A REVIEW OF MANAGEMENT OF FEMORAL NECK FRACTURES IN KENYATTA NATIONAL HOSPITAL

BY

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2. DECLARATION

This is a dissertation that is my original work, and has not been presented for a degree in any other University.

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DEDICATION

To:
My wife Alice, our children Dennis and Derrick and my brother Gideon for the support I got from them during the study.

AKNOWLEDGEMENTS

My foremost thanks to my supervisor Prof. J.A.O. Mulimba who guided me and availed his time for criticisms, corrections and encouragement.
I would also like to thank my teachers and colleagues who were of great help during this training period.

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4. SUMMARY

This was a 6-month cross-sectional prospective study carried out in Kenyatta National Hospital between January 2006 and June 2006. The aim of the study was to determine the age and sex distribution, mechanisms of injury and methods of management of femoral neck fractures seen in Kenyatta National Hospital over this period of time. The authority of the ethical committee was sought and received. Under the guidance of the supervisor suitable patients were selected according to the set out criteria from the orthopaedic wards. The data was collected from them by the principal investigator with the help of colleagues in the orthopaedic wards.

A total of 67 patients were included in the study during the study period. The age range was between 18 and 85 years(mean 53) for the males and 50 to 95 years(mean 67.8) for the females. Forty-eight (71.6%) were males and 19(28.4%) females. Out of the males 31 patients had severe trauma, 16 minor trauma(spontaneous fractures) and 1 pathological fracture, the females 15 had minor trauma, one major trauma and 3 pathological fractures. Thirty-six(53.7%) were managed conservatively(traction) and 32(46.2%) operatively(open reduction and internal fixation). Out of the ones managed operatively 10(32.3%) had multiple screws, 11(35.5%) dynamic hip screw, 3(9.7%) angle plate, 7(9.7%) arthroplasties .

Most of the male patients were in the age group 18-50 years and the injuries were due to severe trauma(road traffic accidents) while majority of females were >60 years with mainly spontaneous fractures. There were more males than females and majority(>50%) of the patients were managed conservatively.

5. INTRODUCTION

The neck of the femur joins the head to the body and greater trochanter of the femur. It meets them posteriorly at a prominent, rounded ridge(the intertrochanteric crest) which extends from the greater trochanter above to lesser trochanter below. Anteriorly, the neck meets them in a rough intertrochanteric line which extends downwards from the greater trochanter and turns backwards on the inferior surface towards the posteriorly situated lesser trochanter. It forms an angle of approximately 125 degrees with the body of the femur (the angle is less in women than in men and greater in children). The structure of the head and neck of femur is developed for the transmission of body weight efficiently, with minimum bone mass, by appropriate distribution of the bony trabeculae in the neck. Fractures of the neck of femur involve the region ranging from the greater trochanter to the head of femur. It is divided into intracapsular and extracapsular fractures. The intracapsular fractures (also called high fracture neck of femur) are anatomically divided into subcapital, transcervical and basal fractures. The extracapsular fractures are all grouped as trochanteric fractures of various types.

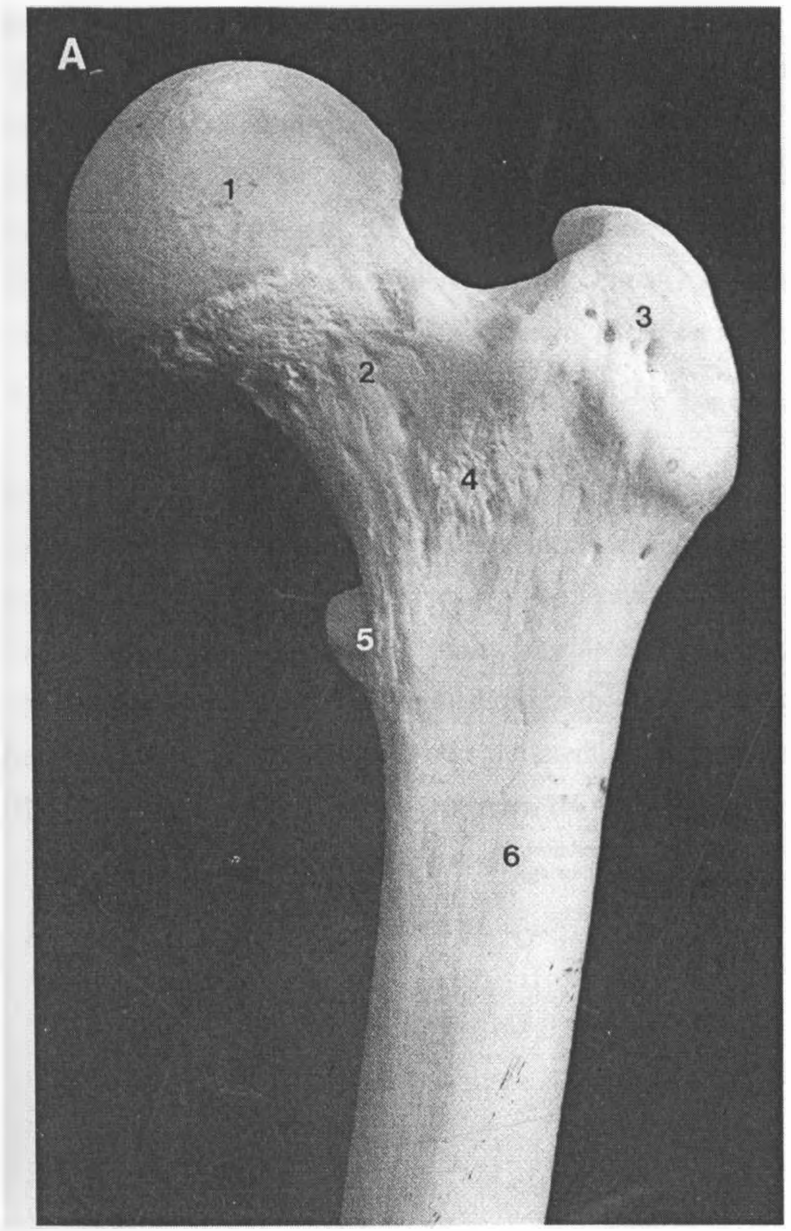


Diagram 1

1.Head 2. Intracapsular neck region 3. Greater tronchanter 4. Extracapsular neck region 5. Lesser trochanter

Incidence and Mechanism

These fractures are common in the elderly especially females in whom they are associated with minor domestic trauma. This is because the bones are osteoporotic with weakened femoral neck. There is now evidence that these fractures are due to fatigue of the bones in these patients. Hip fractures are among the most devastating medical problems experienced by the elderly. The incidence increases exponentially after the age of 70 years. With the increasing number of the elderly population in our set up there has been gradual increase in the number of patients with fracture neck of femur .

In our set up there has been an increase in the incidence of femoral neck fractures in the young adults as a result of road traffic accidents and sports injuries. These occur following severe violence applied in the long axis of the femur so as to shear the femoral neck. These fractures are associated with dislocation of the hip especially in young adults.

The fracture may result either from indirect at the hip due to tripping over something on the floor and falling or direct violence over the lateral aspect of the hip by a fall on the side.

Hip fractures in children make less than 1% of all children's fractures.

6. LITERATURE REVIEW

HISTORICAL BACKGROUND

The evolution of management of femoral neck fractures reflects the evolution of fracture surgery. Femoral neck fractures and complications were defined, classified, and then reclassified by various workers and writers.

In 1823, Cooper described the physical and anatomical findings of femoral neck fractures and observed that they were frequently complicated by non-union and avascular necrosis [1]. Following the advent of the radiographs in early 1900s, low-energy fractures were further classified as being either abduction or adduction fractures [2]. Abduction fractures correspond to Garden stages I and II. Adduction fractures correspond to Garden III and IV [2]. The significance of this classification was that the patients with abduction fractures were noted to have a better prognosis, in that their fractures would heal with prolonged bedrest [2].

In 1911, Cotton modified the management of femoral neck fractures based on whether the fracture were the abduction or adduction type [3,4]. He converted adduction fractures into abduction fractures by closed manipulation hence improving prognosis. The patients were then put on bed rest and casting but this was associated with complications of prolonged bedrest and casting and loss of reduction hence increasing morbidity [3,4]. To counter these problems, surgeons attempted internal fixation . However, the technique was not in general use until Smith- Peterson, in 1937, reported his method and results of open reduction and fixation with a triflanged nail [5,6]. Johanson, Thornton, and Jewett improved upon Smith-Petersons concept by introducing a cannulated triflange nail, thus making closed nailing practical, adding a side plate, and increasing the strength of the nail-side-plate combination by manufacturing it in one piece [6,7].

The management of selected femoral neck fractures with hemi-arthroplasty further decreased postoperative morbidity due to loss of fixation and avascular necrosis. In 1943, Moore described a stainless steeel prosthesis that was used to replace a proximal femur [7]. The Judet brothers developed an acrylic hip prosthesis. Garden further classified femoral neck fractures and found that certain fractures had an extremely high incidence of avascular necrosis [7]. His classification system is used as the basis for determining whether to treat the fracture with

fixation or hemiarthroplasty [8]. Hemiarthroplasties were further modified by adding a second bearing surface . These bipolar prostheses decrease the incidence of acetabular protrusion. Other forms of classification of femoral neck fractures include structural and Pauwel's classifications as given in the literature later.

ANATOMY

The three important anatomic considerations of femoral head and neck fractures are the intracapsular location of the fracture, the degree of osteopenia, and the blood supply of femoral head.

The intracapsular location means that the fracture site is bathed in synovial fluid that lyses the fracture hematoma, thus decreasing healing potential. Intracapsular hematoma increases intracapsular pressure, resulting in avascular necrosis.

Osteopenia leads to loss of fixation and, therefore, is a relative indication for hemiarthroplasty.

Disruption of the vascular supply to the femoral head results in avascular necrosis. The blood supply to the femoral head is given in the literature later. Fracture neck of femur is one of the commonest fractures in the elderly especially females above the age of 65 years of age [9,10]. They usually present with history of trivial trauma or spontaneous onset pain in the hip region and inability to walk.

