International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2020): 7.803

Pearls and Pitfalls of Cannulated Cancellous Screw Fixation for Fracture Neck of Femur

Dr. A. K. Manav[1], Dr. Avinash Kumar Sinha[2], Dr. Kumar Mayank[3]

[1]Associate Professor, P. M. C. H, Patna

[2]Junior Resident, P. M. C. H, Patna
Corresponding author;s Mobile number-8820479141

[3]Junior Resident, P. M. C. H, Patna

Abstract: ***Aims and Objective: The present study was done at P. M. C. H, Patna during the period of 15th July, 2013 to 15th July, 2018 to see the pearls and pitfalls of Cannulated Cancellous Screw fixation for fracture neck of femur. Materials and Methods: 30 cases of fracture neck of femur of age group 15-60 years admitted at P. M. C. H, Patna and operated with C. C. S fixation were analysed retrospectively. Observation: 22 out of 30 cases i. e. (73.33%) fixed with C. C. S (properly placed and aligned screws) and adequate interfragmentary compression showed good surgical outcomes and achieved bony union at acceptable time. 8 out of 30 cases i. e. (26.67%) were grouped into failure cases. Improper C. C. S fixation and inadequate interfragmentary compression were found to be the causative factor in 7 of the 8 cases i. e. (87.5% of failed cases). All 8 cases underwent additional surgeries in post-operative period. In 4 out of 8 cases i. e. (50%) underwent Pauwel's osteotomy with D. H. S fixation, C. C. S fixation with non-vascularised fibular graft was done in 3 out of 8 cases i. e. (37.5%) and D. H. S fixation with muscle pedicle bone graft was done in 1 out of 8 cases i. e. (12.5%).3 out of 8 failed i. e. (37.5%) cases developed AVN in late stage for which T. H. R was done. Conclusion: In our opinion success rate of Cannulated Cancellous Screw fixation for fractures of neck of femur can significantly be increased by proper and aligned screw fixation and adequate interfragmentary compression of the fracture fragments.***

Keywords: Fracture neck of femur, Cannulated Cancellous Screws, Alignment, Compliance.

1. Introduction

Fracture neck of femur is a common injury in all age groups. No agegroup is immune to this fracture.
The treatment varies as per the age, fracture pattern, time of presentation etc. The aim of the treatment is to save the head and neck of femur as far as possible except in elderly (i. e. >.60years).
The varieties of treatment include:

- Plaster (Whitman's cast)
- Internal fixation by Moore's pin, Cannulated Cancellous Screws, Dynamic Hip Screw with or without C. C. S and others.
- In cases of late presentation along with internal fixation various methods of non-vascularised (Fibular graft) and vascularised (Muscle Pedicle graft) have been used.

However, for the primary management of these fractures, fixation with Cannulated Cancellous Screws (C. C. S) for age group of 15-60 years have been found as the gold standard treatment.

Different alignments such as Inverted Triangle, Normal Triangle, single plane parallel screws etc have been described by various authors.

2. References

1) Aminian A, Gao F, Fedoriw W W, et al: Vertically orientedfemoral neck fractures: mechanical analysis of 4 fixation techniques, J Orthop Trauma 21: 544, 2007.
2) Bartonicek J: Pauwel's classification of femoral neck fractures: correct interpretation of the original, J Orthop Trauma 15: 358, 2001.
3) BediA, KarunakarMA, CaronT, et al: Accuracy of reduction of ipsilateral femoral neck and shaft fractures – an analysis of various internal fixation strategies, J Orthop Trauma 23: 249, 2009.
4) Canada LK, VieheT, Cates CA, et al: A retrospective review of high energy femoral neck fractures, J Orthop Trauma 23: 254, 2009.
5) Christal AA, TaitsmanLA, Dunbar RP Jr, et al: Fluoroscopically guided hip capsulotomy: effective or not ? A cadaveric study, J Orthop Trauma 25: 214, 2011.

However, the basic aim of placement of screws is:

- All the screws should be parallel in all planes.
- Achievement of interfragmentary compression.

However even in the best centres, only up to 70 percent success rate has been claimed.

We at Patna Medical College and Hospital (P. M. C. H), Patna did a retrospective analysis of 30 cases of fracture neck of femur over a period of 5 years.

3. Materials and Methods

Case records were obtained from the Department of Orthopaedics, P. M. C. H, Patna.

Thirty cases of fracture neck of femur of age group 15-60 years, admitted during the period of 5 years from 15th July 2013 to 15th July, 2018, havingminimum follow up of 1 year were chosen for study.

