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RESEARCH ARTICLE
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COMPARISON OF OUTCOME OF FEMORAL NECK FRACTURE OSTEOSYNTHESIS TREATED WITH CANNULATED SCREWS WITH CONVENTIONAL INVERTED TRIANGLE CONFIGURATION AND BIPLANAR DOUBLE SUPPORTED SCREW FIXATION

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INTRODUCTION

Intracapsular femoral neck fractures are common among the elderly following trivial trauma or fall [1]. However, femoral neck fracture in adults under 60 years of age are rare and frequently the consequence of high-energy trauma [2-4] amounting to 2-3% of all femoral neck fractures [2,5]. Higher rates of complications such as femoral head osteonecrosis (around 12 to 86 %) [4,6–13] and nonunion are linked to femoral neck fractures in the young adults [4, 6, 9, 14]. Osteoarthritis and femoral head collapse could result from this devastating condition.

In the young patients with high levels of activity, arthroplasty and salvage techniques like osteotomy have high failure rates and poor acceptability [15]. A secure internal fixation and an anatomic reduction are essential, but other treatment factors including time to surgery, the role of capsulotomy, and fixation techniques are still up for debate.

Significant morbidity, mortality, and functional impairment are associated with femoral neck fractures. Even now, femur neck fractures are still considered "unsolved fractures". For femoral neck fracture osteosynthesis, choosing the right surgical strategy is essential to achieve positive outcomes and minimize complications. In order to treat this fracture and avoid complications, we conducted this study to better understand the biomechanics of different implants and surgical approaches [16,17].

The choice of implant for internal fixation, the timing of surgery, open versus closed reduction, capsular tamponade, internal fixation against arthroplasty, THR versus bipolar, and bipolar versus

unipolar are just a few of the many debates that surround the choice of treatment algorithm for management. The biomechanics and outcomes of biplane double-supported screw fixation (BDSF) and traditional inverted triangle Cannulated cancellous screw fixation (ICCS) were the main subjects of our investigation.

Nowadays, the majority of surgeons choose to use cannulated cancellous screws for conventional fixation [18]. The number, type, and thickness of the screws and most crucially, their orientation and spatial arrangement determine the stability and precise reduction of the fixation construct. Complication rates of femoral neck fracture osteosynthesis with CCS fixation varies from 20% to 46% in different studies [19,20], despite the current literature's recommendation that three screws with a diameter of more than 6 mm be inserted in an inverted triangle configuration for increased stability [21–23]. Vertical type femoral neck fracture with a significant amount of comminution may have more difficulties, such as nonunion and fixation failure.

BDSF seems to be theoretically superior to traditional methods in a number of ways. The calcar is supported by two screws in BDSF compared to just one in traditional conventional techniques. Furthermore, the screws in BDSF are dispersed over a greater surface area, which distributes the axial strain from the head to the diaphysis and lowers the possibility of screw cutout and varus collapse. The likelihood of subtrochanteric fractures is reduced by the steeper angle of the screws in BDSF, which also permits impaction at the fracture site during weight-bearing. Because BDSF increases fixation stability, it can be used to treat comminuted and Pauwel's type III fractures where traditional fixation may not work. Additionally, the screws in BDSF are positioned away from the femur's head's weight-bearing pole, which lowers the possibility of harming the intraosseous blood supply.

In this study we have tried to analyse whether BDSF has statistically proven advantages over the conventional inverted triangle configuration in osteosynthesis of the femur neck fractures in the young patients.

MATERIALS AND METHODS:

Study Design:

This was a prospective interventional study, conducted at Tezpur Medical College and Hospital to assess and compare the outcomes of two different surgical techniques used for the fixation of femoral neck fractures, one of which was treated with Cannulated cancellous Screws in Inverted Triangle Configuration and the other group with Biplane Double Supported Screw. The purpose is to compare the clinical efficacy of both methods, including patient recovery and associated complication rates.

Study Setting:

The study was carried out at the Department of Orthopaedics, Tezpur Medical College and Hospital between January 2020 to December 2024.

Study Population:

Prior to surgery, signed informed consent and permission were obtained from all the patients after being fully explained about the study's objectives and procedures. After the patients were admitted, preoperative plain radiographs were obtained and Pauwel's classification of femur neck fracture was done, and the findings of the clinical examination and history were recorded. In cases where a routine X-ray failed to detect a suspected femoral neck fracture, a CT scan was conducted. The sample were selected consecutively from January 2020 to December 2024 based on predefined inclusion criteria.

