REVIEW OF LITERATURE
The human body is an amalgamation of many fundamental units put together. Among these units hand and foot have a distinct and a very important role. The functions of these can not be over emphasized.

DEFORMITIES OF FOOT:

The human foot has become greatly specialised for performance of two divergent functions. Both these functions are dynamic.

1. In standing it must provide a stable support for body weight — balance — a passive function.

2. In walking it must, in addition to supporting the body weight, provide a resilient spring or lever by which the body weight can be propelled forwards - propulsion - an active function.

These objectives are fulfilled by the architectural arrangements of a number of small spongy elastic bones grouped together in the form of series of arches, for each of the functions muscle contractions are essential, their importance being greater in propulsions than in balancing.

Most of our knowledge of medicine and surgery practiced in old time is derived from Egypt. The earliest documentation of foot disorder comes in form of wall painting and preserved writing on the mummies. Paintings on the walls of the ancient tombs depict child with a clubfoot deformity and a statue of diastrophic dwarf with a clubfoot can be found in the TUTAN KHAMEN collection.

Common foot deformities include Hallux valgus, Hallux varus, Hallux rigidis, Cock up deformities (i.e.) flexion of I.P. joint and extension of Metatarsophalan geal joint, Hammer toe, Congenital metatarsal varus & Club foot.

Hallus valgus consists of abnormal adduction of the proximal phalanx of the great toe towards the midline of the foot and is associated, especially in most extreme form with varying degrees of varus of the lst metatarsal. LAPIDUS (1934) suggested the form "Metatarsus Varus Primus" to indicate a primary developmental type of entity. LAKE (1942) considered varus deviation of the metatarsal as the most important factor. KAPLAN (1951) described a strong connection band extending form the tendon of Tibialis posterior muscle into the
Flexor hallucis brevis and Adductor hallucis and regarded this a contributing factor. Treatment as conservative consists of property well fitting shoe. Operative treatment consist of McBride operation, Mitchell's Metatarsal osteotomy (1958), Keller’s arthroplasty, Ross-Smith arthrodesis et al (1952) of Metatarsophalangeal joint.

Pes cavus or the claw foot consists of clawing of the toes combined with a raising long arch of foot. Jones and Lovett reported cause of claw foot due to polio and inflammatory infections. Duchenne originally suggested that it was due to the weakness of the short muscles of the big toe and Interossei. Bre werton et al (1962) in a review of 629 cases of claw foot found that 25% of them had some degree of neurological involvement. Scarpynner (1945) reported congenital stricture of spinal canal. Giannestras (1953) reported right equino cavovarus foot due to intrathecal traction. Treatment includes both conservative and operative. Conservative tretment allow the re-education of the small muscle function by intrinsic exercise. Operative treatment include Lambrinudi Operation.(1927), Girdlestone tendon transfer operation (Tayler 1951), Japas mid tarsal V osteotomy with Steindler's striping of planter fascia.

CTEV / CLUB FOOT -
Archeological investigators in Mexico revealed that Aztecs recognised clubfoot treating it with splints made of cactus leaves.

Hippocrates first described club foot deformity around 300 BC. He emphasized early and gentle treatment. The treatment consisted of "moulding of foot with piece of wax, applying resinous cerates with numerous bandages. In this process one should bring the parts into their true natural position, both, that are twisted and those that are abnormally contracted, adjusting them in this way by both the hands and by bandaging in like manner, so as to draw them into position gently and not violently" (Translation by Withington, 1927).

A club-foot deformity may also be acquired after birth secondary to muscle imbalance as in cerebral palsy, muscular dystrophy or poliomyelitis. Example of this is seen in the famous painting by Spanish artist Ribera (1588-1659), "Pie bot" which is hanging in the Louvre Museum, the subject is a body with right sided hemiplegia with Talipes Equinovarus deformity obviously a victim of cerebral palsy.
In the middle of the 17th century, Arcaeus, Farel, Fabris recommended repeated stretching by the use of mechanical corrective apparatuses, which gradually eliminated the deformity with a turn-buckle.