Statistical Analysis:

The 30 cases as mentioned above were divided into two groups:

- Group A-Those with good results, no /minimal complications and good Harris Hip Score. Twenty-two cases were included in this group.
- Group B- All the failure cases were included in this group. Eight cases were included in this group.

A retrospective study of all the cases was done and they were analysed on the following factors:

- Time of reporting to the hospital.
- Quality of reduction (closed/open).
- Placement of screws.
- Other procedures.
- Post-operative follow up.
- Fate of surgery-Union/Non-Union/Avascular Necrosis/Delayed Union/Implant failure.
- Causes of failure.
- Harris Hip Score.
- Compliance of the patient (i. e., minimum 3 months of complete bed rest followed or not.)

4. Results of the Study

Group A

- Fourteen out of twenty two cases reported within 3 days of injury, five cases reported within 3 weeks of injury and 3 cases reported after 3 weeks of injury.
- In 20 cases, closed reduction and internal fixation with C. C. S was done while in other 2 cases, open reduction and internal fixation with C. C. S was done.
- In 20cases, C. C. S were placed in inverted triangle configuration, placed wide apart, parallel in all planes with good interfragmentary compression. In two cases, only 2 C. C. S were placed in centre-centre position, parallel to each other with adequate interfragmentary compression.
- 19 out of 22 cases were followed up for approximately 2 years and 3 cases were followed up for around 1 year.
- All the cases were compliant and followed the recommendedpost-operative protocols for fracture neck of femur.
- 11 out of 22 cases showed radiological signs of union in 12 weeks, 6 cases showed signs of union in 18 weeks and 5 cases showed union in around 24 weeks post operative period.
- None of the 22 cases required any extra procedure other than primary surgery.
- 2 cases had an HHS between 70-79 (FAIR), 4 cases had HHS between 80-89 (GOOD) and 16 cases had HHS between 90-100 (EXCELLENT)

Group B

- 4 cases reported within three days of injury, 1 case reported within three weeks of injury and 3 cases reported after three weeks of injury.
- In 7 cases closed reduction and C. C. S fixation was done and in 1 case open reduction with C. C. S fixation was done.
- In 5 cases the C. C. S were not placed in proper configuration and were not parallel to each other. In 2 cases, the interfragmentary compression was not adequate and in 1 case C. C. S were fixed in acceptable configuration with adequate interfragmentary compression.
- 3 cases who reported after three weeks of injury had non-vascularised fibular graft placed in the neck along with C. C. S.
- 6 patients were followed up regularly for 2years, 1 patient was followed up for around 18 months and 1 patient was followed up for around 1one year.
- 5 patients were compliant and followed the recommended post-operative protocols. Three patients started early weight bearing (i. e., in less than 3 months) against advice.
- 6 cases had non-union fracture neck of femur of which 3 cases progressed to AVN of head of femur.2 cases suffered from implant failure.
- Revision surgeries were done in all the 8 cases. Two of the non-union cases underwentPauwel's Osteotomy and fixation with D. H. S, three other non-union cases underwent fixation with C. C. S and non-vascularised fibular graft. D. H. S fixation with muscle pedicle bone grafting was done in 1 case. Pauwel's osteotomy with D. H. S fixation was done in 2 cases of implant failure.
- Total Hip Replacement surgery was done later in all 3 cases of AVN of head of femur.
- HHS was less than 70 (POOR) in five cases and between 70-80 (FAIR) in 3 cases who underwent T. H. R.

Case 1: Miss Shikha Priya, 16 year old female from Biharsharif, Bihar presented with 2 days old fracture neck of femur of Left side on 17/02/2018. Closed reduction and internal fixation with 2 C. C. S was done.2 Screws were placed in centre-centre position in parallel alignment. The fracture united completely after 5 months.

