

Pre-operative assessment of K-nail length in fracture shaft of femur

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Abstract

Introduction: Internal fixation of diaphyseal fracture of shaft of femur in an adult by Kuntscher nail is the most common operative method of treatment in Nepal where operative facilities for the same exist. Since the complete range of K-nail sizes and length are not available in most operation theatres in Nepal, most orthopaedic surgeons assess the size and length of the K-nail pre-operatively by various methods and keep one size above and below the assessed length for the planned surgery.

Materials and Methods: The following measurements were taken in five hundred people involved in the study:

Measurement No. 1: Tip of the greater trochanter to lateral knee joint line minus 2cms.

Measurement No. 2: Tip of the olecranon process to the tip of little finger, and

Measurement No. 3: Tip of the greater trochanter to the upper pole of patella.

An average of all three lengths were analysed to see if there were any differences in their mean lengths.

Results: Analysis showed that there were significant differences between the mean lengths measured by the three different methods. The average length of measurement no: 2 was 3 cm longer than the average length of measurement no: 1, which is the reference pre-operative length of K.nail.

Conclusion: However, in practice since measurement no:2 is more convenient to perform and can also be used when the patient has sustained bilateral fractures of femur, an accurate pre-operative K-nail length assessment can be done by subtracting 3 cm from measurement no:2, i.e. the tip of the olecranon process to the tip of the little finger.

Internal fixation of diaphyseal fracture shaft of femur in an adult by Kuntscher nail is the standard method of treatment in Nepal where operative facilities for the same exist. The complete range of K-nail sizes and lengths are not available in most operation theatres in Nepal due to financial constraints. Therefore, most orthopaedic surgeons assess the size and length of the k-nail pre-operatively by various methods and keep one size above and below the assessed length for the planned surgery.

In practice, pre-operative measurement of K-nail for a fractured shaft of femur is measured in the opposite thigh from the tip of the greater trochanter to the lateral knee joint line minus 2cms. An alternate measurement is done by measuring the distance from the tip of the greater trochanter to the upper pole of patella on the opposite side. The distance between the tip of olecranon process of the tip of the little finger on any side ("tip to tip" distance) is an alternate method of pre-operative k-nail lengths measurements. Thus, the aim of this study was to determine any significant difference between the two conventionally taught methods of measurement and the new one.

Materials and methods

500 people 20-50 years of age coming to the OPD of various teaching hospitals through out the valley for any complaints were included in this study. There were 317 males and 183 females. A person was excluded from the study if he had: limb deformities, limb length inequalities, demonstrable and clinical limbs, joints and bone pathology. Past history of limb bone fractures and hereditary skeletal diseases were also exclusion criteria. All measurements were taken with the patient lying in the supine position. The tip of the greater trochanter to the lateral knee joint line minus two centimetres (Measurement No. 1) (Fig. 1) or upper pole of patella (measurement No. 3) (Fig. 2) were measured with the hip in 0° flexion, adduction / abduction and the knee in extension.

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The measurement of the tip of the olecranon process to the tip of the little finger (measurement No.2) (Fig.3) was measured with elbow in 90° flexion, the forearm in neutral supination/pronation and the wrist in 0° flexion and radial / ulnar deviation and

metacarpo-phalangeal and interphalangeal joints in extension. Measurement of the right or left side was taken randomly. The unit of measurement was in centimetres.

Fig 1: Measuring from tip of the greater trochanter to lateral knee joint line

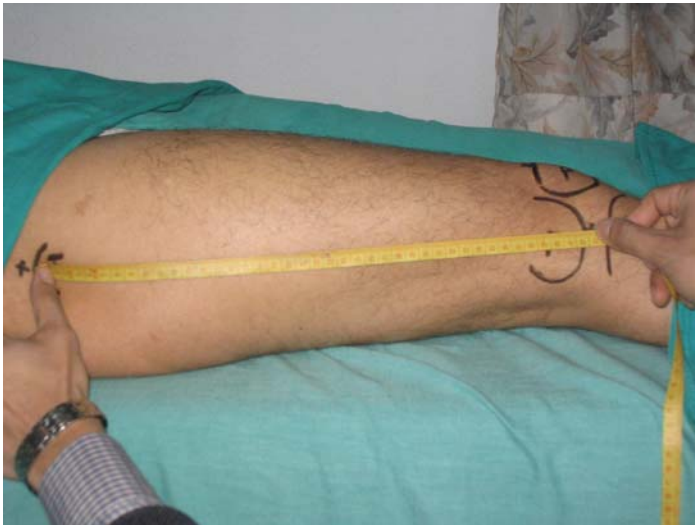


Fig 3: Measuring from tip of the greater trochanter to the upper pole of patella



Fig 2: Measuring from tip of the olecranon process to the tip of little finger.



Results

Measurement	Number	Mean \pm SD
No. 1	500	35.55 \pm 2.27
No. 2	500	38.62 \pm 2.27
No. 3	500	37.03 \pm 2.19

Discussion

The incidence of femoral shaft fracture is of the magnitude of 15 to 20 fractures per 1,00,000 person years.¹ Motor vehicle accidents are the cause of 85% femoral shaft fracture, 11% occur from fall and 6% are caused by gun shot injuries². The concept of intramedullary fixation, as a method of treatment for fracture shaft of femur, was introduced in 1916 by Hey Groves³. For some years, this method of internal fixation lay in abeyance, but it was revived and developed in circumstances of war by Kuntscher⁴. He used intramedullary nails of trefoil section for nearly all femoral fractures and achieved great success. Specific clinical studies comparing the results of intramedullary nailing with other non-operative and operative treatments consistently have demonstrated the superiority of intramedullary fixation^{5,6}.

K-nailing of diaphyseal fracture of shaft of femur in an adult is the standard method of treatment in Nepal where operative facilities for the same exist. The proper pre-operative length of the nail can be best determined by taking an X-ray of the normal thigh with a measured nail strapped to it.⁷ Since the length of the nail is known and calibrated, the proper length of the nail to be used can be determined by simple measurements. Ideally, the length should be long enough to extend from the level of the superior pole of the patella to 1.3 to 1.9 centimetres proximal to the superior aspect of the femoral neck⁷. However, this method of measurement is inconvenient, not cost effective and exposes the patients to unnecessary radiation. It can be accurately assessed by measuring from the proximal portion of the lateral condyle to the greater trochanter⁷.

The pre-operative assessment of k-nail length is conventionally done by measuring the length between the tip of the greater trochanter to the lateral knee joint line minus two centimetres of the intact femur (measurement No: 1) or the length between the tip of the greater trochanter to the upper pole of patella of the intact femur (measurement No: 3). By convention, the assessment of the same has also been done by measuring the length between the tip of the

olecranon and the little finger (measurement No: 2). However, literature search regarding pre-operative nail length assessment did not identify this method (measurement No: 2) as an alternative method for the same. Measurement No: 2 is easier to perform than the other 2 measurements, and can hold special importance when there is bilateral fracture of shaft of femur.

Conclusion

However, in practice, since measurement no 2 is more convenient to perform and can also be used when the patient has sustained bilateral fractures of femur, an accurate preoperative K-nail assessment can be done by subtracting 3 cm from the measurement no 2 i.e. from the tip of the olecranon to the tip of the little finger.

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