It is important to note the blood supply of the femoral neck since this has serious implications to the healing of the fracture. The proximal end of femur has got blood supply from three main sources:- 1) extracapsular arterial ring located at the base of the femoral neck 2) ascending cervical branches of the arterial ring on the surface of the femoral neck 3) arteries of the ligamentum teres. The extracapsular arterial ring is formed posteriorly by a large branch of medial femoral circumflex artery, and anteriorly by a branch of the lateral circumflex artery. The ascending cervical branches or retinacular vessels ascend on the surface of the femoral neck in anterior, posterior, medial and lateral groups, with the lateral group being the most important. Their closeness to the surface of the femoral neck makes them susceptible to injury in femoral neck fractures [11,12].

The subsynovial articular ring penetrate the head and are called epiphyseal arteries, with the lateral epiphyseal group being the most important supplying the lateral weight bearing portion of the femoral head [11,12].

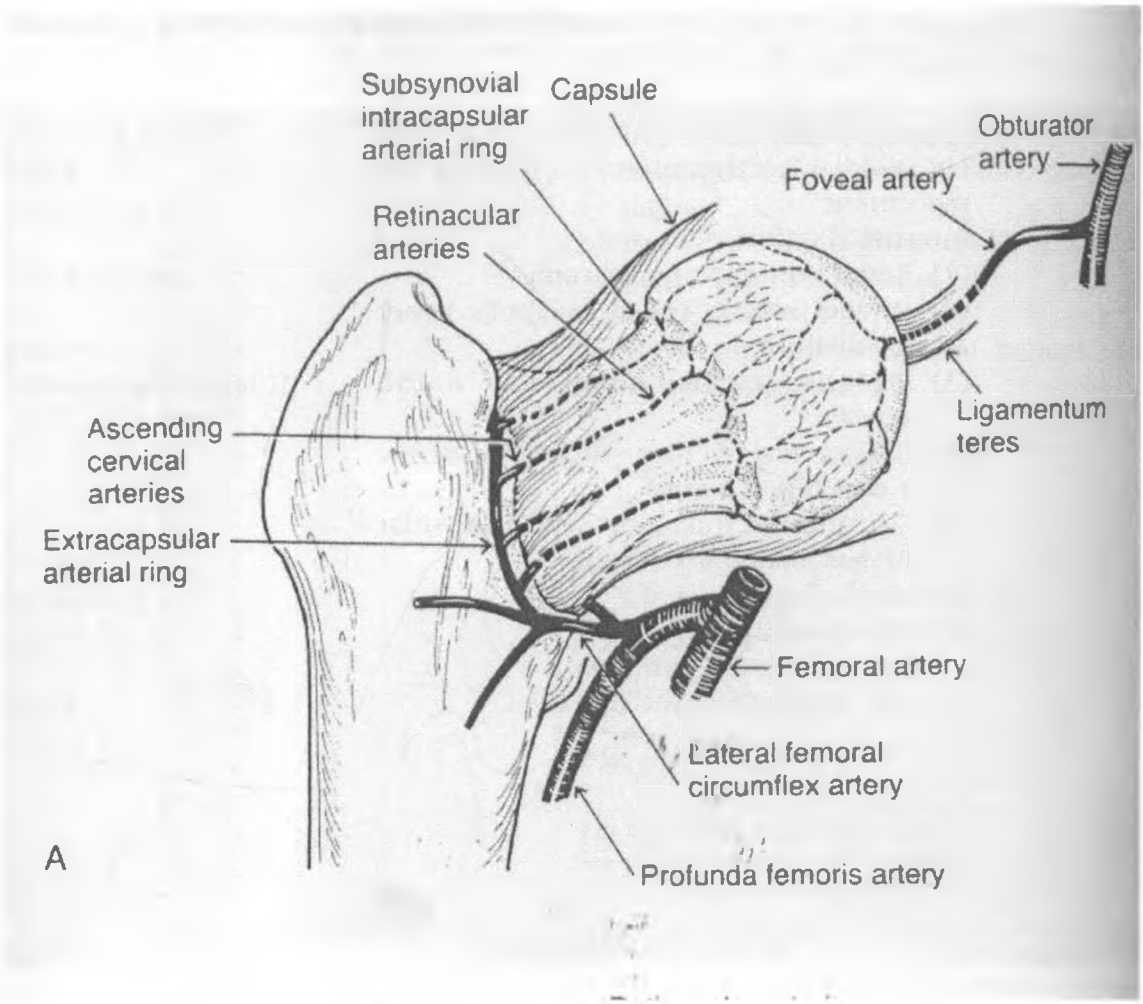


Diagram 2. Vascular anatomy of the femoral head.

Causes of femoral neck fractures include traumatic [13,14], stress(fatigue)[15], pathologic[15] and post-irradiation fractures [16].

In the clinical presentation, the patients are usually elderly females presenting with a painful hip after trivial trauma like a fall in the house. They are unable to stand up after the fall, occasionally they may be able to walk with some pain in the hip (especially imparcted fractures) and diagnosis is only made on X-ray. On examination the limb will be in external rotation and shortened by 2-3 cm. On palpation, there is tenderness over the anterior and lateral aspects of the hip joint. The greater trochanter is elevated on the injured side. All the movements are extremely painful, especially rotatory movements.

Diagram 3. X-ray showing fracture neck of femur.

The fractures can be classified into three categories:- Structural, Pauwel's and Garden's classifications[17]. The structural classification is divided into three groups: Impacted fractures, undisplaced fractures and displaced fractures [17,18]. Impacted fractures are crushed together so that the fracture trabeculae and the cortex of the neck are pushed into the soft trabeculae bone of the head. This imparts stability at the fracture site hence the patients may be able to walk and is an indicator for conservative treatment [17,18,19]. The undisplaced fractures are prone to displacement and requires internal fixation. For displaced fractures adequate reduction, impaction and internal fixation is required if union is to be achieved [19].

Pauwel's classification of displaced femoral neck fractures is based on the angle of inclination of the fracture line across the neck, with type 1 being more horizontal and type 3 more vertical with non-union common in type 3. In type 1 Pauwel's angle is less than 30 degrees, type II the angle is between 30 to 70 degrees and type III the angle is more than 70 degrees and the fracture line is nearer the vertical. Garden's classification is the most widely used and is based on the degrees of displacement. Stage 1 incomplete or impacted fracture, stage 2 complete fracture without displacement, stage 3 complete fractures with partial displacements, stage 4 fracture fragments are completely displaced.

Diagram 4. Pauwel's classification of fracture neck of femur

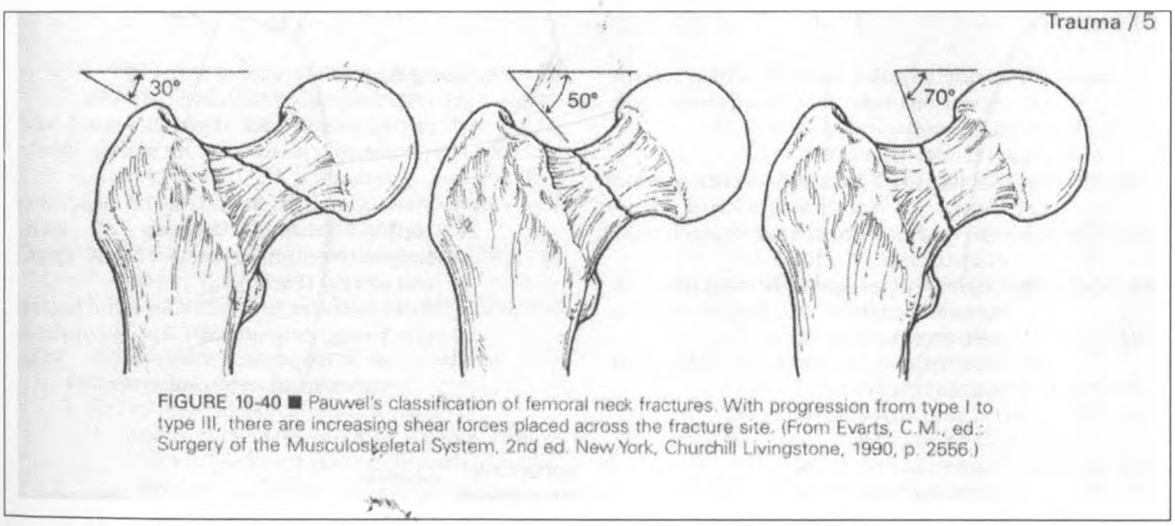


FIGURE 10-40 ■ Pauwel's classification of femoral neck fractures. With progression from type I to type III, there are increasing shear forces placed across the fracture site. (From Evarts, C.M., ed.: Surgery of the Musculoskeletal System, 2nd ed. New York, Churchill Livingstone, 1990, p. 2556.)

