CJOS

Vol 1.2[April 2007]

Clinical Journal of Orthopaedic Surgery

Vasu Pai
Editor
Orthopaedic Surgeon
New Zealand

www.bonefix@co.nz

CONTENTS

IJournal Club

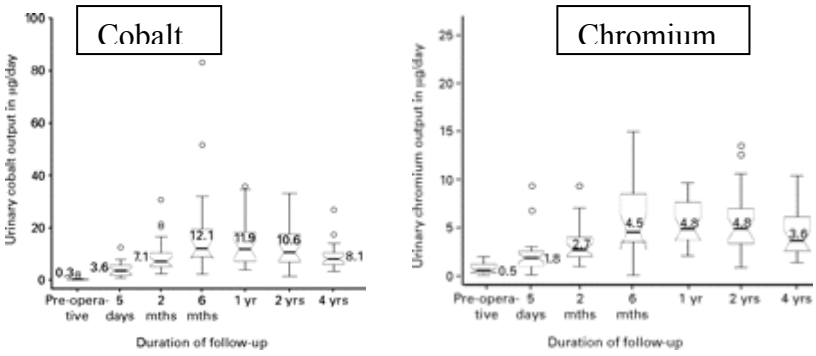
1.Blood and urine metal ion levels in young and active patients after Birmingham hip resurfacing arthroplasty Vol 89-B, Issue 2, 169-17. McMinn

This is a longitudinal study : metal-on-metal resurfacings over a period of four years
Twelve-hour urine collections and whole blood specimens were collected before and periodically after a Birmingham hip resurfacing in 26 patients.
Urine: Early increase in urinary output, a peak at 6 M for Cobalt and 1 year for chromium.
There a steady decrease in the median urinary output of cobalt over the following three years.. This late reduction was statistically significant for chromium but not for cobalt.

The effects of systemic metal ion exposure in patients with metal-on-metal resurfacing arthroplasties continue to be a matter of concern. The levels in this study provide a baseline against which the *in vivo* wear performance . Earlier studies have shown that, as a surrogate measure of systemic metal exposure, serum or plasma levels are not as reliable as whole blood levels.The mean age at operation was 52.9 years . All patients had well-functioning resurfacing arthroplasties

A high-resolution inductively-coupled plasma mass spectrometer (HR-ICP-MS, Thermo Fisher Scientific GmbH, Bremen, Germany). The limits of detection for cobalt and chromium were 0.02 µg/l in the urine, and the reporting limit was three times this (i.e. 0.06 µg/l). The reporting limit in the whole blood was 0.2 µg/l (limit of detection 0.067 µg/l).

The daily urinary output of cobalt : The median cobalt output at six months (12.1 µg/day) was almost 50% greater than that at four years (8.1 µg/day)



The daily urinary output of chromium shows a similar but less pronounced increasing trend up to the one- and two-year stages, followed by a decrease at four years (Fig. 2). The median chromium output at one and two years (4.8 µg/day) was 33% greater than that at four years (3.6 µg/day),
The mean whole blood cobalt and chromium concentrations at the one-year follow-up were 1.3 µg/l and 2.4 µg/l, respectively. At four years they were 1.2 µg/l and 1.1 µg/l, respectively. The difference between the pre-operative and one-year levels for cobalt was statistically significant (Fig. 3). This reduces by a small margin at four years.

Discussion

Problems: mutagenic, teratogenic and immunological sequelae, lymphocyte suppression and lymphocyte-dominated cell-mediated hypersensitivity reactions, Chromosomal aberrations, including aneuploidy and sister chromatid exchanges, have been reported.

However, no correlation between metal ion levels and the degree of chromosomal aberrations could be demonstrated in these studies.

Hip simulator results suggest that metal-on-metal bearings exhibit an early running-in phase in the first one million cycles (Mcyc), followed by a very low steady-state wear rate. This is explained on the basis of a self-polishing effect

2. Treatment for developmental dysplasia of the hip using the Pavlik harness Vol 89-B, Issue 2, 230-235J. Nakamura,

115 patients with 130 hips with DDH with complete dislocation in the absence of a neuromuscular disorder, spontaneous reduction with a Pavlik harness, and a minimum of 14 years' follow-up. 108 hips (83.1%) were treated with the harness alone and supplementary surgery for [acetabular index > 30°], was performed in 22 hips (16.9%).

Satisfactory outcome (Severin grade I or II) was achieved in 92% at 16 yrs.

Avascular necrosis of the femoral head was noted in 16 hips (12.3%), seven of which (44%) underwent supplementary surgery

The acetabular index was the most reliable predictor of residual acetabular dysplasia.

The reported rate of reduction ranges from 70% to 99% and the incidence of AVN from 0% to 28%.

There have been few reports of the long-term outcome on skeletal maturity of treating complete dislocation with the Pavlik harness.

? The mean age at harness application was 4.8 months (1 to 12). The mean time spent in the harness was 6.1 months (3 to 12).

Treatment protocol (Fig. 1).

The harness was applied in the out-patient clinic to patients who were more than three months old or who weighed more than 6 kg. The baby lay supine on a flat, semi-rigid bed and was free to roll and turn. Parents were instructed to cradle the baby in their arms whenever the baby cried. We examined the movement of the lower legs every few days during the first two weeks and established whether the dislocation was reduced either clinically or radiologically. Ultrasound screening was only adopted from 1990, so the majority of patients were monitored clinically and radiologically. As a result we did not evaluate the ultrasound images in the few patients examined by ultrasound. If reduction could not be obtained within the first two weeks, the harness was discontinued and closed reduction under general anaesthesia was attempted after three weeks of preliminary horizontal traction. If the hip was still unstable, open reduction was considered. The harness was worn full-time during the first four weeks after spontaneous reduction, and then part-time for a further five months. During part-time wearing, the harness was removed only for bathing. The parents were instructed in the management of the harness. This schedule followed the original method described by Pavlik.[1,2]

Periodic examination was continued for patients with an AI < 30° (harness-only group), and additional surgery was indicated for those with an AI of 30° or more (supplementary group) (Fig. 1). The operative method depended upon the state of the joint and the surgeon's preference. The centre-edge angle of Wiberg[28] and the centre-head distance discrepancy[29] in unilateral cases, were also measured on the radiographs taken at a mean age of 4.9 years (3 to 7). The Severin classification system[30] was used to evaluate the result at the end of follow-up.

Discussion

1. Albinana : shown that AI is a reliable indicator of acetabular development. They concluded that an AI > 30° four years after closed or open reduction was associated with an 80% probability of developing a Severin grade III/IV hip.

2. Katada[19] reported thatCE angle of 10° at five or six years of age may be a reasonable threshold of normality. [5 yrs]

Severin[30] stated that a follow-up study that does not include the majority of patients originally treated is incomplete.

Furthermore, Koizumi et al[39] reported that Kalamchi[29] type II AVN may not be recognised until after ten years of age.

3. Tibial plateau fracture [JOT 21[1]

202 patients; retrospective; 109 long follow up to 27 years; 45 years

95 % healing at 1 year; 90% resumed work and 75% sports and mean ROM 130; 5% superficial infection and 2 patients deep infection

At 10 years 135°

Discussion:

Unicondylar better than bicondylar

31% OA [only 1/3 rd were symptomatic]

When Valgus/varus >5°: 3 fold increase OA than <5° alignment

71% had perfect alignment; 18% <5° and 8% more than 5°

Long term effects good with ORIF

Age did not seem to be affected

10 patients: 4 arthrodesis, 4 osteotomy, 2 TKR

Technique: 5mm step and 5° instability

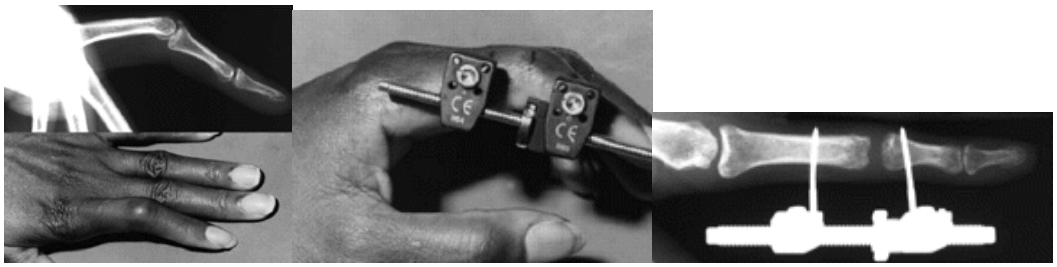
Overreduction by 2mm or residual depression 4 mm did not cause problem

Stability after fixation may influence outcome: AP ; Varus-valgus.

Soft tissue with #: MRI can be high. Significance not known

4.Gradual joint distraction of post-traumatic flexion contracture of the proximal interphalangeal joint by a mini-external fixator Vol 89-B, Issue 2, 206-209

30 consecutive patients with a mean age of 34 years (17 to 54) A mean of 16 days (10 to 22).
The mean active range of movement had significantly increased by 63° (30° to 90°; $p < 0.001$). The mean active extension gained was 47° (30° to 75°). The use of joint distraction to correct chronic flexion contracture of the proximal interphalangeal joint is a minimally-invasive and effective method All had chronic flexion contractures either because of dislocation or fracture-dislocation involving the PIPJ.. Of the 30 patients, 19 (63%) had a posterior PIPJ fracture-dislocation with fractures of the volar lip, seven (23%) had volar dislocation with a dorsal avulsion fracture and the remaining four (14%) had a pure PIPJ dislocation without a fracture. All the intra-articular fractures, when present, involved less than a third of the articular surface, as assessed on the lateral radiographs.



Before surgery, the mean range of movement (ROM) of the PIPJ was 19° (0° to 50°).

Operative technique: Under local or regional anaesthesia a unilateral dynamic mini Orthofix (Orthofix, Guildford, United Kingdom) external fixation device was positioned using image-intensifier guidance (Fig. 2). The proximal and distal block fixations were attached to the proximal and middle phalanges respectively, using a single 2 mm threaded pin in each phalanx. The pins were placed parallel to each other and equidistant from the joint. The block and lengthening bar were placed on the volar aspect to provide both distraction and extension.

The distraction nut was turned each day by a quarter turn (one full turn gave a joint distraction of 1 mm) starting on the first day after surgery. The patients were trained to do the distraction themselves at home and were reviewed weekly. The joint was distracted by a mean of 4 mm (3 to 5), as seen on lateral radiographs. When full extension was obtained (Figs 3 to 5) distraction was then maintained for a mean of 29 days (16 to 40). Hand therapy was undertaken for four weeks after removal of the fixator.

The mean active ROM gained by the procedure was 63° (30° to 90°); Student's *t*-test, $p < 0.001$; Table I. The mean active extension gained was 47° (30° to 75°).

4. Unicameral bone cysts. JBJS Br 2007 89-B: 222-226

Open surgery is rarely justified for the initial treatment of a unicameral bone cyst, but there is some debate concerning the relative effectiveness of closed methods.
Our study was a retrospective .
30 patients were treated by steroid and 28 by grafting with bone marrow.
The overall success rates were 86.7% and 92.0%, respectively ($p > 0.05$).
The success rate after the initial procedure was 23.3% in the steroid group and 52.0% in those receiving autologous bone marrow ($p < 0.05$), and the respective cumulative success rates after second injections were 63.3% and 80.0% ($p > 0.05$).
Although the overall rates of success of both methods were similar, the steroid group had higher recurrence after a single procedure and required more injections to achieve healing.
The proximal metaphysis of the humerus was affected in 33 cases (56.9%), the distal humerus in one (1.7%), the proximal femur in 16 (27.6%), the distal femur in one (1.7%), the calcaneum in five (8.7%

Kenacort: Between 60 mg and 250 mg of methylprednisolone and 12 ml to 50 ml of autologous marrow were injected. Autologous marrow was aspirated from the anterior iliac crest using an 11-gauge needle. In oder to avoid injury to the iliac physis, the needle was inserted 1.5 cm below the crest.

Success rate and recurrences.
The overall success rates for the steroid and bone marrow groups were 86.7% (26 of 30) and 92.0% (23 of 25), respectively. There was no statistical difference between the two groups.

Time to healing.
We defined time to healing as the period required to achieve cortical thickening. The mean time : 12 months in the steroid group and 14 months in the bone marrow group.

Steroid injection might effectively inhibit the generation of these bone resorptive factors, but this in itself would not provide bone-forming potential. When venous recirculation is insufficient, a cyst cannot escape the osteoclastic pathway completely. However, grafting with autologous bone marrow might induce successful bone formation owing to its own osteogenic potential, reduce the internal pressure of the cyst and remove bone resorptive factors. This osteogenic potential may explain the lower rate of recurrence.

