APPROVAL FOR EXAMINATION

I have read this dissertation and approve it for examination.

Date: ... ...

Supervisor: ... ...

Mr. Yakub Mulla

LIST OF CONTENTS **PAGE**

DECLARATION

I hereby declare that the work presented in this study for the Degree of Master of Medicine (General Surgery) has not been presented either wholly or in part for any other degree and is not being currently being submitted for any other degree.

Signed: ……………………………………………………………….

Student

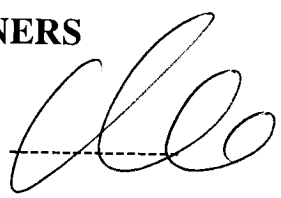
Signed: ……………………………………………………….

Supervisor

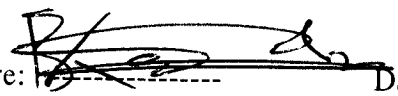
APPROVAL

This dissertation by **Dr. Welani Chilengwe** is approved as partial fulfilment of the requirement to the award of the Master of Medicine (Surgery) degree of the University of Zambia.

EXAMINERS

Signature:  Date: 11/8/00

Signature: ---------- Date: ----------

Signature:  Date: 8/8/00

Signature: ---------- Date: ----------

DEDICATION

To my wife Peggy.

ACKNOWLEDGEMENTS

Without the constant gentle push, guidance and encouragement of Mr. Y. Mulla completion of this thesis would have been almost insurmountable.

Professor Krikor Erzingatsian, Head of the Department of Surgery put me through the paces by his timely reminders.

Dr. Jabbin Mulwanda for his tireless, unpaid editing jobs now and then. Dr. C. Ngwisha for reminding me that it can be done.

All the efforts would have amounted to nought without, Romeo, Mr. S. Chewe and the Medical Illustration crew.

Final year M.Med 1999 for giving the necessary encouragement when panic set in.

Mr. Giles Yambayamba for the logistic support, John S. Kachimba for being a friend. Special thanks to patients included in this study.

And last but far from least Ms. Wendy Muchenya for all her help in preparing this dissertation.

SUMMARY

This study was carried out over a period of 13 months. It is a prospective study on adult patients admitted to the general surgical wards at the University Teaching Hospital, Lusaka, with fractures of the femur.

The aim was to study the pattern of fractures in these patients, document the trend of management of these femoral fractures and to identify problems and complications associated with conservative management.

Forty-six patients were included in the study. Three patients were lost to follow up and one mortality was recorded.

Road traffic accidents were the most common cause of femoral shaft fractures. Most of these fractures were closed and non-comminuted.

All the patients in the study were treated by conservative means using Perkins' traction and Perkins' exercises.

The average hospital stay was 8.5 weeks which compares well with findings by other investigators. The complications were pin tract infection in 50% of the patients, limb shortening of more than 2cm in 42% of the patients and residual knee stiffness 32% of the patients.

LIST OF TABLES

LIST OF ABBREVIATIONS

UTH	-	University Teaching Hospital
RTA	-	Road Traffic Accidents
Pts	-	Patients
%	-	Percent
No.	-	Numbers
>	-	Greater than
cm	-	Centimetres
AO	-	Osteosynthesis Association
Kg	-	Kilogram
HIV	-	Human Immunodeficiency Virus
MUA	-	Manipulation Under Anaesthesia

TERMINOLOGIES

1. Perkins' Traction

   Skeletal traction using Steinmann's or Denham's pin inserted transitibially. It allows weight adjustment, knee flexion exercises. It was described by George Perkins.

2. Kuntscher Nail

   An intramedullary nail introduced by Kuntsher. Gerhard B.G Kuntscher was born in 1900 and died in 1972. He was medical director, Hafen Hospital, Hamburg, Germany.

3. Thomas Splint

   Fixed straight leg traction with the use of full length splint with a groin ring. It is useful for transportation of patient and for maintaining traction for the first few days.

   It has the disadvantage of knee and groin pressure sores if used for a long time. Designed by Hugh Owen Thomas (1834 – 1891), Surgeon Liverpool, England.

4. 90-90 Traction

   Skeletal traction by use of a transtibial or femoral condyle pin. It is especially good for subtrochanteric fractures of the femur. The lower limb is suspended with 90^0 flexion at the hip and 90^0 flexion at the knee with the patient in the supine position.

5. Steinmann Pin

Stainless steel rods 2 to 4 mm in diameter for skeletal traction which were described by Fritz Steinmann (1872 – 1932) in 1907. He was a surgeon in Berne Switzerland.

6. Denham Pin

Stainless steel rod 2 to 4 mm with threads on the middle to obtain a better grip on the bone described by Robin Arthur Denham, Orthopaedic Surgeon , Royal Portsmouth Hospital, Portsmouth, Hants, England.

7. Bohler – Braun Frame

A system of splints with transtibial pins for skeletal traction with elaborate pulley systems useful for reducing a supracondylar fracture. It has a disadvantage of knee stiffness

LIST OF APPENDICES

INTRODUCTION

The University Teaching Hospital (UTH) is a 2,000 bedded hospital situated in the Zambian capital, Lusaka and serves as a tertiary referral centre for the whole country. Lusaka has a population estimated now to be 2 million. At the UTH, general surgical units do initial management of most fractures. As such fractures are usually relegated as second priority in preference to associated injuries.

