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A Study of Functional Outcome of Patients with Extra Capsular Femoral (Pertrochanteric) Fractures Managed by Proximal Femoral Locking Compression Plate

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Abstract
Background: *Proximal femoral fractures are challenging injuries which are usually seen in elderly population due to low energy trauma like domestic falls, along with osteoporosis .In younger patients these fractures occurs with high energy trauma like road traffic accidents and fall from height .Despite vast improvement in implant designs, surgical techniques and patient care these fractures are associated with high incidence of implant failure, refracture and varus collapse.*
Objectives: *assessment of functional outcome of patients with extracapsular proximal femoral (pertrochanteric) fractures managed by proximal femoral locking plate. Potential complications are also evaluated.*
Materials and Methods: *This is a prospective study which was carried out from October 2016 to october 2017 in government medical college Thiruvanathapuram. In this study period 60 cases of pertrochanteric fractures which are managed by PF-LCP were carried out. The functional outcome were measured using harris hip scoring system.*
Results: *most of the patients were between age group of 60 to 80. Average age was 66. Males predominated in our study (60%), with male to female ratio of 3:2.*
Most common mode of injury was domestic fall accounts for 86.7%.Right sided fractures were common -63.3%.Most of the fractures were intertrochanteric fractures accounts for 70% ,as compared to subtrochanteric fractures which is 30%. Most of the pertrochanteric fractures were unstable. Functional outcome measured by harris hip scoring system, after one year, 41.7 % of patients had excellent and 31.7% had good outcome. 10% had fair and 11.7% patients had poor outcome.5% became a failure. Complications like non union ,infection and varus collapse were seen in 6 patients out of 60. Medialisation of femur was there in 3 patients.Secondary surgeries were done for 5 patients.
Conclusion: *In the present study of PF-LCP, performed for extracapsular fracture neck of femur in 60 patients, at government medical college, Thiruvananthapuram. PF-LCP represents a feasible and good alternative for the treatment of unstable inter and subtrochanteric fractures. PF-LCP permits stable fixation of unstable fractures and early functional rehabilitation. Although it is not free of complications our study has has shown very good results. Future biomechanical studies and clinical trials are required to evaluate the validity of the PF-LCP for the treatment of pertrochanteric fractures.*
Keywords: *Intertrochanteric fractures, sutrochanteric fractures, pertrochanteric fractures, proximal femoral locking plate (PF-LCP), harris hip score.*

Introduction

Proximal femoral fractures are one of the commonest fractures encountered in orthopaedic trauma practice with mortality rate of 4.5-22% and major cause of disability in elderly.

Extracapsular proximal femoral (per trochanteric) fractures are those occurring in region extending from extra capsular basilar neck region to 5 cm below lesser trochanter which includes intertrochanteric and subtrochanteric fractures[1].

Conservative treatment are used in[1,2],

1. Non ambulatory patient in whom adequate pain control can be achieved
2. Elderly patient who is high risk for any operative surgery and anesthesia.

Stable proximal femoral fractures can be managed by conventional implants like DHS, DCS, angular blade plates or by cephalomedullary nails with predictable results; whereas unstable fractures are challenging and prone to complications.

Proximal femoral locking compression plate (PF-LCP) is limited contact, angular-stable plate designed for treatment of complex, comminuted fractures of inter trochanteric and sub trochanteric regions.

Salient features of PF-LCP are,

- Anatomically contoured to approximate the lateral aspect of the proximal femur.
- Plates specifically designed for left or right femur to accommodate average femoral neck anteversion.
- Plate length allows spanning of the entire diaphysis in segmental fracture pattern.
- Use of locking screws provides the option of an angular stable construct independant of bone quality.
- Plate can be tensioned to create a load sharing construct.

Complications like primary or secondary varus collapse, hardware failure by cut out of the femoral head screw of dynamic hipscrew and higher incidence of secondary implant failure with use of cephalomedullary nails are reduced with proximal femur locking compression plate.

