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Original article:

Pathaks Classification of Trochanteric fractures

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Abstract:

Trochanteric fractures are those which occur just distal to the capsule of the hip joint and above the isthmus. They are one of the most common causes of hospitalization due to trauma and are seen more frequently now due to increased life expectancy. The incidence of intertrochanteric fractures is showing an alarming trend, about and is estimated to increase to around 500,000 by the year 2040 in the United States alone.[3].About 90% of these types of fractures in the elderly result from a simple fall usually at home. Previous treatment of inter-trochanteric fractures was non-operative with prolonged bed rest in traction followed by lengthy programme of ambulation training. In elderly patients this approach leads to decubitus ulcers, Urinary tract infections, joint contractures, and pneumonia with a high mortality rate.[5] Reduction is best held surgically with an angled devices such as a blade/ plate or screw/plate device which holds the head with the plate alongside the lateral aspect of the femur.

Introduction

Trochanteric fractures are those which occur just distal to the capsule of the hip joint and above the isthmus. They are one of the most common causes of hospitalization due to trauma and are seen more frequently now due to increased life expectancy[1] The incidence of intertrochanteric fractures is showing an alarming trend, about and is estimated to increase to around 500,000 by the year 2040 in the United States alone.[3].About 90% of these types of fractures in the elderly result from a simple fall usually at home.[4]

Previous treatment of inter-trochanteric fractures was non-operative with prolonged bed rest in traction followed by lengthy programme of ambulation training. In elderly patients this approach leads to decubitus ulcers, Urinary tract infections, joint contractures, and pneumonia with a high mortality rate.[5] Reduction is best held surgically with an angled devices such as a blade/ plate or screw/plate device which holds the head with the plate alongside the lateral aspect of the femur.[2]

Classification systems based on radiology play a crucial role in defining the severity, treatment and prognosis of the fracture, with accurate comparison of results and facilitating the establishment of guidelines for evaluation and choice of treatment.[6]The classification of the fractures should be simple, easy to remember so that they are universally acceptable and have much influence on the choice of treatment as in the definition of prognosis.[7, 8]

Pathak KP in the year 1984 had proposed a classification based on the observation of 294 cases of trochanteric fractures based on the radiological findings,the muscles attached to the fragments and the muscular forces acting on them. In his study ,the trochanteric fractures were divided in to 5 types .The literature comparing the classification

systems for trochanteric fractures, considering mainly the deviation and the presumed stability after reduction is scant. Hence this study was undertaken with the aim of the comparing the standard classification system(Boyd and Griffin) used for the trochanteric fractures with Pathak's classification.

Aim and Objectives of the study:

The amount of fracture displacement determines the degree of clinical deformity .which in turn is determined by the forces causing the fracture and the pulling force of the attached muscles.

Methodology

Patients attending the Orthopedic OPD department/Emergency with a history of injury to the hip in young adult following high velocity injury or in osteoporotic elderly patients following trivial injury injuries with affected limb in markedly externally rotation and with an antero-posterior x-ray of the affected hip in maximal deformity and another AP view in gentle traction with patella rotated to neutral position showing an intertrochanteric fracture were included in the study.

Pre-operative workup-

Includes Blood investigation (LFT, KFT, Sr. Electrolytes, RBS, Viral markers, CBC, BT & CT) and Urine Examination. and a Pre-Anesthetic Checkup with co-morbidities (uncontrolled Hypertension and Diabetics, positive viral markers, severe tuberculosis, etc.) to be treated by the general physician accordingly.

Management -

Patients with comorbidities were treated with non-operative management consisting of prolonged bed rest in traction until fracture healing, malunion or non union occurred (usually 10- 12 weeks) followed by a lengthy program of ambulation training. In elderly patients this approach was associated with a high complication rate. Typical problems included decubitus ulcers, Urinary tract infections, joint contractures, pneumonia and thrombo embolic complications, resulting in a high mortality rate. Fracture healing was generally accompanied by varus with external rotation deformity and shortening because of the inability of traction tomaintain reduction or counteract the deforming muscular and gravitational forces.