Sample Size:

A total sample size of 42 patients (21 per group) is taken based on detecting clinically significant differences in functional outcomes between the two fixation methods. This calculation considers a power of 80% and a significance level of 5%, to ensure sufficient statistical strength to identify differences in the outcomes measured.

Group A: includes treatment by Cannulated Screws in Inverted Triangle Configuration technique.

Group B: includes treatment by BDSF technique.

Inclusion Criteria:
a) Pauwels type I–III fracture of neck femur.
b) Patients with fracture neck of femur duration less than 3 weeks.
c) Age- less than 60 years.

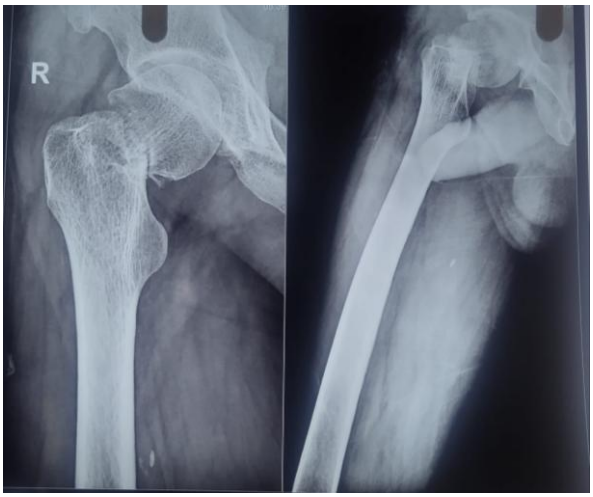
Exclusion Criteria:
a) Patients with legal incompetence.
b) Paediatrics fractures.
c) Patients with delayed presentations.
d) Patients with fracture neck of femur with hip dislocation.
e) Medical Co-Morbidities.
f) Severe Osteoporosis.
g) Pathological Fractures.
h) Age more than 60 years.

Study Procedures:
1**. Pre-operative Assessment:**
A complete history was obtained from every patient at the time of admission, which included personal information, medical history (including the nature of the injury, the side that was impacted, and the interval between the injury and the initiation of treatment was recorded), physical examination, and radiological examination (including standard AP and lateral plain X-rays, as well as AP in traction and internal rotation when necessary). In cases where a routine X-ray failed to detect a suspected femoral neck fracture, a CT scan was conducted.

2. **Randomization and Group Assignment:**
Randomization were conducted using computer-generated lists to assign patients to either Group 1 (Cannulated Screws in Inverted Triangle Configuration technique) or Group 2 (BDSF technique).

3. Surgical technique:
Internal fracture fixation with 6.5 mm self-tapping partially threaded cannulated screws was used for all patients. Leadbetter or Whitman method were used to accomplish closed reduction (24, 25), and C-arm was used to demonstrate fracture reduction in both anteroposterior and cross-leg lateral views. The limb was cleaned, painted, and draped once a satisfactory reduction was achieved. All of the patients received analgesia.

Technique of fixation of neck of femur fracture with cannulated cancellous screws in inverted triangle configuration:
An incision was made 5–6 cm from the greater trochanter tip, extending distally along the greater trochanter line. The greater trochanter was made visible by splitting the superficial fascia, tensor fascia lata, and vastus lateralis muscle in the middle and exposing it sub-periosteally. Using a guide wire angled at 135 degrees and verified under C-ARM, a drill hole was made in the lateral cortex of the femur just below the vastus ridge between the anterior and posterior cortex. Using this guide pin, a second guide wire was inserted into the postero-superior part of the head with the aid of a parallel guide, and a third guide wire was inserted into the antero-superior part of the head. Until it reached the subchondral bone, all of the guide wires were inserted. The drill length was determined by subtracting 10 mm from the guide wire length, which was measured using a depth measuring gauge. A 4mm drill bits with sleeves used for drilling over the guide wire, the fracture is fixed with 6.5 mm cannulated cancellous screws and confirmed under C-ARM. The incision was closed in layers.