Rationale

- Proximal femoral fractures are one of the commonest fractures encountered in orthopaedic trauma especially in elderly and are major cause of morbidity and mortality.
- Unstable, comminuted intertrochanteric and subtrochanteric fractures have been a challenge to achieve stable fixation.
- Difficulties have been multifactorial, including -osteoporotic bone,angular instability, loss of reduction.
- PF-LCP is the one with good results and with least post operative complications.
- The goal is to achieve near anatomical reduction and stabilisation so as to achieve early mobilisation.
- Studies conducted in aspect of effectiveness of PF-LCP is very much less.

Materials and Methods

Study Design: Prospective case series study

Study Setting: Department of Orthopaedics, Government Medical College, Thiruvananthapuram.

Study Period: Individuals with closed extra capsular proximal femoral (per trochanteric) fractures managed by proximal femoral locking compression plate in the age group>18 years irrespective of gender from October 2016 to October 2017.

Study Population

Inclusion criteria

Individuals with closed extra capsular proximal femoral (per trochanteric) fractures managed by proximal femoral locking compression plate in the age group>18 years irrespective of gender admitted in government medical college, Thiruvananthapuram

Exclusion criteria

- Open fractures
- Pathological fractures
- Inability to walk before fracture
- Poly trauma patients
- Bilateral per trochanteric fractures

- Medically unfit and not willing for surgery

Period of Follow Up: 1 year
Sample Size: 60

$$N = Z^2 \, 1\text{-}\alpha/2[pq] \, / \, d^2$$

p=expected proportion=15%
d=absolute precision =10%
confidence interval =95%
sample size calculated was = 49
expected lost follow up =20
so, final sample size = 60

Sampling Technique : All Patients admitted with per trochanteric fractures treated with PF-LCP in orthopaedic ward, Thiruvananthapuram medical college in consecutive order till sample size is satisfied.

Statistical Analysis: The data collected will be checked by the guide periodically and under his guidance, necessary corrections will be done.Data collected will be entered into the excel sheet and analysed with the help of appropriate statistical software .Outcome of the subjects will be analysed with the clinical and functional aspects and indices calculated .In addition to descriptive statistics, appropriate test will be applied accordingly to determine statistically significant differences.

Data Collection

Open ended study questionnaire is used.

The study was a prospective case series study of functional outcome of 60 patients admitted with pertrochanteric fractures who were managed by PF-LCP during October 2016 to October 2017.

All the cases were treated initially with emergency care as per ATLS principle in casualty itself and then once the patient is stabilized, investigation were done and pre operative planning was done. A proforma was used for intra-operative data including age, gender, mechanism of injury, type of fracture, side of injury , associated injury. All the study regarding my thesis was done at this institution only. All cases were operated at this institution only and being conducted by my teachers and assisted by me. Patients admitted with per trochanteric fractures who are undergoing PF-LCP will be seen by the investigator personally during pre and post operative periods and the functional outcome is assessed ; by using a validated questionnaire "HARRIS HIP SCORE". Assessment done after 1 month,3 month,6 month and one year .

Management of Patients

Patients with suspected hip fracture were came in casualty or op, clinical and radiological evaluation done and admitted to the ward after necessary resuscitation and skin traction.

The following investigations were done routinely on all the patients preoperatively:

Blood: Hb%, total leucocyte count, differential count, blood grouping, crossmatching, fasting blood sugar, blood urea, serum creatinine, serum electrolytes.

Urine: Albumin, sugar and microscopic examination.

X-rays:- Pelvis with both hips-AP view. Involved side hip with femur full length-AP and Lateral view in all patients.

Chest-PA view.

All the patients were evaluated for associated medical problems and referred to respective departments and necessary treatments was given. Associated injuries were evaluated and treated simultaneously. All these patients were operated electively after aneasthesia fitness.