For these reasons, the treatment of inter trochanteric fractures should be treated surgically by-

- ORIF WITH DYNAMIC HIP SCREW PLATE FIXATION OR SIMPLE SCREW FIXATION.
- BIPOLAR HEMIARTHROPLASTY (EITHER CEMENTED OR UNCEMENTED).

POST OPERATIVE

Quadriceps strengthening exercises and knee bending exercises were started on day one, partial weight bearing was started with the help of walker from day 3.Patients were followed-up at 1, 3, and 6 months.

In this study, patients were divided into 5 groups based on Pathak's classification and Boyd & Griffin's classification and studied as follows-

a) Classifying the fracture
b) Clinical evaluation of the patients
c) Alloting them to the surgical groups
d) Classifying results into good,fair and poor

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STATISTICAL ANALYSIS

The data thus obtained was compiled by using Excel sheet and then transferred and analysed using Statistical Package for Social Services (SPSS vs 20). The categorical variables were analysed using frequencies and percentages. The quantitative variables were analysed using measures of central tendency and deviation. Kappa statistics was used to find the inter observer agreement between the two classification systems. Chi square test was used as test of significance.

RESULTS :

Table1. Distribution of the study group according to age group

Age group	Frequency	Percent
Less than 20 years	1	1.0
21 – 30 years	3	3.0
31 – 40 years	5	5.0
41 – 50 years	7	7.0
51 – 60 years	29	29.0
More than 60 years	55	55.0
Total	100	100.0

Table 2. Distribution of the study group according to gender

Sex	Frequency	Percent
Male	60	60.0
Female	40	40.0
Total	100	100.0

Table 3. Distribution of the study group according to mode of injury

Mode of injury	Frequency	Percent
Osteoporotic	59	59.0
Osteoporotic with comorbidities	7	7.0
RTA	34	34.0
Total	100	100.0

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Table 4. Distribution of the study group according to K.P.pathak classification

K P Pathak Classification	Frequency	Percent
Type 1	19	19.0
Type 2	35	35.0
Type 3	24	24.0
Type 4	20	20.0
Type 5	2	2.0
Total	100	100.0

Table 5. Distribution of the study group according to Boyd and Griffin classification

Boyd & Griffin Classification	Frequency	Percent
Type 1	35	35.7
Type 2	22	22.4
Type 3	22	22.4
Type 4	19	19.4
Total	98	100.0

Table 6. Distribution of the study group according to Procedure done

Procedure done	Frequency	Percent
ORIF with DHS Plate	68	68.0
Conservative management	10	10.0
Bipolar hemiarthroplasty	20	20.0
Screw fixation	2	2.0
Total	100	100.0

Table 7. Distribution of the study group according to evaluation of results

Evaluation	Frequency	Percent
Poor	26	26.0
Fair	41	41.0
Good	33	33.0
Total	100	100.0

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Table 8. Distribution of the study group according to comparison between K.P.Pathak's classification of Non-operative and Operative group

K.P.Pathak's Classification	Non operative n (%)	Operative n (%)
Type 1	3 (30.0)	16 (17.8)
Type 2	4 (40.0)	31 (34.4)
Type 3	1 (10.0)	23 (25.6)
Type 4	2 (20.0)	18 (20.0)
Type 5	0	2 (2.2)
Total	10 (100)	90 (100)

Table 9- Distribution of the study group according to Procedure done in Boyd and Griffin Classification

Procedure done	Frequency	Percent
ORIF with DHS Plate	68	68.0
Conservative management	10	10.0
Bipolar hemiarthroplasty	20	20.0
Screw fixation	2	2.0
Total	100	100.0

Table 10- Distribution of the study group according to comparison between K P Pathak classification and Boyd and Griffin classification

K. P Pathak classification	Fracture classification on Boyd and Griffin			
	Type 1 n (%)	Type 2 n (%)	Type 3 n (%)	Type 4 n (%)
Type 1	0	17 (77.3)	2 (9.1)	0
Type 2	35 (100)	0	0	0
Type 3	0	5 (22.7)	19 (86.4)	0
Type 4	0	0	1 (4.5)	19 (100.0)
Type 5	0	0	0	0
Total	35 (100)	22 (100)	22 (100)	19 (100)

χ^2 Value= 338.429 df=12 p value=0.