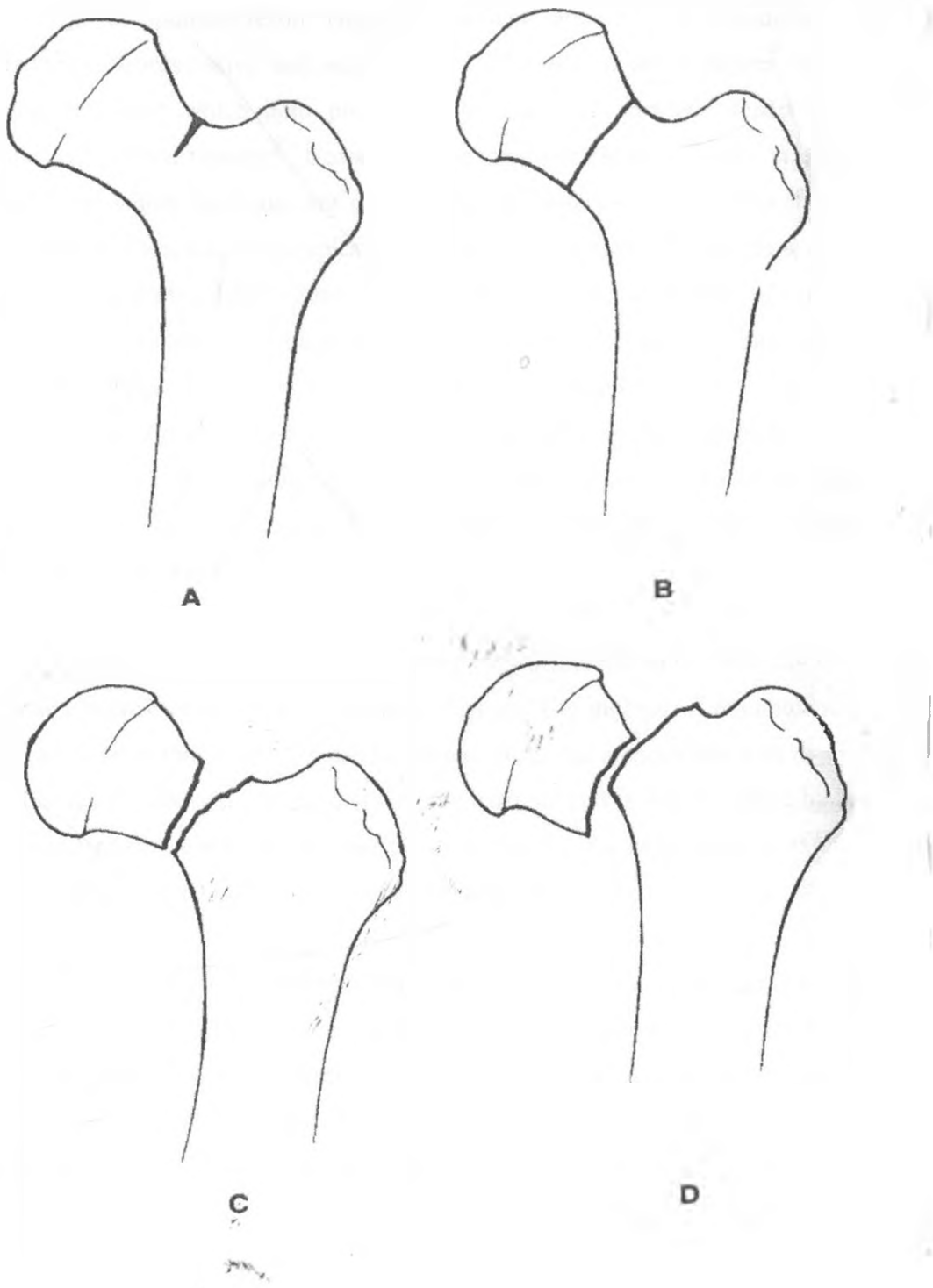


Diagram 5. The Garden classification system: (A)Stage I, (B)stage II, (C)stage III, (D)stageIV.

Fracture neck femur is an orthopaedic emergency which needs to be reduced and fixed within 24 hours to get an optimum result. There are two main methods of management of femoral neck fractures:- Conservative and surgical [22,25]. The aim of the treatment include early anatomical reduction which help prevent further vascular damage, Impact of fracture fragments and internal fixation[23]. Conservative management is used mainly in children and young adults in whom the bones are not osteoporotic or in cases of Garden stage 1 and 2 fractures and involves use of hip spica and traction. Skin traction for children and skeletal traction for 12 weeks in adults[24]. Since fracture neck of femur is a problem of the elderly the preferred method of management is perfect anatomical reduction and rigid internal fixation[25]. Reduction can either be by closed manipulation or open reduction[26]. With the later being preferred method. If two attempts of closed reduction fail, then the surgeon has to resort to open reduction to achieve anatomical positioning of fracture followed by internal fixation[26]. The reduction has to be confirmed by anterosposterior and lateral views on the image intensifier before internal fixation.

Most femoral neck fractures can be reduced by closed manipulation. This has to be done under image intensifier followed by internal fixation. The method of manipulation is that preferred by the surgeon. Reduction can be carried out by the manoeuvres with the hip in the extended or fixed positions. The most commonly used method is that described by Whitman and involves traction on the limb in extension, followed by internal rotation in extension and abduction followed by abduction and internal rotation.

The most preferred method of management of femoral neck fractures is open reduction and internal fixation[26]. Currently various methods and appliances are available for internal fixation of femoral neck fractures. The following basic principles of pre-operative preparation, reduction of fractures, adequate radiographs, surgical exposure and insertion of internal fixation are common to many of the techniques[26].

In the open reduction, the lateral approach is the method commonly used and a hockey stick incision is made and the capsule is opened and the fracture reduced under direct vision.

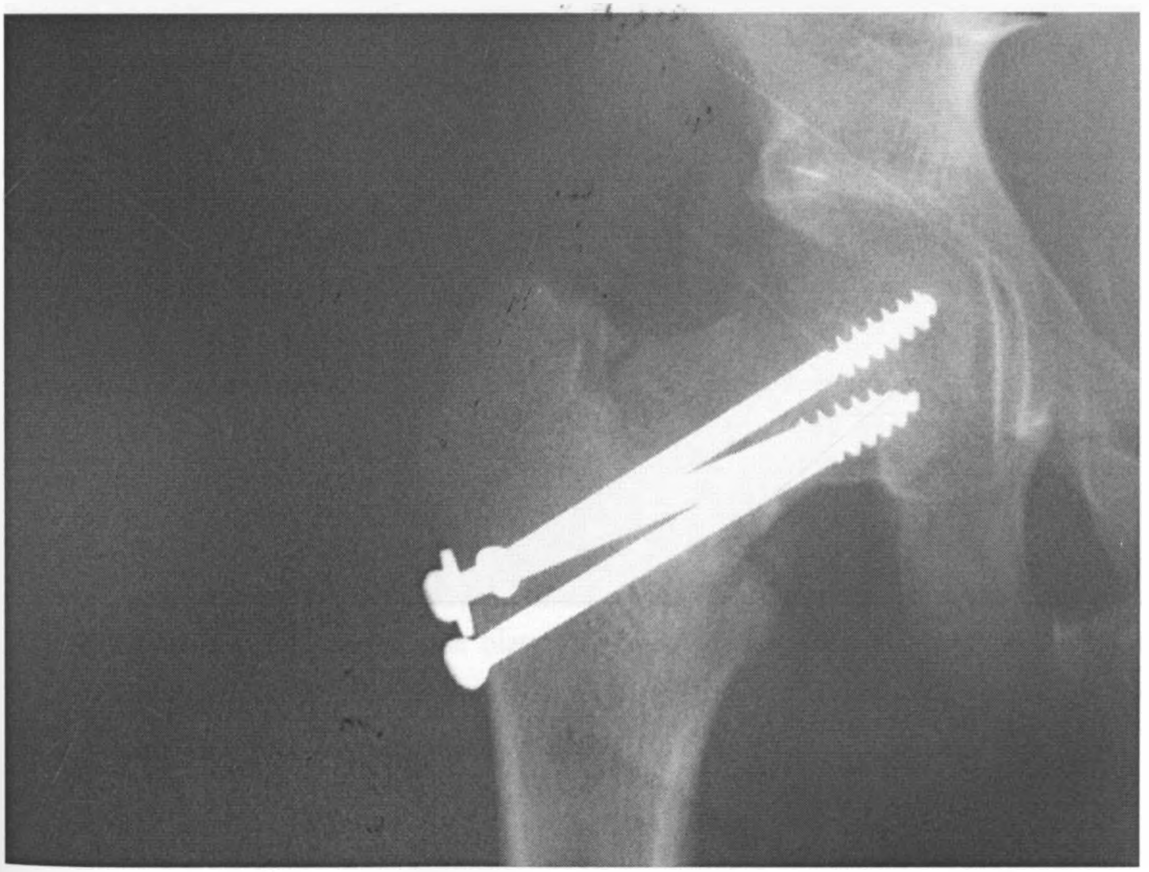
There should be adequate facilities of taking radiographs in the aterioposterior and lateral planes and therefore image intensifier fluoroscopy is required[26].

In children the fracture is reduced by manipulation and the leg immobilized in full plaster spica in abduction for 8 – 10 weeks. When indicated internal fixation can be done with multiple Austin Moore pins [27,28].

Various methods of internal fixation are currently available depending on the type of fracture and choice of the surgeon. They are broadly classified into three categories: - 1) multiple screws or pins [27,28] 2) fixed angle blade plates [31,33] 3) collapsible pin or compression screw and blade plate combinations (Dynamic hip screws) [24].

Fixation with percutaneous Knowle's (Moores) pins is commonly used in patients with severe medical conditions and the very old patients who cannot withstand general anaesthesia hence use of local anaesthesia or for impacted or undisplaced fractures[29].