5.Outcome after corrective osteotomy for malunited fractures of the forearm sustained in childhood Vol 89-B, Issue 2, 236-239R. C. I. van Geenen

Analysed the operative technique, morbidity and functional outcome of osteotomy and ORIF.
1986-2001: 20 consecutive patients underwent corrective osteotomy of 21 malunited fractures at a mean age of 12 years (4 to 25). The mean time between the injury and the osteotomy was 30 months (2 to 140).
The mean gain in the range of movement was 85° (20° to 140°). The interval between injury and osteotomy, and the age at osteotomy significantly influenced the functional outcome.

Malunited fractures of the forearm sustained in childhood can be adequately treated by osteotomy and plate fixation with excellent functional results and minimal complications. In the case of established malunion it is advisable to perform corrective osteotomy without delay. The cut-off value of angulation as a requirement for surgical correction varies from 15° in mid-shaft fractures[3] to 40° in fractures of the distal third.

The more proximal the location of the malunion, the more pronounced the resulting deficit, because spontaneous correction only occurs in the distal metaphysis if sufficient growth remains[2] and periosteal remodelling can only play a significant role in early childhood.

Malunion with forearm rotation of less than 50% to 60% of normal is associated with considerable functional impairment, and justifies corrective osteotomy. The operation may also be indicated in patients with a smaller rotational deficit but who require a high range of rotation for good function.

The humeral epicondyles served as a reference point for obtaining two perpendicular projections. The forearm was held in neutral rotation because pronation and/or supination were compromised. If possible, comparison radiographs of the unaffected arm were taken. The plane of maximum angulation was identified under fluoroscopic guidance. Pre-operative planning of the triplane osteotomy was essential and was based on careful analysis of all the findings.

Operative technique.
The radius is usually exposed first through an anterior approach, because restoring the site and amount of radial bowing is of great importance in optimising rotation. The site of the osteotomy is marked and the plate removed. After subperiosteal exposure, a transverse osteotomy is undertaken. The radial bow is restored and a wedge resection performed to correct angulation. The plate is bent to fit the restored radial bow and held by the proximal screw and a bone clamp distally. Pronation and supination are tested and the reduction and radial bow checked with an image intensifier.

If necessary, the ulna is exposed through an incision parallel to the ulnar crest and osteotomised in a similar fashion to restore alignment. After temporary fixation, pronation and supination are checked and when sufficient, definitive fixation of both bones is performed.

Discussion:

Our technique for osteotomy and fixation has proved to be reliable and without complication.

The ability for spontaneous correction of angulation decreases with advancing age. In our series the age at injury varied from two to 15 years.

The site of the fracture can affect functional outcome. The more proximally it is located, the greater is the risk of angulation and rotation malunion.[5–8]

In our series, the effect of the interval between the initial injury and osteotomy influenced post-operative function.

The gain in the range of movement was greater in the eight malunions treated within one year. This finding agrees with that of an earlier report in which nine patients were treated within one year and gained a mean of 79° (20° to 160°) compared with 30° (–25° to +95°) in 11 patients treated after one year.[11] This effect may have been due to soft-tissue contraction after the initial trauma and to secondary changes in the joints. Therefore it is recommended that malunion is corrected before changes occur.

Our findings suggest that remodelling could positively affect the functional outcome in patients who underwent an osteotomy at a younger age. Children undergoing a corrective osteotomy before the age of ten years had a significantly greater range of movement than those over ten years.

In conclusion, malunited fractures of the forearm which are sustained in childhood can be treated satisfactorily by open reduction and plate fixation.

7. **Dislocation with Displaced Greater Tuberosity Fracture.** JOT 21[2]; 104-12

Objective: To evaluate the radiographic and clinical outcome, including the incidence of recurrence, in patients with displaced greater tuberosity (GT) fractures associated with a traumatic anterior shoulder dislocation.
Design: Retrospective study.
Setting: University Hospital (L.evel 1 trauma center).
Patients: There were 34 completely evaluated patients (19 male, 15 female) seen between 1993 and 2002 with a displaced GT fracture associated with a traumatic anterior shoulder dislocation. Average age was 52.8 years and the mean follow-up period was 4.8 years (range, 2.0 to 10 years).
Intervention: All OT fractures were internally fixed solely with heavy non-absorbable sutures and any associate rotator cuff tear was repaired at the same time. A special rehabilitation protocol was administered in all patients.
Main Outcome Measurements: Functional assessment was obtained using the parameters of the Constant score which grades outcomes as excellent, very good, good and poor.
Results: Overall, there were 25 (73.S°o) excellent, 6 (l7.6°o) very good, 2 (S.8°o) good and 1 (3.l°o) poor results, and the average Constant score was 88.4 (range 45.0 to 100.0). All fractures healed radiographically, without evidence of secondary displacement, except in one patient. No case of recurrence of dislocation was noted in any patient. Partial absorption or "lysis" of the GT without significant clinical relevance was detected in 4 cases.
Conclusions: Displaced fractures of the GT after traumatic anterior shoulder dislocation may result in limitation of motion and functional disability if they are not treated promptly by surgery. Open reduction and stable fixation of the GT along with rotator cuff repair when present, allows for early passive motion of the joint, and yields

Bigliani et al,5 Craig,8 and Jannotti and Sidor7 endorse surgical fixation of fractures that are displaced by 0.5 cm or more to minimize dysfunction and to decrease the incidence of impingement and loss of forward elevation.

8. Metal detection at Arch at airport. JOT 21[2]; 129

Detects Hip prosthesis

Titinium Nail

Plate > 10 holes

Faradays law of electromagnetic field

Stainless Steel has more iron and more sensitive than Ti

Shape is important: straight K wire and coiled k wire

BMI has not got any effect

Single arthroplasty is detected with newer detector

Ti nail is easily identified [no explanation]

9. SLAP CORR. 2007 .Volume 455, February 2007, 45-51

Proven difficult to diagnose clinically. SLAP-lesion-specific physical examination tests have been developed to improve clinical acumen.

We concluded SLAP-specific physical examination results cannot be used as the sole basis of a diagnosis of a SLAP lesion.

Snyder et al 21 later classified the most common labral lesions, coining the term “SLAP,” or superior labrum anterior posterior, lesions.

Clinical Assessment Tests

1. Anterior Slide Test

The patient is examined standing or sitting with his or her hands on the hips and with the thumbs pointing posteriorly. One of the examiner's hands is placed across the top of the shoulder from the posterior direction, with the last segment of the index finger extending over the anterior aspect of the acromion at the glenohumeral joint. The examiner's other hand is placed behind the elbow and forward, and slightly superior force is applied to the elbow and upper arm. The patient is asked to push back against this force. Pain localized to the front of the shoulder under the examiner's hand and/or a pop or click in the same area is considered a positive result.

2. Crank Test

The “crank” test is performed with the arm elevated to 160° in the scapular plane of the body, loaded axially along the humerus and with maximal internal and external rotation. The test is performed with the patient in standing and supine positions and is considered positive for a SLAP lesion if the maneuver produces pain or reproduces mechanical symptoms similar to the patient's symptoms.

3.Active Compression Test

The active compression test was first described by O'Brien et al 18 in 1998. The patient is asked to flex the affected arm forward 90° with the elbow in full extension. The patient then adducts the arm 10° to 15° medial to the sagittal plane of the body. The arm is internally rotated so the thumb pointed downward. The examiner then applies a uniform downward force to the arm. With the arm in the same position, the palm is then fully supinated and the maneuver is repeated. The test is considered positive if pain elicited with the first maneuver and is reduced or eliminated with the second maneuver. Pain localized to the acromioclavicular joint or on top of the shoulder is diagnostic of acromioclavicular joint abnormality. Pain or painful clicking described as inside the glenohumeral joint is indicative of a labral tear.

4.Biceps Load Test

The test is performed with the patient in the supine position. The examiner sits adjacent to the patient on the same side as the affected shoulder and gently grasps the patient's wrist and elbow. The affected arm is abducted at 90°, with the forearm in the supine position. The patient is allowed to relax and an anterior apprehension test is performed. When the patient becomes apprehensive during the external rotation of the shoulder, external rotation is stopped. The patient is then asked to flex the elbow while the examiner resists flexion with one hand and asks how the apprehension has changed, if at all. If the apprehension is lessened, or if the patient feels more comfortable than before the test, the test is negative for a SLAP lesion. If the apprehension has not changed, or if the shoulder becomes more painful, the test is positive. The test is repeated and the patient is instructed not to pull the entire upper extremity, but to bend the elbow against the examiner's resistance. The examiner sits adjacent to the affected shoulder at the same height as the patient, and he or she also faces the patient at a right angle. The

direction of the examiner's resistance should be on the same plane as the patient's arm so as not to change the degree of abduction and rotation of the shoulder. The forearm is kept supine during the test.

5.Pain Provocation Test

The test is performed with the patient in the sitting position. During testing, the abduction angle of the upper arm is maintained at 90° to 100° and the shoulder is rotated externally by the examiner. This maneuver is similar to the anterior apprehension test. The new pain provocation test is performed with the forearm in two different positions: maximum pronation and maximum supination. The examiner evaluated the severity of provoked pain based on the subjective rating by the patients when the shoulder was rotated externally with the forearm in the two positions. Patients were asked “in which position of the forearm do you feel more severe pain, in pronation or in supination?” When the patient was not clearly aware of a difference in the severity of pain, the examiner considered the severity of provoked pain the same for both positions. We defined the new pain provocation test as positive for a superior labral tear when pain was provoked only when the forearm was prone or when pain was more severe in this position than with the forearm supine.

Biceps Load Test II

Kim et al 7 first described the biceps load test II in 2001. The test is conducted with the patient in the supine position. The examiner sits adjacent to the patient on the same side as the shoulder and grasps the patient's wrist and elbow gently. The affected arm is elevated to 120° and externally rotated to its maximal point, with the elbow in 90°s of flexion and the forearm in the supine position. The patient is asked to flex the elbow while resisting the elbow flexion by the examiner. The test is considered positive if the patient reports pain during the resisted elbow flexion or if the patient reports more pain from the resisted elbow flexion regardless of the degree of pain before the elbow flexion maneuver. The test is negative if pain is not elicited by the resisted elbow flexion or if the preexisting pain during the elevation and external rotation of the arm is unchanged or diminished by the resisted elbow flexion.

6.Resisted Supination External Rotation Test

The resisted supination external rotation test was first described by Myers et al 16 in 2005. The patient is placed in the supine position on the examination table with the scapula near the edge of the table. The examiner stands at the patient's side, supporting the affected arm at the elbow and hand. The limb is placed in the starting position with the shoulder abducted to 90°, the elbow flexed 65° to 70°, and the forearm in neutral or slight pronation. The patient is asked to attempt to supinate the hand with maximal effort as the examiner resisted. The patient forcefully supinates the hand against resistance as the shoulder is gently externally rotated to the maximal point. The patient is then asked to describe the symptoms at maximum external rotation. The test is positive if the patient has anterior or deep shoulder pain, clicking or catching in the shoulder, or reproduction of the symptoms that occur during throwing. The test is negative if the patient has posterior shoulder pain, apprehension, or no pain.

7.Rotation-compression Test

Snyder et al 20 first described the rotation-compression test. The test is performed with the patient supine, the shoulder abducted 90° and elbow flexed at 90°. A compression force is applied to the humerus, which is then rotated to trap the torn labrum. Labral tears may be felt to catch and snap during the test, as meniscal tears do with McMurray's test.

8.Forced Abduction Test

Forced abduction test was first described by Nakagawa et al 17 in 2005. The arm is forced into maximal abduction in the vertical position. The patient is asked about pain. The elbow is then flexed. A positive test is pain that occurs at the posterosuperior aspect of the shoulder with maximal abduction and diminished pain with elbow flexion.

DISCUSSION

Reliable, accurate clinical assessment of SLAP lesions would greatly aid the orthopaedic surgeon in the diagnosis and treatment of superior labral injuries.

The prevalence of SLAP lesions for all studies reviewed was higher than the 6% reported in the literature and most of the studies reviewed were markedly higher.4,21

SLAP lesions have been characterized by age and patients over forty are more likely to have co morbid rotator cuff pathology and/or glenohumeral arthritis.

Most of their patients with SLAP lesions had coexisting shoulder pathology, mainly involving the rotator cuff (77% and 73%, respectively). Maffet et al,11 Snyder et al,20 and Morgan et al 15 each identified rotator cuff pathology in a substantial proportion of their patients with SLAP lesions (48%, 40% and 31%, respectively).

Pain produced by SLAP lesions is similar to that produced by rotator cuff impingement and/or pain originating from the acromioclavicular joint and patients often have difficulty localizing pain associated with labral injuries.