Results and Analysis

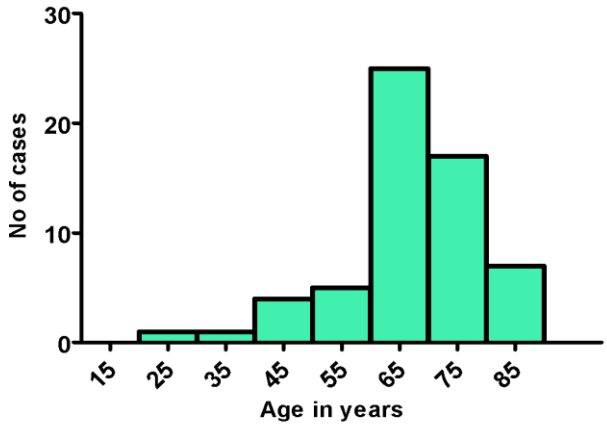
We studied 60 patients with pertrochanteric fractures who were managed by proximal femoral locking compression plate. The following are the observations made and the available data are analysed as follows.

1.Age Distribution

Age group in my study was the patients above 18 years. yougest age was 20 and the eldest was 85.

Mean age distribution got was 66. Most of the patients are in the age group between 60-80.

Age	Frequency	Percent
≤40	3	5.0
41 – 50	4	6.7
51 – 60	5	8.3
61 – 70	25	41.7
71 – 80	19	31.7
>80	4	6.7
Total	60	100.0

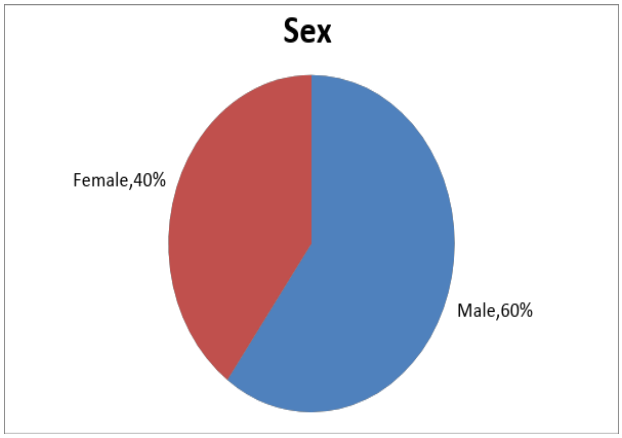


Sex Distribution

60% patients were males ie, 40 in number

40% of patients were males ie, 20 in number

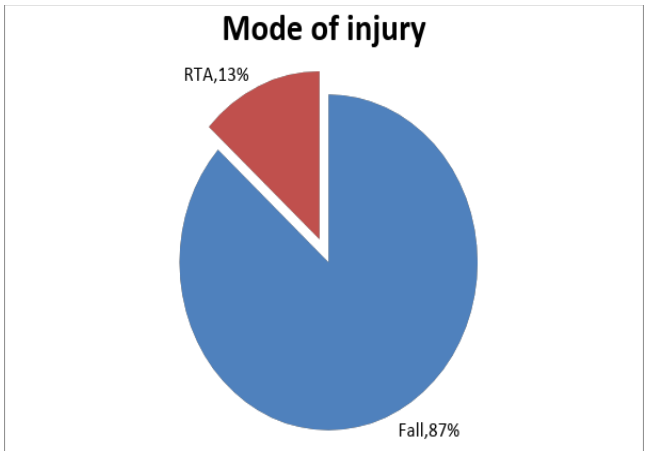
Sex	Frequency	Percent
Male	36	60.0
Female	24	40.0
Total	60	100.0



Mode of Injury

Most of the patients sustained pertrochanteric fracture by falls, and it accounts for 86.7%. Rest of the patients got fractured by road traffic accidents (13.3)% and most of them were younger patients.

