

B O D Y C A S T

Rounds Questions and Answers

Volume One, Issue One

- **What are your guidelines for casting the acute and swollen injury? (The patient has an unstable fracture.)**

From Mansell Hoy

The patient should be prepared both physically and psychologically. If medication is ordered prior to procedure, one must be sure it has been administered before the procedure is carried out.

Comparison should be made between the injured limb or part and the non-affected part. X-rays should be available and reviewed prior to administering treatment. X-rays should also be available for viewing during the procedure. Fracture displacement is then reduced and an appropriate well-padded cast is applied. Ascertainment of satisfactory reduction is achieved by post-reduction x-rays.

When considerable swelling is present or anticipated, the cast should be split. Splitting should be done as soon as the cast is applied. Splitting may be done with a plaster knife, if it is done as soon as the cast has become rigid. Otherwise, it is necessary to use the electric cast cutter to remove a narrow strip of plaster.

The removal of a small strip of plaster from the anterolateral region of the cast does not seriously compromise the strength or stability of the cast. Cutting a strip from the cast allows greater ease in cutting the underlying padding if swelling becomes severe. This also makes it much simpler to introduce bandage scissors under the padding.

If a cast is to be split, it should be split to skin, the entire length of the cast. This is mandatory when swelling has become severe. Unsplit padding may result in circumferential constriction with a tourniquet effect that might further compromise circulation to the distal portion of the extremity.

From R. Vanderwert

I would suggest that the patient be carefully placed in a Robert Jones bandage with plaster slab reinforcement. The posterior slab will adequately support the limb and the soft anterior portion would allow room for any further swelling. If necessary, the anterior flannel could be split to allow for swelling and skin inspection. This is only a temporary measure until a decision is made for a surgical procedure or a circular cast.

From Luis Flores

You should not cast a swollen limb for fear of compartment syndrome. Other methods of temporary immobilization are available to stabilize the fracture such as Jones plaster-reinforced bandages, traction, and external fixator, depending on the nature of the fracture. When the swelling has decreased and further complications have been ruled out, the patient would then be placed, if appropriate, in a circular plaster. The

patient would be instructed to perform adequate exercises to decrease swelling, also avoiding contractures to the joint proximal and distal to the injury.

Volume One, Issue Two

- **A patient in balanced traction discovers that they are unable to dorsiflex their foot. What are the possible causes of foot drop?**

1. Compartment syndrome
2. External pressure on the lateral surface of the head of the fibula.
3. Prolonged bed rest without supporting the foot in a neutral position.
4. Trauma (that results in the interference with nerve function).
5. Excessive traction on the sciatic or peroneal nerve.

Volume One, Issue Three

- **Please describe a Maissonneuve fracture. What is the usual mechanism of the injury and how would you treat this injury?**

From Gianni Maistrelli, MD

Recently, I had a patient with what I considered to be a classic Maissonneuve Fracture.

Maissonneuve emphasized the role of external rotation in the ankle fracture. External rotation of the talus could produce a high fibular fracture.

Stable injuries requiring no reduction are immobilized only for comfort and protection. A below-knee Jones bandage may be used until swelling has subsided. No weight-bearing is permitted during this period and elevation is encouraged. A BKW cast is then applied with the foot in neutral position and weight-bearing progressed as tolerated. If, however, the injury is unstable with damage to the deltoid ligament or medial malleolus, early operative repair is indicated.

The goals of treatment are the same for all ankle injuries:

- anatomical positioning of the talus in the mortise
- a joint line that is parallel to the ground
- a smooth articular surface

Unless these requisites are achieved by treatment, post-traumatic arthritis is likely to occur.

Volume One, Issue Four

- **Charcot-Marie-Tooth Disease!**

Tell us about this disease.

History:

Observations of patients with an unusual muscle atrophy were published by Virchow (1855), Eulenberg (1856), Friedreich (1873), Eichorst and Osler (1880). In 1886, the famous neurologist, J.M. Charcot and Pierre Marie described patients with a "progressive muscular

atrophy" disorder in the journal **Revue de Medecine**. They described patients with similar disorders which started first with their feet, legs, and later to their hands.

Simultaneously in London, a thesis published by H.H. Tooth described a disorder that usually had the peroneal group of muscles affected first. This soon became known as peroneal muscular atrophy. Due to the published findings of these three men, this unknown disorder became known as "Charcot-Marie-Tooth disease" (CMT).

Charcot-Marie-Tooth disease is also referred to as peroneal muscular atrophy. CMT disease is a dominantly inherited, demyelinating, hypertrophic, neuropathy involving peripheral nerves causing gross slowing of sensory and motor nerve conduction velocity. The onset of the disease may begin in late childhood or adolescence. The illness progresses very slowly and it seems to stabilize for long periods of time. This disease can also be occasionally recessive.

The subject still under dispute is the concept that muscular dysfunction is secondary to primary affection of a peripheral nerve or, possibly, the spinal cord.

Orthopaedic surgeons are often called upon to treat problems of locomotion with the CMT patient. Occasionally the orthopaedic technologist is called upon to cast or splint the CMT patient.

Some clinical features of CMT

Early onset of this disorder starts with the feet. Foot deformities include: claw foot deformity (pes cavus), high arch, foot and ankle weakness and loss of ability to plantar flex foot.

Gradual wasting of leg muscles (distal muscle atrophy) gives the leg an inverted champagne bottle appearance. Severe cramping, wasting of the hand and forearm and clumsiness with fine motor activities appear. Sensations, i.e., pain, touch, vibration and temperature are affected. Walking difficulty, which is the main disability, is due to a combination of sensory ataxia and weakness.

Gait is affected by foot drop, muscle weakness and may cause the CMT patient to walk with what is termed a marionette gait.

The complexities of CMT disease are many. It is therefore suggested that you, the orthopaedic technologist, read and research further on this subject. Your skills may be required in the treatment of the CMT patient. The orthopaedic technologist should exhibit skill, compassion and knowledge in the performance of his/her duties.

Volume Two, Issue One

- **The clinical syndrome of the "Frozen Shoulder". What are the probable causes producing this condition?**

From Gary James

Frozen shoulder (adhesive capsulitis) is a condition of unknown etiology characterized by a variety of pathological processes in the shoulder joint. These can be differentiated and treatment is empirical. It is a condition affecting the middle-aged, in whose shoulder cuffs degenerative changes are occurring.

The outstanding feature is limitation of movement in the shoulder. This restriction is often severe, with virtually no gleno-humeral movements possible, but in the milder cases rotation, especially internal rotation, is primarily affected.

Restriction of movements is accompanied in most cases by pain, which is often severe and may disturb

sleep. There is frequently a history of a minor trauma, which is usually presumed to produce some tearing of the degenerating shoulder cuff, thereby initiating the low-grade chronic inflammatory changes responsible for the symptoms. In some cases, the condition is initiated by a period of immobilization of the arm in a shoulder spica or as the result of the unadvised prolonged use of a sling after a colles fracture. It is more common on the left side and, in an appreciable number of cases, preceding a myocardial infarction.

If untreated, pain subsides after many months, but permanent restriction of movements is common. The main aim of treatment is to improve the final range of movements in the shoulder, and graduated shoulder exercises are the mainstay of treatment. These may include pendulum exercises as tolerated and, later, overhead pulley exercises are added. The range of painless motion gradually increases over a period of months to as long as two years.

In some cases where pain is a particular problem, hydrocortisone injections into the shoulder cuff, as prescribed by a physician, may be helpful. In a few cases, once the acute stage is well past, manipulation of the shoulder under general anaesthesia may be helpful in restoring movements in a stiff joint.

Volume Two, Issue Two

- **List six complications that may occur in patients in traction.**
 1. Thrombosis
 2. Pulmonary embolism
 3. Fat embolism
 4. Compartment syndrome (Volkmann's ischemic contracture)
 5. Peroneal Palsy (foot drop)
 6. Pin tract infection (direct link to the bone)

Volume Two, Issue Three

- **Tell us about "Severs Disease".**

Severs Disease (Calcaneal apophysitis)

Severs syndrome is a self-limited apophysitis of the os calcis at the insertion of the achilles tendon. Radiographs may show increased density in the os calcis apophysitis. However, the condition is most frequently diagnosed clinically. The patient's discomfort is found over the posterior aspect of the calcaneus, along with a tight gastroc-soleus mechanism, the characteristic findings of this condition. It often is classed as one of the osteochondroses. The condition is most aggravated by activities such as field sports, including soccer, field hockey and lacrosse. It is also associated with growth spurts and sport maltraining. The condition is most common among males in the six to 10-year-old group and treatment is symptomatic. An examination of the child's playing shoe often reveals a "negative cant" with the heel lower than the toe as a result of cleat wear and shoe design. A worn out heel of a shoe may bring on clinical symptoms of Severs syndrome. Mild restrictions of activities or elevation of the heel or arch supports generally afford prompt relief. Heel cord stretching exercises should be instituted to prevent recurrence. In most severe cases of this condition, a below-the-knee walking cast (BKW) may be applied for a four to six week duration.

Volume Two, Issue Four

• Describe or explain a Madelung's Deformity.

Madelung's deformity is congenital subluxation or dislocation of the lower end of the ulna. A similar deformity is more often caused by disease or injury, such as a fracture of the lower end of the radius with upward displacement of the lower fragment. The deformity is rarely seen before the age of 10 years and increases until growth is incomplete. The deformity varies in degree from a slight prominence of the lower end of the ulna at the back of the wrist to complete dislocation of the inferior radio-ulnar joint with marked radial deviation of the hand. (The lower radius curves forward carrying with it the carpus and hand, but leaving the lower ulna sticking out as a lump on the back of the wrist.) If the disability justifies operation, the lower end of the ulna may be excised, or osteotomy of the lower radius may be combined with shortening of the ulna.

Volume Three, Issue One

• There are several contraindications to skin traction. List three of them.

Contraindications to skin traction include: skin rash, hypersensitive skin, open wound or soft tissue damage, vascular insufficiency, swelling of extremity, pre-existing skin or neurovascular condition

Volume Three, Issue Two

• Describe complications occurring after Colles fracture.

The commonest complaints are of residual deformity, restriction of movements, initial weakness of the wrist, and pain. Colles fractures are very common. It is surprising that complications from this injury are not seen more frequently. Yet, some complications do occur and are of importance.

The commonest deformities are radial deviation of the hand and prominence of the ulna. With the possibility of resorption of bone at the fracture site during healing, shortening of the radius may occur. A disturbance of the inferior radio-ulnar joint is partly responsible for loss of movements in the wrist, loss of supination and restriction of dorsiflexion cause concern to the patient.

There remain two further complications after Colles fracture. Delayed rupture of extensor pollicis longus tendon due to ischemia or attrition of the tendons. Also Sudeck's atrophy, which may occur weeks following removal of the cast. Sudeck's atrophy is characterized by marked swelling of the wrist, hand, and fingers. Also, gross stiffness of the fingers is a complication of this condition. Patients diagnosed as having Sudeck's atrophy will require physiotherapy to avoid permanent stiffness.

Common errors in the management of Colles fractures include:

- failure to perform neurovascular assessment
- failure to initiate early active finger motion
- failure to elevate the arm above the heart level
- ignoring patient complaints about pain and swelling
- ignoring patient complaints about casts
- failure to perform follow-up exercises
- failure to communicate to the patient the necessity of all of the above

Volume Three, Issue Three

• Describe a "Tillaux fracture".

Named after Tillaux (1872). The injury as described by Kleiger and Mankin in 1964, documented cases showing an isolated fracture of the lateral portion of the distal tibial physis. It is a Salter-Harris Type III fracture. The fracture line extends from the articular surface proximally, transversing the physis, and then continuing along the physis laterally. This is similar to the Tillaux lesion in the adult. The fragment is pulled by the anterior tibiofibular ligament when the foot is externally rotated. This type of fracture is a variant of the supination-external rotation mechanism.

Patients with this type of fracture may be in the 12 to 14 years-of-age group. Generally, x-rays show a partial closure of the middle and medial portion of the distal tibial growth plate in most cases. The fracture line increases with external rotation of the foot.

Treatment involves a long leg cast for four to six weeks. A good reduction and post-reduction films are essential. Surgical intervention would be necessary if reduction could not be achieved closed.

Volume Three, Issue Four

• Describe "Freiberg's Infraction."

Freiberg's Infraction is an osteochondrosis of the second metatarsal head. This can be confused with a fracture. Freiberg's Infraction is most common in the second decade of life. Because the second metatarsal is the most rigidly fixed metatarsal, it is subsequently the most injured. Characteristic of Freiberg's Infraction is pain and localized tenderness at the head of the second metatarsal. The residual effects are collapse and shortening of the metatarsal head.

Early treatment suggest a below-the-knee walking cast, with elevation of the depressed metatarsal head. Bone grafting has been suggested as treatment for a deforming metatarsal head.

Volume Four, Issue One

• Tell us about "Myositis Ossificans."

Myositis Ossificans refers to heterotopic* bone formation that can follow local trauma; it generally occurs in, or adjacent to muscles and near bone. A characteristic location for the development of myositis is around the elbow. This may be associated with an extensively damaged brachialis muscle (the brachialis muscle is largely fleshy at the point where it is torn by the protruding distal humerus). What factors favour development of myositis?

1. Delay in treatment
2. Extensive soft tissue damage
3. Repeated or forceful attempts at reduction
4. Early passive stretching to regain motion
5. Delay in surgical intervention

The complication of myositis has become less frequent due to a better understanding of the factors involved and appropriate treatment. Dislocations of the elbow associated with fractures should be given special consideration. Radiographically, myositis may appear within three to four weeks after initial injury. Clinical signs of myositis are prolonged tenderness, and difficulty in regaining motion.
* heterotopia - development of normal tissue in an abnormal location.

Volume Four, Issue Two

- **Tell us about “Gamekeeper’s thumb.”**

Gamekeeper’s thumb is a term that was used to describe an injury to the ulnar collateral ligament of the metacarpophalangeal joint of the thumb to British game wardens. Game wardens would use their thumb as a wedge to break small animals’ necks; this usage subjected the MCP joint of the thumb to significant lateral stress. Today, the label “gamekeeper’s thumb” applies to the patient who has fallen on the outstretched abducted thumb or trapped the thumb in a ski pole strap. Acute trauma to the MCP of the thumb usually results in the distal avulsion or midsubstance tears of the ulnar collateral ligament.

Patients with this injury have severe difficulties with pinching and grasping objects. X-rays of the thumb are important because undisplaced avulsion fractures should not receive a stress examination as this may cause the fragment to become dislodged. Complete ligamentous disruption requires surgical intervention. Undisplaced fractures and partial ulnar collateral ligament tears receive satisfactory treatment by cast immobilization in a thumb spica type cast.

Volume Four, Issue Three

- **What is “Lyme Disease?”**

If not for the AIDS epidemic, Lyme disease would be the new universal plague. It is an uncommon condition, diagnosis is easily missed because it mimics other diseases.

The disease is transmitted by deer ticks (*Ixodes dammini* species) and the cause of infection is the spirochete “*Borrelia burgdorferum*.”

The first stage, found within three to 32 days after a bite, is a bright red expanding rash in the form of a circle (erythema chronicum migrans, ECM) at the site of the bite. Later, untreated stages include extremity involvement dysesthesias, weakness and loss of deep tendon reflexes.

Lyme disease has protean clinical presentations, commonly affecting the skin, nervous system, heart and joints. The infection can also produce a variety of neurological symptoms, including headache, fatigue, meningitis and a number of other disorders that make diagnosis difficult.

The knee joint can be involved and exhibit hypertrophic synovitis similar to, but not identical to, rheumatoid arthritis. Many patients have recurrent attacks of arthritis and arthralgias for as long as three years after the rash ECM.

Early detection and confirmation of Lyme disease, with the use of antibiotics can be used to clear up the infection in the early stages.

An ixotid tick bite is painless and rarely draws the victim’s attention. Skin examination is crucial in detecting a bite. Common sense precautions should be taken when going into wooded areas.