Conservative management is the preferred method of treatment. It is done by the use of tibial pin insertion for skeletal traction and Perkins' exercises, which are commenced as soon as the patient is able to tolerate the pain [1,2].

Conservative management is less preoccupied with mechanical elegance, but allows natural healing processes of the body to occur. It allows you to interfere only when it is absolutely necessary [3].

Fractures of the femur are common in Lusaka, as its population continues to grow rapidly and the road traffic accidents increase, the fracture femurs may increase in numbers. Audit figures for 1996 for one general surgical unit showed 24 fractures of the femur treated by skeletal traction from 2089 surgical operations, representing 1.15 percent (%) [4].

In adults fracture of the shaft of the femur occurs after severe direct or indirect force is applied to the femur and may occur in association with other body injuries. This trauma may be as a result of road traffic accident, fall from height and assault usually with metallic or heavy objects [9].
Fractures of the shaft of the femur are a major source of morbidity in patients with lower extremity injuries. These fractures can be life threatening from extensive haemorrhage into the thigh or from an open wound, fat embolism, adult respiratory distress syndrome or resultant multiple organ failure. Death of a patient with an isolated fracture of the femoral shaft is rare [5], nevertheless after

survival of the initial traumatic moment, many patients suffer significant physical impairment as a result of these injuries [6].

The longest and strongest of the human bones possesses a well - vascularized thick envelope of muscles that promotes rapid fracture healing in most patients. Therefore functional loss does not arise from any inherent problem with fracture healing but rather because of the shortening, malalignment and prolonged immobilisation of the extremity [7].

The art of femoral fracture care is a constant balancing of the goal of anatomic alignment with the need for early function of the limb. George Perkins is quoted as having said you could put any fracture in P.O.P as long as you leave the joints free [15].

MANAGEMENT

(a) Conservative management

Conservative management involves minimally invasive treatment, it can be considered as achieving adequate function with minimal risk. It may be undertaken by skeletal traction, plaster bracing, Thomas splints or application of P.O.P.

Conservative management still retains its attraction due to the fact that perfect reduction was/is considered not necessary in the treatment of femoral fractures of the shaft of the femur and that slight errors in alignment and shortening of the limb are compatible with life and satisfactory function [5].

It is argued that it is not necessary or essential to restore exact anatomy after a fracture and in conservative management this is not sought. Perfect immobilisation is seldom desirable and many fractures may in fact benefit from little movement, which encourages callus formation and union and prevents bone reabsorption at the fracture site [5].

It is also considered that in conservative management,

1. Perfect radiological reduction does not always mean perfect function.

2. Function may be perfect even though reduction is not [9].

At the UTH, conservative management using skeletal traction is undertaken with the use of tibial pin insertion (Denham's and Steinmann's pins as availability dictates) and skeletal traction using between 1/6th and 1/10th of the body weight of the patient.
This method is preferred because it is affordable, requires less specialised skills, and the patients and relatives can be taught the Perkins' exercises and cleaning of the pin tracts [9].

Skeletal Traction

Skeletal traction was the most common method of definitive treatment of the femoral shaft fracture for decades before 1970's. It still remains the method of choice for early fracture care.
Sufficient force can be applied to the limbs to achieve fracture reduction. The skeletal traction pin is most commonly inserted just distal to the tibial tubercle, a relatively subcutaneous area anatomically away from the knee joint and the fractured bone another site to use is the distal femur, it offers a more direct pull but may result in knee stiffness.

Many variations of limb suspension for traction have been devised. Most of them are modifications of the Thomas splint, which may be modified with a Pearson attachment, the Bohler Braun frame, Delorme , the Hogden and associates modification or the 90 to 90 traction. [2].

The results of traction treatment for fractures of the femoral shaft have been acceptable [6,11]. Most current studies report the rate of union of femoral shaft fractures treated with skeletal traction to be between 97 - 100%. Delayed union occurs in up to 30% of cases [6,11].

Perkins' Traction

Perkins' traction is the insertion of a tibial pin (Steinmann or Denham) through the tibia about 2 cm distal to the tibial tuberosity and at a depth of about 2cm posterior to the tibial tuberosity. Perkin's traction works on the principle of traction and counter traction. The traction is supposed to be maintained in a reduced postion after manipulation under general anaesthesia. The fractured ends are supposed to be hitched by removing muscle interposition between the two bony fragments. Counter traction is applied using the weight of the body by elevating the foot end of the bed so that the whole body does not 'follow' the traction thereby causing shortening of the fractured femur. Pulley systems allow the full weight of traction to bear on the fractured ends. Traction can also be provided as a fixed entity as done with Thomas splint.

Perkin's traction is further advantageous because it allows for knee exercised to be done thereby reducing the incidence of knee stiffness.

Adaptations

At UTH adaptations to these principles of skeletal traction are made because of the non-availability of pulley systems, proper weight to be used for traction, proper ropes to be used for suspension of weights, faulty or non-availability of weighing machines, non-availability of check x-rays.

Old x-ray films are used as pulley systems when rolled at the foot end of the bed to overcome friction as the ropes cross the bridge foot end of the bed (see picture index 1 and 2).

Bricks are used for weights and thus weight adjustments are not possible. Counter traction is done by arbitrary raising the foot end of the bed. The normal forward bowing of the femur is maintained by supporting the femur with a sand bag under it.