10.Acromioclavicular Joint Injuries Spindler CORR 455: 38

Although non-operative treatment is considered the standard of care for the treatment of Grade I and II acromioclavicular (AC) joint injuries, the treatment of Grade III injuries is controversial. A systematic review of the English-language literature was performed to determine if Grade III AC joint separationsare best treated operatively or nonoperatively.

There is no evidence any one form of immobilization is better than another and compliance is poor among the arduous forms of immobilization. Results: 50 to 90%. At least 30 different methods of surgical repair or stabilization

Medline and EMBASE databases: Grade III AC joint separation. The initial search with the aforementioned key words resulted in 469 references. 56 of these references met the inclusion criteria . Only nine studies met the inclusion criteria of comparing the results of nonoperative treatment of Grade III AC joint separations to various forms of operative stabilization. [3 prospective]

Larsen et al 23 prospectively randomized : suggested thin patients and those required to perform heavy or overhead work be considered for operative stabilization.

Bannister : concluded nonoperative treatment was superior. The strength of the study is that it is prospective and randomized with intermediateterm followup; however, there were 12 patients who had a displacement of 2 cm or greater, which is better classified as Grade V separation according to Williams et al.42 The authors stated surgery yielded a better result in these patients.

The largest retrospective review, reported by Taft et al,36 concluded nonoperative treatment was superior to two different methods of operative stabilization. The complication rates were 52% in the nonoperative group, 100% in the operative group, and 42% and in the untreated group. Complication rates must be interpreted carefully because the list of complications included arthritis, which was very common and might have been a function of age given the length of followup.

RESULTS

3 prospective studies: the surgical results were no better and were associated with more complications. Excepting one, all of the lower level studies that retrospectively compared the results of patients treated surgically and nonsurgically for Grade III AC separa-tions concluded nonoperative treatment was superior.

DISCUSSION

1. The optimal treatment of Grade III AC separations is less clear
2. Nonoperative treatment was favored
3. None of the studies in this review used a validated outcome measure, making comparison among studies difficult.
4. This review did not address radiographic appearance. These authors reported no correlation between

the radio-graphic appearance and the clinical outcome.

5. Which surgical procedure has the best results not clear

11.**Ultrasound Measurements in the JPO. DDH** 26(6), 2006, 818-822

The purposes of this study were to determine the interobserver and intraobserver reliability of ultrasound measurements in unstable neonatal hips treated with the Pavlik harness and to determine whether ultrasound measurements correlate with radiological outcome at 6 months.

64 treated from birth with the Pavlik harness for neonatal hip instability were scanned at 2 and 6 weeks. The [alpha] and [beta] angles of Graf, the combined (*H*) angle of Hosny, and the femoral head coverage (FHC) were measured by 3 observers and remeasured by each observer on a minimum of 50 scans.

Hips were categorized as normal, abnormal, or borderline for each parameter; and interobserver and intraobserver repeatability coefficients and Kappa values were calculated.

The [alpha] angle had the smallest interobserver range (17 degrees)

H angle range was 21 degrees

The [beta] angle 28 degrees. Kappa values were best for the FHC and [beta] angle (0.66-0.8).

The mean acetabular index (AI) of all hips at 6 months was 26 degrees (SD, 4.9). The Acetabular index was 30 degrees or greater in 24 hips (18 babies) despite prolonged splintage in 9 hips (6 babies). A stepwise linear regression analysis showed that the Femoral head cover at 6 weeks was predictive of dysplasia. AI at 6 months (regression coefficient -0.27; 95% confidence interval -0.42 to -0.12; $P<0.001$). We recommend the FHC as being reproducible, useful, and predictive of outcome in neonatal hips treated for instability.

12 **Late Developmental Dislocation of the Hip** JPO 2007; 27(1), 32

DDH denotes a wide spectrum of pathologies ranging from hip instability to frank dislocation. The current understanding is that cases of late diagnosis were missed during the newborn period.

However, there is some evidence that a number of hip subluxations or dislocations may have been clinically stable in the neonatal period, but dislocate late. We present 5 cases of otherwise healthy children with normal physical examinations and hip radiographs in the first 3 months of life who later developed hip dislocations.

Four of the 5 cases required surgical open reduction. In light of these cases and others in the literature, normal neonatal screening for DDH does not assure that continued normal development of the hip joint will happen.

Our study confirms the existence of another entity in the wide spectrum of DDH: the late hip dislocation. Therefore, hip evaluations should be continued beyond the neonatal period until the child begins to walk. Parents should be informed that hip dislocation can occur in a late form, and they should be encouraged to take their children for repeated evaluations even if the neonatal screening is normal.

Newborn screening programs demonstrate that 1 in 100 infants have some clinical instability of the hip, but the true incidence of dislocation based on historical controls (before neonatal screening was performed) is about 1 to 1.5 in 1000 live births

13.**Treatment of Recurrent Patellar Instability.JPO** 2006 26(4): 461-465

Patellar instability in the skeletally immature population are rare

Females seem to be more likely to present with patellar-tracking problems, whereas males are more likely to have knee extensor mechanism problems.

The Roux-Goldthwait procedure, initially described by Roux 24 in 1888 and subsequently reported upon by Goldthwait 11 in 1895

The transfer of the tibial tubercle described by Trillat et al,28 with subsequent modifications by Maquet,19 and more recently, Fulkerson 9 have reports with good to excellent results in the 85% to 90% range. These transfer procedures, however, are not generally applicable to the skeletally immature population.

Chrisman et al 5 compared the Hauser and Roux-Goldthwait procedures. In his review of 87 knees, there were 10 Roux-Goldthwait procedures performed on patients who were 15 years old or younger. One of those 10 had a reported failure, consistent with his 93% satisfactory results when compared with 72% satisfactory with the Hauser procedure.

Recently, it seems that the primary stabilizing role of the mediopatellofemoral ligament in the unaffected knee and its lesion as an essential key factor for patella instability is more and more emphasized. The trend turns form nonanatomic extensor mechanism reconstructions toward more anatomic procedures based on using a pulley of the semitendinosus tendon around the posterior one third of the medial collateral ligament. As to reconstruct the medio patellofemoral ligament, even artificial ligaments have been successfully used

Fithian et al 7 also stated recently that, although conservative treatment is still the first choice, if surgery is performed, the aim should be to repair or reconstruct the passive retinacular restraints.

By reporting upon a single operation, a modified Roux-Goldthwait procedure with additional release of the contracted lateral structures, to treat one entity of the different causes/clinical signs of patellofemoral problems in childhood and adolescence, namely chronic recurrent patellar instability, we were able to achieve excellent results in the pediatric population.

14.Correction of neglected idiopathic club foot by the Ponseti method JBJS Vol 89-B, Issue 3, 378-381.

The Ponseti method of treating club foot has been shown to be effective in children [<2 years] However, it is not known whether it is successful in older children.
We retrospectively reviewed 17 children (24 feet) with congenital idiopathic club foot who presented after walking age and had undergone no previous treatment. All were treated by the method described by Ponseti, with minor modifications. The mean age at presentation was 3.9 years (1.2 to 9.0) and the mean follow-up was for 3.1 years (2.1 to 5.6). The mean time of immobilisation in a cast was 3.9 months (1.5 to 6.0).

A painless plantigrade foot was obtained in 16 feet without the need for extensive soft-tissue release and/or bony procedures. Four patients (7 feet) had recurrent equinus which required a second tenotomy. Failure was observed in five patients (8 feet) who required a posterior release for full correction of the equinus deformity.

We conclude that the Ponseti method is a safe, effective and low-cost treatment for neglected idiopathic club foot presenting after walking age

15. **Biomechanical Analysis of Single Screw Fixation for SUFE JOP** 26(4), 2006, pp 474-478

In vitro biomechanical study; 30 porcine proximal femurs were sectioned through the physeal line and stabilized with a cannulated 7.3-mm stainless steel AO screw. The distal 16 mm of each screw was threaded (5 threads). The femurs were randomized into 5 groups (1, 2, 3, 4, or 5 threads across the physis) and biomechanically tested to determine failure load (N) and stiffness (N/mm).
Results: Femurs with 2 or 3 threads across the physis had a significantly greater load to failure and stiffness compared with femurs with 1, 4, or 5 threads across the physis ($P < 0.05$).
Conclusions: Thread distribution across the physis seems to be important. When using screws with a 16-mm thread, greatest strength and stiffness are achieved when 40%-60% of threads engage the epiphysis, with a significant decrease when greater than 80% of threads cross the physis. Too few threads in the epiphysis as well as too few in the metaphysis both lead to decreased stability.

Clinical Relevance: This study challenges the belief that compression across the physis maximizes slipped capital femoral epiphysis fixation stability. We recommend equal distribution of threads across the physis when using 16-mm thread screws, and we postulate that screws with a greater thread length (32 mm or fully threaded) would increase fixation stability even further. Optimizing purchase may decrease the incidence of slip progression, especially as the prevalence of obesity increases in the adolescent population.

1. Affected children tend to be overweight, with most above the 90th percentile for their height.1
2. The goals of SCFE treatment are to prevent progression of the slip while avoiding complications of avascular necrosis and chondrolysis.2
3.Regardless of the severity of the slip, in situ fixation is the standard of care in both acute and chronic cases, as it provides the best long-term function, and is associated with the lowest risk of complications and the longest delay of degenerative arthritis
4. However, fixation failures and slip progression can occur despite optimum treatment,7-9 suggesting that current practices may be improved.

5. The screw is positioned in the central axis of the femoral head to avoid damage to its blood supply from the lateral epiphyseal artery 11 and advanced no closer than 5 mm from the subchondral bone to avoid violation of the hip joint.6
6. The most favorable distribution of screw threads across the physis, however, has yet to be determined.
7. Early et al 12 recommend using a 16-mm thread screw to generate a compressive force across the physis by engaging all threads within the epiphysis. Others believe that noncompressive fixation, using 32-mm thread screws, provides optimal fixation by maximizing the number of threads (5 or greater) within the epiphysis.7,13 Thus, the biomechanical relationship between fixation stability and the distribution of threads across the physis remains unclear.

16. Osteoid Osteoma: A Current Review 26(5), 2006, pp 695-700

1. Osteoid osteoma is a solitary, benign lesion of bone, usually occurring in a long bone cortex, leading to marked cortical thickening and causing significant nocturnal pain that usually responds to nonsteroidal anti-inflammatory medications.

2. Its incidence is 11% among the benign tumors and 3% among all primary bone tumors.

3.There is a male to female preponderance of 3 to 1.

In the spine, OOs almost exclusively occur in the posterior vertebral elements

In addition, they may occur in a juxtaarticular bone within a synovial cavity where they are termed *intraarticular OOs*.

The nidus, usually 1.5 to 2 cm in size, consists of osteoid, osteoblasts, and variable amounts of fibrovascular stroma. A nidus is demonstrated in 85% of cases.

Prostaglandins seem to play a major role, with a 1000-fold increase in prostaglandin concentrations reported in the nidus of the lesion.

Nidus osteoblasts also display strong, diffuse staining for cyclooxygenase-2,13 a key enzyme in the production of prostaglandins, particularly prostaglandin E2

When the lesion occurs near a physis, leg length discrepancies may be observed, with the affected extremity being longer. A limp is often noted during evaluation of the patient's gait.

Computed tomographic scanning offers another method of identifying the nidus within the radiologically dense reactive zone about it. This method is often valuable in differentiation of OO from chronic osteomyelitis. Dynamic contrast-enhanced CT may improve assessment, allowing differentiation of a relatively avascular Brodies abscess from a dramatically enhancing nidus at the center of an OO.

Surgeons tend to excise or ablate this painful lesion because patients often are unable to tolerate the pain. However, there is evidence that during a prolonged period (measured in years), the natural history of untreated OO is toward spontaneous regression. Spontaneous regression of clinically and radiologically diagnosed OOs during an average of 6 years (range, 2-15 years).

It is worth a trial of NSAIDs before embarking on more invasive therapeutic procedures. This is especially so if the site of the lesion is less accessible to surgical treatment.

Minimally Invasive Techniques^

Difficulties with lesion localization at surgery led to evolution of newer image-guided, minimally invasive interventions. Percutaneous nidus removal, which has recently been introduced, has become a popular technique. Other methods such as percutaneous ablations of the lesion by CT-guided core-drill excision 34 and destruction of the nidus by thermocoagulation,35 radiofrequency,36 (Fig. 5) or laser 37 have recently been reported as alternative treatments. The advantages of such methods include use of small instruments, resulting in a less invasive surgical approach and removal of less bone. The techniques are reported to reduce cost, have shorter hospital stays and rehabilitation, allow quicker return to work, and yield a lower risk of associated complications, morbidity, and recurrence rate.36

Surgery is done as outpatient procedures, sometimes carried out under local anesthesia.