In the 18th century, Cheselden of England utilized repeated stretching and bandaging to maintain the correction. The bandage was of "several pieces of linen rag dipped in a mixture of whites of egg and flour".

Scarpa in 1803 described the pathologic anatomy in 'A memoir on the congenital talipes equinovarus in children. In this treatise he described the deformity as a 'twisting of the scaphoid, os calcis and cuboid around the astragalus, Calling it a" congenital dislocation of the astragalo-calcaneoscaphoid complex". Scarpa also described the contractures of the soft parts and devised an apparatus with springs in a attempt to stretch the contractures and reduced the scaphoid. Subcutaneous tenotomy of the Achilles tendon was first performed by Lorenz in Frankfurt in 1782. Delpech of France in 1823 reported the same technique in few patients with acquired talipes equinovarus.

In the beginning of 19th century 1802 Heyman lion published ' a complete treatise on spinae pedum' The first book on the foot affection that represented the original efforts in this field.

Little published paper 'A treatise on nature of club-foot ' in 1893. He was Englishman and had attack of polio at the age of 4 year and left leg was paralysed which later resulted into Talipes Equino-varus deformity. He went to Germany in 1835 having read the work of Stromeyer. He went to Hanover where Stromeyer performed subcutaneous tenotomy and corrected his deformity. During his convalescence, Stromeyer taught him how to perform this operation. Later on Little studied club foot in Germany and presented a thesis for which he was awarded Doctor of Medicine in Berlin. After this he returned to London and performed his first operation on February 20, 1837. Later on he devoted all his life to the care of crippled. He also noticed a case of pseudomuscular atrophy and read paper before Obstetrical Society of London, entitled 'on influence of abnormal parturition, difficult labour, premature birth and asphyxia neonatorum on the mental and physical condition of child specially in relation to deformity ' Later on above condition with cerebral palsy was called as Little disease. Later on he found a hospital which is now called as Royal Nation Orthopaedic Hospital.
Guerin in 1838 appears to have been the first to report the use of plaster of Paris in the treatment of club foot.

In 1857, Solly performed one of the first bony operations for club foot—removal of part of the cuboid which was a precursor of the present day Dillwynn-Evans operation.

In 1866, Adams differentiated the acquired talipes equinovarus from the congenital variety. He also noted that the head and neck of the talus were deviated medially. He felt that this medial deviation of the talus was secondary adaptive change and not a primary defect, and stated "the altered or is adaptive rather than result of the defective power of development".

Lund performed the first recorded tatectomy for club foot in 1872. During the later part of the 19th century, Hugh Thomas (of Thomas splint fame and an uncle of Sir Robert Jones) devised the Thomas wrench, which was used to forcibly manipulate and correct the deformity. After the manipulation, a splint was applied to hold the correction. This method was used either along with or following surgery.

Except for tenotomy of the Achilles tendon, the operative treatment of the club foot began in 1867 with Lister's introduction of aseptic technique and the discovery of anaesthesia. These landmark discoveries, along with the introduction of the Esmarch Tourniquet in 1873, which permitted bloodless surgery, increased interest in the surgical approach. The introduction of pneumatic tourniquet by Cushing, in 1904 reduced the danger of tourniquet palsies and made surgery of the extremity less hazardous and more popular.

In 1890 Phelps, an orthopaedist in New York City described a one-stage medial-planter soft tissue release with lengthening of the tendon. He also did an osteotomy of the neck of the talus with wedge resection of the calcaneum.

In 1898, Walshingham and Hughes renewed interest in the theory that the deformity was due to a germ defect of the head of the talus. They along with others, reported osteotomy of the talus as means of correction, years later Elmslie in 1920 and Denis Browne in 1937 once again recommended osteotomy of the neck of the talus to correct the deformity.
In 1906, Codvalla from Italy described a soft tissue release with lengthening of the tendons, including the Anterior tibialis. Codvalla made plea for soft tissue surgery to be done when a child is about three years of age. This plea was made at a time when the prevalent methods of treatment were exocoelhleation bony operations of the calcaneous and cuboid.

