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A new classification system for inter-trochanteric fractures

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ABSTRACT

Trochanteric femoral fractures are among the most common injuries necessitating hospital admission and surgery is the mainstay of treatment. In order to appreciate the results, one needs to understand the fracture patterns involved. It is also important to know whether a fracture is stable or unstable: The answer to this question will guide the reduction technique, the type of fixation to be used, and the postoperative management. No classification is available till date that efficiently guides us for planning of treatment or helps us in prediction of potential complications. None of them has acceptable level of reproducibility. We developed a classification system based on four parameters namely 1. Condition of lateral wall 2. postero medial buttress 3. Extension of fracture line to femoral neck and 4. subtrochanteric extension. Five senior orthopaedic surgeons were asked to classify 30 sets of X-rays of standard AP and Lateral view of intra-trochanteric fractures based on the proposed classification system. The results were then analysed. We think the proposed classification system describes the fracture geometry efficiently, it gives a good idea about a fracture's potential to be anatomically reduced. It also gives an insight towards various factors leading to instability and complications, which guides us in treatment planning, tell us about the possible potential complications. The classification system seems to have acceptable level of reproducibility.

1. Introduction

Trochanteric femoral fractures are among the most common injuries necessitating hospital admission. Regardless of type of fracture they may lead to substantial morbidity and mortality, especially in elderly. Proximal femoral fractures in elderly usually result from minimal to moderate trauma to areas of bone significantly weakened by osteoporosis. Surgery is the mainstay of treatment, for both displaced and undisplaced types, to allow early mobilization of the patient, with partial weight bearing restrictions, depending upon the stability of the reconstruction.

Over the past 60 years, much has been published on the different methods for the fixation of trochanteric fractures. In order to appreciate the results, one needs to understand the fracture patterns involved. It is also important to know whether a fracture is stable or unstable: The answer to this question will guide the reduction technique, the type of fixation to be used, and the postoperative management.

A classification system should be able to describe the exact fracture geometry. It must provide information on the fracture's potential of being anatomically reduced, with good apposition of the fragments. Also, it should be possible to tell, whether a particular fracture is likely to become secondarily displaced after fixation; this information must be available before the patient is allowed to bear weight. Finally, any classification system that aspires to universal adoption must be easy to use and reproducible; only if these criteria are met, it may facilitate communication among surgeons.

Many classification systems have been devised for intertrochanteric fractures;1-4 however, since each has had a different object, none has been unanimously adopted by the Orthopaedic community. Some of the systems proposed have confined themselves to a simple anatomical description of the patterns observed (Evans; Ramadier; Decoulx and Lavarde). Other, more recent, systems were

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designed to provide prognostic information on the prospect of achieving and maintaining reduction of the different types of fractures (Tronzo; Ender; Jensen's modification of the Evans grading; Müller et al.).

No classification is available till date that efficiently guides us for planning of treatment or helps us in prediction of potential complications. None of them has acceptable level of reproducibility.

2. Material & Methods

We propose a new classification / scoring system for classification of inter-trochanteric fractures based on four criteria.

a. The condition of the lateral wall

b. Postero-medial buttress

c. Any extension of fracture line into the femoral neck

d. Sub-trochanteric extension

Here we have excluded pure sub-trochanteric or reverse oblique fracture patterns.

Lateral support 0 – no involvement of lateral wall 1 – involvement of lateral wall but possibly not involving the screw insertion area 2 – possibly involving the screw insertion area
Medial support or Posteromedial buttress 0 – intact (no # of lessor trochanter) 1 – not intact (# of lesser trochanter)
Neck Extension 0 – absent 1 - present
S/T Extension 0 – absent 1 - present

Here we score individual parameter on a 0 – 1 or 0 – 1 – 2 scale. The minimum score would be 0 denoting a stable and potentially less complicated fracture and maximum score would be 5 denoting an unstable and potentially complicated fracture. The total score of two or less will be considered as simple or stable fracture while a total score of three or more will be considered as unstable or potentially complicated fracture.

For identifying a typical fracture pattern we may nominate a fracture as LaMbNcSd, where L stands for Lateral wall support, M stands for Medial buttress, N stands for Neck extension and S stands for Subtrochanteric extension. a,b,c and d are respective values of these parameters.

A lateral wall communition involving the screw insertion area is defined as 2cm above and below the tip of lesser trochanter or any extension of fracture line below the vastus lateralis ridge on lateral wall.

A sub-trochanter extension is defined as fracture extension to the lateral wall below the lesser trochanter. Extension only in the medial wall below the lesser trochanter is not considered as sub-trochanteric extension.