Volume Four, Issue Four

- **What is a “shin splint?”**

The patient complains of pain and tenderness over the anterior tibial muscles, usually occurring at the beginning of athletic training and quite common. The muscles may be swollen in the anterior compartment; there is no functional impairment. Discomfort on examination is brought about by active and passive motion. General treatment involves rest

and ice applications (for swelling) and possible anti-inflammatory medications. Gradual return to activity is recommended.

Always check distal neurovascular status.

Overuse Injury

According to the constancy of pain, the severity of an overuse injury can be graded.

- Grade I - pain only after activity
- Grade II - pain starts during activity
- Grade III - pain still persists the next day
- Grade IV - constant pain

Volume Five, Issue One

- **Describe the two types of fractures of the distal radius: Smith’s and Barton’s fractures.**

Barton’s fracture: John Rae Barton, in 1883, described posterior and anterior marginal fractures of the distal radial articular surface. Barton’s fracture, although similar in clinical deformity to Smith’s fracture, is a more serious injury and is best managed by prompt open reduction and internal fixation. Barton’s, an intra-articular fracture, is present on the volar lip of the radius and the remainder of the carpal bones are dislocated volarly.

Reverse Barton’s fracture - the displaced articular fragment may come from the dorsal surface and is best classified as a Colle’s fracture.

Smith’s fracture: Robert Smith was an 18th century Dublin surgeon. A Smith’s fracture is volar displacement of the distal radius and results from a fall on the evolar flexed wrist, in contrast to the dorsally displaced Colle’s fracture.

Usually this unstable fracture can be reduced by supinating the wrist to tighten the pronator quadratus muscle and the volar capsule of the wrist. Smith’s fracture occurs about one-tenth as often as a Colle’s fracture.

Volume Five, Issue Two

- **Describe radial head subluxation in children.**

A common paediatric injury is radial head subluxation or pulled elbow, and it is easily treated. Diagnosis is made from the history and physical examination, x-rays may reveal negative findings. The diagnosis is also confirmed by the prompt reuse of the affected arm after reduction. Over 90% of the injuries result from an adult pulling or jerking the arm. Typically, the children present themselves with the elbow in a slightly flexed position with the radial head pronated. Children often refuse to use the arm and resist supination. Treatment consists of supination of the forearm, followed by flexion of the elbow. If this proves ineffective, extension may be performed after supination. A click is heard during supination in most cases.

A common belief is that young children are susceptible to radial head subluxation because the distal attachment of the annular ligament that covers the radial head is weaker and easily torn in children under five years of age.

Volume Five, Issue Three

- **Synthetic casting tape remains durable under wet conditions. Should patients get it wet?**

Caution should always be exercised by the patient in a cast near water. Often, patients will request a fibreglass cast with the belief they can get it wet. It is true the

material is durable to moisture - meaning the cast material will not break down. The patient should be made aware that the cast padding underneath (soft roll, felt, silencer cloth) will stay moist and will aid in the maceration of the skin. Patients with incisions under their cast should be discouraged from attempting to safely bathe with their cast on, using just a garbage bag. Complications of a wet cast must be mentioned to the patient. Documentation of skin maceration, ulcers, and ringworm¹ have been published. A warm, moist environment is ideal for the growth of fungi and skin breakdown.

A synthetic cast that is not thoroughly dried is a favourable setting for possible complications.

It is imperative that adequate patient instructions be given to the patient wearing a synthetic cast.

1. **Journal of Paediatric Orthopedics**, 3, 511-512, 1983.

Volume Five, Issue Four

• Describe an ankle sprain injury.

Ankle sprain injuries happen to many people, not just the active sports participant, although 85 per cent of all ankle injuries in sports are sprains. The injury is usually the result of the ankle turning in.

The ankle is a straightforward structure with none of the inherent instability of the knee or the complexity of the shoulder. There is virtually no muscle at all around the joint. Ankle sprains can be graded into three levels of severity. Type I: The most common, is actually a sprain of ligaments connecting the bones to the ankle. They are stretched, but not torn, little swelling is noted, and no instability found. Type II: Is more serious, the ankle ligaments are partially torn. There is some blood in the tissues, and bruising will be seen around the ankle in a few days.

Type III: Is the most severe injury, with a serious tear of the ankle ligaments.

Predisposing factors:

1. Previous injury
2. Weak muscles
3. Inappropriate/worn out shoes
4. Uneven surface.

Immediate proper care will reduce the discomfort of a sprained ankle. The application of an ice pack is beneficial. There is no acute, athletic injury for which you should use heat - not at first. Heat has precisely the opposite effect as cold; it opens blood vessels and expands tissues. It is a great way to increase circulation, but that is the last thing a newly-sprained ankle needs. When appropriate, exercise is recommended to regain motion and strength.

Volume Six, Issue One

• What is Sudek's atrophy?

From Jean Hohs:

Sudek's atrophy is post-traumatic osteoporosis.

The symptoms are noticed about two months post-injury, or when the cast is removed. The function of the limb is not regained as it should be with active use and exercises. Instead, the patient complains of severe pain in the affected hand or foot.

The classic signs are thin, shiny skin, excessive hair growth, attrition of nails and diffuse osteoporosis. Joint movements are severely impaired, especially the metacarpophalangeal and interphalangeal joints in the case of the hand ("frozen hand").

The features that distinguish Sudek's atrophy from the osteoporosis that is commonly seen in limbs immobilized for a long time are: the marked swelling, the shiny stretched appearance of the skin and the marked stiffness of the joints. In addition, the rarefaction of the bones, often with a spotty texture, is more extreme.

When this diagnosis is suspected, treatment should be instituted immediately.

Treatment - most cases respond slowly but surely to efficient conservative treatment. The main component is active exercise, with active use of the limb so far as pain will allow. Elevation of the limb and local heat in the form of wax baths are also thought to be beneficial. Much patience and encouragement are required, and the patient should be under the care of a skilled physiotherapist. Adequate recovery is usually gained in two to four months with this type of conservative treatment.

In obstinate cases, success has been claimed for repeated sympathetic blocks or for permanent sympathetic denervation by ganglionectomy.

Volume Six, Issue Two

• What is a Baker's Cyst?

From Gordon Szol:

Baker's cyst is also known as a popliteal cyst and is most commonly associated with the gastrocnemio-semimembranous bursa. Baker's cyst is thought to be caused by: 1. repeated trauma due to friction of adjacent muscles, or 2. herniation of the synovium through a defect in the posterior capsule.

A Baker's cyst can affect all ages, predominantly males, and can be bilateral. A cystic, tense, painless swelling gradually appears in the popliteal fossa, usually slightly medial. The cyst is made more prominent by extending the knee. Occasionally, vague pain symptoms and a sense of the knee "giving way" are evident. If the cyst is large, a decrease in knee extension is usually found.

On x-ray examination, a globular shadow in the popliteal fossa can usually be seen. This shadow is more dense than the surrounding soft tissue. On an arthrogram, often there is evidence of communication with the synovial sac.

The treatment should be directed at the underlying cause. Often, rest will allow for spontaneous resolution of the cyst. If the cyst is large and does not resolve, then surgical excision would be indicated.

From Guy Chartrand:

Also known as popliteal cyst. Baker's cyst is similar to a ganglion, and may develop in the popliteal region, usually in relation to the semimembranous bursa. Such cysts are common in childhood, but seldom cause symptoms. A popliteal cyst usually regresses spontaneously during childhood.

In adults, popliteal cysts usually communicate with the knee joint through a hollow stalk and, in a sense, represent a "synovial hernia." Thus, in the presence of a synovial effusion in the knee, due to either rheumatoid arthritis or degenerative joint disease, the popliteal cyst becomes distended by the effusion and may extend distally even as far as mid calf.

If a popliteal cyst becomes sufficiently enlarged that it interferes with the knee function, operative excision of the cyst and exploration of the joint are indicated.

Volume Six, Issue Three

- **In brief, describe one or both of these conditions:**

- A) Boutonniere deformity,**
- B) DePuytren's contracture**

Boutonniere deformity is a flexion deformity of the proximal IP joint due to injury to the extensor tendon as it inserts into the base of the middle phalanx. Caution: the injury may also appear as a dislocation, yet it is a flexion deformity.

DePuytren's contracture occurs most often in the ring and small fingers, and is most often seen in older men. It begins as a nodule and advances to fibrous bands, with contracture of the fingers. The flexor tendons are not involved; it is the proliferated longitudinal band of the palmar aponeurosis in the distal palm and fingers.

Volume Six, Issue Four

- **Describe a Monteggia fracture.**

Monteggia's fractures: Ulnar fractures a Type III - Giovanni Battista Monteggia, 1762-1815

Fractures of the proximal third of the ulnar shaft combined with a radial head dislocation are classified as Monteggia fracture. Radial head dislocations can only occur if there is a complete rupture of the annular ligament. Monteggia fractures are classified into three types.

Type A: Sixty per cent of Monteggia fractures are Type A.

This includes fractures of the ulnar shaft, combined with an anterior dislocation of the radial head. There is usually anterior angulation of the distal fragment.

Type B: Ulnar shaft fractures with posterior or posterior lateral dislocations of the radial head. This Type III injury is responsible for 15 per cent of Monteggia fractures.

Type C: Twenty per cent of Monteggia fractures have ulna metaphyseal fractures with lateral or anterolateral dislocations of the radial head. Five per cent of Monteggia fractures involve a fracture of the radius.

Frequently associated with the Type III Monteggia fracture is paralysis of the deep branch of the radial nerve. Monteggia fractures require emergent evaluation because of a high incidence of complications.

Volume Seven, Issue One

- **Describe Lisfranc fracture dislocation.**

This injury to cavalymen during battle was described by Lisfranc in 1840. The dislocation was due to the soldier's foot being caught in the saddle stirrup when thrown from their horse. Today, motor vehicle accidents and falls from ladders may cause this injury. A crush-type injury can also cause this dislocation or rotational stress. A tarsometatarsal dislocation commonly results in a fracture at the base of the second metatarsal. Usually, all the metatarsals dislocate from the tarsals. The neurovascular status of the foot should be carefully examined and documented. The circulation in the forefoot may be obstructed by direct pressure on vessels with the metatarsals dislocated.

Tarsometatarsal dislocations may be associated with the following injuries:

1. Fracture of the base of the second metatarsal
2. Chip fracture of adjacent tarsals or metatarsals
3. Cuboid chip or compression fracture
4. Cuneiform or navicular fracture dislocation
5. Spasm or thrombosis of pedal arteries

If closed reduction is unstable, an anatomic reduction is necessary and may necessitate an open reduction with internal fixation. Tarsometatarsal dislocations are frequently complicated by development of degenerative arthritis or impaired circulation to the distal foot. The dislocation is usually unstable if the first metatarsal is dislocated or fractured, and is always unstable if the second metatarsal is fractured.

Volume Seven, Issue Two

- **Spondylolisthesis - what is it?**

Spondylolisthesis is best seen with an oblique x-ray of the lumbar spine. Although not uncommon, it may be a chance finding on an x-ray. The patient complains of recurring back pain. In severe cases, a spinal fusion may be recommended treatment.

The incidence of spondylolisthesis in the general population is about 5%, and seems to be about equal in men and women. It also affects children, although it's rarely seen in children under five years of age. Spondylolisthesis in children is characteristically different from that in adults. Usually producing a peculiar gait due to tight hamstrings due to abnormal anatomy, a kyphotic deformity at L-5 S-1 caused by compensatory mechanisms of pelvic flexion with hyperlordosis of the spine.

Surgery is not always necessary in spondylolisthesis. Cause of defects is unknown.

Bilateral defects in the pars interarticularis of the fifth lumbar vertebra characterize spondylolisthesis and resultant anterior displacement of the body of this vertebra, and the superincumbent spine on the sacrum.

The defect in the pars interarticularis may be unilateral or bilateral. If bilateral, the fifth lumbar vertebra may or may not become displaced anteriorly; when it is unilateral there is minimal displacement, if any.

Spondylolysis or spondyloschisis is a unilateral or bilateral defect without displacement of the vertebra.

Spondylolisthesis is graded from type I to type IV depending on the severity of the anterior displacement of the fifth vertebra on the sacrum.

Volume Seven, Issue Three

- **Bohler's angle - what is it, or describe it.**

From Bernie Arseneault:

Bohler's tuber-joint angle is best seen on a lateral x-ray projection of the foot. This angle is located at the superior surface of the os calcis. It is formed by the drawing of a straight line from the calcaneal tuberosity to the dome, with a second line from the dome along the subtalar joint to the tip of the os calcis. This angle is normally 20 to 40°. With a compression fracture such as a crush or displaced involvement of the subtalar joint, this angle is decreased. Measurement of the angle may assist in diagnosis of fractures of the os calcis.

Reference

Language of fractures, second edition, R. Shultz.

From Mansell Hoy:

Bohler's angle is referred to when treating fractures of the calcaneus, it is also known as the tuber angle. Bohler's angle is established by the lateral x-ray and is formed by the intersection of one line along the superior aspect of the tuber of the calcaneus with a second line along the superior aspect of the middle and anterior portions of the calcaneus. The angle is normally 20 to 40 degrees. Bohler's angle should be calculated whenever a class B, Type II fracture is diagnosed.

Volume Seven, Issue Four

• What is Ewing's sarcoma?

From Joan Bissonnette:

Ewing's sarcoma is a rapidly-growing malignant neoplasm. It arises from primitive cells of bone marrow in young persons, usually in the medullary cavity of long bones. It is the third most common cancer of the bone. This sarcoma also metastasizes early to lungs and other bones. The main symptom is increasing pain. The differential diagnosis is chronic osteomyelitis. Confirmed diagnosis is by surgical biopsy. Prognosis is grave - 95% mortality in the first few years. Chemotherapy may retard metastases. Radiation may melt away local lesion. It is a very unfortunate disease for those afflicted.

From Mansell Hoy:

Ewing's sarcoma is a malignant bone tumour which occurs mainly in children. Unlike most bone tumours, it affects the shaft of the bone, which it expands in a fusiform manner. Over it, layer upon layer of new bone is laid down, giving a typical "onion peel" appearance. Although the tumour responds dramatically to radiotherapy for a while, it is ultimately fatal from blood-borne metastases.

Volume Eight, Issue One

• Describe the usual path of a clot that becomes a pulmonary embolism.

From Andrew J. Haze:

A pulmonary embolism usually originates from a thrombosed vein in the pelvis or lower extremities. The embolus travels from its origin to one of the iliac veins, into the inferior vena cava, through the right side of the heart, and into the pulmonary arteries. Where the emboli lodges in the pulmonary arteries depends on the size and number of emboli, as well as the size of the vessel.

From James Nijmeh:

Deep calf veins and popliteal vein to the femoral vein, to the iliac vein, to the inferior vena cava, to the right ventricle, to the pulmonary artery, blocking smaller branches and causing pulmonary embolism.

From Joseph Maulucci:

The most likely site of a clot is in the deep veins of the lower extremities. A piece of clot breaks loose and travels through the veins. Since the thigh is the preferred site of a thrombus, the typical path is as follows: posterior tibial up the popliteal, superficial femoral, common femoral, common iliac, inferior and superior vena cava, right atrium and right ventricle of the heart to the left and right pulmonary arterioles and, finally, pulmonary capillaries.

From Joan Bissonnette:

A pulmonary embolism (PE) is a complication of deep vein thrombosis wherein the thrombus, 95% of which arise in the lower extremities in a large deep vein, becomes free and moves through the circulatory system.

The path is usually along the large deep vein in lower extremity, through venous system to the inferior vena cava into the right atrium of the heart, then through the heart valve into the right ventricle where it is pumped on into one of the pulmonary arteries and then into the lung where it obstructs an arterial vessel in the distal lung.

From Mary Perkins:

A pulmonary embolism is a blood clot swept into the circulatory system from a large peripheral vein, usually in the lower extremity or pelvis. Entering the

inferior vena cava, the blood clot will flow into the right atrium of the heart.

The right atrium will force the clot through the tricuspid valve into the right ventricle, which in turn pumps the blood to the pulmonary artery. Instead of flowing smoothly towards the lungs, the blood clot becomes lodged in a pulmonary blood vessel. This prevents adequate blood supply to the lungs, interferes with oxygenation and results in arterial hypoxemia.

As pressure within the obstructed pulmonary artery increases, there is a strain on the right ventricle and it may eventually fail. Two other complications of pulmonary emboli are pulmonary infarct and pulmonary haemorrhage.