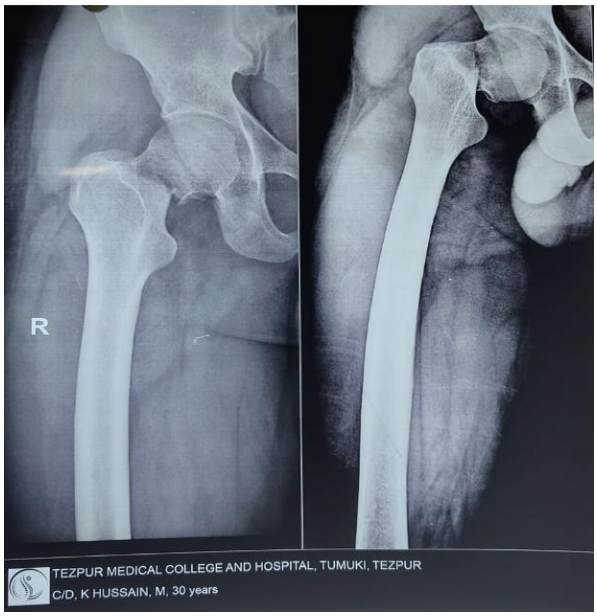


Pre-operative plain radiograph

postoperative plain radiograph

Technique of fixation of neck of femur fracture with biplane double-supported screw fixation (BDSF):

The guiding wire of the distal cannulated screw is inserted to start the surgical procedure. On the anterior third of the femoral diaphysis, the wire's tip is situated 5–7 cm distal to the trochanter's base. The first guide wire is placed into the dorsal inferior section of the femoral head from the lower border of the greater trochanter, angled at a 150–160-degree angle and directed posteriorly, touching the calcar tangentially in AP view. In order to penetrate the anterior inferior section of the femoral head, the second guide wire is positioned 2-4 cm proximal to the distal wire, inclined at an angle of 130-140 degrees, and directed anteriorly. The third wire is put into the anterior superior region of the femoral head, parallel to and 2 cm proximal to the middle wire. A 4 mm drill bit is used to drill the screw after it has been measured similarly with a depth gauge. The middle and proximal screws are inserted initially and are compression screws at the fracture site. The distal screw is inserted from anterior to posterior with a double buttress on the medial and posterior cortex when the traction is released and the screws are tightened.



Pre-operative plain radiograph

postoperative plain radiograph

Post-operative X-ray picture on follow-up

Post-operative clinical picture on follow-up

4. Post operative protocol:

IV fluids, analgesics, and the proper prophylactic antibiotics were administered to patients in both groups, and on day 14, the sutures were taken out. All patients followed a standardized rehabilitation protocol. After 24 hours, or as soon as the patient was pain-free, rehabilitation began. The first exercises were static quadriceps, active/passive straight leg lift, and knee bending at the bedside while seated. On the third postoperative day or as soon as the patient felt comfortable, non-weight-bearing mobility was recommended. Partial weight bearing walk or toe touch walk was started after 6-8 weeks and following radiological union on radiographs at their follow-up visits, full weight-bearing mobilization without assistance was recommended.

5. Outcome Measures:
The clinical outcome was evaluated using the Visual Analog Scale (VAS) for pain and the Harris Hip Score (HHS) for functional recovery at 1, 3, 6, and 12 months after the procedure. Hip AP and lateral view plain radiographs were taken on the first day after the operation to assess the adequacy of reduction, then again one and three months after surgery to check for progressive union signals.

6. Follow-up:
Regular follow-up visits at intervals (i.e., 1 month, 3 month, 6 months and 12 month) was conducted to evaluate postoperative outcomes and monitor for any complications or adverse events. The bridging of bone gaps, the removal of the fracture line, and the continuity of three cortices in anteroposterior and lateral views were used to evaluate radiological union. Infection, screw back-out, implant failure, neck shortening, reduction loss, nonunion, and AVN of the femoral head were among the complications observed.

Statistical analysis:
Version 20.0 of the IBM SPSS software suite (Armonk, NY: IBM Corp.) was used to enter and analyse the data The study population's clinical and demographic features are summed together using descriptive statistics. The outcomes of both surgical groups were analysed through inferential statistics, such as t-tests and chi-square tests. P-values less than 0.05 were regarded as statistically significant [26].

Ethical Considerations:
The Declaration of Helsinki's ethical guidelines were followed in this investigation. Prior to starting, Tezpur Medical College and Hospital's institutional review board (IRB) clearance was sought, and each subject willingly agreed and gave informed consent.