From 1900 to 1930 many varied operations were recommended for the surgical correction of club foot. In addition, during this period considerable progress was made in our knowledge of the pathologic anatomy of this deformity.

In 1930, Kite popularize non-operative treatment with serial manipulations and plaster cast immobilization. Kite was a great advocate of non-operative treatment and stressed the need for gentle manipulations.

In this class monograph in 1930, Brockman described the morbid anatomy of club foot as a congenital atresia of the astragalo-calcaneo-scaphoid joint. He also described a two stage soft tissue release for correction.

In 1934 Denis Browne renewed interest in mechanical intra-uterine pressure as cause of the deformity. He advised forceful manipulations before the application of his Denis Browne splint. Forceful manipulations have since fallen into disrepute because this method caused deformity of the bone and stiffness of the joint.

It is well known that continuous traction will gradually tire out a muscle; that a contracted muscle put on stretch will gradually lengthen and that a stretched muscle if relaxed, will shorten so that it can get back to position in which contraction can occur.

This principle of continuous traction has been applied to problem of CTEV in following manner:

Leo Mayer (1934) assessed that equinus position of Os calcis is extremely difficult to correct. This difficulty is due to inadequate methods hitherto available of gripping the os calcis and pulling down the posterior tubercle. Upward pressure against sole of the foot instead of correcting the deformity adds to it by creating a rocker bottom sole with calcaneocuboid joint at most dependent portion. For this
stubborn resistant type of deformity he devised a method which consisted of inserting of a nail or wire through posterior portion of os calcis by means of which, following tenotomy and posterior capsulotomy, the posterior portion of os calcis can be pulled downwards and anterior portion upwards. A six weeks period of immobilization was employed.

Lloyd T. Brown in 1936 devised an aluminium foot plate. It has been found possible and simple to obtain marked over correction of all the deformities of club feet by the use of continuous slight traction by means of elastic bands applied with this aluminium foot plate.

John F.Bell and David S. Grice (1944) observed that not only was internal torsion corrected but, the forceful and persistent kicking permitted by Denis Browne apparatus provided constant manipulation of the feet and opportunity for development of normal musculature. Thus was obtained a foot which was very flexible and was maintained in normal plane of external rotation.

Shin Movita and Kyoto in 1962 devised a method for treatment of resistant club foot deformities in children up to six years age. After heel-cord lengthening, occasionally combined with posterior capsulotomy, leverage wire traction is applied directly to calcaneous by means of Kirschner wire and padded foot plate, both of which are incorporated in plaster cast between manipulation. After correction of equinus and varus deformities of the heel, the wire is removed and subsequent correction is completed by manipulation and plaster casts.

Satisfactory immediate correction was obtained in forty eight of fifty two feet in children ranging in age from four months to more than six years.

Prof. Gavrill Abramovich devised an external fixator in 1951 in Russia. This remained concealed from the rest of the rest of world for a long time but has gained considerable acceptance and popularity during past ten year. He advocated the use of ring fixator in correction of the deformity, in congenital talipes equino varus. By applying the fixator, not only the bone but also the muscles, nerves, blood vessels, and tissues grow simultaneously.

Grill & Franke (1987) attached much importance of the discrepancy in length between the medial and lateral border of foot in correction of the deformity and
achieved continuous distraction by using external fixator. Ten feet in 9 children were treated with age range from 8 to 15 years. In no patient the treatment was discontinued though five patients had temporary pain in metatarsal region and temporary oedema in the foot. No skin necrosis or sensory or motor disturbance in foot was seen. A plantigrade foot was achieved in all patients with satisfactory radiographic appearance. All feet showed stiffness of subtalar joint and average range of movement at the ankle was 20 degrees. The only complications were minor ones such as pintrack infections which settled with local treatment and increasing the tension in the wires. There were no instances of osteomyelitis. Five children required additional operations. Patients were satisfied with their result and were for the first time, able to wear ready made shoes.

Grill (1990) presented results of 20 feet in 18 children ranging in age from 8 to 16, all having severe deformities. Thirteen children had neglected or relapsed congenital talipes equinovarus. The mean follow-up was seven and a half years, ranging from 12 months to nine years. In only two patients the treatment had to be discontinued because of pain and very severe lymphoedema in the fore-foot. A plantigrade foot with a satisfactory radiographic appearance was achieved in all but three patients.