17. Use and Abuse of Flexible Intramedullary Nailing in Children and Adolescents. JOP 26(6), 2006, pp 827-834

Elastic stable intramedullary nailing (ESIN) has became a well-accepted method of osteosynthesis of diaphyseal fractures in children and adolescents
Operative technique: The principle is to introduce 2 elastic nails, titanium or stainless steel, into the medullary canal through a metaphyseal approach. The bended nails must have their maximum of curve at the level of the fracture, and their orientation, most often face to face, is in charge of the reduction and, so far, the stabilization, of the fracture. The usual size of the nails is equal to 0.4 times the diameter of the medullary canal. As far as possible, a bigger diameter is better than a thinner one. Most fractures of the femur are treated with a bipolar retrograde ESIN when some distal fractures need an antegrade subtrochanteric approach.

Complications are mainly caused by technical errors including too-thin nails, asymmetry of the frame, and malorientation of the implants. Nonunion was never observed in fractures of the femur and the forearm; osteomyelitis rate is 2%, and mean overgrowth of the femur is less than 10 mm before the age of 10 years.

Indications of ESIN are fractures of the diaphysis: all the fractures of the femur between the age of 6 years and the end of growth
Conclusions: The good results of this reliable technique are obtained when surgeons have a good knowledge of it, especially in the understanding of the principle of the correction of the fracture and its stability.
These implants are introduced into the medullary space in retrograde or antegrade ways through 1 or 2 holes made in the metaphyseal cortex away from the fracture site.

Three steps are essential: introduction of the implant into the bone, progression of the implant across the fracture site, and final orientation of the implant to obtain reduction and stabilization of the fracture.

TECHNIQUE-DIAPHYSEAL FRACTURES^

Stainless steel is useful in some circumstances, but titanium (Ti 6Al14V) has better elastic properties in contrast to nonelastic implants whose deformity makes them unable to rotate to allow adequate fracture stabilization.
Many companies sell implants with a pre-bent tip. If the tip is not bent, the surgeon must bend the end of the nail/wire with an angulation of 30 to 40 degrees to allow the implant to advance into the medullary cavity with enough implant length to progress along the canal across the fracture site. The tip must be smooth enough to avoid nail impalement against the intramedullary cortices
To avoid sharp edges at the nail ends after trimming the implant with risk of soft tissue and skin irritation, a smooth cutter is preferable. Another solution is to use nails of specific length with a

rounded end. Nail length is the distance between the proximal and distal physes of the fractured bone. The surgeon must curve the nail with a mean 40-degree radius to position the apex of the curve at the level of the fracture.

According to the type of ESIN chosen, metaphyseal level skin incisions are usually at least 2 cm from the physis.

The first nail is then advanced across the fracture site to the opposite fragment metaphysis, or the second nail is placed and advanced to the fracture site. The nails are sequentially advanced across the fracture to the metaphysis. Both nails are positioned in the opposite metaphysis. Nail rotation may be needed to provide a perfect reduction of the fracture

IMPLANT REMOVAL

Implants are usually removed 3 to 4 months after the fracture except for forearm fractures which need at least 6 months of stabilization to avoid refracture.

SURGICAL TECHNICAL ERRORS

Nail symmetry is one aspect of stability

* avoid too thin diameter nails and choose the bigger size according to the bone diameter;
* create a symmetric construct with the nails having the same amount of curve at the same level
* the maximum curve must be at the fracture site, with the nails crossing above and below;
* avoid spiraling the second nail around the first one; and
* when reduction is not perfect with a standard construct, one may rotate 1 or 2 nails to produce an anatomical correction.

COMPLICATIONS

* do not introduce the nail close to the distal femoral physis which is subcutaneous but rather begin some centimeters more proximal as often as possible;
* cut the nail end smoothly with a special cutter;
* impact the nail with a tamp with a groove of 1 cm;
* do not bend the end of the nail at a very large angle; and
* avoid full flexion exercises of the knee before removing the nails.

Delayed Union and Nonunion

One solution to this situation is to perform a 1-cm fibular resection to induce compression forces on the tibia. Another option is to replace the ESIN with a standard, locked intramedullary nail as soon as the growth plate of the anterior tibial tuberosity is closed.

Ostomyelitis

No case of immediate postoperative osteomyelitis was observed in the normal population. Cases of soft tissue infections around the ends of the nail were healed after a course of antibiotics and shortening the nail tip or removal of the implants.

Late onset osteomyelitis was observed in 2‰ of our cases. One case was an intraosseous abscess diagnosed 3 months after the removal of the nails. All cases were healed after hardware removal, debridement, and intravenous antibiotics.

Malunion

Closed reduction of the fracture must be in 3 planes. The surgeon must test rotation of the hip (femur fracture reduction) and pronation and supination (forearm fracture reduction). Progressive spontaneous correction of 2 degrees per year was noted in femoral varus or valgus with malunions of 6 to 8 degrees.

Refractures

Because children are active and their recovery is excellent, new fractures about the nails do occur in the femur and in the forearm. Treatment usually consists of a closed reduction of the displaced fracture and straightening of the nails. Sometimes, one or both nails must be exchanged.

Refractures of the forearm may occur many months after apparent bone healing. Such cases were seen at the beginning of our experience when forearm nails were removed 4 months postfracture. Since we began not removing nails sooner than 6 months postinsertion, no new case of forearm refracture has occurred. This new result seems correlated with the quality of cortical bone healing and the reestablishment of the medullary canal.

Limb-Length Discrepancy

A longitudinal study of femur fractures treated by ESIN technique showed that natural overgrowth er ESIN was comparable to that after nonoperative treatment.

Mean femoral overgrowth was 9 mm in patients younger than 10 years, especially transverse fractures. In contrast, with oblique and spiral fractures an initial shortening of 5 to 10 mm was compensated for by this overgrowth. For patients older than 10 years, there was a low risk of discrepancy in transverse fractures, but a possibility of shortening existed by impaction in other types of fractures. In these more severe cases, to avoid severe shortening, initial traction for 2 to 3 weeks may be done; in rare circumstances, use of an external fixator may maintain length for a few weeks pre-ESIN insertion.

CONCLUSIONS^

For the past 25 years, the ESIN method has become a widely accepted, standard surgical procedure for treatment of diaphyseal fractures in children and adolescents. It has many advantages over the use of plates and external fixators which, we feel, have few indications for use in this age group. A strong knowledge of the principles and the techniques is mandatory to obtain excellent results. This method is reliable,28 and children benefit from its use.

18 **Cuboid Fractures in Preschool Children.** 26(6), 2006, pp 741-744

The purpose of this study is to describe the clinical and radiographic presentation of cuboid fractures in children and to produce a guide for appropriate evaluation and treatment.

28 patients with cuboid fracture treated [1998 and 2004]; Retrospective

The mean age : 3 yrs.

All patients presented with an avoidance gait pattern, refusing to bear weight on the lateral side of the foot.

There was no history of trauma in 8 patients, and the others had minor trauma such as a fall down a few steps on their feet or ankle sprain.

Plain radiographs were the method of diagnosis in all but one of the patients.

The feet of 21 patients were immobilized at initial presentation. The other 7 patients were observed clinically until symptoms resolved.

All fractures healed completely with no complications, and patients were symptom free in 4.9 weeks

An awareness of cuboid fractures in children can lead to an early diagnosis, treatment, and recovery without the use of a bone scan, and a focus on the possibility of an underlying genetic or medical disorder must be initiated.

19. Prevalence of Charcot-Marie-Tooth Disease in Patients Who Have Bilateral Cavovarus Feet JOP 26(4), 2006, pp 438-443 Shriners, Wilmington

1. Bilateral cavovarus feet or high-arched feet are commonly seen in the general population, the prevalence of which is unknown.

2. The results from this study strongly suggest that all patients who have bilateral cavovarus feet, regardless of clinical symptoms, should be further investigated for Charcot-Marie-Tooth disease. [78%]

3. The presence of a relative with CMT: 78 ➔ 91%

4. CMTe-Tooth disease Type I is the most common inherited disorder of peripheral nerves.7,13,14 Type IA is the most common subtype. 76%

5. The diagnosis of Charcot-Marie-Tooth disease is frequently established after a clinical examination of the patient and family history

6.The clinical manifestations of Charcot-Marie-Tooth disease may not present until adolescence or adulthood, whereas the electrophysiological abnormalities are commonly present by 2 years of age.16

7.Until recently, the nerve conduction velocity study and the electromyogram were the best available diagnostic tests.

8. DNA testing to confirm their diagnosis of Charcot-Marie-Tooth disease. The CMT DNA Duplication Detection Test (Athena Diagnostics Inc) is based upon a point mutation or duplication on chromosome 17p in the region of the PMP22 gene. The sensitivity and specificity of this test are reported to be 99.98% by Athena Diagnostics Inc.

20. Chronic Radial head dislocation [Brazil]

1990 to 2005; 9 patients with chronic radial head dislocation by an ulnar osteotomy and indirect reduction by interosseous membrane.

Age 3 yrs -10 yrs

Injury to operation ranged from 40 days to 3 years.

The range of functional motion and carrying angle was restored in all nine patients, and no complications, such as recurrent dislocation, infection, orneurovascular injury were observed.

The correction of the shortening and angular deformity of the ulna is fundamental to obtaining stable reduction of the dislocation of the radial head..This technique is successful with a good functional results.

Alt:

Reduction of radial head dislocation with reconstruction of the annular ligament

Reduction of radial head dislocation accompanied by osteotomy of radial shortening

Reduction of the radial head with ulna osteotomy at the initial deformity location or at the proximal metaphysis of the ulna .

II Free Article

FRACTURE THROUGH A LARGE GEODE Report of two cases. **V.S.Pai** M.S(Orth), Dip National Board (Orth), M.Ch (Orth), FRACS,,V**shal Pai**, MBCHb

SUMMARY

Small geodes (subchondral cysts) are common radiological findings in joints affected by degenerative disease, especially in rheumatoid patients. Large geodes (>2cm diameter), however, are rarely seen and have only been reported in a few sites (eg femoral neck, proximal tibia)[1,2,3]. Pathological fractures through geodes are also unusual and can pose a problem for diagnosis[4,5]. This is highlighted in the following two cases, which were under investigation for suspected malignancy. In each case the lesion turned out to be a very large geode.

KEY WORDS; geode, pathological fracture

CASE REPORTS

Case 1: A seventy-nine year old Caucasian gentleman presented acutely following a minor fall at home. His main complaint was one of right thigh pain. He had previously been complaining of increasing right thigh and knee pain over a number of weeks and was in the process of being investigated for degenerative disease. There was no history or stigmata of rheumatoid disease.

His plain films confirmed an oblique fracture through a large radiolucent bone lesion in the distal right femur. **(*Fig 1*).** As the concern was that this lesion was malignant, a biopsy was performed. Histological findings were of a densely sclerotic fibrous cyst wall containing a thin fibrinous exudates, consistent with a subchondral cyst (geode). He was treated with open reduction of the fracture and internal fixation with a Dynamic Compression Plate and screws ***(Fig 2)***. The large cavity was curetted and packed with autologous bone graft and bone substitute mixture. At sixteen weeks he was able to weight-bear pain free. Radiologically, the fracture had united and the bone graft had incorporated with the cavity edge.

Case 2: A 63 year old Maori man, known to have rheumatoid arthritis. He had been managed in the past using indomethacin, penicillamine, and methotrexate together with steroid injections into multiple joints mainly involving the hands, wrists, elbows and knees. He presented acutely to us with sudden onset of pain and deformity in his left elbow whilst trying to open a bottle of wine. He heard a crack in his elbow. Upon examination, there was tenderness and swelling posteriorly. The patient could not actively bend or straighten the joint. Radiological study illustrated an extensive osteolytic lesion involving the whole of the olecranon with a fracture running through it (Fig 3). A bone scan did not reveal any other lesions. Under general anaesthesia, the lesion was explored. Scanty inflamed tissue was curetted but there was no evidence of pus. After a thorough wash out, the cavity was packed with corticocancellous bone, harvested from the ilium, and the fracture was stabilized with a reconstruction plate (Fig 4).

The histological report revealed an inflammatory infiltrate with fragments of non-viable bone, necrotic tissue and fibrin consistent with a rheumatoid geode. A culture swab did not isolate any organisms. His

initial recovery was good but he returned to clinic six months later with recurrence of pain and stiffness. He had a white blood count of 9600 cells/mm^3 with a neutrophil count of 6700. The erythrocyte sedimentation rate was 39 mm/h and the C-reactive protein 29 units. As there was a clear indication of recurrence of the cyst with loosening of the fixation and possible infection, the elbow was re-explored . The plate and screw were removed. At the time of implant removal, multiple melon-seed loose bodies together with clear fluid were found. Histologically this material was consistent with a rheumatoid geode. As the patient's joint was very arthritic it was felt that he would benefit from a total elbow replacement. However he refused any further treatment and at one year, he had a movement of 10 to 120°, 60° of supination and pronation and was asymptomatic.