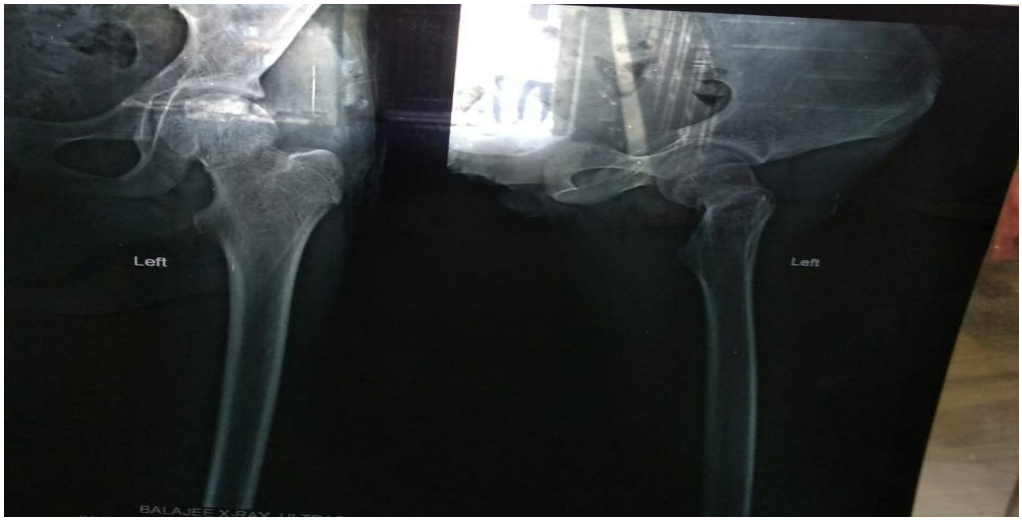

Figure 1: Pre op x ray showing fracture neck of femur (L) dt 17/02/2018

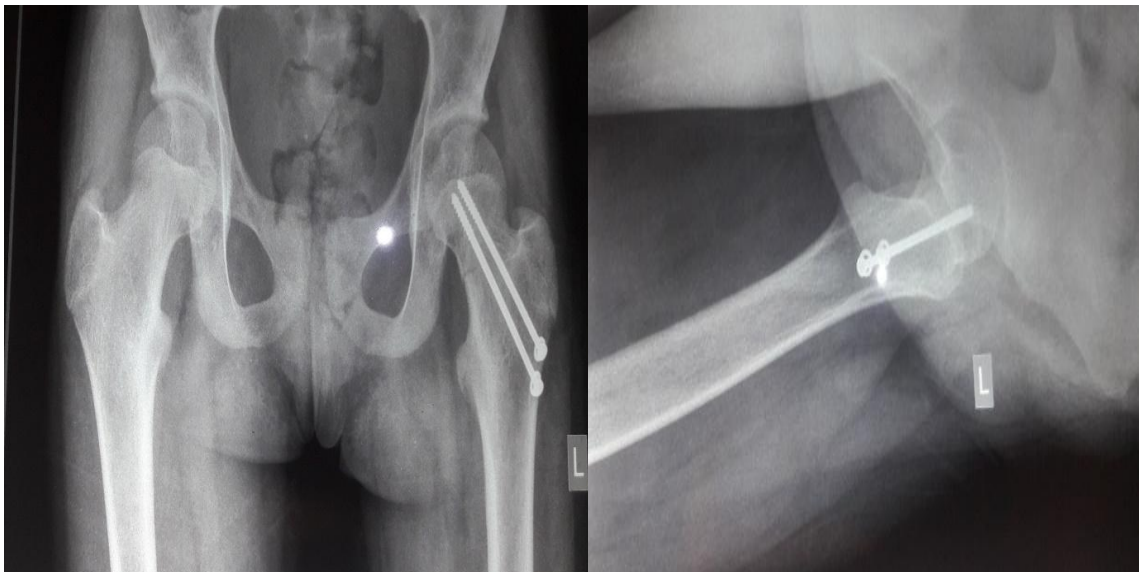

Figure 2, 3: Post op xray after 5 months showing completely united fracture neck of femur (L) dt 12/07/2018.

Case 2

Mr Shivam Kumar, 25 year male from Patna, was operated for fracture neck of femur of left side with C. C. S on 01/02/2018, he was not compliant and started to bear weight after 1 month of operation against advice leading to breakage of C. C. S and was re admitted at P. M. C. H, Patna on 09/07/2018. On 13/07/2018, implant removal followed by Pauwel's osteotomy was done.

Figure 4: Implant Failure with resorption of neck (dt 08/07/2018)

Figure 5: Post Operative xray (dt 13/07/2018)

Case 3:
Mr Ravi Kumar, 35 year old male from Patna, Bihar had fracture neck of femur of left side on 09/10/2017, C. C. S fixation was done at P. M. C. H, Patna on 17/10/2017 but the fracture did not showed signs of union following which Pauel's osteotomy with D. H. S fixation was done on 04/01/2018. After 3 months, on follow up AVN changes were found in the head of femur.