Volume Eight, Issue Two

• Describe osteopenia.

From Andrew J. Haze:

Osteopenia is defined as "reduced bone mass due to inadequate bone formation". However, in the medical field today, we use the term osteopenia to describe generalized decreased bone density on x-ray. This radiologic appearance of bone can be caused by: osteoporosis; osteomalacia (Rickets); hyperparathyroidism; hyperthyroidism; and metastatic tumours, particularly multiple myeloma.

Often, the terms osteopenia and osteoporosis are used interchangeably when describing bone on x-ray. This is incorrect as osteoporosis is a diagnosis made by clinical and laboratory findings, not by standard x-ray appearance.

Since osteopenia does not imply a specific etiology, it should be used as a general term when a specific diagnosis is unknown.

From Mansell Hoy:

Osteopenia is a useful generic term that encompasses all of the diseases associated with the radiologic finding of decreased amounts of mineralized bone. This term is particularly convenient because it does not presuppose the pathologic process responsible for the radiologic picture. Four completely different types of bone diseases may present as osteopenia.

These disorders are important to differentiate because they have different histologic features, pathophysiology, prognosis and therapy. They are osteoporosis, osteomalacia, osteitis fibrosa and osteopenia associated with myeloma and other malignant diseases. Differential diagnosis - The key to the differential diagnosis of osteopenia is to distinguish patients with osteomalacia, osteitis fibrosa cystica or osteopenia associated with malignant disease from patients with osteoporosis. In osteomalacia, there is usually a decrease in the serum calcium and phosphorus associated with decreased serum 25-hydroxyvitamin D, if the condition is caused by vitamin D deficiency due to dietary lack or malabsorption. If this disease is suspected, bone biopsy after double tetracycline labelling should be performed. Osteitis fibrosa cystica is the bone disease of primary hyperparathyroidism and can be distinguished from osteoporosis by several serial evaluations of the serum calcium.

Osteopenia associated with malignant disease should always be suspected in patients with osteoporosis, particularly if they are elderly and particularly if the osteopenia is severe and of recent onset. Myeloma is the most common malignant disease associated with diffuse osteopenia.

In brief, osteoporosis is an important public health problem in western communities. It is responsible for over 200,000 hip fractures and 600,000 vertebral fractures every year. By the year 2000, it has been estimated that 20 million Americans will suffer from this disease, with increasing numbers of people in the population over the age of 65.

Reference

Disease-a-month, October 1987. Peter O. Kohler, MD.

Volume Eight, Issue Three

- **Describe the following paediatric foot deformities (in brief). The Calcaneovalgus foot, Metatarsus Varus, Clubfoot (talipes equinovarus).**

Talipes derives from the Latin words "talus" (ankle bone) and "pes" (foot). It is a term used to describe any congenital foot deformity.

The cause is uncertain. In most cases, a defect in fetal development is responsible, with imbalance between the invertor-plantar flexor and evertor dorsiflexor muscles. Also, in some cases, it may very well be a prolonged malposition of the fetal foot in the uterus.

The crucial component of the deformity is subluxation of the talonavicular joint, so that the navicular bone lies on the medial aspect of the head of the talus instead of on its distal aspect.

The foot is adducted and inverted at the subtalar, midtalar and anterior tarsal joints, and is held in equinus (plantar flexion) at the ankle.

The deformity is more common in boys than in girls. One or both feet may be affected.

Newborn infants should be examined routinely for evidence of clubfoot.

The prognosis depends largely upon the age at which primary treatment is begun and upon the efficiency with which it is carried out. Ideally, treatment should begin immediately after birth. The principles of treatment are to correct and overcorrect the deformity by repeated manual pressure. By holding the foot in the overcorrect position, one can counteract the natural tendency of the deformity to recur. This could be achieved by serial casting, adhesive strapping, metal splints or surgical soft tissue release if, after two to three months, the deformity persists.

Calcaneovalgus foot

This deformity is the opposite of clubfoot. The cause may be simply a postural deformity from holding the foot against the skin for times while in intrauterine life.

The foot is everted and dorsiflexed. One or both feet may be affected. This deformity may respond to repeated manual stretching by the parents, who should be carefully instructed how to gently guide the foot into the over position of the inversion and equinus by steady pressure upon the dorsum of the foot. This manipulation should be carried out several times a day.

If the deformity persists after a month, the surgeon will gently overcorrect the deformity by applying serial casting with the foot in the correct position. The plaster is changed weekly until full range of inversion and equinus is gained.

If that does not correct the problem, operative procedures may be required.

Metatarsus varus

This deformity appears 10 times as frequently as club foot, is quite flexible, and can be corrected easily with passive stretching and corrective immobilization.

Metatarsus varus tends to be hereditary. Possible fetal defect of the talar neck, or muscle imbalance with overpull of the tibialis anterior and posterior may be the cause. Also, sleeping posture contributes to this deformity.

The head of the talus is directed inward, incurving of the lateral border of the foot is noted.

Upon weight-bearing, the lateral border of the foot is in contact with the ground and the medial border is elevated.

Passive stretching by the parents at each diaper change, combined with frequent stroking of the lateral border during the day, may be enough to reverse the inturning.

After three months, if the deformity persists, it is best to initiate serial casting treatment. If no correction is achieved by the time the child reaches two years of age, surgical correction may be carried out.

References

1. **Outline of Orthopaedics**, 1981. J. Crawford Adams.
2. **Surgery of the Foot**, 1986. Roger A. Mann.

Volume Eight, Issue Four

- **What is Ehlers-Danlos syndrome?**

Ehlers-Danlos syndrome is an inherited connective tissue disorder characterized by cutaneous laxity, hypermobile joints and a bleeding diathesis. There are several types. Articular laxity is commonly involved with digits, elbows, shoulders and patella.

From Joe Maulucci:

Ehlers-Danlos syndrome (EDS) is a group of inherited disorders of elastic connective tissue. It also describes a specific biochemical and molecular effect.

EDS is characterized by joint hypermobility and skin abnormalities. The cardiovascular system is also involved. The presence of visceral malformation, atrophic scars, pseudo-tumours and calcified subcutaneous cysts is evident. The skin is soft, velvety, fragile and abundant over the hands and feet. It is hyperextensible, but returns immediately to normal configuration when released.

Orthopaedic problems relate to joint hypermobility. Joint dislocation occurs in 25% of patients; it may be present at birth or turn up as an acute or chronic problem. Joint effusions and arthralgias are common; children are often misdiagnosed with forms of arthritis. Symptomatic shoulder dislocations are typically multi-directional. Subluxations and dislocations of the patella are very common and reducible, while radial head and medial sternoclavicular distractions are irreducible.

Dislocations involving the interphalangeal, metacarpophalangeal, and carpometacarpal joints of the thumb can cause bothersome symptoms. Soft tissue stabilizing procedures usually fail as they stretch out over time because of the underlying collagen abnormality. Physical therapy and appropriate orthosis should be the first line of treatment, with arthrodesis reserved for selected cases.

There is no specific treatment for this syndrome. Surgical repair and tightening of the joint ligament require careful evaluation of individual patients since the ligaments frequently will not hold sutures. The wounds are characterized by minor bleeding and dehiscence. Patients may be uncomfortable and inconvenienced with EDS, but the outlook for life is good. There are exceptions which make this condition life-threatening when the cardiovascular system is involved.

References

1. **Harrison's Principles of Internal Medicines.** Twelfth edition. Inc. 1991.
2. **Orthopaedic Knowledge Update 4.** John W. Frymoyer, MD. 1993.

From James Nijmeh:

Ehlers-Danlos syndrome (EDS) is a group of disorders whose wide phenotypic variability is largely due to extensive genetic heterogeneity.

EDS is a syndrome characterized chiefly by hyperextensibility of the joints and skin, and poor wound healing. Internal manifestations tend to occur only in certain forms of the syndrome. Nine types of EDS are now accepted on the basis of phenotypic and inheritance characteristics. Within individual types, however, biochemical studies have demonstrated considerable heterogeneity.

The most consistently associated orofacial features include narrow maxillae, lop ears, epicanthal folds, wide nasal bridge, recurrent temporomandibular joint subluxation, and fragile and easily bruised oral mucosa. The skin has a velvety appearance and is hyperelastic, especially over the major joints, with poor wound healing and resulting pigmented papyraceous scars. Mulluscoid or raisin-like pseudo-tumours, usually of the heels and over the major joints are frequent. Dislocations, pes planus, talipes, kyphoscoliosis, thoracic asymmetry, and inguinal and umbilical hernias may occur. Occasional ocular abnormalities may include blue sclera, myopia, microcornea, keratoconus, glaucoma and retinal detachment. Small irregular teeth and partial anodontia are the chief dental features. The most common vascular defects consist of ecchymoses and dissecting aneurysm of the aorta. Musculoskeletal anomalies may include a weak hand clasp, genu recurvatum and recurrent joint dislocations. Prematurity due to early rupture of fetal membranes is common.

Volume Nine, Issue One

• What are fracture blisters?

Fracture blisters are caused by edema, friction, and pressure which can all lead to the breakdown of intercellular bonds.

Fracture blisters occur in areas with insufficient tissue, as well as over and around fractured areas that cannot absorb the pressure or fluid area.

You may recognize fracture blisters as you would pressure sores, with stages one to four. The ideal cast for treatment would be a Jones-type bandage with plaster reinforcement. This would protect the injury and be flexible enough to allow for expansion due to swelling.

Should the fluid be evacuated from the blister? Some may evacuate the blister fluid, although the acceptance of this practice is not universal. This topic is an ongoing debate.

The main argument has been over retention of blister fluid because it is a natural biologic dressing with its overlying epithelial cap, or removal of fluid because it serves as an excellent medium for the proliferation of microbes. Generally, blister fluid has suppressive effects on bacterial activity.

It should be noted that there is a scant amount of published material on fracture blisters, however, articles on pressure sores and burn blisters would be of use to the orthopaedic technologist.

Volume Nine, Issue Two

• Describe Osgood-Schlatter Disease.

Osgood-Schlatter's is a disease found in children due to contraction of the quadriceps in sudden repeated or overuse mechanism. It is characterized by pain, tenderness and swelling over the tibial tubercle. Rest is recommended. Cast (cylinder) for the acute complaint.

Volume Nine, Issue Three

• Describe Paget's disease.

From Joan Knighton:

Osteitis deformans or Paget's disease is a slow, progressive disease causing enlargement and deformity of bones. This process of deposition and resorption of bone is unexplained. Three per cent of adults over the age of 40 years have some form of this disease. A possible etiology is a "slow virus" affecting osteoclasts.

The bones most affected are the tibia, femur, lumbar spine, pelvis and skull. The results are spongy, thickened bone which is also weakened.

The complications of this bizarre process of excessive osteoclastic resorption and excessive osteoblastic deposition taking place simultaneously are: 1) progressive deformity due to enlargement and bending of bones; 2) pathological fractures; and 3) malignancy - osteogenic sarcoma.

The symptoms of mild forms of the disease are undetected. Otherwise, they are pain, bowing, enlarged head and loss of height.

There is no truly effective treatment, but some drugs are used to reduce bone resorption and formation.

From Joe Maulucci:

Paget's disease is a slowly progressive disorder of the bones. Bones most commonly affected are the pelvis, vertebrae, femur, tibia and skull.

The disease may be confined to a single bone at first, but later often spreads to involve other bones.

The cortex of the bone loses its normal compact density and becomes spongy. At some time, the bone is widened by the formation of the new bone on both its inner and outer surface. The marrow space fills with fibrous tissue, gradually becoming dense and hard.

In the spongy state, the bones are softer than normal and liable to bend. Pathological fracture may occur.

Often, the disease begins around 40 years of age; usually without symptoms, and is discovered during routine x-ray.

Volume Nine, Issue Four

• What is "Milkman syndrome"? (Not to be confused with "Milkmaid's dislocation")

From Joan Knighton:

Milkman syndrome is an eponym name for a moderately severe form of osteomalacia. These "soft bones" in adults are caused by a failure of calcium salts to be deposited promptly in organic bone matrix. Truly, this disease is adult rickets without any growth plate changes because mature bones are not growing.

Causes of this condition are vitamin D deficiency, chronic renal insufficiency and renal tubular insufficiency.

The result is a generalized decrease in calcified bone

matrix called osteoid. These soft bones gradually bend and become deformed. Pseudo fractures, known as Looser's zones, may develop, usually seen in the ribs, pelvis, upper ends of femora and other sites.

Symptoms are muscle weakness, weight loss, anorexia, bone pain, tenderness and deformity.

Diagnosis on x-ray is easy. Multiple transparent stripes can be seen and there is a generalized decrease in radiographic density (rarefaction), plus deformity and progressive distortion of the bones.

Treatment is vitamin D therapy and a high calcium diet. Later, residual deformities may require osteotomies.

From Preston Linton and Jane Villadiego:

Milkman's syndrome is also known as (Looser) Milkman, Looser's Zone, osteoporosis-osteomalacia and pseudo fractures.

This syndrome is prevalent in females. The onset is middle age, with fatigue pain in the back, tenderness or pressure of the affected bones causing a limp. This syndrome is the adult counterpart of rickets in children.

In adults, demineralization (osteomalacia) occurs particularly in the spine, pelvis and lower extremities. The fibrous lamellae become invisible by x-ray and incomplete ribbon-like demineralizations appear in the cortex, thus "pseudo fractures" (Looser's Zones, and Milkman syndrome).

As bones soften, the weight may cause bowing of the long bones, vertical shortening of the vertebrae and flattening of the pelvic bones.

Using vitamin D is the recommended treatment. This syndrome is occasionally a chronic condition, and a spontaneous disappearance of manifestation during pregnancy or menopause can occur.

Volume Ten, Issue One

• What is the purpose of a PTB cast (Sarmiento)?

To capture the muscle mass of the lower leg and apply a snug, well-molded patella tendon-bearing cast referred to as a PTB. Also known as a tibial fracture cast brace.

Hallmarks of a PTB cast are:

- flattening of the posterior aspect over muscle bulk
- molding of the anterior, lateral and medial sides of the tibial shaft and popliteal fossa
- the PTB extends proximal (the wings) to include the femoral condyles
- open behind the knee to allow flexion of 90 to 100 degrees
- provides support while allowing full ROM and weight-bearing.

The purpose of the well-molded proximal wings is to provide rotational control, not to take the force of weight-bearing on the patella tendon as once believed.

A properly applied PTB - and it is an art form to apply this specialty cast - is to provide rigid external support to prevent the muscle mass from pushing away from the bone during weight-bearing. The PTB is applied post tib-fib fracture that has been in a long leg cast for many weeks, or months. The engineering theory behind the PTB is that when the patient weight-bears, the hydraulic force created within the cast supports the fracture. The hydraulic effect of soft tissue could prevent shortening, not angulation of the fracture.

Readers of **Body Cast** should read the publications of Dr. Sarmiento, the pioneer of the PTB cast and brace.

In the early 1900s, the idea of early weight-bearing with a cast for tibial fractures was encouraged by Championniere.

In the 1950s, Dehune, Sarmiento and Brown documented this theory of weight-bearing in tibial fractures: early weight-bearing with tibia fractures resulted in a rapid and solid union of the fracture.

The PTB requires hours of practice in its application before the ortho tech feels comfortable with the techniques that make up a true PTB cast.

Volume Ten, Issue Two

• What is Guyon's Canal?

At the wrist, the ulnar nerve enters what is called Guyon's canal (Felix J.C. Guyon, French surgeon, 1831-1920). The ulnar artery passes radial to the pisiform, but ulnar to the hook of the hamate.

Ulnar tunnel syndrome is the result of compression of the ulnar nerve at the wrist in Guyon's canal.

Findings due to compression at the level of Guyon's canal:

The compressive tissue is sometimes palpable ganglion, rheumatoid pannus bone fragment.

Sensory loss over the volar ulnar distribution, but spares the dorsal area except over the distal phalanges.

Motor movement affects the hypothenar ulnar two lubricals and interossei.

Clawing of the little and ring fingers is seen.