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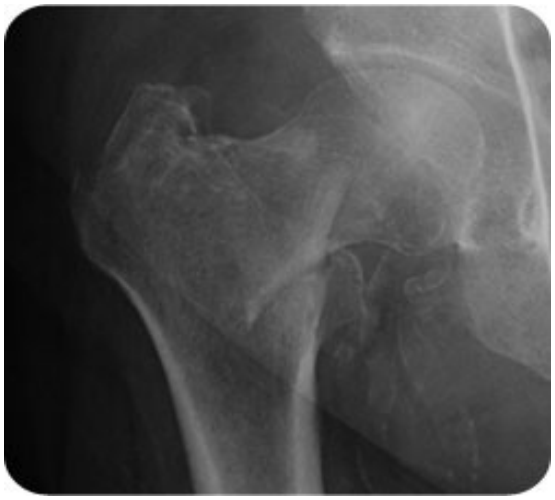

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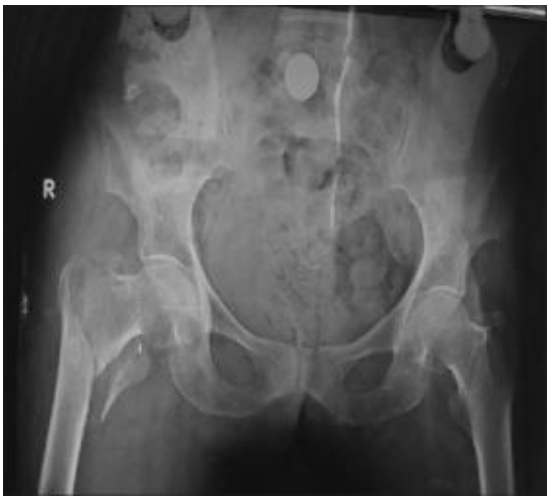

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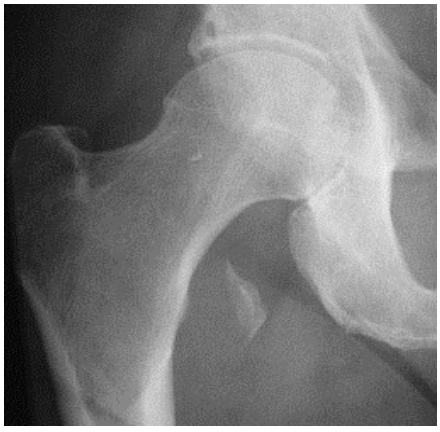

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Discussion-

The agreement in classification systems of hip fractures between the observer's (inter observer) is of paramount importance for its adequate use, both in clinical practice and in scientific research. In this context, the use of simple classifications aims to minimize the lack of uniformity of parameters used in the clinical evaluation, determining prediction in the clinical evaluation, determining prediction in terms of prognosis of the injuries.[7]

Pathak KP in the year 1984 had proposed a classification based on the observation of 294 cases of trochanteric fractures based on the radiological findings. In that study the trochanteric fractures were divided in to 5 types of fractures.

The literature comparing the classification systems for trochanteric fractures, considering mainly the deviation and the presumed stability after reduction is scant. Hence this study was undertaken with the aim of the comparing the different classification systems used for the trochanteric fractures with Pathak's classification.