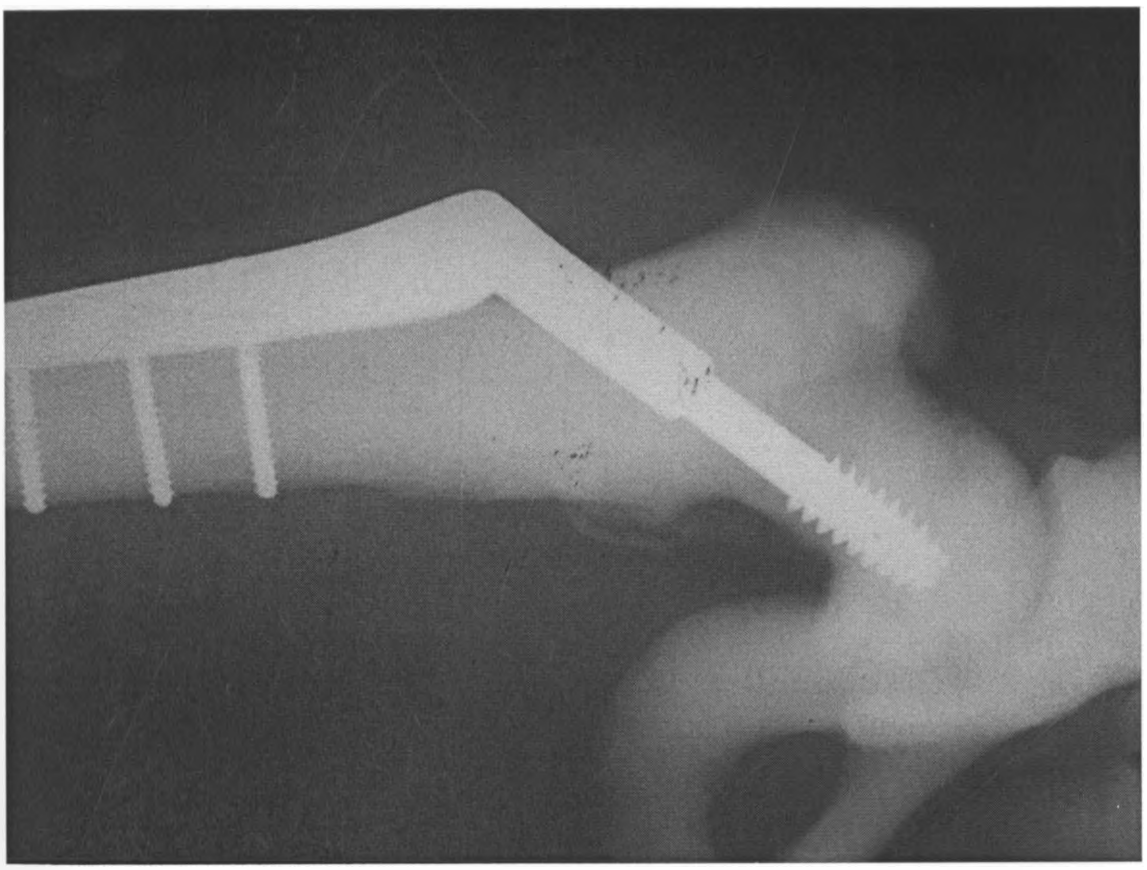
Diagram 6: X-ray showing femoral neck fracture treated with multiple screws.



Internal fixation using compression hip screw and plate (Dynamic hip screw) [35,36]: - For maximum impaction of femoral neck fractures several collapsing or sliding fixation devices

i.e. compression screws have been developed. These traverse the trochanteric area and neck into the head of femur with the base attached to a side plate along the trochanter and proximal shaft to better distribute the forces on the implant [35,36]. These implants allow fracture fragments to impact under the action of the surrounding muscles and weight bearing. It consists of a side plate and a base inside which the end of a large femoral head screw slides. When tightened, a smaller screw inserted through the side plate into the end of the large lag screw impacts the neck and head fragments firmly together [35,36].

Diagram 7 X-ray showing dynamic hip screw



Peripherally placed pins and a side plate (Deyerle):- These allow for absorption of the femoral neck which is a common feature in fractures of neck of femur but they allow for some rotation hence the fracture is not fixed rigidly [34].

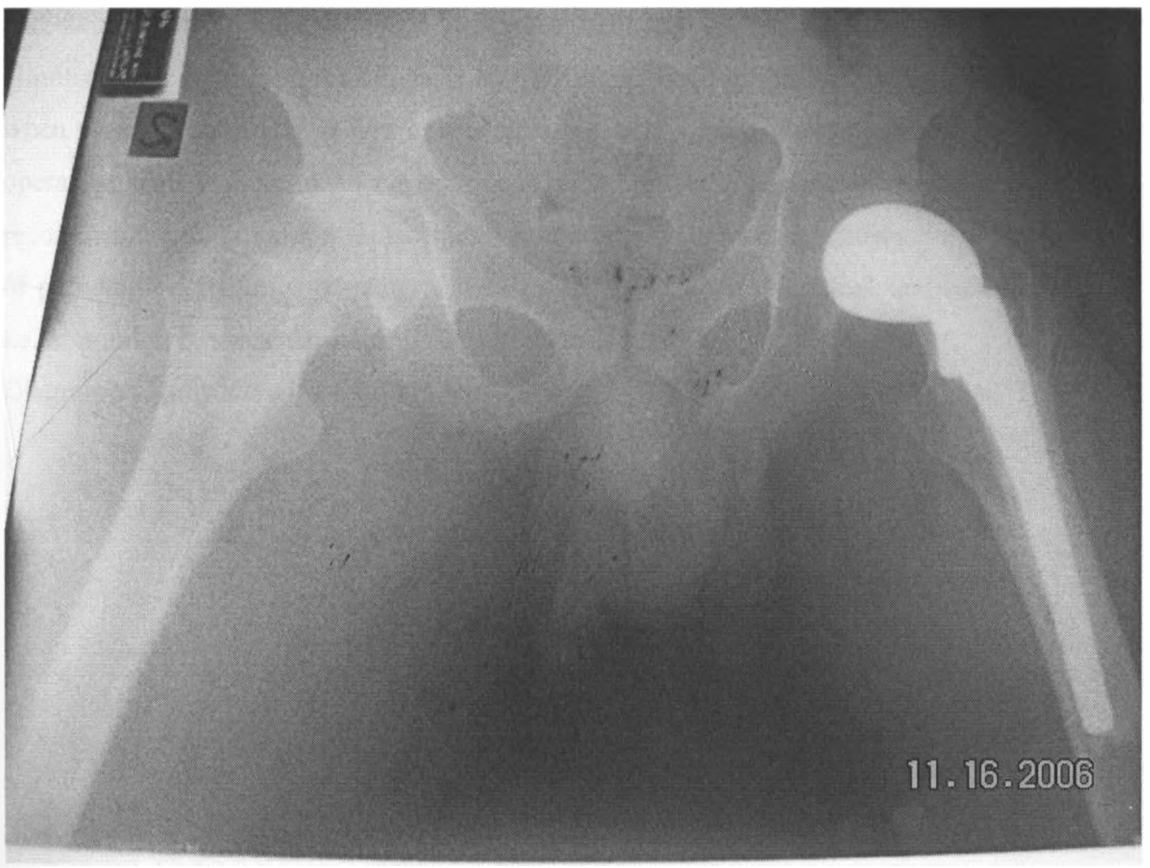
Treatment of femoral neck fractures with a muscle pedicle, bone graft and internal fixation:- This is indicated in displaced fractures of femoral neck. Open reduction and internal fixation is done with a cancellous bone grafting to the posterior neck defect and a muscle pedicle graft

slotted into the posterior head and fixed to the posterior neck. It is also indicated in cases of severe vascular compromise of the femoral head [37].

Other methods of management of femoral neck fractures:-

Half replacement arthroplasty (Hemiarthroplasty) with or without cement [38,39], this involves prosthetic replacement of the femoral head and is commonly used in cases of non-union and avascular necrosis of femoral head. It involves removal of the femoral head and neck and replacement by a metal prosthesis inserted into the medullary canal and fixed with bone cement [42,43].

Diagram 8. X-ray showing fracture neck of femur fixed with hemiarthroplasty



Bipolar (biarticular) replacement arthroplasty, this is a modification of hemiarthroplsty in which the femoral head is enclosed within a loosely fitting plastic-lined cup. This is to reduce wear of the acetabulum by pressure against it by the metal head [40].

Excision arthroplasty (Girdlestone pseudoarthrosis) [41], the head and neck of femur are excised and the side wall of the pelvis is smoothened by removing the upper margin of the

acetabulum. A flap of muscle usually gluteus medius is interposed as a cushion between the shaft of femur and the pelvis, this creates a false joint which is painless and has some range of movement but with shortening and instability. It is commonly used as an alternative operation in cases of deep infection secondary to open reduction and internal fixation or hemiarthroplasty[41].

Total hip replacement (THR):- this involves the replacement of the femoral head and acetabulum with a prosthesis. Some surgeons prefer this mode as the primary treatment of femoral neck fractures especially in the elderly with severely osteoporotic bones[44]. The main advantages is that it allows immediate weight bearing to return elderly patients to activity and help avoid complications of prolonged bed stay. Also as a primary procedure it eliminates the complications of avascular necrosis and non-union [44]. The disadvantage is that when there is mechanical failure or infection, the salvage procedures become difficult and the operation itself is more extensive than open reduction and internal fixation [44]. It is therefore recommended that total hip replacement should only be done as a primary procedure in cases of pathological fractures of femoral neck or failure of open reduction and internal fixation i.e. non-union or avascular necrosis [44,45].

Diagram 9. X-ray showing total hip replacement

Complications of femoral neck fractures

Since the femoral neck fractures is predominantly a problem of the elderly the most common complications are those associated with immobility and prolonged bedstay i.e. deep venous thrombosis, pulmonary embolism, pneumonia, urinary tract infections, bedsores, muscle wasting, severe osteoporosis and senile dementia [46].

The specific complications include: non-union, avascular necrosis and osteoarthritis [46]. Non-union and avascular necrosis of the femoral head are the two major complications of displaced type III and type IV fractures [46]. Non-union is defined as the presence of clinical signs of instability at the fracture or pain in the hip requiring further surgery [51]. The persistence or increase in fracture gap, sclerosis of the margins of fracture, alteration in the orientation of the screws in relation to the bone or a change in the orientation of the two fracture fragments [51]. Avascular necrosis is defined as the appearance of subchondral sclerosis or presence of segmental collapse [51].

The blood supply of the femoral head is as stated above in the literature. In fractures of the femoral neck the nutrient vessels are severed, some capsular vessels are also affected and the higher the fracture the more severe the interruption thus the viability of the femoral head only depends on the vessels of the ligamentum teres which may not be adequate. This leads to the death of bone cells (avascular necrosis) and failure to unite and collapse of the bone structure and fragmentation of the head followed by degenerative arthritis later in life [47].