Figure 6: pre op x ray APl view dt 10/10/2017

Figure 7: pre op xray lateral view dt 10/10/2017

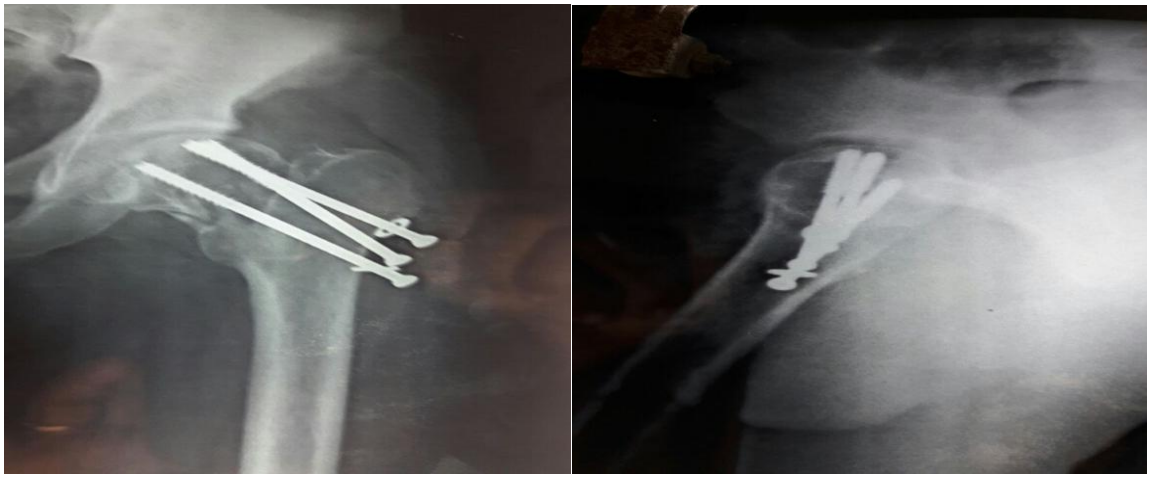

Figure 8, 9: Improperly placed C. C. S (dt-17/10/2017)

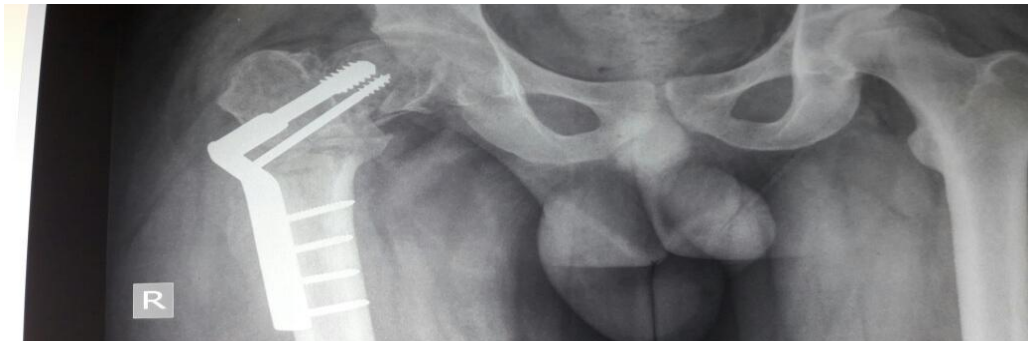

Figure 10: 3 months after Pauwel's osteotomy, AVN developed in femoral head. (dt 14/04/2018)

5. Discussion

Fracture neck of femur is a common injury in world, prevalent in all age groups. Various modalities of treatment have been described in various books and literature by various authors based on their experience and case studies. Theaim of all modalities is to salvage the head and neck of femur as far as possible except in elderly (i. e. >60 years of age.)

The choice of treatment whether C. C. S fixation or D. H. S with/without C. C. S or others like Whitman's cast, Moore's pin fixation, non-vascularised or vascularised bony grafting, arthroplasty (partial /total) depends on various factors like time of presentation, age at presentation, morphology of fracture, choice of surgeon etc.

Internal fixation with C. C. S fixation is considered as the gold standard treatment for fracture neck of femur in the age group of 15-60 years.

The main reasons for C. C. S fixation being the gold standard are-

- Minimally invasive with less operative time and less blood loss.
- Very economic cost of treatment.
- Acceptable results in comparison to other established modalities of treatment, etc.

Despite being the gold standard, the success rate of this surgery is approximately 70 percent even at the best centres.

The common reasons for failure of C. C. S fixation are –

- Improper placement and alignment of screws in the neck.
- Inadequate interfragmentary compression.
- Poor patient compliance.
- Others-late presentation, inadequate follow-upcompliance, immunodeficiency, etc.