From Mary Perkins:

Guyon's canal is a space filled with fat placed at the base of the hypothenar, lateral to the pisiform and medial to the hook of the hamate. Sometimes referred to as the volar carpal ligament, this is the roof of Guyon's canal through which the ulnar nerve and artery pass, radial to the pisiform, but ulnar to the hook of the hamate.

Guyon's canal - Ulnar tunnel syndrome: The volar carpal ligament which roofs over the canal of Guyon is a less substantial structure than the flexor retinaculum which encloses the carpal tunnel. Fewer structures pass through the canal, only the ulnar nerve and artery, and it contains no synovium. For these reasons, compression of the ulnar nerve is much less common than median nerve entrapment at the wrist; when it does occur, it is more frequently associated with the trauma or with the presence in the canal of an abnormal structure, i.e. ganglion.

Ulnar nerve entrapment at Guyon's canal more frequently results in the motor loss than median nerve compression in the carpal tunnel. In all cases with such loss, exploration should be performed.

Volume Ten, Issue Three

• What is a Plafond fracture (also known as a Pilon fracture)?

From Joan Knighton:

A plafond fracture is a common and difficult fracture of the distal tibia extending through the tibial plafond into the ankle joint. Also called a pilon fracture, the nature of the injury is from axial compression or torsional load. Osteoporotic bone is especially prone to this injury.

These fractures are classified according to the severity of comminution and displacement of articular surfaces.

There are three categories, the third being the most severe. The fibula is usually fractured badly as well.

Before treatment is chosen, several factors must be assessed and ascertained such as: joint congruity, joint alignment in the varus-valgus and anteroposterior planes, bone quality, vascular compromise, systemic disease (i.e. diabetes), status of the soft tissue envelope, open areas or bruised or stretched skin.

Non-operative treatment

For type I fractures, if there is little intra-articular displacement, non-operative treatment can be used. Gentle closed reduction is done to prevent disruption of the nondisplaced articular fragment. A long leg cast is applied and the patient will be non-weight-bearing for six to 12 weeks. If evidence of solid union is seen at six weeks, a brace may be worn to allow some ankle motion for the duration of treatment.

In type II fractures, closed reduction using skeletal traction may be done, with the pin in the calcaneus. This is followed by application of a pins-in-plaster traction cast or an external fixator. The cast is worn for six weeks, followed by six weeks of non-weight-bearing, then functional bracing.

Occasionally, type III fractures are so severely comminuted that operative intervention is not feasible. Balanced traction with early motion is considered.

Poor bone quality or soft tissue problems may also contra-indicate ORIF of displaced fractures. Operative treatment

Tibial plafond fractures require all the surgical skill and judgment that the surgeon can muster! Specialized imaging must be acquired to help design the three-dimensional reconstruction necessary. CT scans, tomograms as well as conventional x-rays are usually required. Other prerequisites are an intact soft tissue envelope, sufficient bone strength to hold the internal fixation, and a reconstructible joint surface. Rigid internal fixation is necessary to hold the reduction. Lag screws and plating are used and the fibula is plated as well. Autogenous bone grafting is commonly necessary in the metaphyseal region.

Post-operatively, elevation and early motion in a functional brace are ordered, and no weight-bearing for eight to 12 weeks.

Open fractures are treated with limited open reduction to reconstruct the joint surface. Alignment of the distal tibia is maintained by an external fixator.

Complications

Due to the seriousness of these fractures, it is not surprising that complications do occur. They are: post-traumatic arthritis, infection and varus or valgus angulation. Further treatments could be: aggressive antibiotics and debridements to avoid osteomyelitis or late amputation, ankle arthrodesis or osteotomies.

Reference

Rockwood and Green's Fractures in Adults, Third Edition, Vol. 2, Charles A. Rockwood Jr., David P. Green, Robert W. Bucholz. Lippincott, 1994.

Volume Ten, Issue Four

• What is the Arcade of Frohse?

From Joan Knighton:

An arcade is an arch formation of tissue in the body, usually covering a passageway or area of anastomose or

bifurcation of branches of the vascular or nervous systems.

The Arcade of Frohse is a fibrose tissue arch through which the radial nerve passes after it has branched off from the brachial plexus of nerves. The location of it is the proximal forearm. The insertion point of the two forearm supinator muscles is located at this place as well.

These factors are significant to the orthopaedic surgeon during operative procedures of the elbow. The surgeon, in choosing placement of the surgical incision, for example in the cubital fossa area, will have regard to the location of the Arcade of Frohse. The radial nerve must be protected!

References

Surgical Exposures in Orthopaedics: The Anatomic Approach. Stanley Hoppenfield and Piet deBoer, Illustrations by Hugh A. Thomas. Lippincott, 1994.

Clinically Oriented Anatomy. Keith L. Moore. Williams and Wilkins, 1980.

Volume Eleven, Issue One

• Discuss the instructions to be given to the parents/guardian pertaining to the care of a two-year-old in a hip spica cast.

From Mary Perkins:

With any cast that goes around the groin or buttock area, soilage from urine or stool is anticipated and is your greatest concern. It is vital to give detailed cast care instructions to the parents. Meticulous and diligent care is needed to avoid skin breakdown inside the cast.

1. Keep the cast clean and dry. Sponge baths only.
2. As soon as possible, petal the cast around the groin and buttocks with waterproof tape. Using one- to two-inch pieces, apply the tape around the inside and outside of the cast edge.
3. Diapering - the child's diaper should be tucked up "inside" the cast at the front, back and sides as far as it can go. Frequent diaper changes are encouraged. Using a feminine hygiene sanitary pad stuck to the inside of the diaper will help absorb a lot of the urine.
4. If the child is toilet-trained and using a slipper bed pan, tuck the edge of a plastic bag inside the buttocks aspect of the cast. Leave the free end of the bag hanging inside the pan, so the urine or stool runs down the bag into the bed pan. For females, place a small wad of toilet paper at the groin between the gently spread legs. The toilet paper will fill with urine and fall between the legs and into the bed pan.
5. Use a hair blower set on cool or "no heat" to dry the wet areas of the cast. In special cases, this might have to be done daily.
6. Expose the cast to air. Don't bundle up the child with layers of clothing inside the house.
7. Frequent turning from tummy to back is encouraged to observe for skin breakdown and allow the cast to dry.
8. Make sure that your child does not put any foreign objects inside the cast.
9. Observe the circulation of the feet frequently.
10. No standing or walking unless ordered by the doctor.
11. Check the edges of the cast daily for signs of skin breakdown.

Volume Eleven, Issue Two

- **List danger signals that would indicate that a cast is interfering with the circulation of the casted extremity.**

From Joe Maulucci:

The outpatient person going home with casted extremities must be warned of circulation impairment. The danger signals that would indicate that a cast is interfering with circulation of the extremity include swelling, discoloration, numbness, tingling and the "five Ps".

Swelling of the fingers and toes is common with the casted limb, therefore careful examination of other signs suggesting circulatory impairment should be conducted.

Discoloration of toes or fingers, especially with swelling distally, suggests that the limb within the plaster has reached such a level as to impair the venous return.

The five "Ps" indicate arterial obstruction. They are pain, paralysis, paresthesia, pallor and "perishing cold".

The patient must know that appropriate action must be taken with any of the above symptoms by contacting the doctor or going to the emergency department.

Reference

McRae, Ronald. **Practical Fracture Treatment**, Second edition. Churchill Livingstone.

From Bernie Arseneault:

Despite thoughtful and careful technique, constriction of the extremity in plaster does occur.

Some of the symptoms of circulatory embarrassment would be:

- Pain - within the limb
- Paresthesia - (numbness) of the fingers or toes
- Paralysis - inability to move digits.

Pain may be so severe as to inhibit any attempted motion.

Circulation is also assessed by the phenomenon of capillary refill in nailbeds of the toes or fingers. If the exposed fingers and toes are pale and cool as compared to the opposite extremity, this also is a sign of interference with circulation.

Volume Eleven, Issue Three

- **Tell us what advice or tips you employ for a patient in a Figure 8 bandage for a fractured clavicle (adult/child).**

From Gord Jones:

Do's and don'ts for the Figure 8 bandage in the treatment of a fractured clavicle:

DON'T use a Figure 8 bandage in a fracture of the distal one-third of a clavicle because it will distract the fracture.

DON'T use a Figure 8 bandage on a frail or elderly patient or, indeed, on any patient who could have neurological or circulatory deficiencies. These patients are better-served by one of the many commercial slings available with abduction control.

DO caution the patient to watch for circulation problems and for possible skin breakdown.

DO use additional care to apply the bandage just tightly enough to provide comfortable support, be sure to pad beneath your knots.

DO assure the patient that clavicles heal well, although the "lump" may take time to resolve, the last especially for parents' concern regarding children's injuries.

DO assess the Figure 8 bandage within the first week for loosening.

DO remove as soon as possible (when pain subsides at fracture site) and begin gentle ROM exercises as comfort allows.

Note that in many treatment centres the use of this bandage has been discontinued in favour of abduction control slings which avoid many of the problems associated with it.

From Mary Perkins:

Patient instructions:

A. Don't get the Figure 8 wet. Sponge baths only are encouraged. For hair washing, cover the shoulders with a towel and plastic bag, and ask for assistance to wash hair over the kitchen or bathroom sink.

B. Don't remove the Figure 8 bandage unless otherwise directed by your doctor.

C. If using a stockinette Figure 8, untie it only and snug it up when it becomes loose, making sure the shoulders are held back.

D. For skin care, use a small amount of baking powder or talc, and gently apply daily to prevent skin breakdown under arms.

E. Practise gentle range of motion exercises to shoulders to prevent stiffness.

F. For comfort, sleep with the head of the bed elevated 30-45 degrees by using pillows, or place something between the box spring and the mattress.

G. For pain control, see your orthopaedic doctor or family physician.

H. Restful and quiet activity. No sports.

Volume Eleven, Issue Four

- **Why is a fracture sometimes more visible on x-ray 10 to 14 days after injury?**

From Mardy McPolin:

Undisplaced/impacted fractures, e.g. scaphoid, ribs, etc., are frequently not apparent on initial x-rays. In the initial stage of fracture healing, specialized cells (osteoblasts) debride (phagocytize) the devitalized edges of fracture, and thus a lucency at the fracture line can be apparent at 10 to 14 days.

From Susan Woodrow:

The reason that fractures are sometimes not visible until 10 to 14 days after injury is because decalcification at the fracture site takes about seven to 10 days to show up on any radiographs. This means the body is absorbing any calcium salts that are not needed preparing the site for new callus to be laid down. Of course, after the primary callus is laid down, the bridging external callus is formed which builds up under the periosteum causing a bulging which usually shows up on radiographs quite well. After healing, the body remodels and again absorbs any extra unneeded bone at the fracture site. Eventually, the bone will look as if it had never been fractured. These fractures are usually only seen on scaphoid, stress, or hairline fractures. An avulsion fracture can also be missed if it is very tiny, until some healing has occurred.

Volume Twelve, Issue One

- **What are the immediate treatment priorities in an open fracture?**

From Mary Perkins:

1. Ideally, the patient should be seen within six hours of injury.
2. Assess the patient's vital signs, level of consciousness, airway breathing, and treat appropriately.
3. If the patient is stable, assess the neurovascular condition of the limb involved and examine the wound. An x-ray should be taken of the fracture.
4. Reduce the fracture if the limb is neurovascularly compromised.
5. Cover the open wound with a sterile dressing.
6. Apply a splint to stabilize the fracture and provide the patient comfort.
7. Tetanus and antibiotics are given prophylactically.
8. Patient is taken to the operating room for irrigation and debridement of the open wound.
9. The fracture is reduced by plates, nails, external fixation and casted if necessary.

From Joan Knighton:

The immediate treatment priorities in an open fracture are:

1. Prevent gas gangrene.
2. Prevent any infection.
3. Prevent health care workers from introducing nosocomial infections.

Method:

1. In the emergency room - take a culture.
2. Then cover the wound with a sterile dressing (not to be removed until the patient is in the operating room).
3. Give the patient tetanus toxoid injection.
4. Begin IV antibiotics.
5. WITHIN SIX HOURS [the golden period] - take the patient to the operating room for a general anesthetic. Take another wound culture, do a wound exploration by opening the area larger than the wound, complete debridement including excision of devitalized tissue, irrigate (twice - at the beginning of surgery and at the end) and then,
6. Treat the fracture.
7. Usually the wound is left open for further treatment and will be closed later.

References

Rang, Mercer. **Children's Fractures**, 2nd ed. JB Lippincott Co., 1983.

Salter, Robert B. **Textbook of Disorders and Injuries of the Musculoskeletal System**. 2nd ed. Williams and Wilkins, 1984.

From Norman Ellsworth and Melvin Gillingham:

1. Assess injury to limb.
 - a) pulse; b) sensation; c) active bleeding.
2. Sterile dressings to open wound.
3. Temporary immobilization above and below fracture site.
4. Adequate antibiotic coverage, tetanus update.
5. Arrangements for debridement, if necessary.
6. Definitive stabilization.

Volume Twelve, Issue Two

- **What is the Salter-Harris classification? What is its clinical significance?**

From Joan Knighton:

The Salter-Harris classification is a means of describing epiphyseal plate fractures (The Journal of Bone & Joint

Surgery, 1963). There are five types; number one is less serious. The morbidity increases with each one up to number five. The classifications are used in children's fractures wherein the growth plates remain open.

The clinical significance of this classification relates to the special problems of diagnosis, treatment and risk of serious complications of these fractures, such as local growth and development disturbance and progressive deformity.

Salter and Harris used the mechanism of injury and relationship of the fracture line to the growth cells of the epiphyseal plate, methods of treatment and prognosis of growth disturbances upon which to base their classification system.

From Sharon Bezanson and Lynda Ivany:

The Salter-Harris classification improves communication between medical personnel. It is the most widely-used classification in North America, claimed to be based on mechanism of injury and the relation of the fracture line to the growth plate, visible on x-ray.

Salter I - Epiphysis is completely separated from the metaphysis. Common in younger children.

Salter II - Fracture plane travels transversely across cartilage plate exiting through the metaphysis opposite the site of fracture initiation. Most common type of physeal fracture.

Salter III - Intra-articular fracture with the fracture traversing the physis and exiting through the epiphysis.

Salter IV - Vertical fracture line that is intra-articular, travels longitudinally through the bone initiated at the intra-articular surface of epiphysis, crosses the physis and exits through the metaphysis (epiphysis, physis, metaphysis).

Salter V - Occurs as a result of crush injury to the physis. (Editor's note: It may be difficult to determine by x-ray examination.)

Volume Twelve, Issue Three

- **What are the most common sites of compartment syndrome?**

From Mary Perkins:

Formerly known as Volkmann's Ischemia, compartment syndrome most frequently involves the flexor compartment of the forearm and anterior tibial compartment of the leg (although any osteofascial compartment may be affected).

Since the tissues outside the compartment are spared, the skin and the distal part of the limb, although transiently affected, survive and hence the disorder is quite different from that of gangrene.

The injuries that are most frequently associated with compartment syndrome are: 1. Displaced supracondylar fractures of the humerus with damage to the brachial artery in children; 2. Excessive longitudinal traction in the treatment of femoral fractures in children with resultant arterial spasms; 3. Fractures (as well as surgical osteotomies) of the proximal third of the tibia; and 4. Drug-induced coma with resultant pressure on major arteries from lying on a hard surface in an awkward position for a prolonged period.

From Leo Helfer:

Various muscle groups in the body are surrounded by fascial sheaths that enclose the contained muscles in a "well-packed" fashion, leaving no space for swelling should

an injury occur. Several sites have been implicated where compartment syndromes can occur: interossei of the hand, volar and dorsal compartments of the forearm, gluteus medius, anterior compartment of the leg, peroneal and deep posterior compartments of the leg. An increase in intracompartmental pressure within these sheaths is the principle pathogenic factor in "compartment syndromes". One must suspect a compartment syndrome early to prevent contractive deformities that result from ensuing muscle necrosis. The appearance of inappropriate pain, sensory symptoms and muscle weakness requires examination to rule out a compartment syndrome.

From Sharon Bezanson and Lyn Ivany:

Two of the most common sites of compartment syndrome are lower leg (tibia area) and forearm.

