

Role of hip abduction brace in preventing impending failure in PFN

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Abstract

Introduction: The hip abduction brace is an orthotic device made after taking individual measurements and works on the principle by assisting or resisting the movements of joint and bypass the load on Implant and hip joint.

Materials and Methods: In this study 19 patients are evaluated during 3years period from July 2012 to July 2015 with mean follow up of 9 months, conducted in M.Y. Hospital Indore. Abduction brace applied immediately in postoperative period till three months in all those fracture which were fixed in varus. We radiologically analyzed inter- trochanteric fracture patient operated with PFN fixation in immediate postoperative period, at 6 weeks, 3 months and 9 months period.

Results: Inter-trochanteric fracture patients operated with PFN and identified as cases of impending failure were protected with hip abduction brace in immediate postoperative period giving good to excellent results in terms of reduced complication rate.

Conclusion: Hip abduction brace or an Orthotic assisted weight bearing mobilization of these patients prevent further varus collapse and screw cut outs.

Abbreviations: PFN – Proximal Femoral Nail.

Keywords: Hip abduction brace, PFN.

Introduction

Fracture trochanter has been a major fracture around hip joint and its treatment has undergone a lot of research from the good olden days. The ultimate aim at the treatment is of maintaining the alignment of neck and shaft and leg length. This could be achieved by preventing any varus of the neck and the shaft. The devices like PFN are designed in such a way that they can help in maintaining both the parameters, but the learning curve of the procedure has always been steep. There were cases which were osteoporotic and needed an accurate reduction, but where there was a varus malalignment, the chances of screw cut out and Leg length discrepancy was high, hence in order to avoid further complications, the artificial limb fitting centre and orthotic prosthetic department in coordination with the department devised a hip abduction brace. The department of orthopaedics of M Y Hospital is a tertiary referral centre of central India, and caters a large number of patients from various district and rural areas, hence a lot of cases come to us from low socioeconomic strata, these patients can be osteoporotic, and have delay in presentation. From the large number of the group of patients we have selected cases for our study.

The hip abduction brace is an orthotic device made after taking individual measurements and works on the principle of assisting or resisting the movements of joint and bypass the load on Implant and hip joint.(Fig. 1 and 2)



Fig. 1: Brace



Fig. 2: Brace application

How does hip abduction brace work:

1. Keeps limb in abduction of 20 degree
2. Prevents internal rotation
3. Limits flexion at hip
4. Off loads the implant and hip joint
5. Acts as load sharing device
6. Strengthens abductor muscle force & decreases deforming forces by avoiding pelvic tilt to opposite side (Fig. 3)



Fig. 3: Brace

With introduction of PFN Nail the use of gold standard DHS Plate is drastically reduced in the management of inter-trochanteric fracture as the advantages of PFN Nail are minimally invasive stable intramedullary device with minimal blood loss during surgery and helps in early postoperative recovery and weight bearing mobilization.

PFN is more preferred as the loading forces on the proximal femur, capsule and ligament are much more in the position of flexion and adduction considered to be a factor which may be responsible for mechanical failure. (Fig. 4)

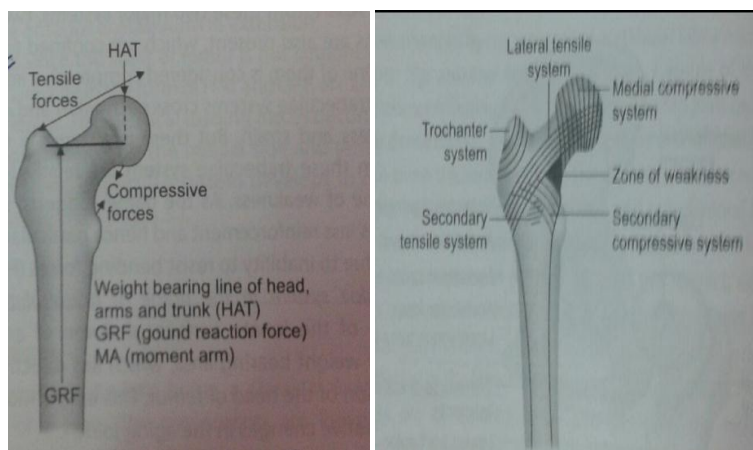


Fig. 4: Biomechanical forces on hip

In recent reports and studies PFN Nail failures are reported with Varus fixation, improper and inadequate anatomical reduction and reverse z effect