The tibial pin is then used for skeletal traction by attaching two separate hooks to which a prescribed weight is hung at the foot end of the bed. [See picture index I & II]

The patient is given a Perkins' bed which has two wooden boards and the board at the foot end may be removed to form the pit for the Perkins' exercises which involves knee flexion and extension exercises. Perkins' exercises are done gently initially under supervision, and progress to become vigorous as the patient gains confidence and is more comfortable. Some patients require close supervision and encouragement with Perkins' exercises which is the mainstay in Perkins' traction.

(b) Operative Management

Operative management involves open reduction with intramedullary nailing with Kuntscher [Intramedullary] nail, long plate and screws or external fixation of the fractured femur. It requires specialised skills, expensive implants and carries a risk of sepsis especially with the increased HIV epidemic [28]. In a study at the UTH within a period of 5 years 18 HIV positive patients presented with infections around implants. Of these, 8 patients presented with infections around total hip prosthesis, 6 infected medullary nails, 1 infected plate an infected Smith Petersen hip pin as compared to only 4 HIV negative patients with infected tibial / femoral plates and symptomatic loosening of hip prosthesis. This is strongly suggestive of reduced immune competence being a factor in the increased infection [8].

STATEMENT OF THE PROBLEM

The fractured femur is managed conservatively by Perkins' traction at UTH and this is done usually by general surgical firms.

There are two Orthopaedic units for the 2,000-bed hospital and thus the units are not enough to cover all Orthopaedic problems.

Conservative management using Perkins' traction though safe in less skilled hands has its own disadvantages,

[1] Long hospital stay

[2] Pin tract infection

[3] Shortening of the femur

[4] Residual knee stiffness

These problems compounded with faulty bone drilling instruments for tibial pin insertion, lack or inadequate supply of skin cleaning materials and the fact that tibial pin insertions are done in an emergency theatre adds a further challenge to the problems associated with conservative management of the fractured femur.

AIMS AND OBJECTIVES

1. To study the pattern of fractures among patients presenting at University Teaching Hospital.

2. To document the current trend of management of femoral fractures at the University Teaching Hospital.

3. To identify problems associated with the management of femoral fractures that lead to complications and prolonged hospitalisation stay and recommend ways of reducing these drawbacks as compared to operative management.

RATIONALE

By understanding the shortcomings in the University Teaching Hospital, Lusaka that lead to increased complications following Conservative Management of the fractured femur, it should be possible to reduce complication rates.

LITERATURE REVIEW

Femoral fractures occur after considerable trauma is applied to the body. It is associated with injuries due to severe violence [9,12].

The femoral fractures usually occur after road traffic accident, train accidents, fall from heights, direct trauma in assault, gun shot and other causes [12,29].

Trends

The treatment of femoral fractures has undergone changes in the past 20 - 30 years. The trend has moved from conservative management where tibial pins and balanced traction were used progressively shifting to intramedullary nailing and the use of long plates and screws. The attention was / is focused on the maintenance of an accurate position, rapid mobilisation of the patient and rigidity of position using specialised plates and screws [7,14].

The choice of management in tropical Africa should be a safe and simple technique, which can be used, in inexperienced hands:

(1) Should concentrate primarily on functional recovery and union with minimal angulation.

(2) Should reduce risks of sepsis to an absolute minimum.

(3) Should be affordable

(4) Should be taught to all levels of personnel with confidence and safety [9,15,16].

Advantages of Perkins' traction

[a] Early reduction of pain at the fracture site

[b] Improves alignment of the fractured bones

[c] Encourages blood flow to the fracture site and encourages healing.

[d] Micromotion at the fracture site stimulates bone healing.

[e] Improves knee flexion and reduces stiffness

[f] Strengthens the quadriceps, and the exercises in the sitting position reduces incidences of thrombosis and hypostatic pneumonia.

[g] Makes nursing of patient easier

[h] Corrects rotational deformities

[i] Avoids osteoporosis

Disadvantages of Perkins' Traction

[a] Lengthy hospital stay.

[b] Pin tract infection

[c]. Residual knee stiffness

[d]. Loss of economical activities by the patient.

[e]. Check X-rays to determine the presence of muscle interposition between the fracture may not be available.

[f]. Due to the presence of other acute pathology it is often relegated to a non-priority status in a surgical firm.

Historical Perspective

The history of femoral fracture management reflects the underlying dilemma of complications.

Before the turn of the century, most treatments involved splinting or encasing the thigh in a variety of materials. The early use of the ancient technique of wooden splints wrapped with sinews of leather or fibrous plants [17] and various fabrics encased with wax [18] gave way to bandages, stiffened with gum and more recently fabrics hardened with plaster of Paris [20].

The advent of skeletal radiology at the end of the 19th century clearly demonstrated the mechanical inadequacy of these traditional treatments. In 1907 Steinmann introduced his first traction pin apparatus. The application of Thomas splint, which provides countertraction on the leg through its ring, allowed for improved control of the traction forces.

Early attempts at internal fixation were fraught with serious complications especially infection and implant failure [7].

The modern era of intramedullary nailing was introduced by Kuntscher [21]. His 1939 presentation to the medical society of Kiel of his first case of intramedullary fixation using V-Shaped cross section designed nail was followed four months later by his report of 12 additional cases to the German society in Berlin. The Kuntscher technique for femur nailing has been refined and perfected over the last 40 years.