A tense, swollen extremity should alert the examiner, especially if there is pain with passive stretching of the muscles in the involved compartment.

A fasciotomy is performed when the pressures rise to within 20 to 30 mm hg of the diastolic blood pressure.

Muscle and nerve damage commence as soon as four to six hours after the onset of abnormal pressures.

Editor's note:

Crush injuries without fracture, e.g. "wringer injuries", animal bites, burns, excessive pressure from tight casts, dressing or elastic wraps (tensor bandages) and prolonged use of the MAST suit have also been associated with compartment syndrome.

Volume Twelve, Issue Four

- **What is "locked knee"? What are the two most common causes?**

From Mardy McPolin, Gary James and Jason Bewers:

Locking of the knee joint involves the inability of the patient to actively or passively extend the knee, which has usually become locked in 10 to 45 degrees of flexion. True locking occurs suddenly, and unlocking takes place with usual abruptness. The two most common causes are a tear of the medial meniscus and a loose body or "joint mouse" (osteochondral fragment) in the knee.

From Leo Helfer:

Ligamentous injuries are frequently associated with the complaint of "knee locking". Knee locking may be of two types: true or pseudo. "Pseudo" locking typically follows an episode of increasing pain and swelling. The locking is usually secondary to an effusion with secondary pain and muscle spasm. "True" locking usually occurs spontaneously and may represent a torn meniscus, a loose body, or a ruptured cruciate ligament inhibiting motion.

From Cheryl Rivers:

In general, locked knee is the inability to extend the leg fully as a result of tear of the medial semilunar cartilage. There are two types of tears of the medial meniscus, the most common one is the bucket handle tear which is the inner portion dislocated into the intercondylar notch. The patient cannot fully extend the knee because of a mechanical block anteriorly. The second type is a tear of the posterior or anterior horn which does not cause a block to extension, although it may cause a "catching" sensation.

From Dion Maxwell:

Locked knee is a condition in which loose bodies or "joint mice", as they are sometimes called, are present within the joint causing a mechanical obstruction. The

loose bodies get trapped between the articular surfaces, restricting the normal range of motion and causing the knee to lock. The two most common causes can be attributed to meniscus tears and bone fragments from fractures through subchondral bone or the tibial spines. Other causes can be attributed to bone spurs in the osteoarthritic knee and osteochondritis dissecans. Even more rare a cause is osteochondromatosis, an unusual condition in which synovial villi within the joint undergo metaplasia into bone and cartilage masses which can drop into the joint.¹ Generally, the form of treatment is aggressive in nature and an arthroscope is needed to explore and excise the loose bodies.

Reference

1. Gartland, J.J. **Fundamentals of orthopaedics**. 4th ed. Philadelphia: W.B. Saunders, 1987.

Volume Thirteen, Issue One

- **Describe the difference between a "buckle" (Torus) fracture and a greenstick fracture.**

From Mardy McPolin, Gary James and Jason Bewers:

Both terms are used to describe paediatric injuries. In children, compression fracture of the callous bone of the metaphysis may merely buckle, but not fracture the overlying cortex producing a protuberance or round swelling. This type of fracture may also be referred to as a "Torus" fracture.

Children's bones have increased elasticity. A greenstick fracture is caused by an angular force applied to the bone, resulting in bowing of one side of the cortex and a fracture of the other. Completion of the fracture in a true buckle fracture is necessitated in proper treatment of these fractures. Opinions vary from surgeon to surgeon whether a simple buckle fracture should be treated in a short arm cast or a long arm cast with weekly follow-up exam with x-rays.

From Romeo S. Fernandez:

BUCKLE fracture is one of the common fractures in children. It is also called Torus which is derived from the Latin work "Tori" meaning swelling or protuberance resembling a raised band around the base of an architectural column. It occurs commonly in the metaphysis of young children or even teenagers who don't bear weight for any reason due to the porosity of the bones. It is as a result of impaction force wherein the cortices and periosteum wrinkle outward producing a bump on the surface of the bone without displacing the fragments.

GREENSTICK fracture, on the other hand, is also common among children, but it occurs frequently in the diaphysial area of long bones just like the buckle. The fracture is as a result of an angulatory force or energy sufficient enough to start and break the cortex on one side, but not enough to drive through. It is due to the failure of the tension (convex) side of the bone, and bend or angulate only on the compression (concave) side. At the time of injury there is considerable angulation of fracture on one side, followed by elastic recoil of soft tissue which improves the position. If angulation resist, may require conversion to complete the fracture to reverse the deformity.

References

1. **Gartland Fundamentals of Orthopaedics**, Fourth edition.
2. **Fractures in Children**, fourth edition. By Charles Rockwood Jr., Kaye E. Wilkins and Richard E. King.
3. **Children's Fractures**, Second edition. By Mercer Rang.

Volume Thirteen, Issue Two

- **What neurological deficit is most likely to be seen with a humeral shaft fracture?**

From Mardy McPolin, Gary James and Jason Bewers:

The radial nerve may be stretched (neurapraxia) or lacerated (rare). Disability includes inability to extend the wrist and fingers at the MCP joints. Numbness occurs on the dorsum of the radial side of the hand. Interphalangeal joint extension is preserved because it is an intrinsic muscle function that is dependent upon intact ulnar and median nerve function.

From Dion Maxwell:

Radial nerve palsy is the most common neurological deficit seen in fractures through the shaft of the humerus. The nerve that is compromised is actually called the musculo-spiral nerve (MSN), appropriately named because it runs through the musculo-spiral groove of the humerus. The MSN is a branch of the brachial plexus, and the radial nerve branches off the MSN. MSN is so susceptible to injury with humerus shaft fractures due to its close relationship to the bone. The telltale sign of a deficit to this nerve is wrist drop, the radial nerve innervates the extensor muscles of the forearm and hand and the ability to extend the wrist and hand is lost. Nerve recovery is a slow and frustrating process that can take several months; complete recovery may never be achieved depending on the extent of damage.

From Joe Maulucci:

The most common neurological deficit to be seen with a humeral shaft fracture is probably the radial nerve.

About 10% of patients with humeral shaft fractures demonstrate radial nerve involvement.

This is particularly true in spiral fractures in the distal third of the humerus.

Damaging the radial nerve is easily recognized by the classic wrist drop and loss of sensation on the thumb side and MCP joints on the dorsum side.

Caution should be exercised if a closed reduction is attempted. Bone fragments may trap the radial nerve at the side.

Reference

Rockwood and Green's Fractures in Adults, Vol. 1, third ed. Lippincott Co.

From Tony Romeo:

The neurological deficit most likely to be seen with a humeral shaft fracture is an injury to the radial nerve. One must be careful to examine the entire extremity to avoid missing this part of the neurovascular status to prevent possible radial nerve palsy.

In the literature, it states that about 10% of patients with humeral shaft fractures show signs of nerve involvement, particularly in spiral fractures of the distal third. Displaced fragments may trap the nerve in the fracture site. This usually ends up with an open reduction and internal fixation.

Most radial nerve injuries are shown to be a result of bruising and/or stretching and, therefore, are not complete so function will return in a matter of days. However, it has gone for so long as months.

If the injury is a complete lesion, delayed intervention is recommended over early surgery because it has shown that the later the repair, the better the results. A method of treatment favoured by many is to support the hand and fingers in a cast or,

more recently, in a dynamic splint until the fracture has healed and by this time the nerve may have returned to some function.

This type of radial nerve palsy in the fracture of the humerus rarely happens in children, but caution is still advised because of the serious outcomes at a young age.

Volume Thirteen, Issue Three

- **What are the incidence and common causes of posterior shoulder dislocations?**

From Mardy McPolin, Gary James and Jason Bewers:

Only five per cent of shoulder dislocations are posterior.

Tonic clonic seizures, electric shock and direct anterior trauma tend to cause posterior shoulder dislocations.

From Joe Maulucci:

Posterior shoulder dislocation is an injury that disrupts the capsule or glenoid. The dislocation is caused by violent internal rotation that moves the humerus completely out of the glenoid fossa. The posterior capsule is severely torn.

Usually, a direct blow to the anterior aspect of the shoulder is sustained in a fall. The arm may be internally rotated at the time of the injury. Forces from the anterior blow direct the internally rotated humerus head posteriorly over the rim of the glenoid. The extent of the injury to the posterior capsule and glenoid labrum determine whether the result is a sprain, subluxation or dislocation.

The patient is frequently an elderly individual or someone who is subject to a seizure disorder or alcoholism.

Reference

Connolly, John F., MD. **Fractures and Dislocations**. Volume 2. W.B. Saunders Company.

From Tony Bellon:

There are several mechanisms by which this injury occurs: a violent internal rotation force such as a fall on the forward flexed internally rotated arm and slightly abducted, or from direct blow on the front shoulder. This type of dislocation is also commonly seen after convulsion.

Posterior dislocations are far less common than anterior dislocations. Also, they are the most commonly missed major dislocations of the body. There are three types of posterior dislocation: subacromial, subglenoid and subspinous. Ninety-eight per cent of all posterior dislocations are of the subacromial type. This dislocation is commonly associated with fractures of the humerus and the posterior aspect of the glenoid rim. Axiom: An isolated fracture of the lesser tuberosity should make one suspect a posterior dislocation until proven otherwise.

From Cheryl Rivers:

When the shoulder dislocates, the head of the humerus may come to lie behind the glenoid which is known as a posterior dislocation of the shoulder. This may result from a fall on the outstretched, internally rotated hand, or from a direct blow on the front of the shoulder or a seizure or electric shock. The head of the humerus is displaced directly backwards.

From Mary Perkins:

Let's hear it for the "Big Three E's": electricity, ethanol and epilepsy. These are the three most common causes of shoulder dislocations. Shoulder dislocations constitute approximately 50% of all dislocations, but only three to four

per cent are posterior. Posterior dislocations are rare and often missed. It occurs after a violent jerk in an unusual position and may be associated with fractures of the proximal humerus. The posterior capsule is stripped from the bone or stretched, and there may be an indentation of the anterior aspect of the humeral head.

Most occur after 20 years of age, but are rare after 45. It may be treated conservatively, and operative treatment is less predictable. Thank goodness I'm now 46 and have stayed away from the "Big Three E's"!

From Leo Helfer:

There are several mechanisms by which this injury occurs, among them being a violent internal rotational force such as would occur during a fall on the forward flexed internal rotated arm. This type of dislocation is also commonly seen after a convulsion. Posterior dislocations are far less common than anterior dislocations.

Volume Thirteen, Issue Four

• How is a rotator cuff tear diagnosed?

From Mardy McPolin, Gary James and Jason Bewers:

In a patient more than 40 years of age suffering a fall on or against the shoulder, traumatic tears of the rotator cuff can occur which interfere with the initiation and the power of abduction. After complete rupture, the patient cannot voluntarily perform the first 15 degrees of abduction. The strength of abduction is inversely proportional to the extent of the tear. Pain and localized tenderness are usually located over the greater tuberosity of the humerus. Following local anesthetic injection and elimination of pain, initiation of active abduction remains absent.

From Blair Matheson:

The most common limitation of shoulder motion involves a tear in the rotator cuff musculature. At the time of diagnosis, the shoulder is usually tight and stiff with limited abduction of shoulder. Muscular atrophy may be apparent over the shoulder joint. Surgical intervention (suturing of rotator cuff) is indicated only when use of local anesthetic agents and steroids have failed. Abduction is restricted with use of sling/swath for three weeks (as clinical status permits) followed by introduction of pendulum and active range of motion exercises.

From Bernie Arseneault:

The rotator cuff is comprised of four muscles (supraspinatus, teres minor, infraspinatus and subscapularis). It is important to distinguish complete tears of the tendinous cuff from incomplete tears. The clinical effects are different.

The mechanism of this injury is usually caused by a strain due to overuse such as throwing an object, having the hand in the overhead position. Another cause is a sudden acute injury such as a heavy load applied to an under-conditioned muscle.

The diagnosis is made by distinguishing the complete tear from the incomplete tear. The complete tear causes the inability to initiate gleno humeral abduction with power (strength) to hold the abduction once the arm has been raised passively. This is characteristic of a widely torn supraspinatus. In the incomplete tear, the power (strength) of abduction is retained, but movement is painful.

From Mary Perkins:

The rotator cuff is composed of the conjoined tendinous attachments of four muscles (subscapularis,

supraspinatus, infraspinatus, teres minor) and the capsular attachment into the upper end of the humerus.

Tears to the rotator cuff may occur during trauma in young adults, and degenerative disease with older patients.

During the clinical exam, signs of pain/weakness in abduction and external rotation of the shoulder and difficulty lifting the arms above the head are all signs and symptoms of a tear.

Diagnostic imaging tools may include an MRI, arthrogram and CT arthrogram.

From Randy Buschau, Murray Olafson and John Humeniuk:

Ruptures of the rotator cuff, or more accurately called the musculotendinous cuff, are tears to the tendons of the supraspinatus muscle near its insertion site. The tear may extend into the tendons of the subscapularis and infraspinatus. It also nearly always involves the capsule of the glenohumeral joint. Rotator cuff tears are normally age-dependent, usually occurring in males over 60 years of age, often after degenerative changes to the cuff, but may be seen in young adults from a direct trauma (i.e. sport-related injury).

In diagnosing a rotator cuff tear, it is important to first do a complete physical assessment including a patient history. As well, whether the tear is complete or incomplete must be distinguished. Whereas an incomplete tear is one cause of painful arc syndrome, a complete tear reduces significantly the ability to abduct the shoulder.

A patient cannot abduct his shoulder, but can maintain the abduction if the arm has been raised passively to 90 degrees. Also, to differentiate between a complete and incomplete tear or any other shoulder disorder, local anesthetic can be injected into the joint space. After a short period of time, if the patient demonstrates no change in symptoms, a rotator cuff tear can be suspected.

A definitive diagnosis can be made by doing either an arthrogram, MRI, ultrasound, or arthroscopy of the shoulder. The above tests clearly show the communication of the glenohumeral joint with the subacromial bursa, thus indicating a tear.

References

Adams, John Crawford, Hamblen, David L. (1991). **Outline of Orthopedics**. Churchill Livingstone.

Salter, Robert Bruce. (1991). **Textbook of disorders and injuries of the musculoskeletal system**. Williams and Wilkins.

Volume Fourteen, Issue One

• What other injuries are associated with a calcaneal fracture?

From Lyn Ivany:

In obvious fractures of the calcaneus, Schmidt and Weiner reported that compression fractures of the spine can relate to fractures of the calcaneus. It is suggested to have a lateral view of the spine.

From Susan Woodrow:

The calcaneus, otherwise known as the os calcis, is the most frequently fractured of the tarsal bones and may be relatively insignificant or very complex. It can be caused by a powerful muscle contraction or from direct trauma to the heel such as a fall from a significant height. The major complication after a calcaneal fracture is the development of arthritis. Patients with arthritic changes in the

talocalcaneal joint often have pain upon weight-bearing, and with inversion and eversion motions of the foot.

When a patient presents with a possible calcaneal fracture, it is important to examine both feet in order to rule out a fracture in both feet. The patient's spine should also be examined and x-rayed to look for a possible wedge fracture in the vertebrae. Approximately five per cent of patients with calcaneal fractures will also sustain a fractured vertebrae.

From Elmer Place:

The possible associated injuries with a calcaneal fracture are: cervical, thoracic and lumbar spine injuries. There is a possibility of lower extremity injuries as well. The most common complications are: chronic pain (heel widening, nerve entrapment), peroneal tendonitis, DJD, malunion, and heel skin slough. The eponym for calcaneus fracture is Essex-Lopresti fracture.

From Rick Horne:

Most calcaneal fractures are caused by a fall from a height and rarely from impact. When looking at associated injuries, one should look first at the other heel for similar injury. A compression fracture or wedge fracture of the spine is common and, usually, is noted in the lower thoracic or upper lumbar regions. Damage is also very common to the subtalar joint and often to the midtarsal joint causing impairment of inversion and eversion of the foot.

From Mary Perkins:

Most calcaneal fractures occur due to falling from a height onto the heels, and only rarely are caused from impact from below. Other injuries to look for would include: a) a similar fracture on the other side/foot; b) a wedge compression of the spine (occurs in approximately five per cent of calcaneal fractures); c) a co-existent intra-articular injury to the subtalar joint.