DISCUSSION

The word geode is a geological term for a "rounded pocket of gas in a mineral specimen." It has been adopted for describing these lesions, as other names are not entirely accurate. Geodes do not have an epithelial lining and are rarely fluid-filled, unlike a true cyst.

Small geodes are often seen on plain radiographs of joints affected with degenerative disease, especially rheumatoid arthritis. Resnick[6] et al reported geodes in ten of thirteen patients with arthritis and correlated the radiological findings to the pathology. Giant geodes (>2cm diameter) however are not commonly seen and those that have been reported have nearly all been in rheumatoid patients[1,2,7,8].

Some authors have drawn a distinction between rheumatoid and non-rheumatoid geodes. Rheumatoid geodes are thought to occur from synovial invasion into the subchondral bone and can be histologically differentiated from non-rheumatoid geodes that contain non-specific fibrous tissue only [4,9]. Both types of geode have been described occurring adjacent to both degenerative and non-degenerative joints although they are mainly associated with arthritic joints, especially the weight bearing ones[6,10].

There are two main theories on how geodes come about [6]. The first was described by Freund in 1940 who suggested that elevated intra-articular pressure caused extrusion of joint fluid through gaps in the articular surface with resultant resorption of bone in the subchondral area. The other theory suggested by Rhaug and Lamb was that geodes were foci of osteonecrosis resulting from bony contusion caused by traumatic impact through a point denuded of protective cartilage, with synovial intrusion a secondary phenomenon to this.

A geode can be totally asymptomatic and can be an incidental finding on the x-ray. Complications of geodes (e.g. fracture) have only been occasionally reported. They tend to produce a diagnostic dilemma of whether this is a pathological fracture through a benign or malignant lesion. The subsequent management of the fracture is entirely dependent on this diagnostic distinction.

It is logical to treat a pathological fracture in a weight-bearing bone with bone graft and internal fixation. As in case 1, **a** bone graft appears to incorporate into the cavity and fracture healing occurs. However it has to be noted that recurrence can be a possibility as in case 2 and this possibility should be discussed with the patient. In such a situation, total joint replacement should be considered.

REFERENCES:

1. Magyar E Talerman A, Feher M, Wouters HW**.** . Giant bone cysts in rheumatoid arthritis. J Bone Joint Surg 1974, 56-B:121-129.
2. McCarty DJ: Arthritis and Allied conditions. 11th edition. Philadelphia, Lea and Febiger, 1989 p730-733
3. Shih Hisn-Nung, Hsu KY, Tan CF, Hsueh S, Hsu RW. Total knee arthroplasty in Rheumatoid Arthritic knee with large Geode: A case Report. Chang Gung Med J 1997, 20(3): 241-5
4. Morrey B.F. Rheumatoid pseudocyst (geode) of the femoral neck without apparent joint involvement. Mayo Clinic Proc. 1987, 62:407-411.
5. Wordsworth B.P. Fracture through a geode in the proximal ulna. British Journal of Rheumatology 1984, 23: 110-112
6. Resnick D**,** Niwayama G. Coutts RD. Subchondral cysts (geodes) in arthritic disorders: pathological and radiographic appearance of the hip joint. Am J Roentgenol 1977, 128: 799-806
7. Cotton CL, Darby AJ: Giant granulomatous lesions of the femoral head and neck in rheumatoid arthritis. Ann Rheuma dis 1970, 29: 626-633
8. Hunder GG, Ward LE, Ivins JC: Rheumatoid granulomatous lesion simulating malignancy in the head and neck of the femur. Mayo Clinic Proc 1965, 40: 766-770
9. Magyar E, Talerman A, Feher M, Wouters HW: The pathogenesis of the subchondral pseudocysts in rheumatoid arthritis. Clinical Orhopaedics 1974, 100: 341-344
10. Rennell C, Mainzer F, Multz CV, Genant HK. Subchondral Pseudocysts in Rheumatoid Arthritis. Am J Roentgenol 1977,129: 1069-1072

Fig. 1 Osteolytic lesion in the distal femur with pathological fracture

Fig 2. Bone grafting and DCS fixation

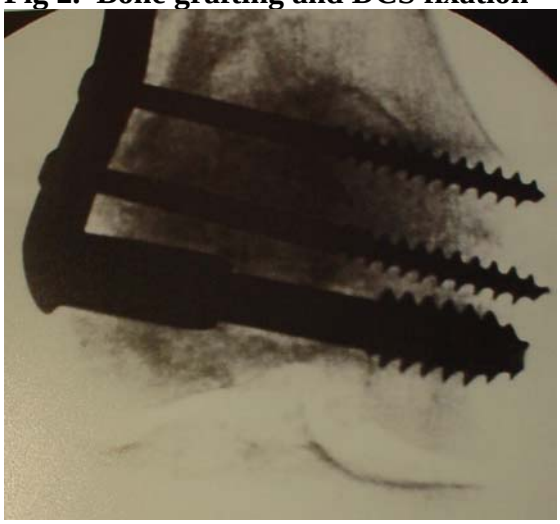


Fig 3. Osteolytic lesion with pathological fracture of Olecranon

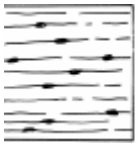
Fig 4: Bone graft and reconstruction plate

III Notes

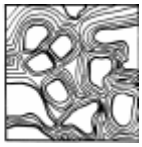
Basic science: Bone

HISTOLOGY OF BONE

Normal bone is lamellar and immature bone is woven bone



Cortical

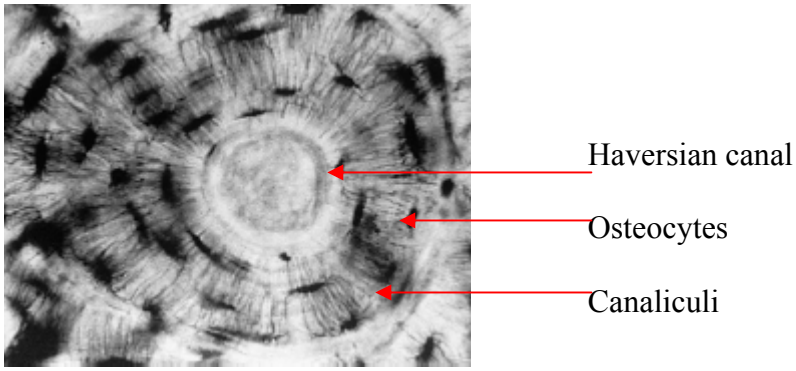


Cancellous

LAMELLAR BONE

Cortical or compact [80%]; Cancellous or trabecular [20%].

Cortical bone: It is composed of tightly-packed osteons or Haversian systems



Made up of small concentric lamellar cylinders

HAVERSIAN SYSTEM [OSTEON]

Consists of a central **Haversian canal** which surrounds a central vascular channel [contains: 2 capillaries, lymphatic]

Volkmann's canals are horizontal canals which connect vertical Haversian canals

Cement lines surround the outer border of each osteon; collagen fibers and canaliculi do not cross cement lines

	Cortical	**Cancellous**
Ultimate tensile strength	165	25
Young's modulus	7 GPA	1GPA
Remodel processing	Cutting cone	Creeping substitute
Rate of remodeling/year	2-5%	20-50%

WOVEN BONE

Woven Bone (primary bone or immature bone)

It forms embryonic skeleton, and is largely absent from

normal bone after age 4 yrs

It is seen in fracture callus in both children and adults

It does not contain lamellae, and rather has a relatively disorganized array of collagen

BONE CONTENT

Water		10%
Calcium hydroxyapatite crystals	[Ca10[PO4]6OH2	70%
Matrix		20%

[Collagen 90% Type I; Glycoproteins: Osteopontin, Osteocalcin, Osteonectin, Sialoprotein]

COLLAGEN

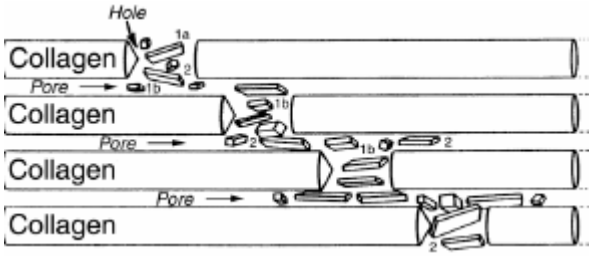
Collagen is composed mainly of type I collagen

It provides bone's tensile strength

Collagen is composed of a triple helix of tropocollagen (2 @1 chain and 1 ß2 chain)

"Hole zones" (gaps) in the collagen fibril are located between the ends of molecules, while "pores" are located between the sides of parallel molecules - calcification is thought to occur within hole zones and pores.

Cross-linking leads to decreased solubility and increased tensile strength.



Osteocalcin

Osteocalcin is produced by osteoblasts

It makes up 10-20% of the collagenous protein of bone.

It attracts osteoclasts, therefore its function is associated with bone remodeling.

Increased synthesis is induced 1,25(OH)2D3 and inhibited by PTH.

Osteonectin

Osteonectin is secreted by platelets, osteoblasts and osteoclasts.

It is thought to play a role in the regulation of calcium or the organization of material within matrix

Osteopontin

Osteopontin mediates the attachment of cells to bone matrix, similar to integrins.

Growth Factors and Cytokines

Other factors

I Include Transforming Growth Factor, Insulin-like Growth Factor (IGF), Interleukins (IL-1, IL-6),

Bone Morphogenic Proteins (BMP1-6) , Platelet-Derived Growth Factor (PDGF), Colony Stimulating Factors (CSFs), Heparin-Binding Growth Factors (HBGFs), Tumour Necrosis Factor □ (TNF-□), Prostaglandins (PGs) and Leukotrienes.

Transforming Growth Factor

Most prevalent growth factors found in bone matrix. It is released during bone absorption, and enhances osteoblast activity (via elevated collagen synthesis), increases the bone apposition rate, and inhibits the differentiation of osteoclasts

Insulin-like Growth Factor

In bone tissue, IGF-1 and IGF-2 are produced by fibroblasts and osteoblasts.

Interleukins

IL-1 is a powerful stimulant of bone resorption. It is mitogenic for osteoclast precursors, and it promotes the proliferation and differentiation of committed precursors. Its action is potentiated by TNF, and it acts synergistically with PTH and PTH-related peptide.

IL-6 is mainly responsible for the acute-phase protein response, and plays a major role as a paracrine growth factor in myeloma.

Bone Morphogenic Proteins

BMPs are members of the TGF super family of growth factors. They act on progenitor cells to induce differentiation into osteoblasts and chondroblasts. They are responsible for ectopic bone formation by certain tumour cells, epithelial cells and dematerialized bone.

BMPs appear to be stored with bone matrix and released with the resorptive activity that often follows injury

Bone Remodelling

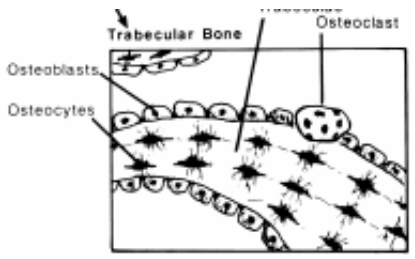
Bone remodelling is affected by mechanical function, according to Wolff's Law, which attempts to predict bone adaptation in the face of an altered loading environment.

Generally, remodelling occurs in response to stress, and responds to piezoelectric charges (compression causes negative potential, which stimulates osteoblast activity & bone formation; tension causes positive potential, leading to osteoclast stimulation). Bone is dynamic - coordinated osteoblast and osteoclast activity results in continuous remodelling of both cortical and cancellous bone throughout life.

Cortical bone remodelling occurs by osteoclasts which tunnel through to the bone forming "cutting cones", followed by sheets of osteoblasts which deposit osteoid in lamellae.

Cancellous bone remodelling involves osteoclast resorption of bone, followed by the deposition of osteoid by osteoblasts.

BONE CELLS



Resting flat cell [resting osteoblasts]

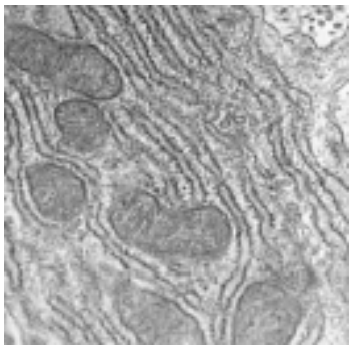
Forms a thin layer on the surface of bone

Develops from osteoblasts, once they have completed their work

May dedifferentiate back into osteoblasts

When there is stimulus for resorption, the

Resting cell produce collagenase and digest the fibrous layer to expose calcified bone for Osteoclast



Active Osteoblasts

An osteoblast is defined as a cell that produces osteoid, or bone matrix.