Mode of injury	Frequency	Percent
Fall	52	86.7
RTA	8	13.3
Total	60	100.0

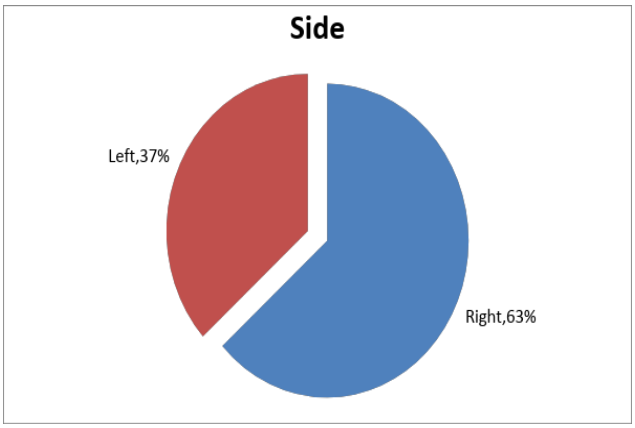


Side of Involvement

63.3% patients had right sided fracture .

36.7% patients had left sided fracture.

Side	Frequency	Percent
Right	38	63.3
Left	22	36.7
Total	60	100.0



Type of Fractures

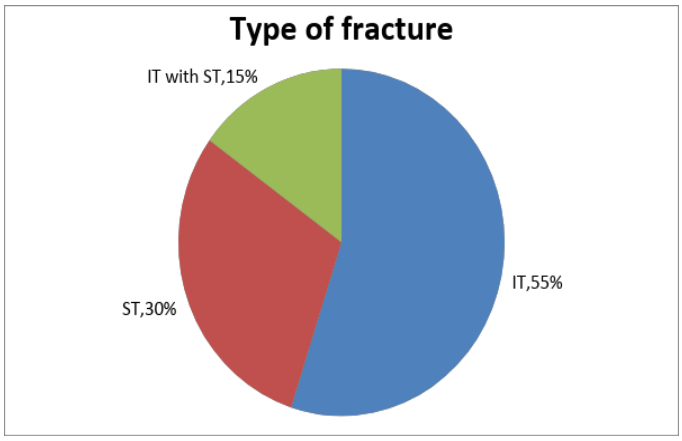
In this study we had;

55% of intertrochanteric fractures

30% of subtrochanteric fractures

15% of intertrochanteric fracture with subtrochanteric extension.

Type of fracture	Frequency	Percent
IT	33	55.0
ST	18	30.0
IT WITH ST EXTENSION	9	15.0
Total	60	100.0



Type of Classification

In our study, Intertrochanteric fractures were classified by boyd and griffin classification. subtrochanteric fractures classified by seinsheimer classification

Most of the IT fractures were belongs to boyd and griffin type 2 ie, 46.7%. Most of the ST fractures belongs to seinsheimer type 4 and 3a ,15% each.

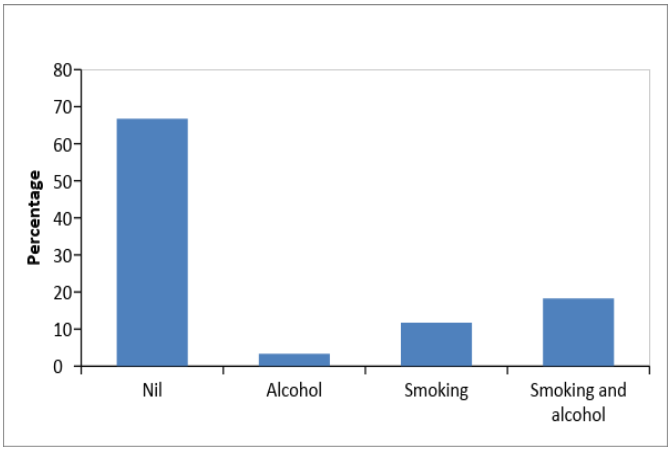
Type of Classification	Frequency	Percent
B&g-type 2	28	46.7
B&g-type 3	5	8.3
B&g-type 4	9	15.0
Seins-type 2b	3	5.0
Seins-type 3a	9	15.0
Seins-type 3b	1	1.7
Seins-type 4	5	8.3
Total	60	100.0

Habits

Studied the habits of smoking and alcohol consumption among the patients. 66.7% of them have no bad habits ,most of these were females.