In this study-

- The mean age was 60.86 years with a standard deviation of 13.61 years. About 55% of the patients were aged more 60 years of age.
- About 60% of the subjects were males and 40% were females.
- Osteoporosis was the common mode of injury in this study amounting to 59% of the patients.
- Most of the patients in this study had middle income.
- The Boyd and Griffin classification had shown that, about 24% had type 3 fractures, 22% had type 2 fractures, 20% had type 4 fractures, 19% had type 1 fractures and 15% had type 5 fractures.
- The K P Pathak classification had shown that, 37% of the subjects had type 1 fractures, 22% of the subjects had had type 2 and type 3 fractures and 19% of the subjects had type 4 fractures.
- ORIF with DHS plate fixation was the procedure done in 70% of the cases, Bipolar Hemiarthroplasty in 20% of the cases and 10% had conservative management.
- This study had shown that at 6 months of follow up about 25% of the cases had fixed flexion deformity,26% had flexion less than 90^{O} ,26% had shortening of 2cm or more,24% had fixed external rotation deformity with no internal rotation and 26% had less than 10^{o} abduction;25% had less than 90^{o} knee flexion.
- About 26% of the study subjects had shown poor result, 41% had fair and 33% had good result after evaluation.The kappa statistic had shown a fair result on comparison of KP Pathak and Boyd & Griffin classification.

Pathaks classification is based on geometry of fracture fragments along with the muscles attached to them and the forces acting on them. Classification of these fractures requires a simple identification of fracture pattern by outlining the head and neck, shaft, greater trochanter and lesser trochanter on the Xray of the patient. This immediately classifies it ,and .the approach to the fracture ,its method of reduction and behavior on table is predicted with accuracy once this is done.

Type 1 fractures have an intact posterior hinge of the external rotators. They can be easily reduced by gentle traction and internal rotation of the limb which closes the fracture like a book, and fixed internally.

In Type 2 fractures, the fragments are subjected to the greatest muscular forces. The proximal fragment is severely pulled backwards and tilts posteriorly. This is seen as a gap and tilt of the proximal fragment in the lateral view.If the lesser trochanter is attached to the proximal fragment, flexion of this fragment also occurs. Reduction of this fracture is difficult and has to be done by the open method. Traction makes the fragments more difficult to reduce, and internal rotation only opens the fracture fragments more posteriorly and increases the sag.

In Type 3, the comminuted mass makes all fragments unstable. There is no anatomical congruency between the head and neck fragment and the comminuted mass of the trochanters. The screw of the angled device is not stable until it is fixed laterally to the shaft. Medialisation may occur on its own during fixation and valgization may also occur. Overdriven shaft of screw was a concern in Pathaks series. In subtrochanteric fractures, exposure is started from the distal fragment upwards. A small spiken of bone of the proximal fragment may be the only key to accurate reduction. On the basis of Pathaks classification,Type 1 fractures are easily reduced on the fracture table Type 2 fractures require open reduction to reduce the fixed fragment by feeling the proximal fragment with the finger and reducing it with a specific technique. .Excessive traction makes the fracture more difficult to reduce, as does internal rotation which opens up the fracture posteriorly. Forcible maneuvers and excessive traction in type 2 and 4 fractures causes excessive hemorrhage . The Boyd and Griffin classification does not take into account all these factors. Moreover, there is no device available which takes into account femoral anteversion and curvature of the femoral shaft. Hence, reduction of the fracture is more important than the device used, and a central placement of the screw is not needed in trochanteric fractures.It is better to have a good reduction with a screw placed well within the head and neck with subcortical placement of the screw for a good hold. Pathaks classification addresses all the factors essential for a good anatomical reduction ,and was better in terms of understanding fracture morphology and treatment planning.

CONCLUSION

This study was mainly taken up to compare the K P Pathak classification with Boyd & Griffin classification. The study has shown that trochanteric fractures are common in old age due to osetoporosis. The inter observer agreement between the two types of classification were fair in this study. The main difference is that Boyds classification differs in Type 1 as being easy to reduce and a simple fracture, which is challenged by the Pathak classification as being a fixed fragment and difficult to reduce. This study was able to prove the importance of KP Pathak classification in classifying the trochanteric fractures which helps us in their management, both. Conservative and operative. This was one novel study to compare the classifications where further researchers can take up such studies to study the importance of K P Pathak classification.

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