RESULTS AND ANALYSIS:
The study was conducted on 42 patients diagnosed with femoral neck fractures. The Biplane Double Supported Screw Fixation (BDSF) approach was used to treat 21 of them, and the inverted triangular conventional compression screw fixation (ICCS) technique was used to treat the remaining 21 patients.

Age distribution:
In BDSF group Patients below 20 years were 6 patients (28.6%), 7 patients aged 20 –40 years (33.3%) and 8 patients aged above 40 years (38.1%).
In ICCS group 11 patients (52.4%) aged above 40 years, 6 patients aged 20-40 years (28.6%) and 4 patients aged below 20 years (19%).

Gender:
In BDSF group 13 patients (62%) were males and the other 8 (38%) patients were females.
In ICCS group 11 patients (52.4%) were females and 10 patients (47.6%) were males.

Pauwels classification:
In BDSF group there are 9 fractures (42.9%) classified as pauwel type I, 6 fractures (28.6%) classified as pauwel type II, and 6 fractures (28.5%) classified as pauwel type III.
In ICCS group there are 7 fractures (33.3%) classified as pauwel type I, 4 fractures (19%) classified as pauwel type II, and 10 fractures (47.7%) classified as pauwel type III.

Duration of hospital stay:
Hospital stays had a mean value of 2.67±0.82 days in BDSF group and 4.60±1.64 days in ICCS group.

Association with outcomes:
BDSF: 19 patients (90.4%) had a satisfactory outcome, while 2 patient (9.6%) had an unsatisfactory outcome.
ICCS: 13 patients (62%) had a satisfactory outcome, while 8 patients (38%) had an unsatisfactory outcome, 4 of which (19%) didn't unite.

Harris hip score outcomes:
In the BDSF group: 12 patients (57.1%) had an excellent outcome, 6 patients (28.6%) had a good outcome, 3 patients (14.3%) had a fair outcome, and none had a poor outcome. In contrast, in the ICCS group: 9 patients (42.8%) had an excellent outcome, 5 patients (23.8%) had a good outcome, 2 patients (9.5%) had a fair outcome, and 5 patients (23.9%) had a poor outcome.

Time of union:
BDSF group: 16 patients achieved union within 3 months, 5 had delayed union.
ICCS group: 11 patients achieved union within 3 months, 10 had delayed union.

Blood loss during operation:
Regarding blood loss, mild blood loss was noted in 20 patients (95.2%) while moderate blood loss occurred in 1 patient (4.8%) in the BDSF group mild blood loss was noted in 18 patients (85.7%) while moderate blood loss occurred in 3 patients (14.3%) in the ICCS group

Post-operative complications:
Most common postoperative complication was a nonunion, AVN, and screw cut-out.
In the BDSF group: 1 patient had complication was a screw cut-out.
In the ICCS group: 8 patients had complication in which 4 patients are nonunion, 3 patients are AVN, and 1 patient are screw cut-out.

Table (1): Relation between Method of fixation, time till union, blood loss, Harris hip score, results, complications, Surgical time & X-ray exposure and hospital stay (days).

METHOD OF FIXATION			
Variable	**BDSF (n = 21)**	**ICCS (n = 21)**	**p-value**
Time till union			0.197
≤3 months	16 (76.2%)	11 (52.3%)	
>3 months	5 (23.8%)	10 (47.7%)	
Blood loss			0.606
Mild	20 (95.2%)	18 (85.7%)	
Moderate	1 (4.8%)	3 (14.3%)	
Harris hip score			0.227
Excellent	12 (57.1%)	9 (42.8%)	
Good	6 (28.6%)	5 (23.8%)	
Fair	3 (14.3%)	2 (9.5%)	
Poor	0 (0%)	5 (23.9%)	
Outcome			0.067
Satisfactory	19 (90.4%)	13 (62%)	
Unsatisfactory	2 (9.6%)	8 (38%)	
Complication			**0.020***
Yes	1 (4.8%)	8 (38%)	
Surgical time & X-ray exposure (min)	**72.33±13.15**	**63.93±20.75**	0.126
Hospital stays (days)	**2.67±0.82**	**4.60±1.64**	**0.001***

Statistically significant results ($p < 0.05$) are marked with **

A notable association was identified between the methods of fixation in both hospitals stay (P=0.001) and complications (P=0.020). However, the method of fixation did not show a significant effect on variables such as time till union, blood loss, Harris score of the fracture, fracture outcome, surgical time, and Xray exposure.