In 18.3% patients both Smoking and alcoholism were present.

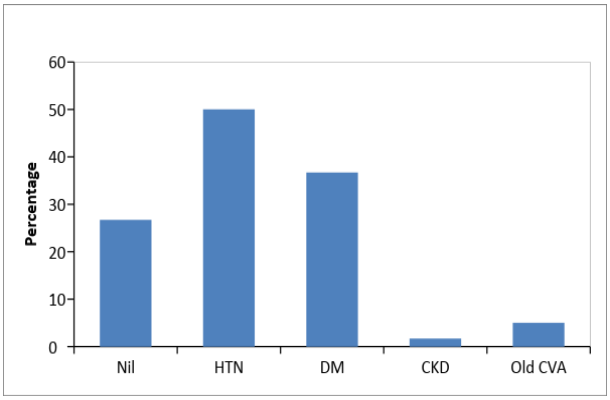
Habits	Frequency	Percent
Nil	40	66.7
Alcohol	2	3.3
Smoking	7	11.7
Smoking and alcohol	11	18.3
Total	60	100.0



Comorbidities

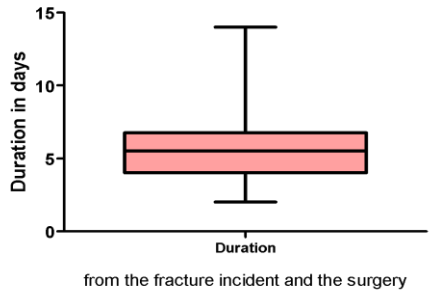
Among the patients 26.7 % had no comorbidities. 50% of them had hypertension, 36.7% had diabetes mellitus. 3 patients had old cerebrovascular accident.

Comorbidities	Frequency	Percent
Nil	16	26.7
HTN	30	50.0
DM	22	36.7
CKD	1	1.7
Old CVA	3	5.0



Duration from Fracture Incident and the Surgery

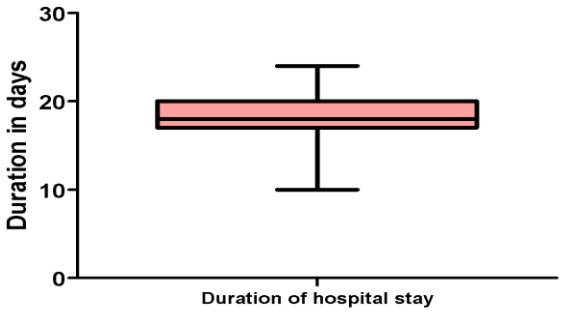
Average duration from the fracture incident and the surgery was 5.4 days.



from the fracture incident and the surgery

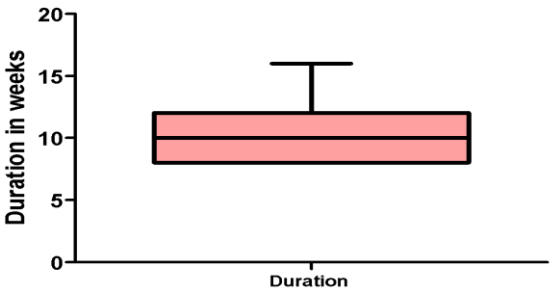
Duration of Hospital Stay

Average duratin of hospital stay was 18.2 days.



Duration from Surgery to Mobilisation (Partial Weihgt Bearing)

Average duration from surgery to mobilisation was 10.5 weeks.