ANATOMY

THE FEMUR

The femur is the longest bone in the body, it is about a quarter of the human height and the largest long bone, almost 18 inches (45cm) in an average man. It articulates with the acetabulum above, the tibia and the patella at the lower end. It serves as an attachment and origin for muscles. The condyles rest on the tibia as on a horizontal platform. The shaft is slightly convex anteriorly, the head and the neck project upward and medially into the acetabulum [5].

Blood supply

The head and neck receives blood through three sources

(a) The artery of the ligamentum trees

(b) The intramedullary nutrient artery

(c) Three or four synovial retinacular arteries and branches of the femoral circumflex arteries.

The blood supply to the rest of the shaft is through the nutrient artery and the surrounding muscles.

BIOMECHANICS

The femur has strain and stress lines, which run from the acetabulum through the head and neck down the shaft of the femur representing the weight bearing lines. Like most bones the femoral shaft fails under tensile strain [22]. The most common mechanism of injury is a bending load, resulting in transverse fracture. High velocity injuries cause varying degrees of fracture comminution. It has been estimated that 250 Newton metres of bending force are needed to fracture

a normal adult femoral shaft [23]. Additional force is dissipated on the soft tissues. Pathological bones are more prone to spiral fractures following minor torsional loads. Such fractures are rarely comminuted nor associated with significant soft tissue damage. The femur is normally loaded in compression, bending and torsion. Bending and torsion loads generate a combination of tensile, compressive and shear stresses on the bone compared to other internal and external fixation devices intramedullary nails are closer to the centre of motion of the loads and are subjected to lesser loads [22,23].

CLASSIFICATION

There is no universally accepted classification scheme for fractures of the femoral shaft. Most investigators categorise fractures according to specific variables that directly influence their preferred treatment. Such factors as soft tissue injury, geographic location, fracture geometry, comminution and associated fractures are most often employed when classifying these fractures [7].

Femoral fractures can be broadly separated into 3 groups

1. Upper one third of shaft of femur in which the proximal fragment is flexed by the Iliopsoas muscles, abducted by the gluteal muscles and everted by the external rotators.

2. The middle one third fractures have an added backward angulation of the distal fragment due to the weight of the limb and shortening due to the pull of the strong quadriceps and the hamstrings.

3. The lower one third fragment is adducted by the adductor magnus, pulled proximally by the hamstrings and quadriceps femoris and everted by the weight of the limb.

Open fractures are classified using the standard grades used in the GUSTILLO-ANDERSEN classification [27].

Shortening may be produced by:

(a) Initial injury

(b) Muscular pull

(c) Bleeding leading to increase of girth and thus reduction of length by sliding of the fractured fragments.

PATIENTS AND METHODS

Forty six adult patients with fractured shaft of the femurs were selected for inclusion in the study. Patients were included as they presented and no randomising was done. The patients included were those who gave written or verbal consent to be part of the study. Patients below the age of 18 years and those with fractures of the neck of the femur were not included. Pathological fractures were also not included. To avoid ethical and medicolegal implications it was found necessary not to interfere with the unit instruction on the conservative management. General anaesthesia was used in most of the cases for the pin insertions.

TRACTION

At the UTH, Perkins' traction is done as a modification of the original method by George Perkins. Two independent cords with an initial weight were fixed to the foot end of the patient's bed. Old X-ray films were rolled to the bar at the foot end of the bed and used as pulleys to reduce friction between the ropes and the metal bar. Limb measurements were done 2 weeks, 4 weeks and 6 weeks.

EXERCISES

Exercises were started as soon as the patients were comfortable, this was usually in the first week of skeletal traction. Leg length measurements and the amount of knee flexion in the exercises were supervised by Physiotherapists. All patients were taught how to clean pin tracts and a 1 litre IV fluid bag was inserted under the fractured femur to maintain the normal femoral bowing.

FOLLOW UP

- Real limb length measurements at 2,4 and 6 weeks.
- Measurements of knee flexion were done at 2,4,6 weeks and at discharge.
- Filling up of the proforma.
- X-ray done only when indicated.

RESULTS

A total of 46 adult patients with fractures of the shaft of the femur were entered in the study at the end of 13 months.

Of the 46 patients 3 were not included in the final data analysis due to lost documents leaving 43 patients for data analysis. There was one mortality due to other associated injuries. A Data mastersheet was made. [See appendices 3,4 and 4].

CAUSES OF THE FRACTURES

TABLE I

Causes	Patients	%
Rta	31	72.1
Fall	6	14.0
Bullet	4	9.3
Object	1	2.3
Assault	1	2.3
TOTAL	**43**	**100**

Road traffic accidents were the most common cause of the fractured femurs in this study contributing to about 73% of the patients. Of the patients who had Rta as a cause of fracture; 20 were passengers, 6 were drivers and 5 were pedestrians.

AGE

TABLE II

		Years
1.	Average age	33.8
2.	Minimum	18
3.	Maximum	72
4.	Median	27
5.	Mode (Most frequent)	26

All 43 patients entered were male patients.

TABLE III

Left side	31	-	72%
Right side	12	-	28%
TOTAL	**43**	**-**	**100%**

Of the 43 patients, left-sided fractures of the femur were more than the right. Thirty one fractures were on the left side. No bilateral fractures were encountered in the study.