Non-union occurs in approximately 1/4 to 1/3 of all cases of fracture neck treated by internal fixation.The common causes of non-union include: avascular necrosis, incomplete immobilization, flushing of fracture haematoma by synovial fluid especially in intra-articular fractures[50].

There are cases of failures following internal fixation of fractures of the neck of femur. These include 1) infection 2) loss of fixation 3) non-union 4) avascular necrosis.

Infection after internal fixation of femoral neck fractures is always very serious and leads to significant compromise of hip function. The incidence varies from 1% to 14%. Several factors contribute to this. Most of these patients are geriatric with attendant lowered immunity. They may also have other diseases such as diabetes or infection in other organs [52]. Incisions for hip surgery are near the perineum and thus easily contaminated. Intraoperative wound contamination from wide exposure and prolonged operating time and postoperative haematomas are other factors. Disorientated patients may remove dressing hence contaminating the wound directly. Infection should be suspected if a patient complains of persistent pain in the postoperative hip, particularly on movement, elevated erythrocyte sedimentation rate, reduced joint space on X-rays, progressive loss of bone density in head, neck or the acetabulum or loosening of internal fixation. There may be no classical signs of infection like fever, chills, or redness. Aspiration of the hip allows for early response to drainage and antibiotics. Deep infections present with all the cardinal signs and symptoms of acute infection and requires aggressive early treatment with drainage and antibiotics. If the infection involves the hip joint the internal fixation should be removed with the femoral head and the limb put on traction to maintain the length and reconstruction done later [52].

7. THE STUDY

AIMS AND OBJECTIVES

General

To determine the age and sex distribution, mechanisms of injury and management modalities of femoral neck fractures at Kenyatta National Hospital.

Specific

1) To determine the age and sex distribution of femoral neck fractures
2) To determine the mechanisms of injury.
3) To compare different management options available at Kenyatta National Hospital.

8. RATIONALE

With increasing life expectancy and motor accidents in our set up, there has been a gradual increase in the number of patients presenting with femoral neck fractures. Femoral neck fractures have always presented great challenges to orthopaedic surgeons and remains a difficult fracture in terms of management and healing. Since most of the patients are geriatric with the attendant complications of old age like osteoporosis, hypostatic pneumonia , urinary tract infections and medical conditions i.e. diabetes mellitus and heart diseases, this requires that the modality of management to be used should take these factors into consideration by reducing period of bedstay. It is also important that the method of management should allow early mobilisation to avoid complications of prolonged bedstay in the elderly and allow early return to work in the young and productive age group. The method of management should also take into account the extent of injury (displacement, communication), the availability of facilities (personnel, equipments and implants), the skill of the surgeon and the cost of the implants.

This study therefore intends to determine the age and sex distribution, mechanisms of injury and adequacy of management of femoral neck fractures in Kenyatta National Hospital.

Study question

Is fracture neck of femur being managed adequately at Kenyatta National Hospital? (In comparison to the international standards)

9. METHODOLOGY

STUDY AREA AND POPULATION

The study was conducted in Kenyatta National Hospital in the Orthopaedic wards. Duration of data collection was between January 2006 and June 2006.

The participants in the study were all patients admitted with confirmed clinical and X-ray diagnosis of femoral neck fractures during the period.

Study design

This was a six month cross-sectional prospective study.

Inclusion criteria

1) All the patients who were admitted during the study period.

2) Informed consent.

Exclusion criteria

1) Declined consent

2)The mechanism of injury not known.

3)The patients whose ages could not be determined.

Sample size

The sample size was estimated using the formula developed by Kish and Leslie.

$$n = \frac{Z^2 1 \times P(1-P)}{D^2}$$

n = Sample size to be determined

P = Expected prevalence of the event to occur

Z = Standard errors from mean corresponding to 95% level of confidence (1.96)

D = Absolute precision (0.05)

Estimated prevalence of fracture neck of femur in KNH is 4.6% from the random sampling of the patients in the orthopaedic wards, therefore taking P to be 0.046; then

$$n = \frac{(1.96 \times 1.96) \times 0.046(1-0.046)}{(0.05)^2} = 67.4$$

Sampling Procedures

This was performed by including all patients who satisfied the inclusion criteria and were admitted within the study period. History and physical examination findings were obtained from the patients records.

The X-ray of the hip joint both anteroposterior and lateral views were taken to confirm the diagnosis.

Data collection

This was by the principle investigator with the help of colleagues in the relevant units by history taking , physical examination, confirming the diagnosis by x-ray examination and reviewing the mode of treatment offered. The attached questionnaire was then completed for each patient.

Data management

This was by the principal investigator. Tables have been made from the results obtained and statistics limited to calculation of percentage.

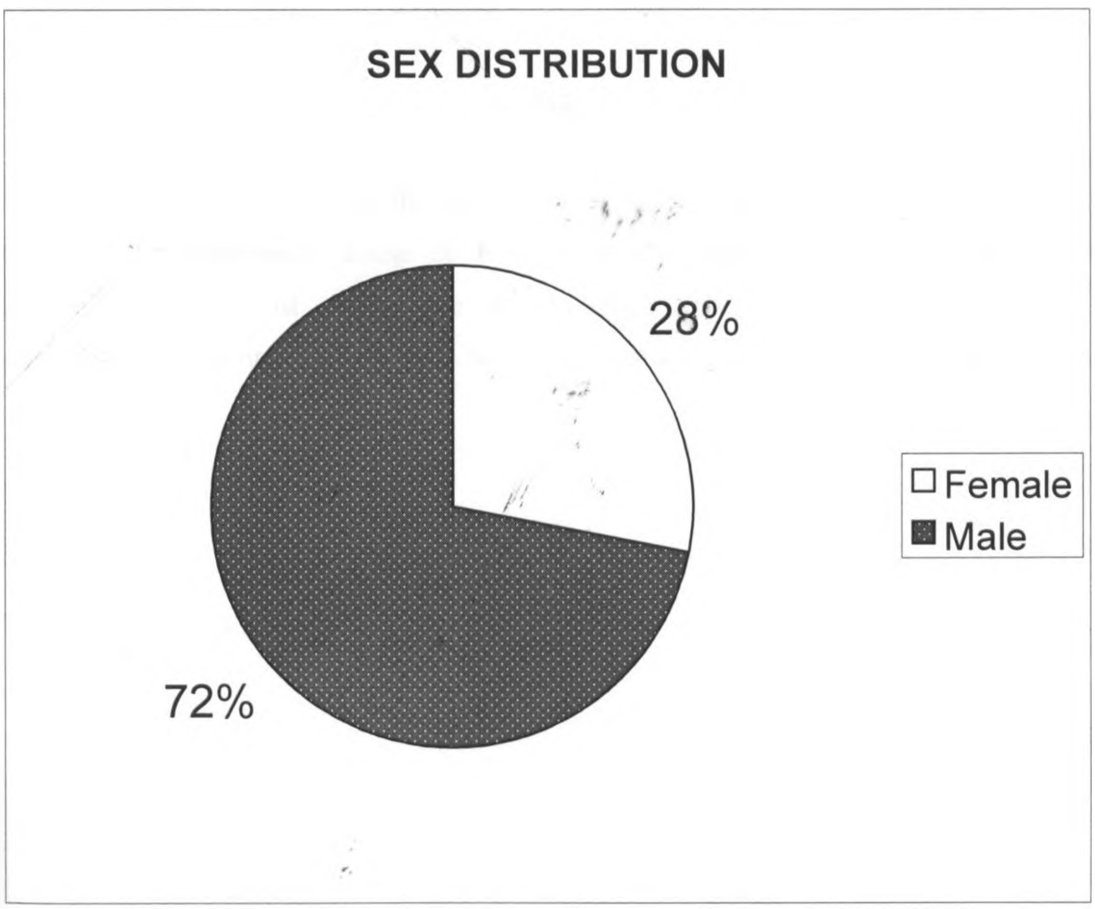
Study limitation

1. Late referral i.e. time interval between injury and referral
2. The long duration of time taken from the time of admission to surgery hence difficulty in follow up. Most of the patients stayed for long on conservative treatment(traction) before being taken for surgery making it difficult to have clear distinction between those managed conservatively and operatively.
3. The duration of stay in the training do not allow for long follow-up of the outcome of treatment.

10) RESULTS

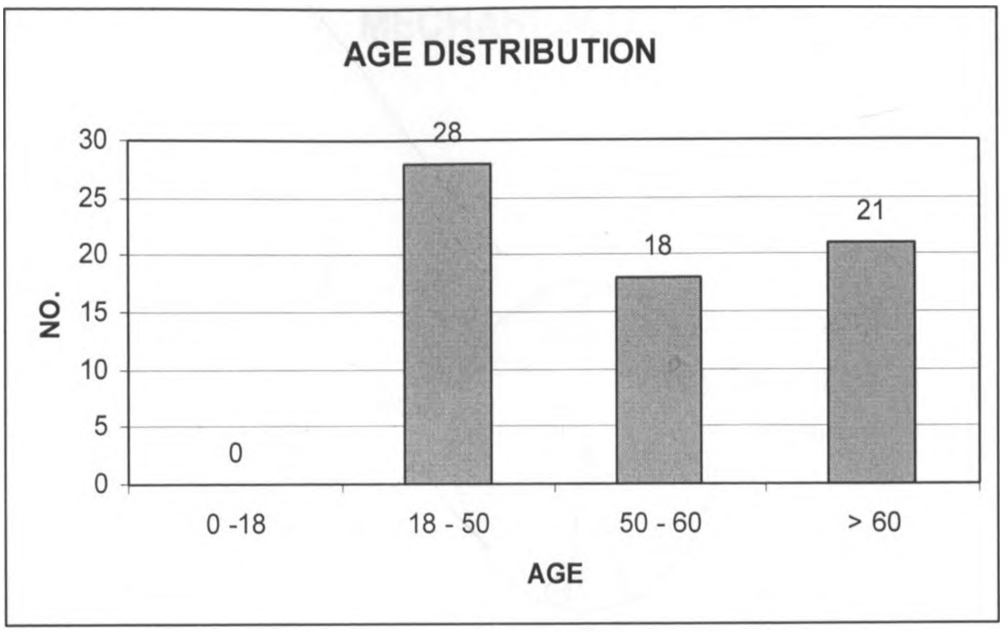
A total of 67 patients with fracture neck of femur were admitted in Kenyatta National Hospital between January 2006 and June 2006. The age range was between 18 and 85 years (mean 47.5) for males and 50 to 95 years(mean 67.8) for females respectively. There were 48(71.4%) males and 19(28.4%) females. Among the males 31 patients had severe trauma, 16 minor trauma and 1 pathological fracture and females 15 had minor trauma; 1 major trauma and 3 pathological fractures. Thirty-six patients were managed conservatively and 31 operatively. Out of those managed operatively 10 had multiple screws, 11 dynamic hip screws, 3 angle plate , 7 arthroplasties.