Cantin et al (1990) presented management of relapsed club foot and other severe foot deformities with the Ilizarov external fixator. He reported its use on 14 feet in 13 children aged two to 16 years. It included eight idiopathic relapsed club foot and six severely deformed feet secondary to teratogenic or neurological anomalies. A mean follow-up of 9 month was recorded. Plantigrade and functional foot was obtained in all of idiopathic club feet and in two of the teratogenic deformed feet.

Joshi et al (1990) presented a method of treatment based on use of external fixator in combination with controlled distraction of soft tissues for realignment of skeleton of foot in talipes equinovarus. This process of differential distraction corrects the deformity and all the same time keeps the joint surfaces apart, thereby avoiding any crushing force on bone or cartilage. By this fixator, not only the bone but also the muscles, nerve, blood vessels and tissues grow simultaneously. Also this being a semi-invasive procedure, does not require bony and soft tissue resection, corrects the deformity, gains foot length, improve mobility and streches
soft tissue contractures. If less than complete correction is achieved then this procedure may be followed by soft tissue release or bony resection. The medial border of the foot is distracted at the rate of 1.0 mm per day while the lateral border is distracted at the rate of 0.5 mm per day, thus preventing crushing of the cartilages of the bones of lateral border due to wedging effect. Threaded rods between the tibial and the calcaneal pins allow corrections of equinus. Pressure over ankle is relieved by the rods by connecting the tibia to the fore foot.

Deformity of Hand

Hand, is a primary means through which human being physically interacts with the environment around them. In order to fulfil this crucial and varied role, the human hand has remarkable sensibility and adaptibility. These sensibilities are combined with a complex tool capable of performing a wide variety of coordinated motions and tasks with precision, speed and strength.

Because of the resultant diversity of functions, the hands are used in nearly all physical tasks. Further, because of the dependance on our hands for both proprioception and physical interaction, any condition which effect the hand will have a profound effect not only on the functions but in the overall personality.

As we know human being carries out his profession and daily activities with the help of this efficient tool of nature. Even in minute disturbances he is liable to suffer not only economically but also emotionally, e.g. a painter who has lost his functions of hand due to some cause may not only loose his source of income but will also make him an emotionl wreck.

HAND INJURY

Fractures of hand are the most frequent of all fractures. These fractures frequently involve more than one bone of hand and have intra-articular extension, may be associated with dislocation and usually involve the soft tissues extensively. In most of these cases, conservative treatment with plaster leads to malunited fractures, unreduced dislocation and poor soft tissue care. Intramedullary fixation may lead to rotational instability, telescropy and poor fixation. External fixator at the same time achieves and maintain accurate alignment, permits soft tissue
care, spares the proximal joints & causes least periosteal stripping. At present external fixation is a universally accepted technique for the treatment of fractures or dislocations of hand for prevention of subsequent deformities.

Earlier methods of external fixation in hand injuries included pin anchored in acrylic frame & the small Roger Anderson metallic frame. These methods were simple to apply but did not have stability & modularity. Henry Jecqnet (1976) was the first person who developed fixation with a mini external (exo skeletal) fixator for skeletal & soft tissue support in severe hand injuries.

Schuned F, Donker, Wolcke, M,Burny,F.(1984) used external mini fixation in the treatment of 63 closed diaphyseal metacarpal fractures. A simple half frame configuration was applied in all the cases and open reduction was performed in 26% The mean duration of external fixation was 30 days. There were no cases of non-union & anatomical reduction was obtained in 86.6% of cases. There was no case of reflex sympathetic dystrophy. The general functional results were very good or good in 96.6% & open reduction did not significantly altered the final result. They inferred that for treatment of metacarpal fractures closed reduction or open reduction along with stabilization by an external fixator is a fairly useful alternative. Fgebryest, Rosenberg, Mosbe Koni (1986) used a simple and easily available low cost external fixation device made of two parallel plastic tubes and transverse Kirschner wire for finger reconstruction. They found this fixator assembly using the plastic tubes especially useful in comminuted, unstable fractures and dislocations of fingers associated with extensive soft tissue injury in the absence of other commercially available external fixators.