Every patient with a fracture of the calcaneus should be examined clinically and radiographically for all of the above.

From James Nijmeh:

The usual mechanism of calcaneal injury is a fall from a considerable height on one or both heels. Thus, both heels should always be examined. Moreover, there is a high incidence of associated compression fractures of the spine which should also be examined clinically and radiographically. Also, such fractures are often missed by attending physicians in the ER. Because of the severity of pain, the patient complains more of the os calcis pain rather than back pain.

The major problem related to these fractures is co-existent intra-articular injury to the subtalar joint.

Since the subtalar joint is the most important structure in relation to fractures of the os calcis, it is best to consider such fractures in two main groups: extra-articular fractures which do not involve the joint, and intra-articular fractures which require open reduction.

Volume Fourteen, Issue Two

- **What is “nursemaid’s elbow”? What is its management? (Note: In this era, this injury is no longer referred to as “nursemaid’s elbow”).**

From Romeo Fernandez:

Nursemaid’s elbow is also called subluxation of the head of the radius or, most recently, has been popularly known as “pulled elbow syndrome”.

The term “nursemaid’s syndrome” was popularized by Dr. Boyette because of the frequency of the injury in young children cared for by “nursemaids” or “nannies”. Other names used are “supermarket elbow”, “slipped elbow”, “temper tantrum elbow”, “Malgaignes’ injury”, and “elbow luxation”. There are many who made studies about this condition as early as 1671 in different parts of the globe. The latest of most acceptable studies were done by Salter and Saltz.

Pulled elbow occurs commonly in the age group of two to three years old, although it has been recorded as young as two months and as old as 16 years of age. Surprisingly, according to the latest study, 60% to 65% of cases are girls. The left upper extremity was involved in 70% of cases. This injury is frequently seen in the emergency room - two to three cases per week and 112 per year are on the statistical record for Toronto’s Hospital for Sick Children. Injury rarely occurs after seven years of age, but there is one reported case at 16 years.

Many controversies have been reported as to the mechanism of injury. Some say it occurs in pulling the elbow with the forearm in supination. Recent studies of Salter and Saltz contradicted this and said in order to subluxate the radial head, the forearm has to be in pronation with the elbow in extension and distal traction applied to the patient’s wrist or hand.

To recognize this condition, taking a full history is very important because plain x-rays are usually negative because the radial head at this age is still cartilage and will not show on x-ray films. Most of the time, the subluxated radial head is reduced by the x-ray technician as they take the x-ray of the elbow in supination.

The child usually complains of minimal to moderate pain in the elbow which is slightly flexed, and their activities are reduced. X-ray is helpful when it becomes recurrent and reduction becomes impossible.

Simple procedure to treat this injury is closed manual manoeuvre reduction procedure consisting of supination of the forearm. The elbow is then flexed with the thumb placed on the radial head to feel the characteristic snapping or click sound as the orbicular or annular ligament is reduced. No plaster immobilization is required except probably a sling. In the past, long arm plaster of Paris slabs or casts were applied for at least three weeks in cases which recurred at least three times, but studies have also found this ineffective with injuries that tend to recur. Sometimes, surgical options are necessary if medical staff are unable to reduce the injury. Recurrence rate is five per cent to 39%.

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- Resnick, Donald. **Diagnosis of Bone and Joint Disorders**, 3rd ed. 2723-2724.
- Rockwood, Charles Jr., Wilkins, Kaye E., King, Richard E. **Fractures in Children**, 4th ed. 878-887.
- Tachjian, Mirhan O. **Pediatric Orthopaedics**, Volume 2. 1619-1625.

From Preston Linton and Jane Villadiego:

Subluxation of the radial head, known as “nursemaid’s elbow” or a pulled elbow, is an injury seen exclusively in infants and young children. It is also said to occur in wrestlers.

This injury is caused from a forceful pulling on a child’s hand or forearm, causing the cartilaginous radial head to

slip partially out of the encircling orbicular ligament. The child refuses to use the arm because of pain, and folds the arm in a semiflexed and slightly pronated position. X-ray is of no help because the radial head at this age is cartilage and is not seen on the film.

To reduce this injury, no anesthesia is required. Rapidly turn the forearm into full supination and then flex the elbow suddenly. The radial head can be felt to "click" back into place. No immobilization is required because the reduction is usually stable.

If not reduced, place arm in a sling and spontaneous reduction usually occurs within 24 hours.

From Mary Perkins:

Nursemaid's elbow is commonly known as "pulled elbow". It occurs in children of pre-school age due to a sudden pull or jerk on their arms. A parent/caregiver, while lifting the small child up a step by the hand or pulling him/her away from potential danger, exerts a strong pull on the extended elbow. This action causes a transient subluxation of the radial head. The management consists of a deft supination of the child's forearm while the elbow is flexed. A slight "click" can usually be felt over the anterolateral aspect of the radial head as the annular ligament is freed from the joint. Occasionally, the radiographic technician unwittingly "treats" the pulled elbow while the forearm is being passively supinated to obtain the anteroposterior radiograph. A sling for two weeks allows the tear in the attachment of the annular ligament to heal.

Volume Fourteen, Issue Three

- **What vascular injury must be considered with a knee dislocation (tibiofemoral)?**

From Mardy McPolin, Gary James and Jason Bewers:

A posterior dislocation of the knee is especially likely to injure or compress the popliteal artery. Strong consideration should be given to post-reduction angiography.

From James Punwassie:

Injury to the popliteal artery must be considered with a knee dislocation. Repair of damaged popliteal vessel should take precedence over other injuries once reduction of dislocation is done.

From Jane Villadiego and Preston Linton:

Dislocation of the knee joint may be associated with injury to the popliteal artery, particularly in a hyperextension injury. Obvious initial signs of vascular insufficiency or severe increasing pain after reduction should alert the physician to the possibility of vascular injury. Early arteriography is mandatory if vascular injury is suspected.

Repair of damaged popliteal vessel should take precedence over all other injuries once reduction of the dislocation has been accomplished.

From Mary Perkins:

The popliteal artery is at severe risk of injury with a dislocation of the knee. The laceration of the popliteal artery is most common in an anterior or posterior traumatic dislocation. The popliteal artery courses through a fibrous tunnel at the level of the adductor hiatus. After it gives off the five genicular branches at the level of the knee joint, it passes deep into the soleus where it transverses through another fibrous tunnel. The fixation of the artery in these tunnels causes a proximal and distal tethering, especially at

the moment of any dislocation. Owing to the parallel course of the popliteal vein, it likewise is vulnerable to a similar injury.

Immediate attention must be directed toward the status of the limb, and an angiogram will assist in determining if there is a disruption of the popliteal artery. A vein graft is the preferred method of treatment. If the limb ischemia exceeds six hours, a fasciotomy should be done at the time of vascular repair.

Reference

Rockwood & Green. **Fractures in Adults**, 2, 3rd ed.

Volume Fourteen, Issue Four

- **Which non-traumatic hip disorders cause a limp in a child?**

From Mardy McPolin, Gary James and Jason Bewers:

Developmental dislocation of the hip, previously termed congenital dislocation of the hip, causes a painless limp in toddlers. On examination of the toddler's gait, a limp may be noted with one-sided toe walking or swayed back appearance followed by a waddle.

Coxa vara congenital may present on examination, similar to DDH in toddlers, but is a lot less common. The hip abduction is limited and, if bilateral, a waddling gait may be present. This also presents as a painless limp. The diagnosis is made on x-ray - the femoral neck shaft angle is decreased and the physis has a vertical orientation.

Although all of the causes are uncommon, they include septic arthritis, transient synovitis (ages two to 12), idiopathic avascular necrosis (males, ages five to nine), and slipped capital femoral epiphysis (males, ages 10 to 16). Transient synovitis is probably the most common non-traumatic cause of painful limp in a child.

From Tony Romeo:

A non-traumatic hip disorder that causes a limp in a child is that of a condition known as a slipped capital femoral epiphysis which does occur in growing children. The disorder occurs when a child has a minor trauma or experiences undue pressure to the top of their femur to a point where it may cause the epiphysis to slip out of alignment. This, in turn, causes a shortening of the leg and pain which leads the child to limp.

From Melvin Gillingham and Norman Ellsworth:

Some of the non-traumatic hip disorders causing a limp in children are:

1. Perthes' disease
2. Developmental dysplasia hip (DDH)
3. Slipped capital femoral epiphysis (SCFE)
4. Septic hip
5. Tumours

From Javad Movasseli:

Legg-Calve-Perthes disease. Osteochondrosis of the capital femoral epiphysis is one of the important causes of painful limp in childhood. Also known as coxa plana or flat hip.

From Joan Knighton and Mary Perkins:

Through our work at the Hospital for Sick Children, we have found the following list of non-traumatic hip disorders that could cause a limp in a child: leg Perthes; developmental disorders of the hip; slipped capital femoral epiphysis; osteomyelitis; avascular necrosis; metabolic disorders causing stress fractures; pathological fracture; tumour; juvenile rheumatoid arthritis; early degenerative arthritis; septic hip; sickle cell disease; toxic synovitis; Stills

disease; Gaucher's disease; osteoporosis/osteopenia; proximal femoral focal disease; unicameral bone cysts; Lyme disease; leukemia.

Its amazing that everyone who comes to our clinic does not limp!!

From Joe Maulucci:

There are several causes of a limp in a child with a non-traumatic hip disorder including: Legg-Calve-Perthes disease; degenerative dysplasia hip; juvenile rheumatoid arthritis; slipped capital femoral epiphysis...!

Volume Fifteen, Issue One

- **How is motor function of the median, ulnar and radial nerves tested?**

From Mardy McPolin, Gary James and Jason Bewers:

Median: Abductor pollicis brevis (APB) - abduct the thumb against resistance while palpating the APB muscle belly.

Ulnar: First dorsal interosseous - abduct the index finger against resistance.

Radial: (no intrinsics) extensor pollicis longus (EPL) - extend the thumb IP against resistance.

From Javad Movasseli:

For testing motor function of the median nerve, examine the hand flexion, because the median nerve branches cover the motor function of the flexor group of anterior forearm.

For testing motor function of the ulnar nerve, examine the phalanges and open and close them side to side, and also check the flexion of the hand in ulnar side because muscular branches of the ulnar nerve cover the motor function of the flexor muscle in anterior forearm (flexor carpi ulnaris and medial half of the flexor digitorum profundus) and the most intrinsic muscle of the hand (interossei).

For testing motor function of the radial nerve, examine the hand for extension because the muscular branches of the radial nerve cover the motor function of the posterior muscles of the arm, forearm and hand.

From Suzanne Groulx:

The median nerve is tested by checking pinprick and two-point discrimination over the eponychium of the index and long fingers.

Ulnar nerve sensation is best tested over the little finger, and motor branches are examined by asking the patient to forcibly spread the fingers and comparing the strength to the normal side. Flexion of the distal joint of the ring and little fingers against resistance is an additional test of the ulnar nerve function.

Adduction of the thumb is also a function of the ulnar nerve and this should be tested.

The test of radial nerve sensation is done with pinprick and two-point discrimination over the dorsum of the thumb web space. The motor branches of the radial nerve are tested by the extensors of the wrist and extension at the MP joint.

Volume Fifteen, Issue Two

- **How is posterior hip dislocation differentiated clinically from a femoral neck fracture?**

From Mardy McPolin, Gary James and Jason Bewers:

Fracture and dislocation both result in lower extremity shortening. In posterior dislocation, the hip is adducted and internally rotated. In a fracture, it is abducted and externally rotated.

From Brian Lavallee:

Femoral neck fracture is rare in younger patients.

Average age is 74-78 years. Extremity will naturally be held in a slightly shortened, abducted and externally rotated position unless it is only a stress fracture or severely impacted. In this case, hip will be held in a natural position.

With posterior hip dislocation, the affected limb is shortened, adducted and internally rotated, with the hip and knee held in slight flexion. Signs of vascular or sciatic nerve injury may be present.

From Neuville Yao:

Dislocations of the hip are the result of severe trauma, and are usually posterior in direction - the common result from the knee being struck while the hip and the knee are in a flexed position. This force drives the femoral head out of the joint posteriorly. These injuries are frequently associated with fractures of the posterior acetabular wall. In a typical posterior dislocation, the hip is held slightly flexed, adducted and internally rotated. The leg appears short and all motions are painful. Few other injuries are associated with the agony accompanying posterior dislocation, and this is almost as diagnostic as the deformity. There may be an associated injury of the ipsilateral knee. Pain is less severe if the acetabulum is fractured, and the deformity can be concealed if there is an associated femoral fracture.

Femoral neck (intracapsular) and intertrochanteric fractures are both common in the elderly patient and usually result from a fall on the hip. Both fractures are characterized by shortening and external rotation of the affected leg with pain in the region of the hip joint. Osteoporosis clearly plays a significant role. Occasionally, the patient may actually fracture the hip before falling, the fracture representing the completion of an insufficiency injury. Femoral neck fractures may also be occult and show up only with repeated examinations or bone scan.

Volume Fifteen, Issue Three

- **What is the ER management of a child with injury and bone tenderness adjacent to an epiphysis which is still open, and who has a "normal" x-ray?**

From Mardy McPolin, Gary James and Jason Bewers:

It is best to assume that the child has sustained an undeterminable fracture of the physis under the Salter-Harris scale I to IV. With gentle care, apply a resting splint or posterior slab (Jones type bandage) to immobilize the joint and keep the patient non-weight-bearing if the lower extremity is involved. The type of injury and the potential for growth disturbance should be explained to the concerned parents. Follow-up in the fracture clinic with an orthopaedic surgeon should be arranged for examination, x-rays, and continued follow-up for the child. Prompt follow-up is emphasized.

From Mary Perkins and Dr. Sarah Burrow:

With swelling and tenderness near the epiphysis, the ER must look for other signs and symptoms which might indicate an infection such as septic arthritis or osteomyelitis. If this proves negative, a possible Salter-Harris Type I fracture dislocation, subluxation or ligamentous injury might be suspected, even if not visible on x-ray. The ER should immobilize the injury site with a cast or posterior slab, making sure to immobilize the joint above and below, if necessary. If the injury is on an upper limb, a sling should be applied with the cast/posterior slab. If it is a

lower limb injury, a long leg cast or posterior slab would be appropriate with crutches/walker to keep the patient non-weight-bearing. Cast care instructions should be given, and a follow-up appointment arranged for the orthopaedic clinic in one week for a repeat x-ray.

From Neville Yao and Bernie Arseneault:

The growth plate (physis) is the weakest point in children's long bones and the frequent site of fractures. The ligaments and periosteum are stronger than the physis, tolerating mechanical forces at the expense of physeal injury. The blood supply to the physis arises from the epiphysis, so separation of the physis from the epiphysis may be disastrous for future growth. The Salter-Harris classification is widely used to describe fractures involving the growth plate.

A child from the ER who is assumed by the ER as having a fracture through the growth plate, but has normal x-rays, is said to have had a Type I physeal fracture. In Type I physeal fracture (six per cent of all physeal injuries), the epiphysis separates from the metaphysis. There are no bony fragments. Bone growth is undisturbed. Diagnosis of this injury is suspected clinically in children with point tenderness over a growth plate. On x-ray, the only abnormality may be an associated joint effusion. There may be epiphyseal displacement from the metaphysis. In the absence of epiphyseal displacement, the diagnosis is clinical, supported by the joint effusion. Treatment consists of splint immobilization, ice, elevation, and referral to an orthopaedic specialist.

Volume Fifteen, Issue Four

- **During clinical examination of an orthopaedic patient, the surgeon placed a stethoscope behind the patient's knee. Upon removal of the stethoscope he remarked, "I hear a bruit." What is a bruit (pronounced "bru-ee")?**

From Mardy McPolin, Gary James and Jason Bewers:

Bruit is a sign of generalized atherosclerosis or carotid artery disease. With the use of a stethoscope it is an unusual sound heard on auscultation of a blood vessel when positioned over an artery.