Osteoblasts make type I collagen.

They are responsive to parathyroid hormone (PTH).

The cytoplasm of the cell is occupied by 3 major components: the nucleus, the Golgi apparatus, and the rough endoplasmic reticulum.

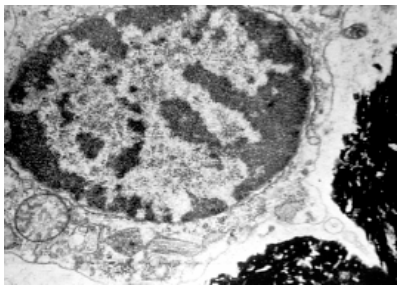
The nucleus in the osteoblast is large relative to that in other cell types.

The abundant rough endoplasmic reticulum suggest that it manufactures protein

Alkaline phosphatase is distributed over the outer surface of the osteoblast cell

OSTEOCYTES

Osteocytes maintain bone, and comprise 90% of all cells in the mature skeleton. They originate as osteoblasts which have been trapped within osteoid formed by surrounding osteoblasts, forming a lacuna.



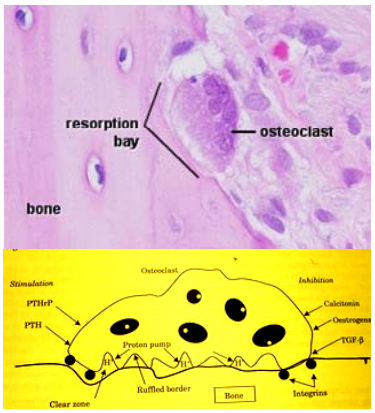
It has a higher nucleus-to-cytoplasm ratio and contains fewer organelles [cf. osteoblasts]

Osteocytes arranged concentrically around the central lumen of an osteon

Osteocytes have extensive cell processes that project through the canaliculi, and establish contact and “communication” between adjacent osteocytes

Function: Is important to cellular regulation of calcium exchange.

Osteoclasts



Large motile, multinucleated cell located on bone surfaces;

Osteoclasts have a ruffled border: an organelle -free region, or 'clear zone', and they adhere to the bone surface via integrins

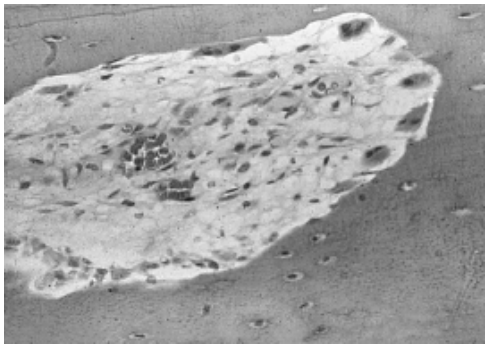
Formed by the fusion of mononuclear cells derived from haematopoetic stem cells in marrow

They differ from macrophages by producing tartrate-resistant aci

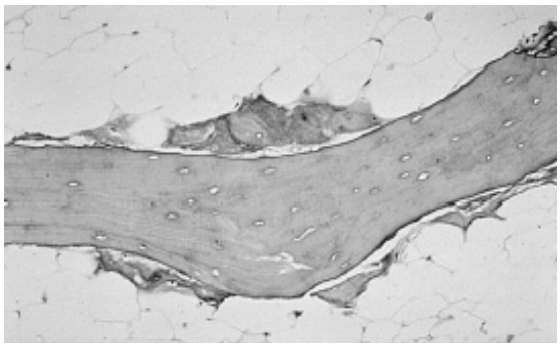
Osteoclasts lie in regions of bone resorption in pits called Howsh

BONE REMODELLING

Bone remodelling is affected by mechanical function, according to Wolff's Law. Remodelling occurs in response to stress, and responds to piezoelectric charges (compression causes negative potential, which stimulates osteoblast activity and bone formation; tension causes positive potential, leading to osteoclast stimulation). Compression causes negative potential leading to osteoblast stimulation.
Bone is dynamic - coordinated osteoblast and osteoclast activity results in continuous remodelling of both cortical and cancellous bone throughout life at a rate of 2% and 20% per year respectively .
Cortical bone remodelling occurs by osteoclasts which tunnel through to the bone forming "cutting cones", followed by sheets of osteoblasts which deposit osteoid in lamellae.
Cancellous bone remodelling involves osteoclast resorption of bone, followed by the deposition of osteoid by osteoblasts. "Creeping substitute"

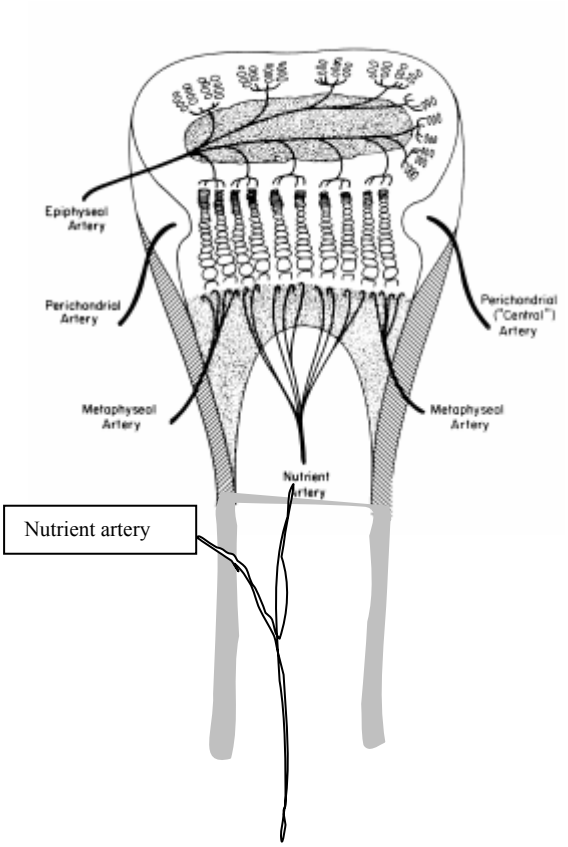


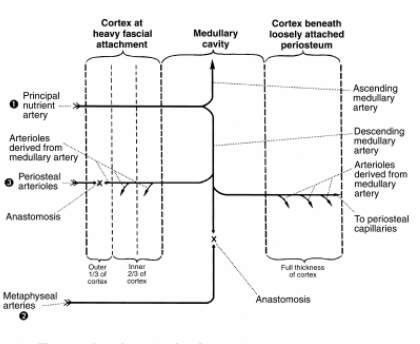
Cutting cone in Cortical bone



Creeping substitute in a cancellous bone

PTH [Parathormone] stimulation causes contraction of resting osteoblast cells.
This exposes the bone surface for osteoclast.
The osteoclasts lower the pH of the local environment by production of hydrogen ions through the carbonic anhydrase system. The lowered pH increases the solubility of the apatite crystals
Now osteoblast produces osteoid and that is formed on preexisting mineral surface.
Mineralisation front: These osteoid form 4 layers of collagen and then mineralisation commences at the interface between the osteoid and the mineralised substance (mineralisation front)
Matrix vesicle released from the osteoblast promotes mineralisation
Bone Circulation
Bones are well-supplied with arteries, receiving 5% of cardiac output under basal conditions.
Long bones receive blood from periosteal arteries, nutrient arteries, and metaphyseal and epiphyseal arteries.
Periosteal arteries enter the body of a bone at various points and supply the outer third of the cortex of the diaphysis. This is a low pressure system.
Nutrient arteries are branches of major systemic arteries, and pass obliquely through the diaphyseal cortex to reach the medullary canal. Here they divide into longitudinally directed branches which supply at least the inner two-thirds of mature diaphyseal cortex. This is a high pressure system.
Metaphyseal and epiphyseal arteries supply the ends of bone, and arise mainly from the periarticular vascular plexus. In growing bones they supply growth plates, so significant disruptions of blood flow disturb bone growth.


Epiphyseal Artery
Perichondrial Artery
Perichondrial ("Central") Artery
Metaphyseal Artery
Metaphyseal Artery
Nutrient Artery
Nutrient artery


Cortex at heavy fascial attachment
Medullary cavity
Cortex beneath loosely attached periosteum
Principal nutrient artery
Arterioles derived from medullary artery
Periosteal arterioles
Anastomosis
Ascending medullary artery
Descending medullary artery
Arterioles derived from medullary artery
To periosteal capillaries
Outer 1/3 of cortex
Inner 2/3 of cortex
Full thickness of cortex
Anastomosis
Metaphyseal arteries

Direction of blood flow

In mature bone, arterial blood flows centrifugally from the high pressure nutrient arteries to the low pressure periosteal arteries. If a displaced fracture causes interruption of the nutrient artery system, the flow reverses as the periosteal system now predominates, so blood flow becomes centripetal.

In developing bone, arterial flow is centripetal, because the periosteum is highly vascularised and is the major component of blood flow in bone.

FRACTURE HEALING

After a bony injury, blood flow to the site initially decreases due to disruption of vascular structures[mainly nutrient vessels]. Blood flow then gradually increases over the following hours and days, peaking at around 2 weeks. By 3-5 months, flow has returned to normal.

Fracture healing is largely reliant on bone blood flow - reaming of bone devascularises the central 50-80% of cortex, and thus is associated with most delayed vascularisation of all types of fixation.

Tissues surrounding bone

Periosteum is a dense connective tissue membrane which covers bone.

It is composed of an outer: fibrous layer

Inner: cambrium, layer which is loose and contains osteoblasts

Bone marrow

Young bones: Red marrow is the tissue in which blood cells develop, and is 40% water, 40% fat and 20% protein.

Aged bone: , when the rate of blood cell has decreased, red marrow slowly changes to yellow marrow. (80% fat, 15% water, 5% protein

Yellow marrow is made up mostly of fat).

Under the appropriate stimulus, yellow marrow can revert to red marrow.

Skeletal Development:

4th wk	Limb bud appears[Mesenchyme + ectoderm]
6th wk	Chondrification of the mesenchyme
8th wk	Blood vessel invade the bony sleeve to the cartilage centre
	Primary ossification (Humeri is the first one)

Bone is formed by 2 ways:

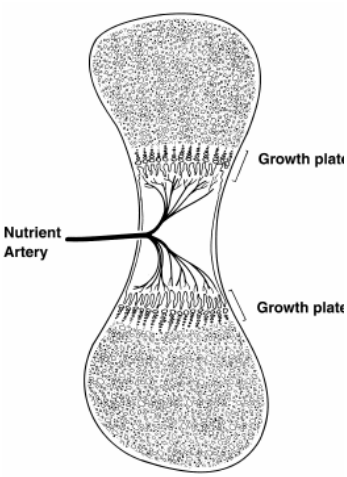
Membranous : Example Skull, clavicle, scapula, pelvis

Enchondral bone formation: long bones

Longitudinal growth

In fracture healing: both processes occur

Enchondral bone formation



Mesenchymal chondrification: hyaline cartilage

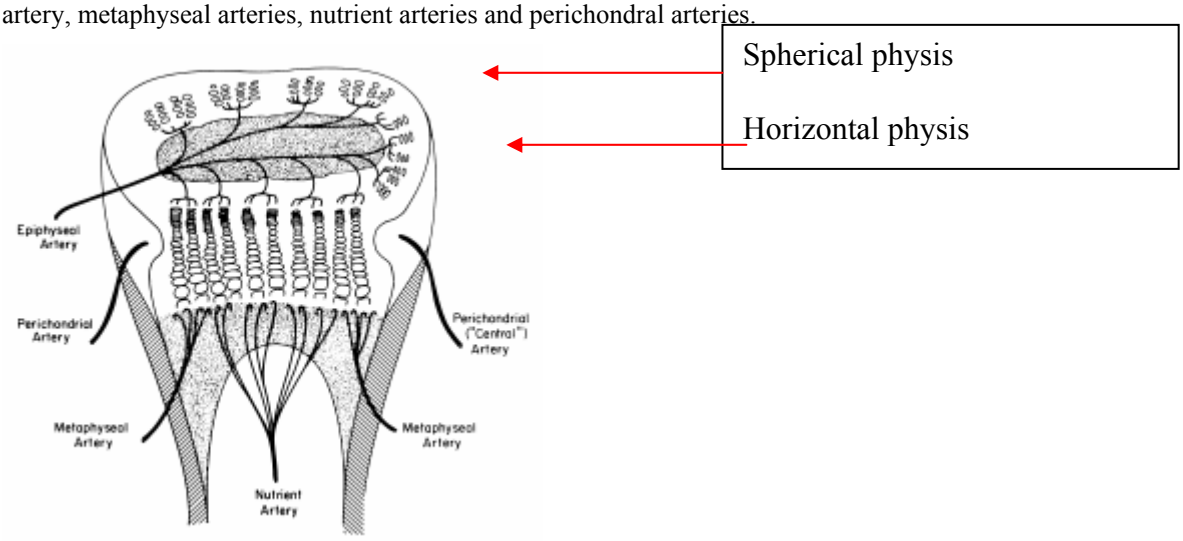
Nutrient artery invading the centre of the bone

The osteoblasts produce an osteoid matrix on the surfaces of the calcified cartilaginous bars and form the primary trabeculae

The osteoclasts remove the primary trabecular bone to form a medullary canal

The cartilaginous regions at either end of the primary center of ossification become the secondary centres of ossification develop at the ends of bone

During the developmental stage, the epiphyses enjoy a rich arterial supply composed of an epiphyseal artery, metaphyseal arteries, nutrient arteries and perichondral arteries.