FIGURE 1: Sex distribution.



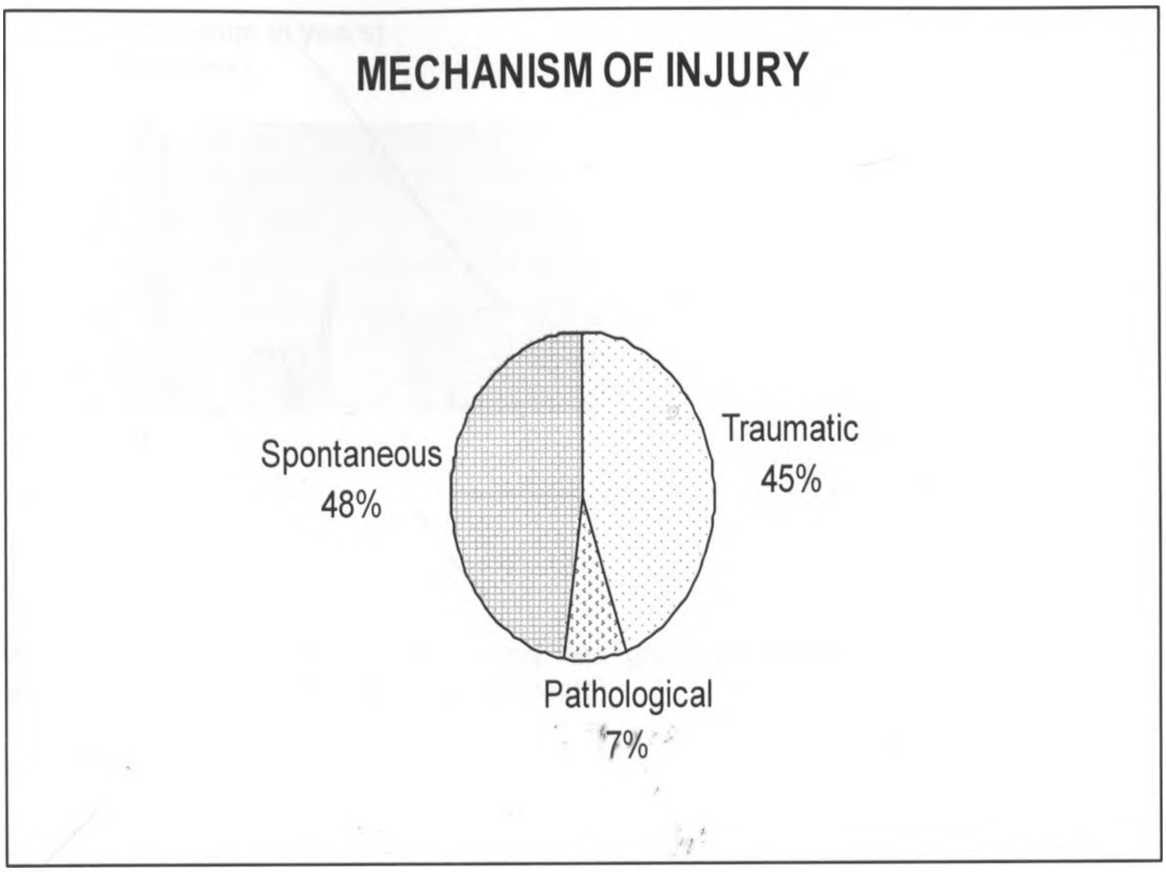
More males 48(71.6%) were affected than females 19(28.4%). This is because most of the patients were in the young age group consisting predominantly of males. Most of the admissions in the orthopaedic units were males.

FIGURE 2: Age distribution.



Most of the patients were in the age range of 18-50 years. This was attributed to the fact that the commonest cause of femoral neck fractures was road traffic accidents and this is the most active age group hence exposure to injuries. Majority of admissions in the orthopaedic units were the young age group i.e. <50years of age.

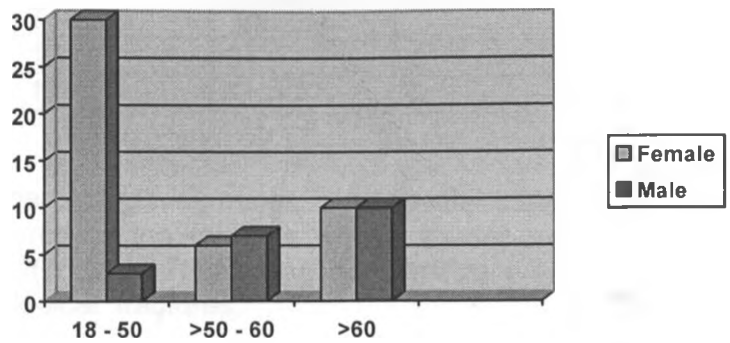
FIGURE 3: Mechanism of injury



Spontaneous fractures (non-traumatic) contributed the majority with 47.8% with the age range of 60 years and above , females more than males. Traumatic fractures 44.8% and pathological fractures 7.5%. The spontaneous fractures (trivial trauma) were due to osteoporosis and increased fragility of the bones in old age. The pathological fractures were due to malignancies either primary or secondary in the old and chronic osteomyelitis in the young age groups. One patient was noted to have Parkinsonism.

Age range & sex & numbers

X – axis (Age range in years)
Y – axis (Numbers)



Most of the males were in the young age group(18-50years) while the females were mainly the elderly(>60 years).

TABLE 1: Sex Vs Mechanism of injury.

Sex	Minor Trauma	Major Trauma	Pathological	Total
M	16	31	1	48
F	15	1	3	19

The percentage of males with severe trauma(50%) was much higher compared to the females whose injuries were mainly due to minor trauma(78.9%). There was no significant sex difference between those with pathological fractures.

TABLE 2: Age Vs Mechanism of Injury for males and females

Age(Yrs)	Minor	Major	Pathological
18 -50	M – 2	24	2
	F -	1	-
>50 – 60	M – 3	5	-
	F – 4	-	3
>60 yrs	M – 11	-	-
	F – 11	-	-

TABLE 3: Age Vs method of management

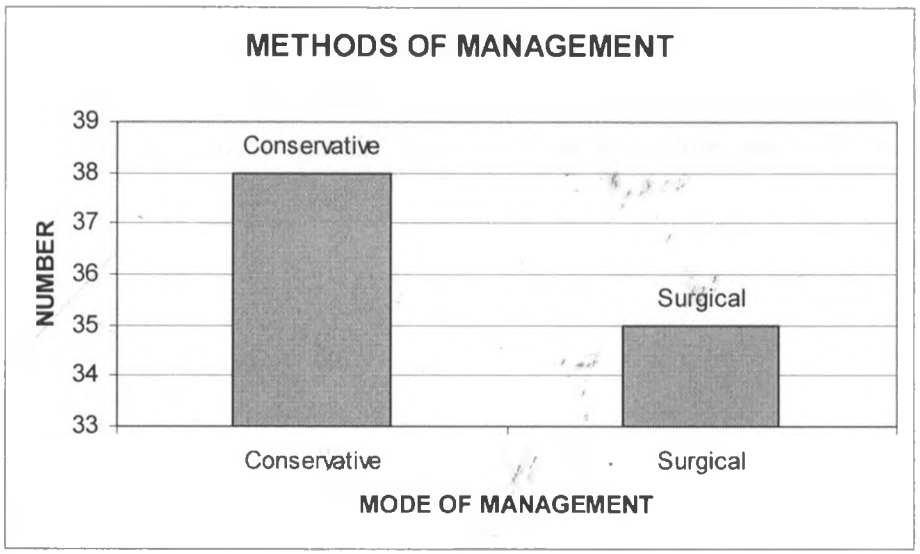
Age (Years)	Conservative	Operative	Total
18 – 50	18	13	31
>50 – 60	9	6	15
>60	11	10	21

In all the age groups most of the patients were managed conservatively.

TABLE 4: Sex Vs method of management

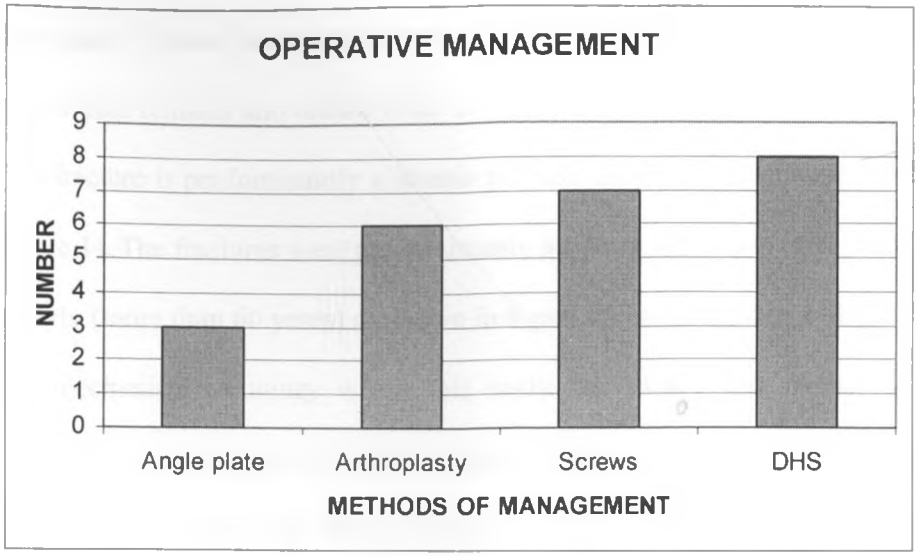
Sex	Conservative	Operative	Total
Male	29	18	47
Female	9	11	20

More females were managed operatively(57.9%) as compared to the males (38.2%)



Majority of the patients were managed conservatively 36(53.7%) while 31(46.2%) were treated surgically.