From Neville Yao:

A Bruit is an unexpected, superficially audible swishing (high-pitched) sound or murmur that is heard when a stethoscope is placed over an arterial or vascular channel. It indicates increased turbulence often caused by an arterial obstruction of built-up atherosclerotic plaque in an artery or vein. This build-up of laminated plaque or atherosclerosis in the wall of the artery or vein can lead to eventual occlusion, but most commonly results in narrowing that predisposes the artery or vein to clot development or flaking off of cholesterol plaque which then travels to smaller arteries or veins. Atherosclerosis is the most common cause of chronic arterial occlusive disease of the lower extremities. The arterial narrowing or obstruction that occurs as a result of the atherosclerotic process reduces blood flow to the lower limb during exercise or at rest. The superficial femoral and popliteal arteries are the vessels most commonly affected by the atherosclerotic process, thus explaining the Bruit heard by the orthopaedic surgeon during a clinical examination of an orthopaedic patient when a stethoscope was placed behind the patient's knee.

From Gord Jones, Khaleel Khan and Romeo Fernandez:

A "Bruit" is a characteristic sound (whoosh-whoosh, whoosh-whoosh) that may be heard through a stethoscope. It is caused by blood and/or other serous fluids pulsing through a hole (fistula) in an artery, such as the femoral artery or branch thereof.

A fistula in a vein can also produce an audible sound known as, and sounding like, a "hum".

Sometimes the fluid escaping through a fistula can be palpated. The tactile sensation produced is called a "Thrill". Seriously.

Volume Sixteen, Issue One

- **What is Paget's disease of the bone?**

From Mardy McPolin, Gary James and Jason Bewers:

An unusual bone disorder that mainly affects seniors is named after the British surgeon to Queen Victoria. Paget's affects up to three per cent of the population over 60 years of age, although most of those with this condition do not know it because there is no unique set of identifying symptoms.

The condition usually is identified by chance finding on an x-ray done for some other purpose. In Paget's, something makes the bone growth process go awry in one or more bones. The result is bone that is thicker, though more brittle, than normal.

About 10% of the people with Paget's disease have bone pain or joint pain similar to that from arthritis.

From Susan Woodrow:

Paget's disease of the bone is a fairly common skeletal abnormality. The etiology is unknown, but it is thought to be a pre-cancerous condition. This disease is more common in men than women and is usually found between the age of 50 to 70. Most individuals are asymptomatic and the disease is usually discovered during some radiographic examination which is often unrelated to the problem. On x-rays, the affected bone or bones are seen to be thickened and curved. The bone substance appears sclerotic and may have porous thick trabeculae which give the appearance of honeycomb.

Sometimes only a single bone is affected, but it is not uncommon to see many bones involved. The disease frequently affects the pelvis, femur, tibia, lower spine and skull. The disease starts at one end of the bone and works its way to the other end. Scientists believe that a slow virus is the probable cause of Paget's disease. The osteoclast (resorption) and the osteoblasts (rebuilding) are overactive, therefore, the bone turnover is increased which leads to thickening and deformity. The long bones tend to bow, usually anteriorly, however they remain strong enough for weight-bearing. If the spine is involved, the deformity is often a compression of the vertebral bodies with a development of a spinal stenosis (narrowing), which can cause nerve root or spinal cord compression. When the skull is involved, the progressive thickening to the external cortex leads to enlargement of the head.

Since the disease is a pre-cancerous condition, 20 to 30 per cent of the affected people may develop a malignant degeneration. The bone tumours associated with this disease often are highly malignant and the usual life expectancy for these people is about one year after their development. Another complication which is common would be a pathological fracture.

Treatment consists of medications which slow down the resorption (osteoclastic) process which slows down the rebuilding (osteoblastic) process.

From John J. Humeniuk:

Paget's disease (osteitis deformans) of the bone is a slow, progressive disorder of one or several bones. Affected bones are thickened and spongy. They have a tendency to bend.

Paget's disease was first described by Sir James Paget in 1879 and, to this day, the cause is unknown.

The increase in size of the affected bone distinguishes the condition from metastases and other disorders which look similar.

Paget's disease usually involves limited areas of the skeleton. The bones usually affected are the pelvis, skull, clavicle, vertebrae, and the long bones of the leg.

Paget's disease varies in frequency from one part of the country to another which suggests infective cause which is thought to be viral. The disease affects about three per cent of the population over the age of 40, with the incidence increasing with age. Paget's disease seems to run in families and affects more men than women.

Affected bones of Paget's disease are prone to fracture.

Paget's disease is usually discovered by means of an x-ray taken for some other reason.

Paget's disease of the skull may distort the facial bones (leontiasis) and lead to inner ear damage. Paget's disease of the vertebrae may press on the spinal cord, which in turn may cause pain or paralysis of the legs. If the pelvis is affected, severe arthritis of the hips may develop. In rare cases, when many bones are involved with the disease, bone cancer may develop. This is a condition known as Paget's sarcoma. The increased blood flow through the affected bones may cause heart failure.

Another form of Paget's disease is that of the nipple. This is a rare type of breast cancer in which the tumour starts in the milk ducts of the nipple. This disease affects usually one nipple. Paget's disease of the nipple looks similar to eczema. Itching and a burning sensation will be experienced.

Paget's disease usually does not require treatment. In some cases, pain killers (analgesics) will be given. In severe cases, the hormone calcitonin may be prescribed. This hormone reduces pain, alkaline phosphatase levels, and promotes normal bone formation.

Surgery may be required to correct deformities or to treat arthritis.

Volume Sixteen, Issue Two

- **In your scope of practice, which is considered more appropriate to apply immediately following a closed reduction of a Colles' fracture: a partial cast (splint) or a (plaster, fibreglass) circumferential cast?**

From the editor:

Depending on your place of apprenticeship, you believe in the application of a full cast or a splint following a closed reduction of a Colles' fracture. Remember that your method is a method, and not the method for this treatment. The important issue is the reduction and the maintenance of the reduction without complication to the patient in restoring their limb to anatomical function. Methods may vary, but the results should all be the same.

The orthopaedic technologist has a real clinical sense with fracture treatment. There is no harm in useful dialogue

that causes each of us to re-examine some of our unwavering presuppositions and inherited beliefs.

*I would hope that **Body Cast** will continue to hear from a majority of members on this particular rounds question with the preferred method of treatment at their institutions for an injury that was first described in 1814 by Abraham Colles. Imagine, in almost 200 years, the fixation methods of treatment are still being debated.*

*As a matter of interest, refer to past issues of **Body Cast** which dealt with Colles' fracture and related complications: Spring 1986, Summer 1988, Spring 1991, Fall 1994, summer 1996, Fall 1997, Spring 2000.*

From Mardy McPolin, Gary James and Jason Bewers:

Immediately following a closed reduction of a Colles' fracture, we apply a splint of plaster slabs. The slabs cover the dorsum, along with the ulnar and radial borders, leaving an opening along the ventral side. This allows for the potential swelling of the injury and the effects of closed reduction. We allow full movement of the fingers and thumb. Flannel is used to hold the slabs in place by firm, but not tight, application. Patients are followed up the following day with a cast check and then weekly for the first three weeks with x-ray. Each week the splint is tightened easily by a fresh application of flannel to snug the splint. Generally, the splint is changed to a full circular cast at the two or three week range, depending on the surgeon and the severity of the fracture. We have not had a single case of Volkmann's ischaemic contracture or circulatory impairment due to tight plaster with this technique. The results are more than satisfactory as an external fixation device is used without hesitation by today's young surgeons.

From James Punwassie:

Partial cast is not enough to maintain reduction, especially if the fracture is unstable. A full cast (plaster because it takes to molding better), univalved or bivalved to accommodate swelling, works best for me.

From Javad Movasseli:

There are two different ways to reduce Colles' fracture, and different casting. First, in the situation of the patient who has displacement with edema, a closed reduction should be stabilized with a two-piece slab, one for the radial side and the other for the ulnar side to maintain the fracture and also prevent more pressure and neurovascular damage to the hand. Second, for the patient with Colles' fracture without swelling, closed reduction and regular plaster (circumferential cast) should be followed by cast care instruction to prevent any edema or damage to the neurovascular system in the hand.

From Sokol Balili:

For the Colles' fractures in my scope of practice, the method of immobilization selected depends on the classification status of the fracture.

For this type of fracture, immediately following a closed reduction, two of the most important things to look after are alignment and redisplacement prevention. For these two reasons, and in order to maintain traction and allow molding in three points pressure, we use circumferential long arm casts. In children, we sometimes even go above the elbow for redisplacement prevention.

When deciding between a plaster and a fibreglass cast, we generally use a plaster cast which gives more room to manipulate, makes molding easier and more precise.

From Brian Lavallee (Manitoba):

A plaster circumferential cast is our choice. After the x-ray to assess reduction, it is split on the ulnar side (sometimes bivalved, but not usually). Plaster will release more for swelling, especially if you have to wedge it open, where fibreglass is more like a vice. Also you can mold plaster easier and it sets quicker.

From Doug Longphee (New Brunswick):

In my scope of practice, it is more appropriate to use a full cast in post-reduction care of a Colles' fracture. The full cast protects the fracture better and keeps it out to length, where a dorsal slab can cause the distal radial fragment to displace or tilt dorsally if the slab is incorrectly applied or becomes loose. To hold a Colles out to length there should be support on both the dorsal and volar aspects of the wrist, keeping in mind the correct positioning of the hand in the palmar flexion and ulnar deviated positioning. The fracture is less likely to move if supported properly in a full cast rather than a splint. If swelling is an issue, the cast can be bivalved and taped, and instructions given to the patient upon discharge.

Volume Sixteen, Issue Three

• **What is Munchausen syndrome?**

From alba Greco:

Munchausen syndrome is a psychiatric disorder that causes an individual to self-inflect injury or illness or to fabricate symptoms of physical or mental illness in order to receive medical care or hospitalization. In a variation of this disorder, Munchausen by proxy (MSBP), an individual intentionally causes or fabricates illness in a person under his/her care. This allows the caregiver to fulfil their need to step into the patient role.

The exact cause of Munchausen syndrome is unknown. It has been theorized that Munchausen patients are led by a desire to be cared for, a need for attention, dependency, an ambivalence toward doctors or a need to suffer. Factors that may predispose one to Munchausen syndrome include a serious illness in childhood or an existing personality disorder.

This disorder first appeared in psychiatric literature in the early 1950s when it was used to describe patients who sought hospitalization by inventing symptoms and/or inducing illness and injury in themselves. This disease takes its name from Baron Karl Friederich von Munchausen, an 18th century German military man known for his tall tales.

A clearly effective treatment for Munchausen's does not exist. Extensive psychotherapy may be helpful for some patients.

From John J. Humeniuk:

Munchausen syndrome is a form of chronic fictitious disorder in which the sufferer complains of physical symptoms that are pretended or self-induced. Sufferers are not malingering, they simply want to play the patient role. Most afflicted people are repeatedly hospitalized for investigations and treatment.

Pain in the abdomen, dizziness, blackouts, skin rashes and fever are the usual complaints. Sufferers invent dramatic, but often plausible histories and once in the hospital behave disruptively. Many of them show evidence of self-injury or of previous treatment (such as numerous scars or detailed medical knowledge).

In Munchausen's syndrome by proxy, parents cause fictitious disorders in their children. The parents crave attention given to them by society when their children are ill.

It is difficult to determine the causes of Munchausen syndrome because when challenged, sufferers may deny any allegations of deception or may immediately discharge themselves from the hospital.

Treatment is aimed at protecting sufferers from unnecessary operations and treatments.

From Mary Perkins:

Munchausen's syndrome refers to a psychiatric disorder which causes repeated fabrication of physical illness. It was named after Baron Munchausen whose exaggerated tales as a hunter, soldier, and sportsman became well-known in the late 1700s.

Munchausen's name subsequently became associated with the amusingly preposterous story. It manifests itself in the person who simulates many physical disorders, often causing self-mutilation. The disorders are usually acute, dramatic and convincing, and the person often wanders from hospital to hospital, physician to physician, seeking treatment. The Munchausen patient is rarely treated successfully and management is generally limited to recognizing the disorder early.

From Cheryl Rivers:

Munchausen syndrome is repeated fabrication of illness, usually acute, dramatic, and convincing, by a person who wanders from hospital to hospital for treatment. In a bizarre variant of the syndrome, a child may be used as a surrogate patient. This has been referred to as "Munchausen by proxy." The patient falsifies history and may injure the child with drugs, add blood or bacterial contaminants to urine specimens, etc., all in order to simulate disease.

Volume Sixteen, Issue Four

• **Describe Patello-Femoral Syndrome.**

From Alba Greco:

The patella, otherwise known as the "knee cap", and its tendon transmit power from the quadriceps to the lower leg. When the knee bends, the patella slides smoothly along a groove in the thigh bone. Under certain conditions, the patella may experience forces which push it against the sides of the groove causing pain. This process is referred to as "Patella-Femoral Syndrome" (PFS). You may be familiar with the older term, chondromalacia patella.

Pain is usually located in the front part of the knee, but may be on the inside or outside. The pain can feel either sharp or dull, and is often made worse by squatting or walking down stairs. Sometimes there is grinding or clicking. PFS is one of the most common causes of knee pain in runners.

Predisposing factors include:

- Training errors - excess hill work, stairs, or too much distance
- Biomechanical abnormalities - overpronation, "knocking knees" or poor pelvic control
- Muscle tightness - calf, hamstring, iliotibial band or vastus lateralis
- Muscle weakness - vastus medialis obliques or gluteus.

Treatment involves rest, ice, anti-inflammatory medications and physiotherapy to strengthen or stretch the problematic muscle to help keep the patella in its groove.

From Suzanne Groulx:

The patella, commonly referred to as the "knee cap", and its tendon transmit power from the quadriceps to the lower leg. Normally, as the knee bends, the patella slides smoothly along a groove in the thigh bone. However, under certain conditions the patella may experience forces which push it against the sides of the groove, causing pain. Additionally, inflammation and roughening of the smooth underside of the patella may occur. Collectively, this process is referred to as patello-femoral syndrome (PFS). An older term is "chondromalacia patella."

PFS is one of the most common causes of knee pain in runners. The pain is usually located in the front part of the knee, but may be on the inside, outside or vaguely located. The pain can feel either sharp or dull and is often made worse by squatting or walking down stairs. Sometimes there is grinding or clicking.

Volume Seventeen, Issue One

• What are Kanavel's four cardinal signs of flexor tenosynovitis?

From Sokol Balili:

Infection that spreads into flexor tendon sheaths displays Kanavel's four cardinal signs of suppurative flexor tenosynovitis (a surgical emergency):

1. Tenderness along the entire course of the tendon sheath
2. Uniform swelling along the tendon (as compared with localized swelling in the typical carbuncle) (sausage-appearing digits).
3. Finger held in slight flexion
4. Intense pain on attempting to extend the finger.

From Mardy McPolin, Gary James and Jason Bewers:

1. Slightly flexed posture of digit
2. Uniform swelling
3. Pain on passive extension
4. Tenderness along flexor tendon sheath
(Flexor tenosynovitis requires admission and surgery.)

From Neville Yao and Suzanne Groulx:

Kanavel's four cardinal signs of flexor tenosynovitis:

1. Intense pain accompanies any attempt to extend partly flexed finger;
 - this is absent in local involvement;
 - pain will be noted along the course of tendon with extension;
 - this is the earliest and most important sign;
 - in case of a local furuncle, in contrast, the finger can be held straight without much pain;
2. Flexion posture: finger is held in flexion for comfort;
3. Uniform swelling involving entire finger in contrast to localized swelling in local inflammation;
4. Percussion tenderness along the course of the tendon sheath;
 - tenderness is marked along the course of inflamed sheath in contrast to its absence in a localized inflammation.

Volume Seventeen, Issue Two

• Should men be screened for osteoporosis?

From Fay Gibson, Mary Perkins, Jean Hohns and Kim Leslie:

Recent studies show that men of all ethnicities can develop osteoporosis as young as age 50, and as frequently as women. The cause is unknown, but

researchers are focusing on testosterone levels, smoking, alcohol, bone density and other factors. Currently, the information available to us is based on data from women's studies. There have yet to be guidelines or references developed specifically for men. In men, symptoms of osteoporosis such as stiff joints and back pain are often misdiagnosed as other maladies such as arthritis. The prevalence of a male suffering a hip fracture is higher than a male suffering from prostate cancer. Men also have a higher mortality rate following hip fractures than women. As more baby boomers reach middle age, it is evident that a new public health crisis could be emerging. If adequate evaluations and therapeutic interventions are to be made, it is essential that men be screened for osteoporosis as part of their regular health routine.