FRACTURE GEOGRAPHY

TABLE IV

Type	No.Pts	%
Upper 1/3	19	44.2
Middle 1/3	11	25.6
Lower 1/3	11	25.6
Segmented	2	4.6
TOTAL	**43**	**100**

Of the 43 patients, 13 had closed fractures and of these 10 were comminuted. Ten patients had open fractures and of these 7 were comminuted.

All patients with fractures of the upper 1/3 were discharged walking with crutches non weight bearing. The average hospital stay was 7 weeks.

The average hospital stay of patients with fractures of the lower third of the femur was 8 weeks. One of these patients required further surgery.

Two patients had segmented or unspecified fractures.

FRACTURE GEOMETRY

TABLE V

Geometrical Type	No. Pts	%
Spiral	4	10
Transverse	16	37
Oblique	7	16
Multiple	16	37
TOTAL	**43**	**100**

Femoral fractures fail with a bending load on the tension side and are commonly transverse fractures.

Thirty-seven percent of the patients had multiple fractures, which could not be classified as simple, transverse, oblique or spiral.

INITIAL SHORTENING [cm]

TABLE VI A

Length in cm	No. Pts.
0 – 2	06
3 – 4	16
5 – 6	14
Above 7	07
TOTAL	**43**

RANGE OF INITIAL SHORTENING

TABLE VI B

Lengths	No. Pts
0 - 4cm	21
5 - 8cm	17
Above 8 cm	04
TOTAL	**42**

Twenty-one Patients had initial shortening of more than 4cm at the time of injury.

ANAESTHESIA USED

TABLE VII

Type	No. Pts	%
General	33	77
Local	10	23
TOTAL	**43**	**100**

General anaesthesia was more commonly used.

EQUIPMENT FOR TRANSTIBIAL PIN INSERTION

TABLE VIII

Type	No. Pts.	%
Hand drill	38	88
Hammer	3	7
Jacob's chuck	2	5
TOTAL	**43**	**100**

Hand drill was the commonest used tool for pin insertion.

WEIGHT FOR PERKINS' TRACTION

TABLE IX

Average	6.1
Minimum	4
Maximum	8
Mode	6

Six-kg was used in 36 patients [84%]. One brick is taken to be equivalent to 1 kg (6kg ≈ 6 bricks)

PERKINS' EXERCISES

TABLE X

Time Started	No. Pts
Within 7 days	20
Within 14 days	16
After 14 days	06
Mortality	01
TOTAL:	**43**

Thirty - six patients started Perkins' exercises within 2 weeks of tibial pin insertion.

ALLUS FORMATION

ABLE XI

Period	No. Pts.	%
Within 4 weeks	19	45.3
Within 6 weeks	14	33.3
Over 7 weeks	9	21.4
TOTAL	**42**	**100**

irty - three patients had palpable callus within the first 6 weeks of Perkins' traction.

CLINICAL UNION [WEEKS]

TABLE XII

Average	8.4
Minimum	4
Maximum	22
Median	8
Mode	6

Twenty-six patients had clinical union within the first 8 weeks and 13 had within 12 weeks. Only 3 patients had no union within the 12 weeks.

COMPLICATIONS

1. PIN TRACT INFECTION

Twenty one of the patients had pin tract infection from mild to severe associated with loosening of the pin. Of the 21 patients thirteen were rested from doing Perkins' exercises and given antibiotics. Six had removal and re-insertion of the pin at a later date. While six had removal followed by skin or boot traction.

2. SHORTENING AT LAST FOLLOW UP

TABLE XIII

Length [cm]	No. Pts.
0 - 2	22
3 - 4	15
5 - 6	3
Above 7	2
TOTAL:	**43**

Eighteen patients had shortening of more than 2cm.

3. **KNEE FLEXION**

TABLE XIV

Range	No. Pts.
0 – 45 Degrees	14
45 – 90 Degrees	28
TOTAL	**42**

The average range was 57 degrees. Twenty-eight patients out of 44 had knee flexion of between 45^0 to 90^0. Twenty-two out of 42 patients had knee flexion of 70^0 or more.

HOSPITAL STAY RESULTS

TABLE XV

Weeks	No. Pts
0 - 4	1
4 - 6	15
6 - 12	20
> 12	7
TOTAL:	**42**

Average hospital stay 8.5 weeks

HOSPITAL STAY (Continued)

TABLE XVI

Time	No. Pts
Minimum	0
Maximum	22
Median	8
Mode	6

The longest period for the patient's stay in the hospital was not more than 12 weeks. Seven patients had severe associated injuries and 4 patients required corrective intramedullary nailing for malunion or severe shortening.

Twenty-eight patients were seen in the surgical clinical follow up. Of the 28, only 2 were walking without clutches at 12 weeks after fracture. Twenty six patients were walking with clutches on partial weight bearing, 15 patients were lost to follow up after 12 weeks for unknown reasons.

DISCUSSION

Fractures of the shaft of the femur in adults above 18 is a common occurrence and contributes to almost 25% of the bed space in a general surgical ward. Fractured femurs continue to increase in numbers as the population of the country increases at a 3.6% growth rate [3]. Urbanisation and increased economic activities which go with it such as street vending and increase in road traffic accidents, all contribute to the high incidence of the fractured femur.