FIGURE 6: Methods of operative treatment.



Dynamic hip screw was the commonest operative procedure done followed by multiple screws since most patients were the young age group. Arthoplasties especially total hip replacement was the most preferred procedure especially in the elderly.

11) DISCUSSION

The study shows that femoral neck fractures at Kenyatta National Hospital occurs in more males than females and unlike what is in the literature and the developed world where this fracture is predominantly a female problem due to the postmenopausal osteoporosis (see figure 1). The fractures were predominantly in young age group (18 – 50 years) more than the elderly (more than 60 years) as shown in figure 2. the two findings above can be attributed to the mechanism of injury which this study has shown was mainly severe trauma. It is important to note that the fracture is rare in children (especially under 18 years) as no case was reported within the study period, this compares very well with literature and studies which has been done in other centres (figure2).

The mechanism for injury for both sexes showed that spontaneous or low energy femoral neck structures were the commonest contributing 48% while traumatic or high energy fractures had 45% with the remaining 7% being pathological fractures. Spontaneous fractures were classified as injuries resulting from trivial causes i.e. tripping and falling in the house or bathroom, severe trauma as high energy injuries as seen in motor vehicle accidents, sports injuries, fall from a height or direct blow to the femoral neck while pathological fractures are those resulting from primary bone pathology e.g. hereditary bone diseases, bone tumours (primary or secondary) or chronic osteomyelitis (figure 3). It is important to note that in the elderly the bones are osteoporotic and some literature classify all the fractures in the elderly as pathologic.

The age comparison in both sexes shows the males were mainly in the young age group (18 – 50 years) as compared to the females who were mostly elderly (>60 years) as shown in figure 4. this finding does not compare with the literature and studies which have been done in other centres in the developed world where the condition is almost exclusively of the elderly in both sexes but more so in females.

In comparing the mechanism of injury for both sexes (table 1), most of the males had severe trauma while females predominantly had minor trauma or spontaneous fractures. This is due to postmenopausal osteoporosis in the elderly females while in males most injuries were high energy due to their young age group and activities.

There was no significant difference in both sexes for pathological fractures.

In both sexes the young age group had severe trauma as the major cause of injury as compared to the elderly who had minor trauma or spontaneous fractures (table 2). This is because the young age group are involved in many activities like travelling to work, exposure to industrial accidents and sports activities hence predisposing them to severe or high energy injuries. The injuries in the elderly were either due to minor trauma or spontaneous fractures because of their osteoporotic bones especially postmenopausal women. These fractures in the elderly are sometimes called fatigue fractures.

The aims of treatment of femoral neck fractures should be early anatomical reduction to prevent further muscular damage, impaction of fracture fragments and rigid internal fixation to enable revascularisation from the surrounding soft tissues and uninjured bones which help in callous formation. It is important to note that fracture neck of femur is an orthopaedic surgical emergency which need to be reduced and fixed within 24 hours, hence the speed is the watchdog in managing fracture neck of femur.

This fracture invariably needs to be operated because of the small proximal fragment, which requires accurate reduction, which is usually not possible by conservative methods. The procedure should be based on Garden's classification system, the age of the patient and the degree of osteopenia. In Garden II the fracture is complete and may get displaced and should be fixed with dynamic hip screw or multiple screws. Garden III conservative treatment is rarely indicated except in severely ill patients and surgery is the ultimate treatment of choice. The young age group should age treated with dynamic hip screw or multiple screws and the

old >60 years with dynamic hip screws, various types of prosthesis or total hip replacement depending on the degree of ostoepaenia.

There was no significant difference between the age group in terms of the method of treatment i.e. conservative or operative (age was not a determinant factor as to the method of treatment).

In overall for both sexes most of the patients were managed conservatively (53.7%) by traction as compared to 46.2% treated surgically (figure 5). This shows that most of the patients were not properly managed since there is no role of conservative treatment for fracture neck of femur except in children. This was partly due to the prohibitive costs of implants and unavailability of theatre space.

In terms of sex and management most males were managed conservatively while females operatively (table 4), this is because most of the males were younger as compared to the females who were in the elderly age group and were given priority for operative for early mobilization to avoid complications of prolonged immobilisation.

The commonest operative procedure done was dynamic heap screw and multiple screws because most of the patients were mainly in the young age group and the relative cost and availability. Several arthroplasties especially total heap replacement were also done especially in the very elderly (figure 6). This enhanced their early mobilisation hence reducing complications of prolonged bed rest. Age was therefore a determinant as to the surgical method of treatment option chosen.

The outcome of the treatment options chosen was difficult to assess from this study since follow-up required long period of time and most patients were referrals and lost follow-up after treatment. Some patients were also lost in follow-up due to financial reasons. But it is important to note that those managed conservatively had long hospital stay and delayed mobilisation with the attendant complications of prolonged immobilisation.

The cases treated surgically mobilised well after fixation and had average postoperative discharge time of two weeks.

Proper follow-up of treatment outcome requires long period of time which could not be accommodated within the training period.

CONCLUSION

1. The young age group were involved more than the elderly.
2. The males were more than the females
3. Most of the males were in the young age group as compared to the females who were predominantly elderly
4. The young age group sustained their injuries as a result of severe trauma as compared to the elderly who had spontaneous fractures.
5. Most females had spontaneous fractures
6. Conservative treatment was the commonest mode of treatment
7. Majority of the patients were not properly managed since most were managed conservatively and as we can see from the literature there is no role for conservative management except in children.
8. Dynamic hip screw was the predominant surgical procedure done.
9. Other methods of management included multiple screws and various arthroplasties.

10. RECOMENDATIONS

1) Attempts should be made to reduce the number of road traffic accidents as this was the commonest cause of injury in patients who had severe trauma.

2) To try to improve on the number of patients managed operatively to avoid prolonged hospital stay to allow early return to work for the young age group and early mobilisation in the elderly.

3) To try to reduce the time interval between the injury and time of surgery.

4) Further studies to be carried to determine other aspects of femoral neck fractures i.e. post operative treatment regime, duration of hospital stay, associated complications.

5) Further studies on the outcome of various methods of treatment.

12). APPENDIX I (QUESTIONNAIRE)

1. Name.....
2. Unit number.....
3. Age.....
4. Sex.....
5. Mechanism of injury:-
   (a) Traumatic ☐ (b) Spontaneous ☐ (c) Pathological ☐
6. Severity of trauma:-
   (a) Minor ☐ (b) Major ☐
7. Mode of management
   (a) Conservative ☐ (b) Operative ☐
8. Operative
   (a) Pins ☐ (b) Plate and screws ☐
   (c) Arthroplasty ☐ (d) Total hip replacement ☐
9. Type of athroplasty
   (a) Unipolar athroplasty ☐ (b) Bipolar athroplasty ☐
   (c) Girdlestone athroplasty ☐ (d) Total hip athroplasty ☐

13. APPENDIX II

CONSENT BY THE PARTICIPATING PATIENT

INTRODUCTION

My name is Dr. Dan F.O. Ochiel and I am conducting a study on femoral neck fractures in Kenyatta National Hospital between the months of February 2005 to February 2006. I have sought authority from the Kenyatta National Hospital Ethical Committee before embarking on the study.

CONSENT FORM

I have understood the explanation by Dr. D. F. O. Ochiel and hereby give consent to participate in the study:

1. I accept to participate in the study on my free will
2. I accept to be interviewed concerning my illness and the answers to be recorded by Dr. Ochiel
3. I accept to be examined physically
4. I understand that my participation is strictly voluntary and I can withdraw my consent at any point of the study, and that such withdrawal will not affect my treatment in any way.
5. I understand that the information I give will be treated with utmost confidence and that my name will not be published in the results.
6. I understand that I may raise any issues relating to the study through the contact number given by Dr. Ochiel.

PARTICIPANT'S NAME (RELATIVE/GUARDIAN'S NAME)	SIGNATURE/THUMB PRINT
.....	.....
WITNESS	SIGNATURE/THUMB PRINT
.....	.....
INVESTIGATOR DR. D. F. O. OCHIEL TEL: 0720-898921	SIGNATURE .....

KUKUBALI KWA MGONJWA

MAELEZO

Jina langu ni Daktari Dan F.O Ochiel na nina fanya utafiti kuhusu ugonjwa ya wale wanaume hawawezi kupata watoto, katika hospitali kuu ya Kenyatta kati ya mwezi saba na mwezi wa kumi na mbili mwaka elufu mbili na tano. Nimeomba ruhusa rasmi kutoka kwa kamati inayosimamia hospitali.

KUKUBALI KWA MGONJWA

Nimeelewa maelezo yote kutoka kwa Daktari Dan F.O. Ochiel na nina toa kibali kuhusishwa kwenye utafiti.

1. Kwa hiari yangu binafsi bila kulazimishwa
2. Nakubali kutoa habari kuhusu ugonjwa wangu na majibu yake kurekodiwa na Daktari Dan F.O. Ochiel.
3. Nakubali kupimwa kudhibitishwa ugonjwa wangu
4. Nimeelewa kwamba kuhusishwa kwangu ni kwa hiari yangu na unaweza kujiondoa wakati wowote bila masharti, na kujiondoa kwangu hakutdhuru matibabu yangu kwa njia yeyote.
5. Nimeelewa kwamba habari yeyote nitakayoitoa kuhusu ugonjwa wangu itahidhiwa kwa siri na kwamba jina langu halitachapishwa hadharani
6. Nimeelewa kwamba naweza kuuliza swali lolote kuhusiana na utafiti kupita nambari ya simu Daktari D.F.O Ochiel atakayonipa hapa chini.