To evaluate & validate the proposed classification system, we asked five senior orthopaedic surgeons to classify 30 sets of X-rays of standard AP and Lateral view of intra-trochanteric fractures. The 30 sets of X-ray were selected from our database randomly. Poor quality X-rays and X-rays of pure sub-trochanteric and reverse oblique patterns were excluded. Each observer independently classified these X-rays. They were not allowed to see how the fractures were treated or to discuss their observations with other observers. Each observer was given a brief introduction about the new classification system. The observers were provided as much time as they needed.

They were also asked to provide their comments on stability of the fracture depending upon their personal experience. No definition for fracture stability was described to them.

The results were then analysed.

3. Results

The score ranged from 0 to 4. There was no fracture with score 5.

The most common score was 2 (29%) & 3 (45%).

The most common pattern was L1M1 (31%) & L2M1 (45%).

48% fractures were marked as stable (range 33 – 60%) while 52% fractures were marked as unstable (range 36 – 66%).

85% of fracture designated as stable were having a score of two or less (range 67 – 100%) and 81% of fractures marked as unstable scored three or more (range 75 – 83%).

4. Discussion

In most of the classification systems, the importance of posteromedial buttress and subtrochanteric extension have been emphasized but they fail to give, the lateral wall integrity, its required weightage.

The lateral wall is the proximal extension of femoral shaft. In an unstable three-part or four-part pertrochanteric hip fracture, the lateral wall is a fragile bony structure. It is this region that provides the best opportunity for osteosynthesis with the proximal part of the fracture complex. It cannot be overemphasized that fracture of this delicate structure will convert a pertrochanteric fracture into a subtrochanteric fracture equivalent, which is a more severe problem, and therefore should be avoided5.

According to Gotfried "In unstable pertrochanteric hip fractures, the traditional description of the posteromedial fracture part as the most important prognostic factor should be revised to include the structural description of the lateral wall"5.

A posterolateral fragment described in Jensen's modification of Evans classification does not always lead to instability. Many a times, sufficient lateral wall remains for a stable reconstruction. The most crucial portion of the lateral wall probably is the area below Vastus Lateralis ridge, as this is the area, which is subjected to further iatrogenic injury during surgical fixation. Any deficiency in this area will lead to a complete disruption of the lateral wall at the time of surgical fixation particularly with sliding hip screw. So a lateral wall deficiency above the Vastus Lateralis ridge should be differentiated from a deficiency below the ridge.

If we know the condition of lateral wall before hand, in certain fractures, we may avoid a further fracture of lateral wall during screw insertion by changing the guide wire entry point to some extent. If it seems unavoidable than we can predict an uncontrolled medial collapse of proximal fragment. In this case either we may go for proximal femoral nail or we can delay the weight bearing for few weeks.

Extension into the femoral neck has not been addressed in any classification system so far. But we know, when present, it makes the surgical fixation extremely difficult and results are poor. Moreover this is not a very rare situation. Kyle has described in his series an incidence of around 8%6. So this parameter qualifies to be mentioned in a classification system for trochanteric fractures.

As intertrochanteric fractures may be characterised by infinite unusual patterns and it is unfair to expect the fracture line to follow few pre designed fracture patterns. The high degree of inter-observer and intra-observer disagreement7-8 shown with available classification system can be attributed to the fact that many of the intertrochanteric fractures do not fall exactly in any classification group or pattern and in that case the observer have to classify it into a related group leading to subjective biases.

As the proposed classification system is not based upon few pre designated radiological patterns, we may expect a reasonable reliability and reproducibility.

The proposed classification system is reasonably easy to remember and to apply, as one has to think about four directions – lateral, medial, proximal (neck extension) & distal (subtrochanteric extension). More so, three out of four parameters have only present or absent as options. So it is not difficult to calculate.

5. Conclusion

We think the proposed classification system has the advantage that while examining the X-rays, it gives an insight towards various factors leading to instability hence complications. So as we classify the fracture, we may get some idea about the potential problems in fixation and we can choose our implant accordingly. So it helps in planning of treatment.

We also think that the proposed classification systems helps in predicting the fracture behaviour in respect to the probability of a particular fracture to become secondarily displaced after fixation. This information helps in evaluation of prognosis and better planning of post-operative regimen.

In other words we can say that it changes the way we look at the X-rays of intertrochanteric fractures.

A long-term study is needed to establish a positive correlation between high score and poor prognosis and high rate of complications.

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