In this study all the patients were male adults because the female patients who qualified for the study were treated by operative means and some did not give their consent for inclusion in the study.

Most femoral shaft fractures are sustained in young male adults in high energy injuries such as motor vehicle accidents, falls from heights or gunshot wounds [7]. This trend seems to be due to the fact that most are occupational injuries sustained by drivers and builders falling from heights.
It was found that road traffic accidents contributed 72 % of the causes of the fractures of shaft of the femur and of these, 20 were passengers, 6 drivers and only 5 were pedestrians involved in road traffic accidents and sustaining fractures of the femur. Most femoral fractures sustained by young adults are due to high velocity injuries such as RTA [3].

Thirty - one patients had fractures of the left side of the femur, this was about 72%. It was difficult to explain this finding except to include that most of the fractures in patients involved in road traffic accidents were passengers. In Zambia driving is done on the left side of the road and drivers are on the right side of the car. It may also be that most motor vehicle accidents or collisions tend to occur on the side further away from the driver!

The geographical distribution of the fractures of the shaft of the femur was similar to previous studies done by Bewes et al [24]. They found that 21 patients out of 40 were in the upper 1/3, 8 were in the middle 1/3 and 11 were in the lower 1/3. In this study there were 19 [44%] patients with upper 1/3 fractures, 11 [26%] upper 1/3, and 11 [26%] in the lower 1/3. Five percent had segmented fractures of the shaft of the femur.

The 19 patients who had fractures of the upper 1/3 represent 44.2% of all patients. Their average hospital stay was about 9 weeks, none of these patients required further operative management. The patients were discharged on crutches, non-weight bearing.

These results compare well with other series in Africa where they found the hospital stay of patients with fractures of the middle 1/3 to be about 7 weeks [9]. Patients with fractures of the lower 1/3 of the femur had an average hospital stay of 8 weeks. The other 10 patients were discharged on crutches, non-weight bearing.

The distribution of the fractures of the shaft of the femur showed that most fractures were closed 33 [77%]. Out of the 33, 10 were comminuted fractures. Ten [23%] patients had open fractures of the shaft of the femur and of these 7 [70%] were comminuted. Comminuted and open fractures are usually due to high-energy injuries of the fractures of the shaft of the femur such as Rta, fall from height and bullet wounds. Pathological fractures of the shaft of the femur on the other hand rarely show any comminution [6,7,25].

Transverse and multiple fractures of the shaft of the femur contributed a total of about 32 patients [74%], spiral and oblique fractures 11 [26%]. Spiral and oblique fractures occur when a rotational force is applied to the shaft of the femur [7,26].

Conservative management of the fractures of the shaft of the femur aims at reducing the initial shortening seen at the time of admission. The average shortening at time of admission was 5.3 cm

and 21 patients had initial shortening of more than 4cm at the time of admission. Shortening occurs due to the strong pull of the quadriceps femoris and the hamstrings on the distal fragment which is pulled proximally [9,24,25]. This amount of shortening would cause a patient to walk with a short limb gait and may later cause osteoarthritis of the hip joints and would impair the active, productive life of the patient. Since manipulation of the fragments is not done at the time of transtibial pin insertion. This shortening should be reduced by skeletal traction of the weights and counter traction of the body [24].

Thirty-three patients had transtibial pin insertion under general anaesthesia as opposed to 10 [23%] under local anaesthesia. In contrast to this study, most investigators advocate the use of local anaesthesia for pin insertion [10,24]. General anaesthesia was used in most cases because

[1] Patients preferred to sleep during the pin insertion

[2] Non availability / inadequate supply of lignocaine.

[3] Use of blunt Steinmann's or Denhams pins, malfunctioning handdrills, and use of a hammer for pin insertion leads to a lot of fidgeting by the operators which can cause pain and distress to the patient if not done under general or spinal anaesthesia.

Thirty-five patients regardless of their individual weights and regardless of the geometry of the fractured femur had 6 kg used for their skeletal traction, this is due to logistical problems of having no weighing scales in the wards and the weights used are old bricks. These bricks are in bags, which are then hung at the end of the ropes.

Weight adjustments are thus difficult as you can only add or subtract a brick or half a brick to add or reduce on the traction. One brick is approximately 1 kg in weight.

Check X - rays were too expensive for most of the patients and sometimes not available due to other problems in the X - ray department.

following prolonged traction and in that study no patient achieved more than 90 degrees flexion. The loss of the knee flexion has been noted by several other investigators [2,11]. In contrast full range of knee motion after some time on traction has been reported by other workers [7].
Serious associated injuries were noted in 7 patients and one mortality was recorded.

Twenty-seven patients were in hospital for more than 6 weeks with an average of 8.5 weeks. Other investigators report an average stay of 8 weeks [2,9,24]. This length of stay is considered lengthy especially that fractures of the shaft of the femur occur in young male adults at their prime of productive and active life.

CONCLUSIONS

1. Road traffic accident is the commonest cause of fracture of the shaft of the femur at University Teaching Hospital.
2. Fractures of the upper 1/3 of the femur are the commonest.
3. Transverse fractures represented more than 74% of all the fractured femurs
4. The average hospital stay of patients with fractured shaft of the femur treated by Perkins' traction is 8.5 weeks.
5. Pin tract infection is a major problem in patients at the University Teaching Hospital. Fifty percent of the patients had infected pin tracts in this study.
6. Shortening is a major problem. This study shows 50% of the patients had shortening of more than 2cm.
7. General anaesthesia was the common form of anaesthesia for transtibial pin insertion.
8. Most of the fractures seen were closed and non - comminuted.
9. Perkins' traction gives acceptable results with regard to knee movement.
10. Fractures of the shaft of the femur are common in young male adults.