Table (2): Relation between outcome and age, sex, side affected, Pawel classification, time till union of the patients in BDSF Group.

OUTCOME IN BDSF			
Variable	**Satisfactory (n = 19)**	**Unsatisfactory (n = 2)**	**p-value**
Age (years)			1.000
<20	6 (31.6%)	0 (0%)	
20 – 40	6 (31.6%)	1 (50%)	
>40	7 (36.8%)	1 (50%)	
Sex			0.057
Male	13 (68.4%)	0 (0%)	
Female	6 (31.6%)	2(100%)	
Side affected			1.000
Right	8 (42.1%)	1 (50%)	
Left	11 (57.9%)	1 (50%)	
Pawel Classification			0.333
I	8 (42.1%)	1 (50%)	
II	6 (31.6%)	0 (0%)	
III	5 (26.3%)	1 (50%)	
Time till union (months)			**0.018***
≤3 months	16 (84.2%)	0 (0%)	
>3 months	3 (15.8%)	2 (100%)	

Statistically significant results ($p < 0.05$) are marked with **

A notable association was identified between the time till union and the outcome (P=0.018) in the BDSF group. However, no significant statistical correlation was identified between variables such as age, sex, side affected, and Pawel classification of the fracture and the outcome

Table (3): Relation between outcome and age, sex, side affected, Pawel classification, time till union of the patients in ICCS Group.

OUTCOME IN ICCS			
Variable	**Satisfactory (n = 13)**	**Unsatisfactory (n = 8)**	**p-value**
Age (years)			0.656
<20	3 (23%)	1 (12.5%)	
20 – 40	4(30.8%)	2 (25%)	
>40	6 (46.2%)	5 (65.5%)	
Sex			0.651
Male	7 (53.9%)	3 (37.5%)	
Female	6 (46.1%)	5 (62.5%)	
Side affected			0.382
Right	8 (61.5%)	3 (37.5%)	
Left	5 (38.5%)	5 (62.5%)	
Pawel Classification			0.388
I	6 (46.1%)	1 (12.5%)	
II	2 (15.4%)	2 (25%)	
III	5 (38.5%)	5 (65.5%)	
Time till union (days)			**0.001***
≤3	11 (84.7%)	0 (0%)	
>3	2(15.3%)	8 (100%)	

Statistically significant results ($p < 0.05$) are marked with **

A notable association was identified between the time till union and the outcome (P=0.001) in the ICCS group. However, no significant statistical correlation was identified between variables such as age, sex, side affected, and Pauwel classification of the fracture and the outcome.

Table (4): Relation between complications and Age, sex, side affected, Pawel classification, time till union, and Harris score in BDSF Group.

COMPLICATION IN BDSF			
Variable	**No Complications (n = 20)**	**Screw Cut Out (n = 1)**	**p-value**
Age (years)			0.343
<20	6 (30%)	0 (0%)	
20 – 40	7 (35%)	0 (0%)	
>40	7 (35%)	1 (100%)	
Sex			0.205
Male	13 (65%)	0 (0%)	
Female	7 (35%)	1 (100%)	
Side affected			0.268
Right	9 (45%)	0 (0%)	
Left	11 (55%)	1 (100%)	
Pawel Classification			0.105
I	9 (45%)	0 (0%)	
II	6(30%)	0 (0%)	
III	5 (25%)	1 (100%)	
Time till union (days)			0.086
≤3	16 (80%)	0 (0%)	
>3	4 (20%)	1 (100%)	
Harris Score			**0.031***
Excellent	12 (60%)	0 (0%)	
Good	6 (30%)	0 (0%)	
Fair	2 (10%)	1 (100%)	

Statistically significant results ($p < 0.05$) are marked with **

A notable association was identified between the Harris score of the fracture and the occurrence of complications (P=0.031) in the BDSF group. However, no significant statistical correlation was identified between variables such as age, sex, side affected, Pawel classification, time till union, and the occurrence of complications.