Jina la Mgonjwa	Sahihi/Kidole
.....	.....
Shahidi	Sahihi/Kidole
.....	.....
Mtafiti	
Daktari Dan F.O Ochiel	.....

Nambari ya simu: 0720-898921

13). REFERENCES

1. **Cooper AP.** A treatise on dislocations and fractures of the joints, 2d ed. London,Longman, Hurst, 1823, pp 570-576.
2. **Davis DG.** An operation for ununited fractures of the neck of femur. Univ Med Mag Philadelphia 13:507, 1900
3. **Cotton FJ.** Artificial imparction in hip fracture. Am j Orthop Surg 8:680, 1911.
4. **Kocher T.** Text-book of operative surgery. London, A&C Black, 1911.
5. **Johansson S.** On operative treatment of medial fractures of neck of femur. Acta Orthop Scand 3:362-392, 1932.
6. **Leadbetter GW.** A treatment for fracture of the neck of femur. J Bone Joint Surg 15:932-940, 1933.
7. **Smith-Peterson MN.** Treatment of fractures of the neck of femur by internal fixation. Surg 64:287-294, 1937.
8. **Judet J, Judet R.** The use of an artificial femoral head for arthroplasty of the hip joint. J Bone Joint Surg, 1950.
9. **Kannus P, Oarkkari J, Sievanen H, et al.** Epidemiology of hip fractures. Bone \ 1996: 18 (Suppl 1): 57- 63.
10. **Guliberg B, Nilsson, B, et al.** Incidence of hip fracture in Miamo, Sweden, Bone 1993 (Suppl 1): 23-9.
11. **Crock, H.V:** A revision of the anatomy of the arteries supplying the upper end of femur, J. Anat (London) 1965.
12. **Brodetti, A.:** The blood supply of the femoral neck and head in relation to the damaging effects of nails and screws, J. Bone joint Surg. 42-B: 794, 1980.
13. **Swiontkowski MF, Winquist RA, Hansen ST jr.** Fractures of femoral neck in patients between the ages of twelve and forty years. J Bone Joint Surg, 1984.
14. **Zetterberg CH, Irstam L, Anderson GBJ.** Femoral neck fractures in young adults. Acta Orthop Scand 1982. 14: 35 - 8
15. **Freeman, M.A.R., Morris, J.M.:** Role of fatigue in the pathogenesis of senile femoral neck fractures, J. Bone Joint Surg. 56-B:698, 1974.

16. **Bickel, W.S., Childs, D.S., Porretta, C.M.:** Postirradiation fractures of the femoral neck, JAMA 175: 204, 1985.

17. **Halpin, P.J.,** and **Nelson, C.L.:** A system of classification of femoral neck fractures with special reference to choice of treatment, Clin.Ortho.152:44,1990.

18. **Barnes, R., Brown, J.T., Garden, R.S.,** and **Niccol, E.A.:** Subcapital fractures of femur, J. Bone Joint Surg. 1998. 58 – B:2

19. **Bentley, g.:** Impacted fractures of the femoral neck, J. Bone Surg. 50-B:551, 1995.

20. **Parker MJ, Garden** grading of intracapsular fractures: meaningful of misleading? Injury 1993.

21. **Swiontkowski MF, Intracapsular** fractures of the hip. J Bone Surg/Amj 1994; 76-A:129-38.

22. **Gerber C, Strehle j, Ganz R.** The treatment of fractures of femoral neck. Clin Orthop 1993. 19: 150

23. **Raaymakers ELFB, Schafrith M.** The femoral neck fracture: controversies in treatment. Unfallchirurg 2002; 105:178-86 (in German)

24. **Bentley, G.:** Treatment of no displace fractures of the femoral neck, Clin. Ortho. 152:93 1985.

25. **Bray, T.J.:** Femoral neck fracture fixation. Clin. Orthop. 1997. 2:57

26. **Keller, C.S.,** and **Laros, G.S.:** Indications for open reduction of femoral neck, Clin. Ortho. 146:53 1990.

27. **Legerby, M., Asplund, S., Ringqvist, L.:** Cannulated screws for fixation of femoral neck fractures. Acta. Orthop Stand 1998. 56: 123 - 6

28. **Bout, C.A, Cannegiter, D.M, Juttman, J.W.:** Percutanous cannulated screw fixation of femoral neck fractures: three point principle. Injury 1997:28:135-9.

29. **Banan, H, Al- Sabti A, Jimulia T, Hart AJ.:** The treatment of unstable, extracapsular hip fractures with the AO/ASIF proximal femoral nail: Injury 2002. 120: 268 -9

30. **Ansis, A E, Wanek-Sgaglione L.:** Intracapsular fractures of the femoral neck: results of cannulated screw fixation, J.Bone Joint Surg. (Am) 1994.

31 **Madsen F, Linde F, Andersen L, et al:** Fixation of displaced femoral neck fractures: a comparison between sliding screw plate and four cancellous screws. Acta Orthop Scand 1997.

32. **Bosch U, Schreiber T, Krettek C,** Reduction and fixation of displaced intracapsular fractures of the proximal fermur. Clin Ortho 2002:339:59-72.

33. **Svenningsen S, Benum P, Nesse O,** and **Furset O I.:** Internal fixation of femoral neck fractures: compression screw compared with nail plate fixation, Acta Ortho. Scand 55:423, 1994.

34. **Clark D I, Crofts C E, Saleh M.:** Femoral neck fracture fixation: comparison of sliding screw with lag screws. J Bone Joint Surg 1990.

35. **Butt M A, Krikler SJ, Nafie S, Ali MS.:** Comparison of dynamic hip screw and Gamma nail: a prospective, randomized, controlled trial. Injury 1995. 10: 104 - 9

36. **Madsen J, Naess L, Aune A, et al.** Dynamic hip screw with trochanterc stabilizing plate in the treatment of unstable proximal femoral fractures: a comparitive study with the Gamma nail and compression screw. J Orthop Trauma 1998. 21: 198

37. **Meyers MH.** Fractures of the neck of femur. Treatment by muscle pedicle graft and internal fixation. In American Academy of Orthopaedic Surgeons, 1990.

38. **Parker M J, Khan RJK, Crawford J, Pryor GA.** Hemiarthroplasty versus internal fixation for displaced intracapsular hip fractures in the elderly: a randomized trial of 455 patients. J Bone Joint Surg (Br) 2002. 12: 126 - 8

39. **Masson M, Parker MJ, Fleischer S.** Internal fixation verses arthroplasty for intracapsular proximal femoral fractures in adults (Cochrane review) In: The Cochrane Library. Issue 4 Chichester, UK: John Wiley & sons, Ltd, 2003. 31: 162 - 8

40. **Bhandari M, Devereaux PJ, Swiontkowski MF, et al.** Internal fixation compared with arthroplasty for displaced fractures of femoral neck, J Bone Surg (Am) 2003.

41. **Horan FT.** Robert Jones, Gathorne Girdlestone and excision arthroplasty of the hip. J Bone Joint Surg, Jan 2005. 131:375 - 9

42. **Barrack RL.** Early failure of modern cemented stems. J Arthroplasty 2000. 15: 19 - 24

43. **Jasty M, Maloney WJ, Bradgon CR, et al.** The initiation of failure in cemented femoral components of hip arthroplastis. J Bone Joint Surg 1997. 14: 98 - 9

44. **Sim FH and** Steffer **RN.** Total hip arthroplasty in acute femoral neck fractures. In American Academy of Orthopaedic Surgeons 1995. 5:156 - 8

45. **Dowd JE, Cha CW, Traku S, et al.** Failure of total hip arthroplasty with a precoated prosthesis. Clin Orthop 1998. 14:15 - 9

46. **Lowwel JD.** Results and complications of femoral neck fractures, Clin Ortho. 1990. 5:67 – 80

47. **Alberts KA, Jervaeus J.** Factors predisposing to healing complications after internal fixation of femoral neck fracture. Clin Orthop 1990:257:129-33.

48. **Nilsson LT, Johansson A, Stroqvist B.** Factors predicting healing complications in femoral neck fractures: 138 patients followed for 2 years. Acta Orthop Scand 1993. 12: 140 – 2

49. **Bonfiglio M, Voke EM.** Aseptic necrosis of femoral head and non- union of the neck. J Bone Joint Surg 1984. 67:135

50. **Saito N, Miyasaka T, Toriumi H.** Radiographic factors predicting non-union of displaced intracapsular femoral neck fractures. Arch Orthop Trauma 1995, 114:183-7.

51. **Hammer AJ.** Non- union of subcapital femoral neck fracturers. Orthop Trauma 1992; 6:73-7.

52. **Ridgeway S, Wilson J, Charlot A, Kafatos G, et al.** Infection of the surgical site after arthroplasty of the hip. J Bone Joint Surg Jun 2005. 4:135 – 7.

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Date: 6th January 2006

Dr. Dan. F.O. Ochiel
Dept. of Surgery
Faculty of Medicine
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Dear Dr. Ochiel

RESEARCH PROPOSAL: "A REVIEW OF MANAGEMENT OF FEMORAL NECK FRACTURES IN KENYATTA N.HOSPITAL" (P170/10/2005)

This is to inform you that the Kenyatta National Hospital Ethics and Research Committee has reviewed and **approved** revised version of your above cited research proposal for the period 6th January 2006 – 5th January 2007. You will be required to request for a renewal of the approval if you intend to continue with the study beyond the deadline given.

On behalf of the Committee, I wish you fruitful research and look forward to receiving a summary of the research findings upon completion of the study.

This information will form part of database that will be consulted in future when processing related research study so as to minimize chances of study duplication.

Yours sincerely

PROF A N GUANTAI
SECRETARY, KNH-ERC

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