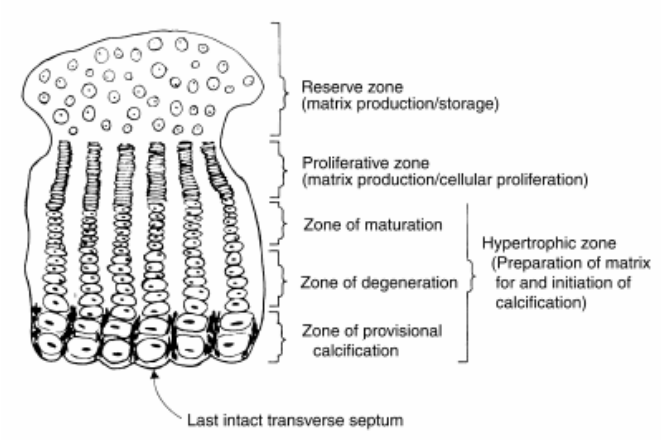


Physis

In immature long bones there are 2 growth plates:

Horizontal (the physis): Responsible for longitudinal growth

Spherical : Responsible for the growth of the epiphysis



Horizontal physis

Reserve zone –

Here there is no evidence of cellular proliferation or active matrix production

There is decreased oxygen tension.

Cells here store lipids, glycogen and proteoglycan aggregates for later growth.

Therefore diseases such as lysosomal storage diseases (Gaucher's) can affect this zone.

Proliferative zone –

The cartilage cells undergo division and actively produce matrix, and longitudinal growth occurs with chondrocytes forming columns.

The oxygen tension here is increased, and there is also increased proteoglycan in the surrounding matrix which inhibits calcification.

Defects in this occur in achondroplasia.

Hypertrophic zone –

The cartilage cells are greatly enlarged (up to 5 times normal size)

They have clear cytoplasm as a result of the glycogen accumulated

The cartilage cells accumulate calcium in mitochondria, then die, releasing calcium from matrix vesicles.

Sinusoidal vessels bring osteoblasts, which use the cartilage as a template for bone formation.

Metaphysis

Here osteoblasts from progenitor cells accumulate on cartilage bars formed by physeal expansion.

Mineralisation of primary spongiosa (calcified cartilage bars) occurs, forming woven bone which is remodelled to form secondary spongiosa and a "cutback zone" at the metaphysis.

Cortical bone is formed when physeal and intramembranous bone are remodelled in response to stress along the periphery of growing long bones.

Periphery of the Physis

This has 2 main components:

Groove of Ranvier - allow chondrocytes to travel to the periphery of the growth plate , resulting in lateral growth

Perichondrial Ring of LaCroix dense fibrous tissue which anchors and supports the physis

Intramembranous Ossification

The flat bones of the skull, the mandible, and the clavicle ossify at least partly by intramembranous ossification.

This occurs without a cartilage model, and occurs by aggregation of layers of connective tissue cells at the site of future bone formation, and their differentiation into osteoblasts.

The osteoblasts then form a centre of ossification which expands by appositional growth.

FRACTURE HEALING

Primary healing: Occurs with rigid fixation of the fracture

Bone heals by remodelling of the osteon

Secondary Healing: Periosteum and surrounding soft tissues are involved

Fracture Hematoma: Fibrin, IL1 and IL2; TGF and PDGF, Fibronectin

Angiogenesis and cartilage begin to form

Cartilage calcification.

Death of chondrocyte and its removal

Bone formation by endochondral [Centre] and membranous [Periphery]

Callus:

I. Periphery: Formation of intramembranous (hard) callus ,subperiosteal

II.Central: Endochondral bone formation in the centre (soft callus)

Within 2 weeks, primary callus response occurs. If the bone ends are not in apposition to one another, soft (bridging) callus is formed around and between the fragments, reducing their mobility. This soft callus contains fibroblasts, proliferating osteoblasts and often chondroblasts, embedded in a matrix rich in collagen and glycoprotein, into which new blood vessels grow.

Hard (medullary) callus supplements the bridging callus - the soft callus is gradually converted into woven bone, mainly by enchondral ossification. This stage is reached about 3 or 4 weeks after injury and continues until firm bony union occurs (around 2 or 3 months later for most adult bones).

The amount of callus formation is indirectly proportional to the degree of immobilisation of the fracture.

Remodelling: This stage overlap with hard callus formation and may continue for up to 7 years. It involves the gradual conversion of the woven bone of the hard callus to lamellar bone.

It is considered complete when the site of the fracture can no longer be identified either structurally or functionally.

It allows the restoration of bone to its normal configuration and shape, according to the stresses placed on it (Wolff's Law).

Normal healing:

Perkins Rule

	Healing	Consolidation
Spiral fracture upper limb	3 weeks	6 weeks
Spiral fracture lower limb	6 weeks	12 weeks

For transverse fracture: multiply by 2

Delayed Union:

Failure to fuse within the time usually required

Eg: Open fracture

Tibial fracture

Non-union:

No healing by 6-8 months = NU.

Healing process has stopped.

No callus in sequential X rays

Failure of cortical continuity at 6 months in 2 planes

Eg: Tibia, Scaphoid, Fracture neck of femur

Types: Hypertrophic: Excessive callus formation

Atrophic : No callus formation

Synovial pseudrthrosis: False joint formation

Malunion

Heals in abnormal alignment

Varus or Valgus; Internal or external rotation; Shortening

Eg: Fracture distal end of radius

Ankle fracture treated non-operatively

Elbow fractures

Factors for fracture healing:

Cytokines:

Fibronectin: Initial part in # healing (3 rd day)
Mediates adhesion and migration
By fibro,chondro and osteoblast

Osteonectin: Role in early ossification
Peak 9-15 days

Osteocalcin: Promoter of the minerlisation
Peak on the 15 th day

Osteopontin: Important in remodelling

Hormonal Effects on Fracture Healing

Fracture healing is increased by: growth hormone

thyroid hormone/parathyroid hormone

Possibly also by calcitonin

Healing is retarded by Cortisone

Factors responsible for Non-union

1.Nutritional status

Malnutrition

Anorexia Nervosa : IGF I is low and there is impaired healing.

3. Smoking: Directly interfere with Osteoblast and nicotine as well as vasoconstriction

4. Indomethacin interferes with fracture healing.

5. Local: Excessive motion at the fracture site

Soft tissue interposition

Infection

Enhancement for fracture healing

Direct current (DC),

Pulsed electromagnetic fields (PEMFs),

Ultrasound.

Bone grafting

BMP

Electricity and Fracture Healing

Bone produces small electric potentials on its surface when an appropriate mechanical stress is exerted. It has been suggested that bone remodelling as a response to mechanical stress is mediated by these electric potentials, which then activate osteoclasts and osteoblasts. Therefore, devices have been invented with the aim of stimulating fracture repair by altering a variety of cellular activities of cartilage and bone cells.

Various types of electrical stimulation have been used:

Direct Current (DC) stimulates an inflammatory-like response.

Alternating Current (AC) causes changes in cAMP accumulation, increases collagen synthesis, increases DNA synthesis and increases mineralisation.

Pulsed Electromagnetic Fields (PEMF) initiate calcification of fibrocartilage, but cannot induce the calcification of fibrous tissue.

Ultrasound

30 mW/cm2. x 20 mnts. [Diagnostic U/S: 1-50 mW/cm2]

Daily use. Accelerate healing by 35%

May be beneficial in smokers

BMP [Bone Morphogenic Protein]

BMP 2 and 7 can be synthesized and can be used to enhance healing of a fracture

rhBMP2 + collagen: has been used in open tibial fracture with an encouraging outcome

BMP7 [OP1]: used in Nonunion of tibia and in spinal fusion with good results

BONE GRAFTING

Autografts (tissue from the same individual), allografts (tissue transferred between members of the same species; donors must be screened for potential transmissible diseases) or xenografts (tissues transferred between species) can be used.

3 Processes:

Osteoconduction: Framework or lattice,

Osteoinduction: TGF and BMP, PGDP

Osteogenesis: Osteoblast in the graft [only in Autograft or vascularised graft]

Osteoconduction: Bone grafts provide a passive framework for host osteoblasts and osteoclasts

Osteoinduction : may provide active signals to the host response capable of influencing the process

Cancellous grafts are commonly used due to their porous nature, allowing rapid revascularisation, followed soon after by osteoblastic activity and mineralisation, and later remodelling ("creeping substitution"). The incorporation process in cancellous bone is relatively rapid and complete compared to cortical grafts. They are used for grafting nonunions or cavitary defects.

Cortical grafts are used to repair structural defects (stronger) and have a slower turnover. Revascularisation is slower than in cancellous grafts. Slow remodelling of Haversian systems is followed by a vigorous osteoclastic response, weakening the graft, then deposition of new bone, restoring strength.

Osteoarticular allografts are often used in tumour surgery - these grafts are immunogenic, therefore they are usually subjected to long-term preservation, such as freezing or lyophilisation. This process destroys the viability of many of the chondrocytes. Tissue-matched fresh osteochondral grafts produce minimal immunogenic rejection and are well incorporated.

Vascularised grafts do not undergo the incorporation process described for nonvascularised grafts. Instead they unite to the recipient-site skeleton by a process similar to fracture repair, and allow more rapid union with the preservation of most cells.

Bone grafts may be:

1.fresh

2.fresh frozen - less immunogenic than fresh

3.freeze-dried - loses its structural integrity; least immunogenic

There are 5 recognised stages of graft healing: (as in fracture healing)

Inflammation - necrotic debris stimulated chemotaxis

Osteoblast differentiation - osteoblasts differentiate from precursors

Osteoinduction - osteoblasts and osteoclasts function

Osteoconduction - new bone is formed over the graft tissue

Remodelling - a process continuing for years

Synthetic bone grafts are now in use, and are composed of either calcium (as the phosphate, sulfate, carbonate, or corralline hydroxyapatite - thermoexchange process used to convert calcium carbonate skeleton to calcium phosphate), silicon (as silicate) or aluminium (as the oxide). Most recent is tantalum metallic mesh.

IV Current concepts:Percutaneous fixation of the pelvic ring. Vol 89-B, Issue 2, 145-154. Leeds

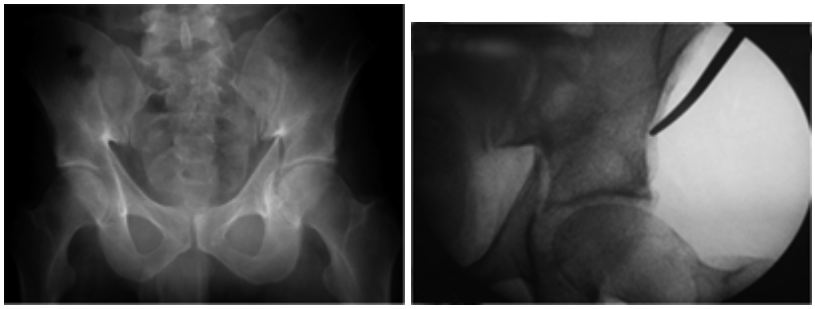
New methods of percutaneous treatment in conjunction with innovative computer-based imaging have evolved in an attempt to overcome the existing difficulties. This paper presents an overview of the technical aspects of percutaneous surgery of the pelvis and acetabulum.

Given the anatomical complexity of the intrapelvic structures, open internal fixation is a challenging task and the definitive surgical treatment of injuries to the pelvic ring is still controversial. It can be associated with problems of wound healing, damage to major vessels or nerves and an incidence of infection of up to 25%.[21,22]

Indications
Percutaneous techniques may offer a shorter surgical time, reduce exposure-related hazards[33,34] and decrease soft-tissue disruption. Patients can often begin weight-bearing within two weeks after percutaneous fixation and do not have to recuperate from a major operation

1.In patients with severe comminution and osteopenia
2.In polytrauma.
3. Patients treated after seven days may require open reduction because of soft-tissue fibrosis which could prevent closed reduction.

