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A study on various factors affecting life of human femur bone at neck portion

[1]Pruthviraj Devidas Patil, [2]Dr. N. S. Poonawala,[3]Dr.Subim Nabilal Khan

[1]Research Scholar, Shri. J. J. T. University, Rajasthan, India,[2]Guide Shri. J. J. T. University, Rajasthan, India,[3]Co-Guide Shri. J. J. T. University, Rajasthan, India
[1] Department of Mechanical Engineering,
[1] Shri. Jagdishprasad Jhabarwal Tibervala University, Jhunjhunu, Rajasthan, India

Abstract : This study helps to investigate the various parameters which cause the failure of human femur bone as well as the different factors by which the femur bone may cause the break. For this past study and article referred. By which some most common and important parameters collected for further study on human femur bone. The femur bone is responsible to bear the major percentage of body weight during standard force bearing activities. Femur bone is longest bone in the body. That's why there is focus on this area to find out relations between mechanical strength and life of human femur bone.

***IndexTerms* – BMD, subcapital, transcervica**

I. INTRODUCTION

Human Femur bone is an important part of the human body. Femur bone also called thigh bone, which mainly bearing maximum load of body. The femur bone is responsible to bear the major percentage of body weight during standard force bearing activities. Femur bone is longest bone in the body. Its length is about 26% of the total height of a body. It provides support to the human body in certain movements like standing, sitting, running walking and during other physical activities. It is the body's largest bone and the only one in the upper leg. The femur bone is the human body's largest, heaviest, and strongest bone. It's also known as the thighbone or long bone. The head and hip form a ball and socket joint that is held in place by ligaments. The overall length of a bone begins at the tip of the hip and finishes at the knee's borders. It can fracture as a result of age or an accident, in which case surgery is required. Following are some functions of femur bone

- The femur is the primary bone of the leg. It supports the weight of the body on the leg.
- The femur provides the ability for articulation and leverage for the leg. Articulation allows for the standing, jumping and running.
- All other leg bones are attached to the distal portion of femur.
- It serves as an attachment point for all the muscles that exert their force over the hip and knee joints.

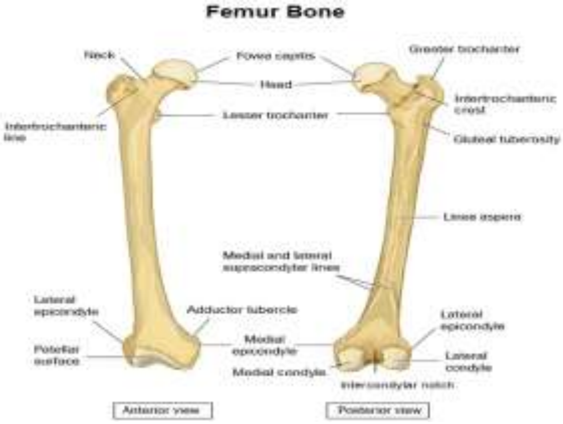

Fig. 1 Femur Bone Anatomy [4]

II. TYPES OF LOADING

- The femur bone is the longest bone in the human structure and carries much load. During functioning it undergoes variety of load which may lead for the failure of femur.
- Large varieties of impact loads will come on different region of femur.
- Bending load often encounter in femur bone particularly in case of lateral impact.
- The fatigue failure occurs due to impact

- Shear loading cause's shear stress and Shear strain
- In some cases twisting causes torsional stress

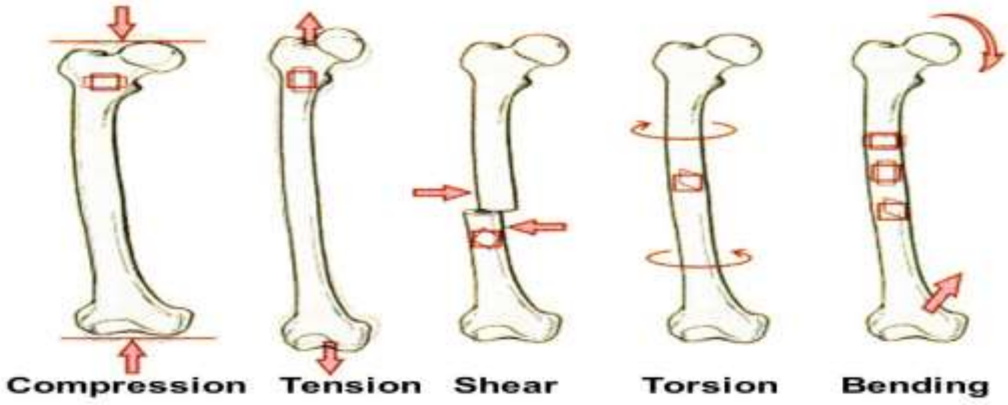

Fig. 2 Types of loading on Human bone

III. VARIOUS FACTORS AFFECTING LIFE OF HUMAN FEMUR BONE AT NECK PORTION

A. BONE MINERAL DENSITY (BMD)

The volumetric bone mineral density at the femoral neck was found experimentally the same for women and men without hip fractures (0.31 ± 0.06 g/cm^3). [2] There is great relationship of BMD with load carrying capacity of femur bone. Large the BMD, more the loading capacity of bone. By observation found that, But as increase in age, the BMD decreasing. This causes increase in failure chance of bone.

B. LOAD / FORCES ACTING ON BONE

There was a static stress on the femoral head of up to 3.29 to 3.88 times the body weight while standing on one leg, acting at 1 5 degrees to the vertical. During experimentation of 66 to 89 age people with cyclic loading considering all loading condition on femur bone like running, jumping, falling, the fracture observed like indented, subcapital fracture, fracture base of neck.[1]

Whenever considered that load acting from body or from external load carried (like weight lifting) then there is large vertical load acts on head of femur bone. This can be causes to fatigue stress, sharing stress and bending stress generation

Fig.3 Fatigue failure at epiphysis head of Human bone [1]

C. AGE AND GENDER

There is effect of age and gender on neck failure of femur bone greatly. During study it is observed that, failure percentage of femoral neck is more in women as compare to man.

Fig. 4 C.T. Scan Image of Human bone

IV. CONCLUSION

While investigated for failure of femur bone at neck portion then different factors to be considered. For load acting on human femur bone at neck portion as well as on head side, there is other factors that to be considered like age, gender, BMD, line of action of load with bone axis, angle of application. There is scope of study in the area of head as well as neck of human femur bone because of fracture observed like subcapital fracture ,, transcervica fracture ,l, intertrochanteric fracture , subtrochanteric fracture. The cause of such failure near neck portion is majorly due to fatuge stress, shear stress, bending stress, torsional stress. There may consideration of principal stresses, but its depends on which plane and area to be considred during study, experimentation and load applied.

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