Ilizarov technique. It is a good option for reconstructing severe complex defects in the lower limb.



UpToDate is the leading evidence-based clinical decision support system, designed for use at the point of care.

It contains more than 9,500 searchable topics across the following specialities:

- ❖ Adult and paediatric emergency medicine
- ❖ Allergy and immunology
- ❖ Cardiovascular medicine
- ❖ Dermatology
- ❖ Drug therapy
- ❖ Endocrinology and diabetes mellitus
- ❖ Family medicine
- ❖ Gastroenterology and hepatology
- ❖ General surgery
- ❖ Geriatrics
- ❖ Haematology
- ❖ Hospital Medicine
- ❖ Infectious diseases
- ❖ Nephrology and hypertension
- ❖ Neurology
- ❖ Obstetrics and gynaecology
- ❖ Oncology
- ❖ Paediatrics
- ❖ Primary care internal medicine
- ❖ Psychiatry
- ❖ Pulmonary, critical care and sleep medicine
- ❖ Rheumatology

How to access UpToDate

You can access UpToDate from any computer via www.uptodate.com. You will need your NHS Athens username/password (register through <http://openathens.nice.org.uk/>).

Exercise: Heterogeneity

Heterogeneity is the extent to which studies brought together in a systematic review demonstrate variation across a range of key variables.

Match the different types of heterogeneity:

1. Statistical heterogeneity (conventionally just known as 'heterogeneity')
 2. Methodological heterogeneity
 3. Clinical heterogeneity
-
- A. Variability in the participants, interventions and outcomes studied
 - B. Variability in study design and risk of bias
 - C. Variability in the intervention effects being evaluated in the different studies

Answers: 1C, 2B, 3A



Library Opening Times

Staffed hours: 8am-5pm, Monday to Friday

Swipe-card access: 7am-11pm, seven days a week

Level 5, Education and Research Centre

University Hospitals Bristol

Contact your Outreach Librarian:

Jo Hooper

library@uhbristol.nhs.uk

Ext. 20103