RECOMMENDATIONS

1. Most fractures of the shaft of the femur treated by conservative means should be managed by Perkins' exercises.

2. Regular limb length measurements and check X - rays with adjustments to traction can reduce the complication of limb shortening.

3. To reduce the length of hospital stay for patients on Perkins' traction the following should be instituted.

   [i] Teaching medical workers, patients and attending relatives the meticulous care of the pin tract.

   [ii] Regular and supervised Perkins' exercises after explaining the importance and benefit of Perkins' exercises to patients and relatives. Nursing patients on Perkins' traction in the same cubical or ward would greatly motivate them in doing Perkins' exercises.

   [iii] In the absence of check X- rays, real limb measurements and weight adjustments within the first 48 hours would reduce length limb shortening and encourage good callus formation and enhance fracture healing.

   [iv]. Patients should be encouraged to start Perkins' exercises early.

GUIDELINES FOR CARE OF THE PIN TRACT

Introduction

More than half of the patients with transtibial pins have pin tract infection as shown in this study. This leads to suspension of the Perkins' exercises and sometimes removal of the transtibial pin, which leads to prolonged hospital stay of patients with fractures of the shaft of the femur.

In the UTH, Perkins' Traction of the femur still remains the first choice in the treatment of the fractures of the shaft of the femur.

In order to reduce the incidences of pin infection and thus reduce hospital say it is recommended that the following steps should be taken:

(a) Technique transtibial pins should be inserted under local or general anaesthesia in a clean theatre.

(b) Meticulous care in skin preparation should be taken and skin should be clean with savlon, iodine and spirit. Pre-drilling should be encouraged.

Cleaning

(a) Pin insertion sites should be cleaned by the nurses/doctors on the first few days in order to teach the patient and relatives how to clean the pin tracts. The scab that forms when blood clots would be carefully removed for good aeration, and drainage of the pin tract.

(b) The pin insertion sites should be cleaned with normal saline or methylated spirit.

(c) The pin insertion site should be cleaned at least two times a day.

(d) Pin insertion sites should be left exposed.

Signs of Pin Tract Infection

(i) Pain when doing Perkins' exercises.

(ii) Increasing discharge initially serosanguinous but may change to pus discharge.

(iii) Evidence of inflammation.

Treatment of Pin Tract Infection

(i) Rest from exercises and clean pin tract thoroughly.

(ii) Pus swab should be taken and then patients should on broad spectrum antibiotics.

(iii) If infection has not resolved in 48 –72 hours transtibial pin should be removed.

(iv) Infection should be controlled completely before another pin site is chosen for transtibial pin insertion.

REFERENCES

1. **Winnant E.M.** The use of skeletal traction in the treatment of fractures of the femur. *Journal of Bone and Joint Surgery.* 1946; **31 A:** 87 – 93.

2. **Buxton RA.** The use of Perkins' traction in the treatment of fractures of the femoral shaft. *Journal of Bone and Joint Surgery.* 1981; **63B:** 326 – 366.

3. **Robert Bucholz and Robert.J. Brumback**. Fractures of the shaft of the femur In: Charles A. Rockwood jr., David Green., Robert W. Bucholz. Eds *Rockwood and Greens Fractures in Adults.*Philadelphia J.B Lippincott company, 1991; 1653 –1714.

4. *Departmental Morbidity and Mortality Audit:* White Firm. University Teaching Hospital Department of Surgery, Lusaka 1996.

5. **Paul J. Cregg**. Fractures and dislocations of pelvis and lower limbs: In: Charles V. Mann, R.C.G Russel and Norman S. Williams eds. *Bailey and Love's Short Practice of Surgery,* London; Chapman and Hall Medicals. 1995; 242-252.

6. **Hubbard M.J.S.** The treatment of femoral shaft fractures in the elderly. *Journal of Bone and Joint Surgery*1974; **56B:** 96 – 104.

7. **Kolmert L. Wuff.** Epidemiology and treatment of distal femoral fractures in adults. *Acta Orthop. Scandinavia* .1982**; 53 (6):** 957 – 962.

8. **J.E Jellis.** Orthopaedic Surgery and H.I.V disease in Africa. *International Orthopaedics* 1990; **20:** 253 – 256.

9. **Peter Bewes**. Fractures of the shaft of the Femur. In: Maurice King, Peter Bewes eds. *Primary Surgery Volume 2: Trauma,* London. Oxford University Press1987; 313-321.

10. **I.G Stother.** External fixation of femoral shaft fractures. *Proceedings of the Association of Surgeons of East Africa.* 1989; **12:** 75-77.

11. **Denker H.** Shaft fractures of the femur; A comparative study of the results of various methods of treatment in 1003 cases. *Acta. Scandinavia* 1965; **130:** 173 – 184.

12. **J. Carbelledo, R.Fisher, J. Lungu and C. Omar.** High velocity gun shot injuries of the femur. *Proceedings of the Association of Surgeons of East Africa*, 1992; **15**: 54-56.