4. Miminimally-displaced transtectal acetabular fractures, high anterior-column fractures, posterior hemitransverse fractures of the anterior column or vertical fractures of the ilium



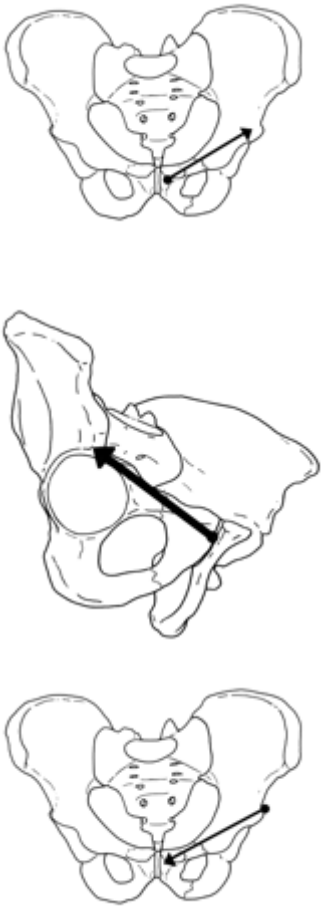
Fractures of the posterior wall of the acetabulum are rarely amenable to percutaneous reduction and fixation

In general, fractures of the acetabulum which are potentially amenable to fixation by percutaneous techniques include non-displaced (1 mm to 3 mm), but potentially unstable fractures

Technique
Aware of the anatomical structures
A radiolucent operating table is used.
Position: Supine for fractures of the anterior column, those involving both columns and injuries to the sacroiliac joint, and in the lateral decubitus position for transverse fractures, and fractures of the posterior column.

Manipulation: Under fluoroscopic control the application of various techniques such as leg traction, hip rotation and the use of Schanz pins or a temporary external fixator can be made in order to realign the fragments.

Fractures of the superior ramus: use of an antegrade and retrograde medullary screw
When symphyseal disruption and fracture of the ramus coexist, a retrograde screw can be combined with plating of the symphysis.[25]



View larger version (55K):
[in this window]
[in a new window]

Percutaneous intramedullary screw fixation of an unstable fracture of the superior pubic ramus is achieved using fluoroscopic supervision after closed or open reduction. Diagrams showing retrograde insertion (a, b) from the pubic tubercle directed laterally and c) ante-grade insertion from the supra-acetabular area directed medially.

Fractures of the ilium managed by a medullary screw in the pelvic brim (Fig. 3).
Fractures of the ilium occur infrequently due to direct trauma[47] and are usually associated with other disruptions of the pelvic ring, visceral injuries or damage to the superior gluteal vasculature.[22]

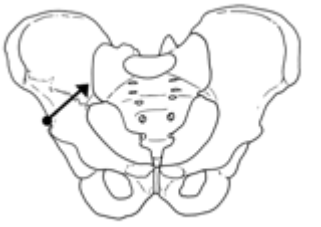


Fig. 3a, Fig. 3b Stabilisation of a fracture of the wing of the ilium may be indicated for the management of pain, early mobilisation, and optimisation of pulmonary function in patients with multiple injuries. Diagrams showing percutaneous screws, inserted from a) the anterior inferior iliac spine and b) terminating in the posterior iliac crest, which are used to stabilise the inferior portion of the fracture.

View larger version (41K):
[in this window]
[in a new window]

Sacroiliac joint disruptions
The application of a pelvic external fixator or reduction and fixation of the anterior pelvic ring may worsen posterior disruption.

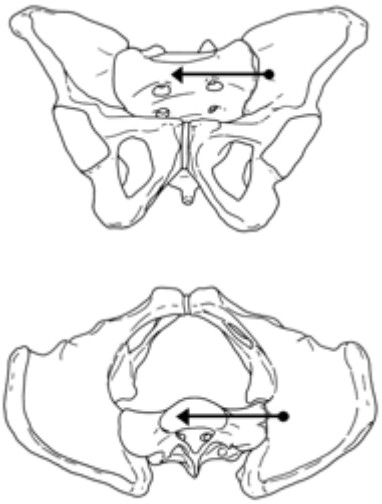


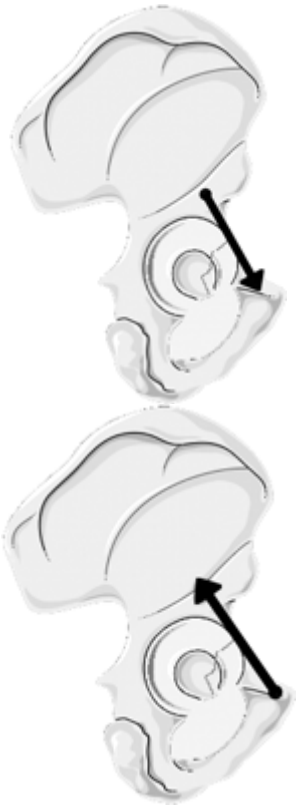
Fig. 5a, Fig. 5b Diagrams showing that sacroiliac screws avoid the chondral surfaces, being orientated obliquely to remain perpendicular to the disrupted sacroiliac joint. a) the pelvic outlet view and b) the pelvic inlet view.

View larger version (46K):
[in this window]
[in a new window]

Fractures of the wing of the ilium.
Fracture dislocations involving the sacroiliac joint may occur in combination with a fracture of the posterior part of the ilium, usually after a lateral compression injury.[13] The extent of the fracture of the ilium is determined by CT. Small fragments are amenable to percutaneous fixation by a sacroiliac screw with or without supplementary fixation. In patients with large fractures of the wing of the ilium, plates and screws should be utilised to stabilise the iliac fracture and disruption of the sacroiliac joint.[22]

Fractures of the anterior column : acetabulum
Screws can be placed in the anterior column in either an antegrade (cephalad to caudad) or retrograde (caudad to cephalad) direction. The insertion point for antegrade placement is determined by a line drawn between the tip of the greater trochanter and the thick part of the iliac crest, about 4 cm to 5 cm posterior to the anterosuperior iliac spine. In obese patients a more proximal entry point is advisable. A

skin incision of about 1 cm is made and deep dissection performed by spreading the soft tissues with a clamp down to bone, with care taken to avoid the lateral femoral cutaneous nerve. Imaging control using the outlet-obturator oblique and inlet-iliac oblique views allows safe passage of a 2.8 mm guide wire down the superior pubic ramus towards the symphysis pubis, avoiding penetration of the cortex. After drilling, a 7.3 mm cannulated screw is passed over the guide wire. For retrograde placement an incision 1 cm long is made inferior and lateral to the ipsilateral pubic tubercle. A guide wire is passed at 45° from medial to lateral through the superior pubic ramus across the fracture and above and anterior to the hip. Obturator-outlet and iliac-inlet views are helpful, although standard Judet views[1] may be adequate. Care must be taken to avoid damage to the femoral vessels or nerve, or to the spermatic cord in men. If the point of entry of the guide wire lies too inferior, the obturator nerve and artery may be damaged.[54] A 7.3 mm screw is used in men,



View larger version (99K):
[in this window]
[in a new window]

Fig. 6a, Fig. 6b Diagrams showing that anterior-column screws can be placed in a) a retrograde or b) antegrade fashion. Usually retrograde placement is easier unless the patient is obese. During placement of the guide wire the femoral nerve, artery, vein and spermatic cord could be injured.

Complications

The technical problems are compounded by difficulties in radiological interpretation.

The risk of neurological injury after positioning of sacroiliac screws have been reported to between 0.5% and 7.7%.

Percutaneous pelvic fixation

1. Has been receiving more attention in an attempt to avoid extensile surgical approaches
2. The early results of percutaneous fixation have shown a decrease in hospital stay and morbidity in longitudinal studies and in case reports of selected fractures

V. MCQ

Metal on metal prosthesis

1.Hip simulator results suggest that metal-on-metal bearings exhibit an early running-in phase in the first one million cycles (Mcyc), followed by a very low steady-state wear rate. This is explained on the basis of a self-polishing effect
2. A high-resolution inductively-coupled plasma mass spectrometer (HR-ICP-MS, Thermo Fisher Scientific GmbH, Bremen, Germany) is used to detect metal
3. Urine: Early increase in urinary output, a peak at 6 M for Cobalt and 1 year for chromium. There a steady decrease in the median urinary output of cobalt over the following three years.
4. The daily urinary output of chromium shows a similar to chromion but less pronounced increasing trend up to the one- and two-year stages, followed by a decrease at four years).
5. Blood: The mean whole blood cobalt and chromium concentrations at the one-year follow-up were 1.3 µg/l and 2.4 µg/l, respectively. At four years they were 1.2 µg/l and 1.1 µg/l, respectively.

DDH

1. 83% treated with the harness results are successful without further surgery
2. Avascular necrosis of the femoral head was noted in 12%
3.The acetabular index was the most reliable predictor of residual acetabular dysplasia.
4. The mean age at harness application was 4 months and the mean time spent in the harness was 6.1 months
5.An Acetabular index > 30° at four years after closed or open reduction was associated with an 80% probability of developing a Severin grade III/IV hip.
6. CE angle of 10° at five or six years of age may be a reasonable threshold of normality. [5 yrs]
7. AVN may not be recognised until after ten years of age.
8. The [alpha] angle had the smallest interobserver range (17 degrees) and B angle had largest range
9. The mean acetabular index (AI) of all hips at 6 months was 26 degree. The Acetabular index was 30 degrees or greater is significant.
10. A stepwise linear regression analysis showed that the Femoral head cover at 6 weeks was predictive of dysplasia.
11. Newborn screening programs demonstrate that 1 in 100 infants have some clinical instability of the hip, but the true incidence of dislocation ia 1 to 1.5 in 1000 live birth nd late dislocation is 1:10,000

Tibial Plateu fracture

3. Tibial plateau fracture [JOT 21[1]

1.At 1 year; 90% resumed work and 75% sports and mean ROM 130
2. Unicondylar better than bicondylar fracture
3.31% OA [only 1/3 rd were symptomatic]
4.When Valgus/varus >5°: 3 fold increase OA than <5° alignment
5.Age did not seem to be affected
6. >5mm step and 5° instability requires surgical stabilization

Malunited Forearm

1. osteotomy and ORIF is a good procedure
2. The mean gain in the range of movement was 85° (20° to 140°).
3. The interval between injury and osteotomy: < one year is favourable
4. The results are better when osteotomy is done at younger age.
5 The cut-off value of angulation as a requirement for surgical correction varies from 15° in mid-shaft fractures to 40° in fractures of the distal third.
6.The more proximal the location of the malunion, the more pronounced the resulting deficit
7. Rotation less than 50% to 60% of normal is associated with considerable functional impairment, and justifies corrective osteotomy.

SUFE

1. Affected children tend to be overweight, with most above the 90th percentile for their height.1
2. The goals of SCFE treatment are to prevent progression of the slip while avoiding complications of avascular necrosis and chondrolysis.
3.Regardless of the severity of the slip, in situ fixation is the standard of care in both acute and chronic cases, as it provides the best long-term function, and is associated with the lowest risk of complications and the longest delay of degenerative arthritis
4. The screw is positioned in the central axis of the femoral head to avoid damage to its blood supply from the lateral epiphyseal artery 11 and advanced no closer than 5 mm from the subchondral bone to avoid violation of the hip joint.6

6. The most favorable distribution of screw threads across the physis: It ha been recommend using a 16-mm thread screw to generate a compressive force across the physis by engaging all threads within the epiphysis. Others believe that noncompressive fixation, using 32-mm thread screws, provides optimal fixation by maximizing the number of threads (5 or greater) within the epiphysis.

Titinium nail for fracture femur

The usual size of the nails is equal to 0.4 times the diameter of the medullary canal
The mean overgrowth of the femur is less than 10 mm before the age of 10 years.
Indication: 6 years-13 years
BMI <25 [<50 Kg]5
Entry should be 2 cm distal to physis

Charcot Marie Tooth Syndrome

1. The results from this study strongly suggest that all patients who have bilateral cavovarus feet, regardless of clinical symptoms, should be further investigated for Charcot-Marie-Tooth disease. [78%]
2. The presence of a relative with CMT: 78 ➔ 91%
3 CMTe-Tooth disease Type I is the most common inherited disorder of peripheral nerves. Type IA is the most common subtype. 76%
4.The electrophysiological abnormalities are commonly present by 2 years of age.16
5. DNA testing to confirm their diagnosis of Charcot-Marie-Tooth disease. The CMT DNA Duplication Detection Test (Athena Diagnostics Inc) is based upon a point mutation or duplication on chromosome 17p in the region of the PMP22 gene. The sensitivity and specificity of this test are reported to be 99.98% by Athena Diagnostics Inc.