From Ed Hayes:

My opinion is no. I feel money could be better spent on treatment studies and other measures for osteoporosis. Yes, I agree men can have diseases mainly pertaining to them and a small number of women as well. If feel it's not just cause to use money for screening/testing for something that pertains to a certain sex. Money is so very limited in this day and age and I feel it could be better spent.

From John Humeniuk:

Osteoporosis is a disease of the skeleton in which bone breakdown is greater than the bone being built. Loss of protein matrix tissue causes bone to become brittle and easily fractured.

Osteoporosis should not be confused with osteomalacia which is demineralization of bone due to vitamin D deficiency. Osteoporosis and osteomalacia may be present at the same time.

Osteoporosis is a natural part of aging. Osteoporosis is more common in women than men for hormonal reasons. After menopause, estrogen hormones which help maintain bone mass are no longer produced.

Osteoporosis in men is usually identified with excessive alcohol or tobacco abuse. Men with certain hormonal imbalances are also prone to osteoporosis. A diet low in calcium is known to be another factor for osteoporosis.

Studies have shown that the gap in the number of fractures between men and women is decreasing.

In summary, men should be screened for osteoporosis, as this disease is increasingly being diagnosed in men.

From Mardy McPolin, Gary James and Jason Bewers:

Like women, men may have secondary causes of osteoporosis, hormonal deficiency being the number one cause followed by alcohol abuse, steroid use, malignancies and systemic inflammatory disorders. Screening for secondary problems includes routine hematology and biochemistry, liver and renal function, testosterone, serum protein, calcium and phosphorous. Naturally, a bone mineral density scan should be done with treatment following accordingly.

Hypogonadism is a well-established cause of osteoporosis in men, but andropause also leads to a drop in bone mineral density (BMD). Many endocrinologists are using testosterone replacement therapy and/or biphosphonates to treat male osteoporosis.

From Neville Yao:

Yes - bone is constantly changing - that is, old bone is removed and replaced by new bone. During childhood,

more bone is produced than removed, so the skeleton grows in both size and strength. The amount of tissue or bone mass in the skeleton reaches its maximum amount by the late twenties. By this age, men typically have accumulated more bone mass than women. After this point, the amount of bone in the skeleton typically begins to decline slowly as removal of old bone exceeds formation of new bone.

In the fifties, men do not experience the rapid loss of bone mass that women have in the years following menopause. By age 65 or 70, however, men and women lose bone mass at the same rate and the absorption of calcium, an essential nutrient for bone health throughout life, decreases in both sexes.

Once bone is lost, it cannot be replaced. Excessive bone loss causes bone to become fragile and more likely to fracture. This condition, known as osteoporosis, is called a "silent disease" because it progresses without symptoms until a fracture occurs.

Fractures resulting from osteoporosis most commonly occur in the hip, spine, and wrist and can be permanently disabling. Perhaps because such fractures tend to occur at older ages in men than in women, men who sustain hip fractures are more likely to die from complications than women. More than half of all men who suffer a hip fracture are discharged to a nursing home, and 79 per cent of those who survive for one year after a hip fracture still live in nursing homes or intermediate care facilities.

Volume Seventeen, Issue Three

• What is Leriche syndrome?

From R. Fernandez, G. Jones and K. Khan:

Leriche's syndrome is also called abdominal thrombosis of aorta, or aortic bifurcation occlusion, or Syndrome de l'obliteration-aortique in French. It is a condition which occurs predominantly in young males caused by atheromatous involvement or occlusion of the abdominal aorta by a thrombus just above the site of its bifurcation.

The main symptoms present as impotence in young males, fatigue in the lower limbs, cramps in the thighs, ischemic pain of intermittent claudication starting in the lower back, buttocks, thighs and calves. There is also atrophy of the limbs and they appear pale.

The signs and symptoms are the result of chronic hypoxia (oxygen lack) caused by inadequate arterial perfusion of the affected areas.

First described in 1814 by Robert Graham (1786-1845), but it was Rene Leriche (1879-1954), a French surgeon extraordinaire, who successfully first operated and reversed the syndrome. The surgical procedure named after him is called periarterial sympathectomy which is sympathetic denervation by arterial decortication. It became a popular procedure which is also used in treating RSD (regional sympathetic dystrophy). The syndrome is named after Rene Leriche.

References

1. Mosby's Medical, Nursing and Allied Health Dictionary, 4th edition.
2. Cecil's Internal Medicine.
3. Harrison's Principles of Internal Medicine.

From James Nijmeh:

Leriche's syndrome aka. Femoropopliteal Occlusive Disease.

I. History

A. Claudication derived from Latin "claudication", to limp

II. Epidemiology

A. Prevalence in age over 70 years: 10 to 18%

B. Prevalence seven to 12 million in the United States

III. Risk factors

A. Tobacco abuse (risk persists > five years after cessation)

1. Cigarette smoking 20 per day: 2.11 relative risk

2. Cigarette smoking 11-20 per day: 1.75 relative risk

B. Diabetes Mellitus

C. Systolic Hypertension

D. Hypercholesterolemia

E. Advanced age

F. Increased body mass index (obesity)

IV. Associated co-morbid conditions

A. Coronary artery disease (myocardial infarction)

B. Carotid stenosis (cerebrovascular accident)

V. Symptoms

A. Timing of symptoms related to degree of stenosis

1. Exertional pain: 70% arterial pain

2. Nocturnal pain: 70 to 90% arterial stenosis

3. Ischemic rest pain: 90% arterial stenosis

B. Claudication symptom characteristics

1. Calf, thigh or buttock pain

2. Pain worse with exertion

3. Pain relieved with several minutes rest

4. Pain relieved with dependent position

VI. Occlusion location

A. Inflow disease: Aortiliac occlusive disease

1. Also known as Leriche's syndrome

2. Bilateral leg diminished pulses throughout

3. Slow wound healing in legs

4. Impotence

B. Outflow disease

1. Iliofemoral occlusive disease

i. Unilateral leg diminished pulses throughout

ii. Buttock claudication may be present

2. Femoropopliteal occlusive disease

i. Thigh and calf claudication

ii. Normal femoral pulses in groin

Volume Seventeen, Issue Four

• What is the best treatment for stasis edema of both feet in an elderly patient? Are compression stockings the answer?

From Mary Perkins and Kimberley Leslie:

Edema is excessive build-up of fluid in the tissues, or an increase in tissue mass. There are many factors which can cause edema in the legs. These include: burns, sunburn, excess salt and/or sodium in the diet, malnutrition, certain medications, and heart or liver failure. To determine the treatment for edema, the cause of the edema must first be determined. Assuming the elderly person is free of major health problems, compression stockings are a good solution, in conjunction with periodic elevation of the legs. Other treatments may include diuretics, exercise, modifications to diet, and medication.

From James Nijmeh:

Treatment of stasis edema is multifaceted. Elevation of the feet is helpful, but compression stockings can be very effective. Good compression stockings limit the amount of swelling and prevent the development of lymphoedema.

For such stockings to be beneficial, they must be measured so as they are not loose and ineffectual, and not too tight so as to interfere with circulation.

From Susan Woodrow:

Stasis edema is the impairment or cessation of venous flow. The first thing a physician should do is to rule out reversible components including CHF, hypoalbuminemia and drugs which the patient may be taking that could be causing fluid retention. If the stasis edema is thought to be due to insufficient venous return, the patient should be encouraged to try more walking and leg muscle contraction exercises as well as elevating the legs when sitting.

Compression stockings will help if the stasis edema is caused by insufficient venous return. There are three types of stockings that can be prescribed. The physician must look at the severity of the stasis edema as well as the patient's well-being before deciding which type to recommend.

The three types of stockings are:

1. Simple antiembolic stockings with low compression for bed-ridden patients.
2. Over-the-counter, ready-to-wear, graduated stockings which are suitable for mild to moderate stasis edema.
3. For more severe cases of stasis edema, custom-made stockings are necessary.

In all types of stockings, the below-the-knee type are both suitable and preferable as long as the proximal band is wide and well-fitted. The purpose of the stockings is to help pump blood back up to the heart, therefore helping to prevent swelling.

From Cheryl Rivers:

Stasis edema is a term meaning stagnation of the flow of fluids, as of the blood, through the extremities and other areas of the body. It can be caused by several factors but, most commonly, stasis of the blood is caused by venous congestion. Treatment includes ambulation, elevation, compression stockings, and isometric exercises.

Compression stockings are a positive treatment for stasis edema. The fabric is made of stretch material so that pressure is maintained against the limbs to help reduce the edema and increase the flow of blood.

Volume Eighteen, Issue One

- **What is the best treatment for stasis edema of both feet in an elderly patient? Are compression stockings the answer?"**

From Mary Perkins and Kimberley Leslie:

Edema is excessive build-up of fluid in the tissues, or an increase in tissue mass. There are many factors which can cause edema in the legs. These include: burns, sunburn, excess salt and/or sodium in the diet, malnutrition, certain medications, and heart or liver failure. To determine the treatment for edema, the cause of the edema must first be determined. Assuming the elderly person is free of major health problems, compression stockings are a good solution, in conjunction with periodic elevation of the legs. Other treatments may include diuretics, exercise, modifications to diet, and medication.

From James Nijmeh:

Treatment of stasis edema is multifaceted. Elevation of the feet is helpful, but compression stockings can be very effective. Good compression stockings limit the amount of swelling and prevent the development of lymphoedema.

For such stockings to be beneficial, they must be measured so as they are not loose and ineffectual, and not too tight so as to interfere with circulation.

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Volume Eighteen, Issue Two

- **What are the lateral radiographic findings of a slipped capital femoral epiphysis (SCFE)?"**

From Mardy McPolin and Gary James:

Any asymmetry of the relationship of the femoral head to the femoral neck should raise the suspicion of slipped capital femoral epiphysis (SCFE), even if it is evident on only one x-ray view. If AP and lateral films are normal, frog-leg views should be obtained. Comparison of the two hips may not always be helpful in discerning subtle differences because SCFE occurs bilaterally over 20% of the time.

From Adrian Crossman:

You would see a globular swelling in the joint capsule, widening of the epiphysis, decalcification of the metaphysis caused by the displacement of the head posteriorly and inferiorly. The loss of "Shelton's Line". A wide irregular or mottled epiphyseal plate, metaphyseal rarefaction and periosteal new bone formation.

Reference

Emergency Orthopedics: The Extremities.

Simon/Koenigskecht, 3rd edition.

From Tom Broughton:

The early radiographic findings of a SCFE are when the femoral head (ossify nucleus) is not perfectly aligned with the femoral head. This view would show how the femoral head slides laterally and superiorly with the femur, and how the femoral head stays in the acetabulum. The best view to see this is in the frog-leg lateral view.

From Irene Mills:

When an obese teen or preteen presents to the doctor complaining of pain in the groin or knee along with a history of limping for several weeks duration, they should be presumed to have a slipped capital femoral epiphysis until proven otherwise. AP and lateral x-rays need to be performed on both hips for comparison to either confirm or exclude the diagnosis.

In the early stages, the AP film is usually normal since slippage is posterior. Lateral films must always be taken. The early sign on this x-ray is a minimal posterior step-off at the anterior epiphyseal-meta-epiphyseal junction. On the AP view, subtle signs include Klein's line drawn along the superior surface of the femoral neck. The epiphysis should normally project superiorly to it, but in the early stages the epiphysis is flush with it.

From Derrick Lundrigan and Ed Clancey:

On the lateral x-ray, the femur lies slightly anterior and slightly proximal to the epiphysis. The epiphysis cartilage of the upper end of the femur becomes displaced in some children. It should be remembered that the epiphysis itself stays in the acetabulum so that the displacement is more of the femoral metaphysis on the epiphysis than a slipping of the femoral epiphysis as the name implies.

When severe, the displacement is such that the neck of the femur turns forward and passes upwards or, to describe the displacement in the conventional manner, the capital epiphysis comes to lie behind and slightly below its normal attachment to the neck. The condition occurs more in boys than in girls, and normally between the ages of 10 to 15 years. Classically, it occurs in overweight children, and is said to occur in those with delayed onset of puberty.

From Joe Maulucci:

The early x-ray findings of a SCFE are:

- epiphysis plate wide and irregular
- decreased height of epiphysis
- a dense area in femoral neck
- the metaphysis farther from medial wall of acetabulum than normal
- a line along superior femoral neck transects less of epiphysis than the opposite normal hip (Klein line).

Volume Eighteen, Issue Three

- **What are the four types of physical examinations that can be performed to make the diagnosis of an ACL tear?"**

From Tom Broughton:

- 1) Medial/lateral stability test: Hold the femur with the left hand from under the knee and the tibia in the right hand. Flex the knee to 30 degrees and put the knee in varus/valgus stress. If there is not a firm stop, an ACL may be torn.
- 2) Anterior/posterior stability test: It is done with the left hand grasping the femur and the right the proximal tibia. The knee is flexed to 30 degrees and pulled anteriorly and posteriorly. Increased looseness in the knee joint is indicative of an ACL injury.
- 3) Drawer sign test: Performed by flexing the knee to 90 degrees, gently sitting on the foot, and grasping the proximal tibia with both hands and pulling the knee in an anterior

plane looking for a mushy endpoint suggestive of a tear.

- 4) Apley's test: The patient is placed in the prone position, the knee is flexed, and pressure is placed on the femur to fix it on the table while the ankle is pulled upwards and the tibia internally and externally rotated. If there is pain, it is most likely due to an ACL injury.

From Blair Matheson:

The four types of physical examinations that can be performed to make the diagnosis of an ACL tear are:

- 1) The Lachman test - is the main clinical examination test and is the most sensitive test. This involves having the patient lie on their back with the affected knee bent at a 30 degree angle at which time the examiner applies slow pressure to the back of the proximal tibia. Increased looseness in the knee joint is indicative of an ACL injury.
- 2) Pivot shift test - also known as MacIntosh test. This is the test that reproduces the feeling of instability that the patient complains about.
- 3) Range of motion - the knee is examined for range of motion.
- 4) Swelling - usually indicative of a torn anterior cruciate ligament whereby bleeding takes place and fills the knee. Seventy-five per cent of cases of blood in the knee are related to a tear of the ACL.

From Mary Perkins:

- 1) The Lachman's test is a gentle pull on the tibia with the leg flexed at 30 degrees. This checks forward motion of the lower leg in relation to the upper leg. An ACL tear will have increased forward motion and a soft end feel at the end of the movement.
- 2) The anterior drawer test is similar, with the knee bent to 90 degrees.
- 3) The pivot shift test is applied with greater stress to the knee as it is straightened by the physician from a bent and inwardly-rotated position. If the knee "gives", this is an indication that stabilizing structures inside the knee may be torn, as well as the ACL.
- 4) Effusion/swelling is also a sign of an ACL tear with a history of a "popping" in the knee at the time of injury. Diagnostic tools such as x-rays, MRI, and KT 1000 may be used to confirm the physician's physical exam.

From Angela Lynk:

The four types of physical examinations are:

- 1) The Lachman test (the main clinical examination test)
- 2) Pivot shift test - this test reproduces the feeling of instability that the patient complains about.
- 3) Range of motion - the knee is examined for range of motion. An operation should not be performed until the patient has a full range of motion.
- 3) Swelling - usually when the anterior cruciate ligament is torn it bleeds and fills the knee with blood. In fact, in 75% of cases of blood in the knee, a torn anterior cruciate is responsible.

From Heather Wong:

The four standard physical exams of the knee for a possible ACL tear are:

- 1) Pressure applied from different directions to check for abnormal motion of tibia in relation to femur. In particular, the Lachman test measures how far the tibia can be displaced forward in relation to the femur.
- 2) Pivot shift test - a test that reproduces the feeling of instability that the patient is complaining of.
- 3) Range of motion of the knee
- 4) Swelling of the knee occurs in 75-80% of ACL tears due to hemarthrosis.