Table (5): Relation between complications and Age, sex, side affected, garden classification of fracture, Pawel classification, time till union, and Harris score in ICCS Group

COMPLICATION IN ICCS					
Variable	**No Complications (n = 13)**	**Non-union (n = 4)**	**AVN (n = 3)**	**Screw Cut Out (n = 1)**	**p-value**
Age (years)					0.925
<20	3 (23%)	1 (25%)	0 (0%)	0 (0%)	
20 – 40	4(30.8%)	1 (25%)	1 (33.3%)	0 (0%)	
>40	6 (46.2%)	2 (50%)	2 (66.7%)	1 (100%)	
Sex					1.000
Male	6 (46.2%)	3 (75%)	1 (33.3%)	0 (0%)	
Female	7 (53.8%)	1 (25%)	2 (66.7%)	1 (100%)	
Side affected					0.659
Right	6 (46.2%)	2 (50%)	2 (66.7%)	1 (100%)	
Left	7 (53.8%)	2 (50%)	1 (33.3%)	0 (0%)	
Pawel Classification					**0.007***
I	7(53.8%)	0 (0%)	0 (0%)	0 (0%)	
II	4 (23.1%)	0 (0%)	0 (0%)	0 (0%)	

III	2 (23.1%)	4 (100%)	3 (100%)	1 (100%)	
Time till union (days)					**0.002***
≤3	11 (84.7%)	0 (0%)	0 (0%)	0 (0%)	
>3	2 (15.3%)	4 (100%)	3 (100%)	1 (100%)	
Harris Score					**<0.001***
Excellent	9 (69.2%)	0 (0%)	0 (0%)	0 (0%)	
Good	4 (30.8%)	0 (0%)	0 (0%)	1 (100%)	
Fair	0 (0%)	0 (0%)	2 (66.7%)	0 (0%)	
Poor	0 (0%)	4 (100%)	1 (33.3%)	0 (0%)	

Statistically significant results ($p < 0.05$) are marked with **

In the ICCS, a notable association was identified between the Pawel classification (P=0.007), time till union (P=0.002), Harris score of the fracture (P<0.001), and the occurrence of complications. However, no significant statistical correlation was identified between variables such as age, sex, side affected in relation to the occurrence of complications.

DISCUSSION:

Age Distribution

In our study, the mean patient age was comparable between the two groups, with a slight predominance of individuals in the 31–40year range. This reflects a population segment that is at greater risk of sustain high-energy trauma such as road traffic accidents. The younger demographic is significant because preserving the femoral head and promoting union are paramount. A comparable trend in age distribution was observed by **Zhao et al. (2017)**, who reported a mean patient age of 36.2 years in their comparative study of BDSF and ICCS techniques [27].

Sex Distribution

There was a higher incidence of femoral neck fractures among males in this study. This aligns with trauma-related patterns where males, particularly in younger individuals are more susceptible to high-impact injuries. Studies such as **Hu et al. (2020)** also reported a male predominance in BDSF groups, attributing it to occupational hazards and higher exposure to vehicular trauma [28].

Side of Fracture

The right side was affected with greater frequency in both groups. Although not statistically significant, a slight right-side dominance is often observed in orthopaedics trauma literature. **Mabry et al. (2004)** similarly noted a right-sided preference in traumatic femoral neck fractures, possibly due to the dominance of right-sided limb function and reflex patterns during falls [29].

Pauwels Classification

Our data showed that the greater proportion of fractures were classified as **Pauwels type III**, which tend to be unstable because of their vertical orientation and higher shear forces. This classification is critical in choosing the appropriate fixation technique. **Nowotarski et al. (2012)** demonstrated in a cadaveric biomechanical study that the BDSF configuration offers greater resistance to vertical shear and torsion, making it more suitable for Pauwels type III fractures compared to ICCS [30].

Surgical Time

Interestingly, the surgical time was longer in the BDSF group, reflecting the added technical demand of placing screws in two different planes with precision. This observation is supported by **Nowotarski et al. (2012)**, who noted that biplanar constructs require meticulous fluoroscopic alignment and a steeper learning curve. Nonetheless, with increasing familiarity and experience with the technique, surgical time is likely to decrease [30].

Intraoperative Blood Loss

In our study, patients in the BDSF group experienced a slightly higher blood loss compared to the ICCS group, although this difference did not reach statistical significance. This is likely due to the more complex screw trajectory and extended fluoroscopy guidance required during BDSS fixation. However, the blood loss remained within acceptable surgical parameters in both groups. A comparable observation was made by **Zhou et al. (2019)**, who noted a marginal increase in intraoperative bleeding with BDSF due to prolonged instrumentation time [31].