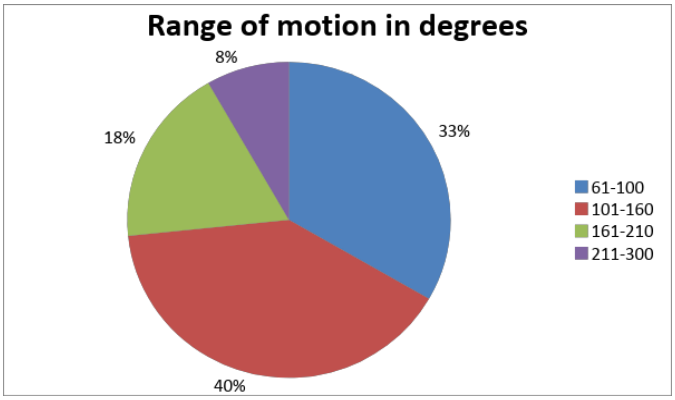
from surgery to mobilisatin

	N	Mean	Sd	Minimum	Maximum	Median	Inter quartile range
Duration from the fracture incident and the surgery(days)	60	5.4	2.4	2	14.0	5.5	4.0 - 6.8
Duration of hospital stay(days)	60	18.2	2.6	10	24.0	18.0	17.0 - 20.0
Duration from surgery to mobilisation (weeks)	60	10.5	2.3	8	16.0	10.0	8.0 - 12.0

Range of Motion at one year

Range of motion	Frequency	Percent
$61\text{-}100^0$	20	33.3
$101\text{-}160^0$	24	40.0
$161\text{-}210^0$	11	18.3
$211\text{-}300^0$	5	8.3
Total	60	100.0

Around full range of motion got in 5 patients only. 48.3 % got reasonable range of motion.



Harris Hip Score (Functioal Outcome)

The functional outcome is measured by using Harris Hip Scoring System.

AT 1 month: 65% were in poor group and 35% were in fair group

At 3 months: 31.7 % were in poor group, 40% in fair group and 28.3 % in good group

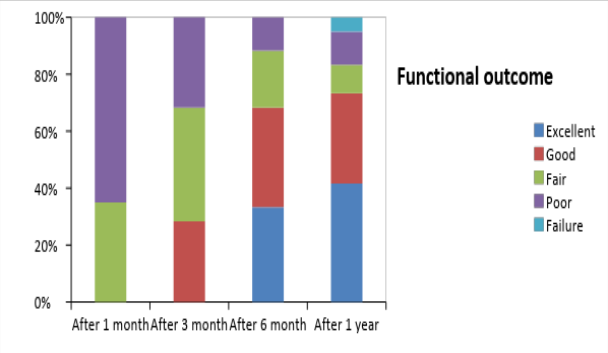
At 6 months: 33.3% were become in excellent group. Reduced to 11.7 % patients in poor group and 20% in fair group.

At 1 year:

- 41.7 % of patients had excellent outcome.
- 31.7% got good outcome.
- 10% had fair outcome.
- 11.7 patients had poor outcome.
- 5% became a failure.

Functional outcome	At 1 month		At 3 month		At 6 month		At 1 year	
	N	%	N	%	N	%	N	%
Excellent	0	0	0	0	20	33.3	25	41.7
Good	0	0	17	28.3	21	35.0	19	31.7
Fair	21	35.0	24	40.0	12	20.0	6	10.0
Poor	39	65.0	19	31.7	7	11.7	7	11.7
Failure	0	0	0	0	0	0	3	5.0
Total	60	100.0	60	100.0	60	100.0	60	100.0

Wicoxon signed rank test	Paired comparison of functional outcome with First month observation		
	HHS3month - HHS1month	HHS6months - HHS1month	Functional outcome - HHS1month
Z	5.771	6.493	6.242
p	<0.001	<0.001	<0.001



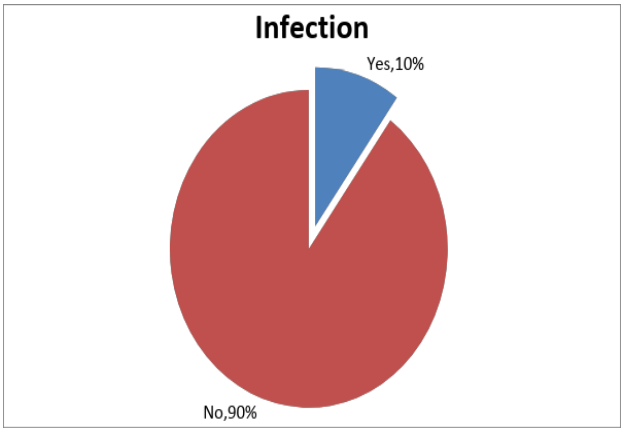
Complications

Studied various complications of surgery. They are;

A.Infection

10% of patients developed implant infecton.