13. **C. Korea.** Subtrochanteric fractures of the femur. *Proceedings of the Association of Surgeons of East Africa,*1992; **15:** 68-69.

14. **John Crawford Adams.** Pelvis, thigh and knee In: John Crawford Adams eds *Outline of Fractures*, London; Churchill Livingstone, 1991; 218-228.

15. **P.C Bewes.** The ideal splint. *Proceedings of the Association of Surgeons of East Africa* 1981; **4:** 185 – 188.

16. **B.A Da Costa. K. C Rankin.** Cast bracing for femoral shaft fractures. *Proceedings of the Association of Surgeons of East Africa,* 1982; **5:** 158 – 164.

17. **Fang H, Chew Y.** The integration of modern and traditional Chinese medicine in the treatment of fractures. *Chinese Medical Journal* 1964; **83:** 411 – 418.

18. **Adam F** (trans). *The genuine works of Hippocrates.* Baltimore, Williams and Wilkins. 1939.

19. **Smith G.E.** *Ancient Egypt and the origins of civilisation.* 1923; London, Harper.

20. **Mathysen A.** *Du Bandage platre et de son application dans le treatment des fractures, liege.*1854.

21. **Kuntscher G.** The intramedullary nailing of fractures *Clinical Orthopaedics* 1968; **60:** 5-12.

22. **Evans F, Pederscu H.** The role of tensile stress in the mechanism of femoral fractures. *Journal of Bone and Joint Surgery,* 1951; **33A:** 485 – 501.

23. **Kyle R.F.** Biomechanics of intramedullary nailing fracture fixation. *Orthopaedics* 1985; **8:**1356 – 1359.

24. **P.C Bewes.** Perkins' traction for fractured femur. *Proceedings of the Association of Surgeons of East Africa,* 1979; **2:**17-19.

25. **Jeshrani M.K, Bencivega A. Mbindyo. B.S, Heda PM and Gakuu. LM.** The management of post traumatic limb length discrepancies. *Proceedings of the Association of Surgeons of East Africa,* 1982; **5:** 181 – 186.

26. **Stuart D.** Management of lower limb fractures by functional cast bracing. *Proceedings of the Association of Surgeons of East Africa,* 1979; **2:** 182-185.

27. **Gustillo R.B, Anderson J.T.** Prevention of infection in the treatment of 1025 open fractures of long bones. Retrospective analysis. *Journal of Bone and Joint Surgery* 1976; **58 A:** 453 – 458.

28. **Jellis J. E Regisford C.** The impact of HIV infection in orthopaedic practice. *Proceedings of the Association of Surgeons of East Africa.* 1990; **13:**44- 50.

29. **De Palma A.F.** Fractures of the shaft of the Femur. In: De Palma A.F ed. *The management of fractures and dislocations volume 2* Philadelphia. W. Saunders Company. 1959; 666-676.

PROFORMA

Index 7

1. Hospital
2. Name
3. Age 4. Sex 5. Weight
6. Date of Admission 7. Date of Fracture
8. Cause of injury,

   RTA/ Falls/ Assault/ Any other.
9. Type of fracture,

a Upper 1/3 / Middle 1/3 / Lower 1/3.

b. Open / Closed

c. Comminution, Yes / No

d. Spiral, Transverse, Oblique

10. Displacement, Yes / No
11. Limb shortening (cms)
12. Operation, MUA/ No MUA
13. Date of operation
14. Pin inserted using

    Hand drill/ Drill Jack/ Hammer/ Other methods.
15. Initial traction weight
16. Skin preparation,

    Savlon/ Iodine/ Spirit/ Normal Saline

17. Date Perkins' exercises started

18. Pin tract infection, Yes/ No

19. Treatment,

    (a) Rest + Antibiotics + Cleaning,

    (b) Removal of pin,

    (c) Re insertion of pin traction

20. Wound cleaning by,

    (a) Nurses,

    (b) Patient

    (c) Relatives

    (d) Doctors

21. Wound cleaning with

    (a) Spirit,

    (b) Iodine,

    (c) Savlon,

    (d) Normal Saline

OUT COME

At 2 weeks

(a) Union / No union

(b) Limb Shortening Yes / No

(c) Knee Bending in degrees

At 4 weeks

(a) Union / No union

(b) Limb shortening Yes / No

(c) Knee bending in degrees

At 6 weeks

Clinical union date.....

Mobilisation Total weight, date.....

Full weight bearing date....

Discharge date.....

Length of hospital stay....

Reviewed in clinic date.....

Final Assessment at 12 weeks

Requiring further surgery

Good outcome

Residual disability

Knee stiffness

Appendix 6

CONSENT FOR OPERATION

UNIVERSITY TEACHING HOSPITAL / KATETE St. FRANCIS HOSPITAL.

TO: MEDICAL STAFF AND COMMITTEE OF MANAGEMENT

I.....

.....

OF .....

Hereby consent to the operation of .....

to be performed on .....

The effect and nature of which have been explained to me.

I also consent to such further or alternative operative measures as may be found to be necessary during the course of such operation and to the administration of a local or other anaesthetic for any of the foregoing purposes.

I understand that an assurance has not been given that the operation will be performed by a particular surgeon.

Dated this..... day of .....

Signed .....

Witness .....