Some pitfalls of C. C. S fixation are:

- Difficulty in placement of screws in proper alignment.
- Due to unavailability of any JIG, correct screw placement becomes technically difficult.
- Difficulty in achieving good anatomic reduction.
- Valgus placement is also difficult technically. It is comparatively easy with other implants like 120 degree angled blade plate.

We at P. M. C. H, Patna did a retrospective analysis of 30 cases of fracture neck of femur in the age group of 15-60 years admitted during the period of 5 years from 1stJuly 2013 to 1stJuly 2018.

They were grouped into two groups A & B. The A group included all the cases treated successfully with C. C. S fixation and B group included failed cases of non-union, implant failure, AVN etc.

They were analysed on various factors including time of presentation, quality of reduction, placement of screws, postoperative follow-up, patient compliance, result of treatment, additional treatments, causes of failure and Harris Hip Scoring was done.

6. Conclusion

Internal fixation with Cannulated Cancellous Screws is the gold standard treatment for fracture neck of femur in the age group of 15-60 years with various advantages. The success rate of Cancellous Cannulated Screw fixation was found to be dependent on:

- Proper placement and alignment of cancellous cannulated screws.
- Adequate interfragmentary compression of the fracture fragments.
- Good patient compliance.

7. Disclaimer

- There is no conflict of interest.
- There is no financial involvement.

References

[1] Aminian A, Gao F, Fedoriw W W, et al: Vertically orientedfemoral neck fractures: mechanical analysis of 4 fixation techniques, J Orthop Trauma 21: 544, 2007.
[2] Bartonicek J: Pauwel's classification of femoral neck fractures: correct interpretation of the original, J Orthop Trauma 15: 358, 2001.
[3] BediA, KarunakarMA, CaronT, et al: Accuracy of reduction of ipsilateral femoral neck and shaft fractures – an analysis of various internal fixation strategies, J Orthop Trauma 23: 249, 2009.
[4] Canada LK, VieheT, Cates CA, et al: A retrospective review of high energy femoral neck fractures, J Orthop Trauma 23: 254, 2009.
[5] Christal AA, TaitsmanLA, Dunbar RP Jr, et al: Fluoroscopically guided hip capsulotomy: effective or not ? A cadaveric study, J Orthop Trauma 25: 214, 2011.
[6] Chapman MW, Bowman WE, CongridJJ, et al.
[7] Aminian A, Gao F, FedoriwW, et al: Vertically orientedfemoral neck fractures: mechanical analysis of 4 fixation techniques, J Orthop Trauma 21: 544, 2007.
[8] Bartonicek J: Pauwel's classification of femoral neck fractures: correct interpretation of the original, J Orthop Trauma 15: 358, 2001.
[9] BediA, KarunakarMA, CaronT, et al: Accuracy of reduction of ipsilateral femoral neck and shaft fractures – an analysis of various internal fixation strategies, J Orthop Trauma 23: 249, 2009.
[10] Canada LK, VieheT, Cates CA, et al: A retrospective review of high energy femoral neck fractures, J Orthop Trauma 23: 254, 2009.
[11] Christal AA, TaitsmanLA, Dunbar RP Jr, et al: Fluoroscopically guided hip capsulotomy: effective or not ? A cadaveric study, J Orthop Trauma 25: 214, 2011.
[12] Davison JNS, Anderson GH, et al: Treatment for displaced intra capsular fracture of the proximal femur: a prospective, randomised trial with early follow up, J Orthop Trauma 26: 135, 2012.
[13] FrihagenF, Nordsletten L, Madsen JE: Hemiarthroplasty or internal fixation for intra-capsular femoral neck fractures: randomised control trial, BMJ 335: 1251, 2007.
[14] Goldstein C, Petrisor BA, Ferguson T, Bhandari M: Implants for fixation of femoral neck fractures, Tech Orthop 23: 301, 2008.
[15] Jain R, Koo M, KrederHJ, et al: Comparisonof early and delayed fixation of subcapital femoral neck fractures in patients 60 years of age or less, J Bone Joint Surg 84 A: 1605, 2002.

Bibliography

[16] C. C. S-Cancellous Cannulated Screws.
[17] D. H. S-Dynamic Hip Screw.
[18] P. M. C. H-Patna Medical College & Hospital.
[19] AVN-Avascular Necrosis.
[20] T. H. R-Total Hip Replacement.
[21] H. H. S-Harris Hip Score.
[22] Dt-Date