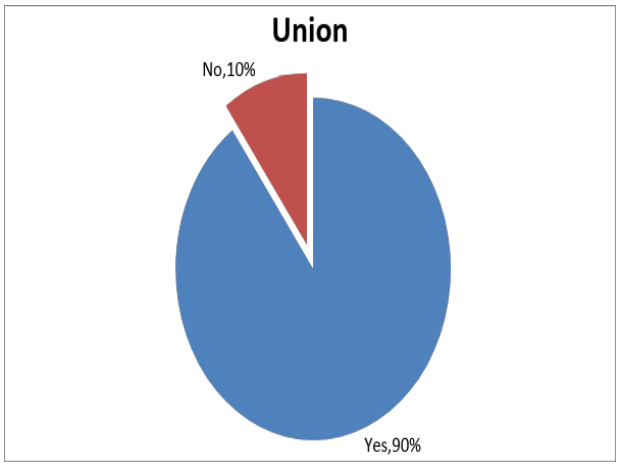
Infection	Frequency	Percent
Yes	6	10.0
No	54	90.0
Total	60	100.0



B. Non Union

6 patient's fracture not united ie, 10 %.

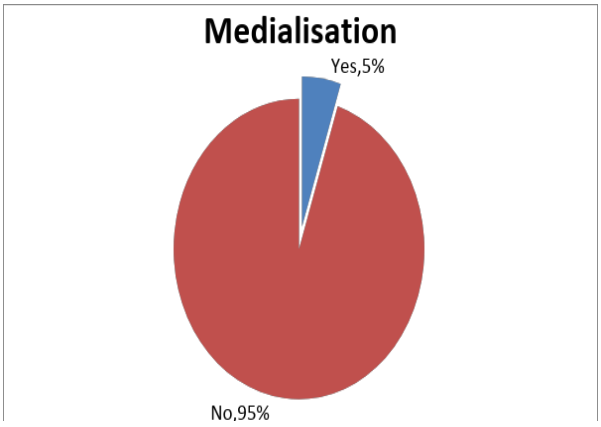
Union	Frequency	Percent
Yes	54	90.0
No	6	10.0
Total	60	100.0



C. Medialisation of Femur

5% of patients showed medialisation of femur radiographically.

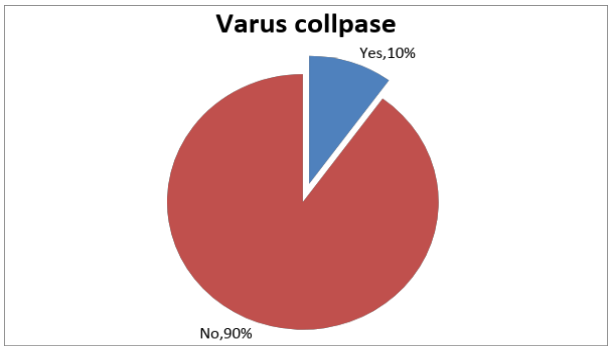
Medialisation	Frequency	Percent
Yes	3	5.0
No	57	95.0
Total	60	100.0

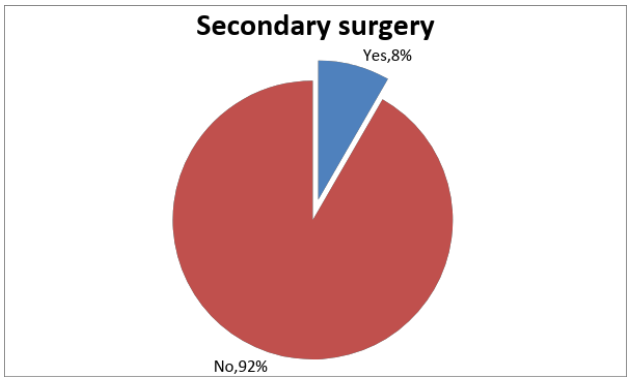


D.Varus Collapse

Varus collapse is assessed in xrays and were positive in 10% of patients.