Dr.B.B. Joshi of Bombay, India (1988) developed a simple light external fixator system for use in fractures of hand. It came to be known as J.E.S.S. (Joshi’s external stabilisation system). Dr. Joshi used this external fixator system in more than 150 cases of crush injuries of hand involving soft tissues & bones in varying degrees of severity. He found this assembly to be very effective in stabilising the skeleton in functional position to allow soft tissue assessment & subsequently soft tissue healing. This system helps in tissue stabilisation, spontaneous revascularisation & tissue expression by gradual & controlled distraction.

Sameer, I Shehadi (1961) used closed reduction & external fixation of difficult hand injuries. In this study they excluded patients with fractures of distal
phalanx, undisplaced & stable fractures & those displaced fractures in which a stable closed reduction could be achieved. The Kirschner wire were introduced transversely at a 90 degree angle to the long axis of the bone, one at the midlateral level and the second about 2 mm dorsal to the first. The Kirschner wire were then fixed externally with methylmethacrylate rods (which were made by introducing the soft methylmethacrylate inside clear plastic tubes slit open on one side. The open side of the tube was then applied against the free ends of Kirschner wires & allowed to set in 5 to 10 mins.) thus stabilising the fracture. They utilised the plastic tubes used for packing the Kirschner wires for this purpose. They had conducted their study on 26 patients with 30 hand fractures (19 metacarpals & 11 phalangeal ) treated by closed reductions & external fixation. The percentage return of total range of motion in phalangeal fractures varies from 66 percent to 98% (mean 84%).

Buchlar et al (1991) : In managing the fractures & dislocation of first metacarpal the external fixation provides stable reduction and functional positioning. He showed that in 20 displaced comminuted fractures of thumb (Carpo Metacarpal) joint which were treated by external fixation, 75% of patients had very good result after follow up of three years. As compared with the uninvolved side, axial rotation averaged 79%, radial abduction 89%, key pinch 88% grip strength 81%.

Asmead, D. Roth et al (1992) used external fixation not only for the skeletal stabilization but also for the management of soft tissues in twenty nine cases of acute hand injuries.

Parson, S.W. Fitzgerald ja, Shearer (1992) treated complex metacarpal & phalangeal fractures by Shearer micro external fixator. This fixator consist of unpolished stainless steel rods which may be used singly or linked by an articulating central block. The fracture may be first reduced and the fixed externally or the fixator can be applied with two rods and central block. They had carried out their study in 30 patients with 37 unstable or complex matacarpal or phalangeal fractures. In one & half year of follow up there was minimal soft tissue tethering thus allowing early joint mobilization with good or excellent function. Due to well recognized delay in appearance of radio-opaque callus, the fixator was removed when union was clinically rather than radiologically evident.

Steeley, A. Cooney et al (1992) applied external fixator in 33 injuries of the
upper extremity. Ten fractures of hand, 22 Colles’ fracture & one in osteotomy for Madelung’s deformity. In 19 patients external fixation was primary and in 14 patients it was following failure of another type of fixation (cast or K-wire).

All ten fractures of the hand united in four to twelve weeks (average six weeks). In the two patient with proximal phalangeal fractures, external fixation resulted in bone union, after healing failed to occur with the fixation by crossed Kirschner wires. Range of motion after fracture union was 5 to 80° at the metacarpo phalangeal joint & 10 to 60° at proximal interphalangeal joint. In other patients, intra-articular fractures & tendon injuries associated with joint fusion resulted in limited joint motion. The incidence of complications in this series was 33%. There were four instances of infections at pin site. There was no case of ring sequestrum or osteomyelitis at the pin site. The external fixator for unstable fracture at the hand & wrist with bone or soft tissue loss provides rigid skeletal stabilization, adaptability of mini fixator frame provides for placement of pins in wide variety of angles and position, so that they do not interfere with soft tissue care or overall hand function.