Varus collapse occurs due to

1. Decreased internal strength [bone density & implant quality]
2. Medial wall comminution
3. Iatrogenic
 - a. lateral entry
 - b. varus sitting of implant
 - c. TAD >25mm

Z Effect: lateral migration of inferior screw, varus collapse, perforation of femoral head by superior screw (Fig. 5)¹



Fig. 5: Z effect

Reverse Z effect: Lateral migration of superior screw with medial migration of inferior screw (Fig. 6)¹



Fig. 6: Reverse z effect

Causes of implant failure^{-2,3}

1. Reverse Z- effect
2. Z- effect
3. Breakage of nail
4. Both screw breakage
5. Single upper proximal screw breakage
6. Spiral # shaft distal to tip of nail

Impending failure- Identified on the basis of^{-2,4}

1. Varus fixation
2. Inadequate anatomical reduction
3. Reverse z effect in severely osteoporotic bones

The PFN failure can be prevented by judicious use of hip abduction brace as an orthotic device during immediate postoperative period till three months duration

Materials and Methods

The department of Orthopaedics of M Y Hospital is a tertiary referral centre of central India, and caters a

large number of patients from various district and rural areas, hence a lot of cases come to us from low socioeconomic strata, these patients can be osteoporotic, and have delay in presentation. From the large number of the group of patients we have selected cases for our study.

1. In this study 19 patients are evaluated during 3 years period from July 2012 to July 2015 with mean follow up 9 months. The patients were operated in department of orthopedics in M. Y. Hospital Indore. All fractures with varus malalignment post operatively were applied hip abduction brace immediately postoperative and continued till three months period.
2. We radiologically analyzed inter-trochanteric fracture patient operated with PFN fixation in immediate postoperative Period at 6 weeks, 3 months and 9 months period.
3. Inclusion criteria:
4. All inter-trochanteric fractures in all age group treated with PFN with post-operative varus malalignment and those with inadequate anatomical reduction.

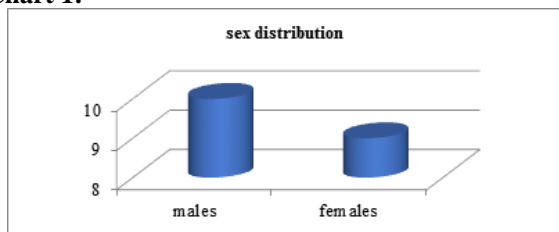
Exclusion Criteria:

1. Comminuted fracture
2. Inter-trochanteric fractures associated with sub-trochanteric or fracture shaft femur
3. Medically unfit for surgery
4. Basal neck femur fracture

Observations:

1. Male female ratio (Chart 1)

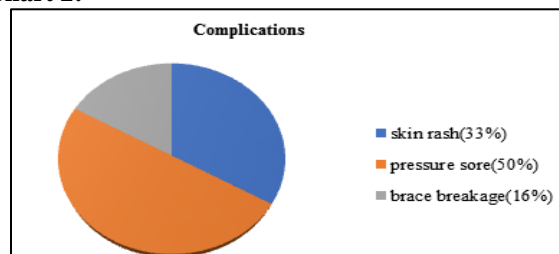
Chart 1:



Complications (Chart 2)

1. Skin rash
2. Pressure sore
3. brace failure/brakage

Chart 2:



Result

In the Inter-trochanteric fracture patient operated with PFN fixation if post op identified as cases of impending failure then they are protected with hip abduction brace in immediate postoperative period are shown to give good to excellent results in terms of union and reduced complication rate.

Abbreviations: PFN – Proximal Femoral Nail.

Conclusion

1. Inter-trochanteric fracture patient operated with PFN fixation are analyzed in immediate postoperative period and till three months.
2. All these fractures went into varus malalignment because of delayed presentation, loss of reduction post-operatively, treated by post graduates as this being a teaching institute and a learning curve was needed. These cases were applied hip abduction brace to reduce the burden of implant failure and re-surgery. It also gave a sense of confidence to the patient and the surgeon alike.
3. Hip abduction brace assisted weight bearing mobilization of these patient prevent further varus collapse and screw cut outs.
4. We also found the use of hip abduction brace to prevent posterior dislocation of operated hips mainly those who were operated through posterior approach and this will provide a further window for future research.

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