Varus collpase	Frequency	Percent
Yes	6	10.0
No	54	90.0
Total	60	100.0





E.Pain

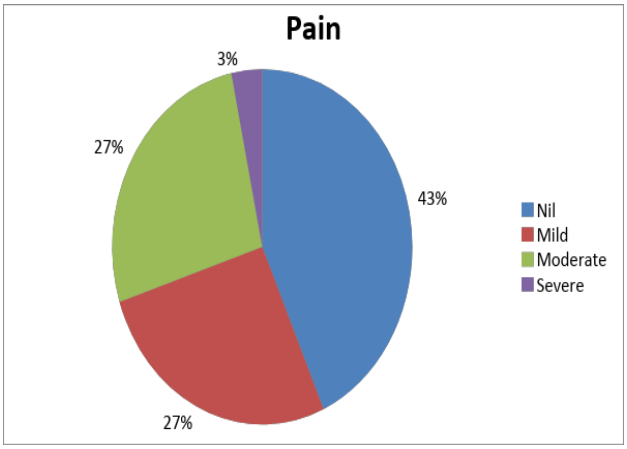
Pain is assessed which is one of the component in HARRIS HIP SCORE. At 1 year,

43.3% were absolutely pain free.

26.7% had only mild pain.

2 patient had severe pain.

Pain	Frequency	Percent
Nil	26	43.3
Mild	16	26.7
Moderate	16	26.7
Severe	2	3.3
Total	60	100.0



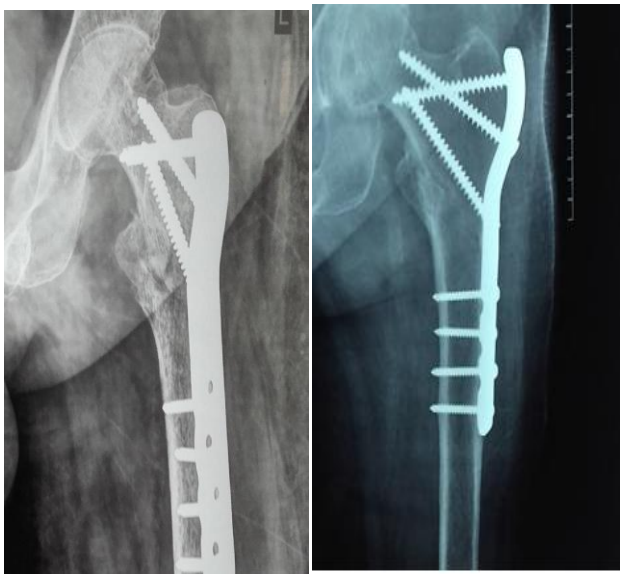
F. SECONDARY SURGERIES

Secondary surgeries were done to 5 patients.

Secondarysurgery	Frequency	Percent
Yes	5	8.3
No	55	91.7
Total	60	100.0

Photos and x rays

Intraoperative
1ST Guide Wire Insertion
2NDGuide Wire Insertion
3RD Guide Wire Insertion
Pre Op Xray



Follow Up X rays

Follow up Photos (Range of Movements)

Conclusion

In the present study of PF-LCP, performed for extracapsular fracture neck of femur in 60 patients, at government medical college, Thiruvananthapuram. PF-LCP represents a feasible and good alternative for the treatment of unstable inter and subtrochanteric fractures. PF-LCP permits stable fixation of unstable fractures and early functional rehabilitation. Although it is not free of complications our study has has shown very good results. Future biomechanical studies and clinical trials are required to evaluate the validity of the PF-LCP for the treatment of pertrochanteric fractures.