X-ray Exposure

A notable increase in intraoperative fluoroscopy usage was observed in the BDSF group. This is understandable, as accurate placement of postero-inferior and anterosuperior screws in two planes requires multiple imaging angles to confirm trajectory. While this increases radiation exposure marginally, it is justified by the superior fixation stability achieved. Zhou et al. (2019) also reported increased fluoroscopy time during BDSF surgeries and recommended using preoperative templating and guidewires to reduce exposure [31]

Hospital Stay

The length of hospital stay was shorter in the BDSF group, likely due to earlier mobilization and fewer complications such as fixation failure or infection. This directly impacts patient satisfaction and healthcare resource utilization. Early discharge was also highlighted in **Hu et al. (2020)**, where patients treated with BDSF began weight-bearing earlier and returned home faster compared to those treated with traditional methods [28]

Radiological Union

The BDSF group demonstrated a faster and more consistent union rate (96.67%) than the ICCS group (86.67%). Early fracture healing was observed more often in the BDSF group, likely due to the improved biomechanical construct providing superior interfragmentary stability. **Zhao et al. (2017)** and **Hu et al. (2020)** also reported faster radiological union times in BDSF-treated patients, especially in high Pauwels angle fractures [27,28].

Avascular Necrosis (AVN)

The incidence of AVN was less frequent in the BDSF group (3.33%) compared to the ICCS group (10%). This is likely a result of the enhanced stability provided by BDSF, which minimizes micromotion and helps maintain the vascular integrity of the femoral head. AVN is a devastating complication, and studies such as **Swiontkowski (1994)** and **Parker & Gurusamy (2006)** have emphasized the importance of stability and anatomical reduction in reducing AVN risk [32,33].

Complications and Technical Challenges

This study found a higher rate of complications—including avascular necrosis (AVN) and nonunion—in patients treated with the inverted triangle configuration. These findings may be explained by reduced mechanical stability and potential disruption of the femoral head's blood supply during screw placement. In contrast, the Biplane Double Supported Screw (BDSF) method demonstrated superior results, with only one case of implant failure and no AVN. [30]. The BDSF technique provides enhanced biomechanical support through anterior and posterior cortical engagement, which likely contributes to better fracture stability and healing. These observations are supported by earlier studies, which reported fewer complications and improved union rates using BDSF constructs due to their ability to limit micromotion and maintain reduction (Zhang et al., 2020; Huang et al., 2018) [34,35].

Harris Hip Score

This study utilized the Harris Hip Score (HHS) to assess hip function following internal fixation with either 'Biplane Double Supported Screw Fixation' (BDSF) or Inverted Cannulated Cancellous Screws

(ICCS). Although the BDSF group revealed a higher rate of patients with excellent or good scores compared to the ICCS group (85.7% vs. 66.6%), the difference did not reach statistical significance ($p = 0.277$). This suggests that, while there is a clinical trend supporting BDSF, the data did not demonstrate a definitive advantage in functional outcome.

Previous research supports the idea that screw positioning can influence stability and healing. Filipov et al. (2011) introduced the BDSF method and highlighted its enhanced biomechanical properties due to dual-plane support, which could potentially lead to improved hip function postoperatively [36]. Despite this, outcomes measured by HHS can also be affected by a range of other factors, such as patient age, bone quality, and rehabilitation efforts. Parker and Blundell (1998) have shown that even when different fixation methods are used, these external variables can diminish the impact of screw configuration on final hip function scores [37].

CONCLUSION:

The comparative evaluation between the 'Inverted Cannulated Cancellous Screws' (ICCS) and the biplanar double-supported screw fixation techniques for 'femoral neck fractures' demonstrates that both techniques are effective for internal fixation. However, the biplanar double-supported screw configuration demonstrated superior outcomes in terms of fracture stability, union rates, and a lower incidence of complications such as avascular necrosis and nonunion. These advantages are likely attributed to enhanced biomechanical stability and better load distribution offered by the biplanar approach. Therefore, the biplanar double-supported technique may be considered a more effective option for the surgical management of femoral neck fractures, particularly in active adults and younger patients where optimal mechanical support is crucial for healing.

Future research with larger sample sizes and prospective designs and longer follow-up periods are needed to confirm these results and assess long-term functional outcomes.

LIMITATION OF STUDY:

This study was limited by a small sample size and short follow-up period, which may affect the reliability of long-term outcome assessment. Additionally, being a single-centre analysis, these findings might not be widely generalizable. Further studies conducted on larger and more diverse patient population is necessary for broader validation.

CONFLICT OF INTEREST: - None

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