

Is Dynamic Condylar Screw Better Than (95°) Blade Plate in Management of Subtrochanteric Fracture of Femur?

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Abstract

- Background:** Subtrochanteric fractures account for approximately 10-30% of all hip fractures, affecting persons of all ages and should be internally fixed to reduce the morbidity and mortality by early rehabilitation and mobilization. A dynamic condylar screw (DCS) and a 95° angle blade plate (BP) provide a good choice for fixation of subtrochanteric fractures so it is a matter of debate that which one is the best fixation in such fractures.
- Objective:** To evaluate the surgical treatment of subtrochanteric fracture of femur using DCS versus a 95° BP.
- Methods:** Prospective comparative study of 40 patients conducted in Al-Imamein Al-Kadhimein Medical City from November 2015 to November 2017. Twenty patients treated with open reduction and internal fixation by using DCS and other twenty patients treated with open reduction and internal fixation by using a 95° BP. The mode of injury, site and type of fracture, age of patients, operating time, and blood loss, union rate, complication of implants, functional results were compared between the groups.
- Results:** Out of 40 patients, there were 26 (65%) male, right side affected in 24 (60%) patients. Mechanism of injury was trivial trauma observed in 28 (70%) patients. According to a Russell-Taylor's classification, majority of fractures are type IB that observed in 16 (40%) patients. Majority of the patients, 27 (67.5%), started full weight bearing at 14 weeks. There was no significant mean age difference between the two groups ($p=0.7$). The mean operation time of DCS (83 ± 4.3 min) was lower significantly than of 95° BP ($p<0.001$). Mean blood loss from DCS variety (365 ± 63 cc) was lower significantly than of 95° BP ($p=0.007$). Infection occurred less frequently significantly in patients who treated by DCS than those treated by 95° BP ($p=0.03$). There was no association between types of open reduction and internal fixation treatment variety and functional result according to the modified Harris hip score ($p=0.52$).
- Conclusion:** DCS better than 95° BP because of its technically easier, possibility to correct reduction even after insertion, less perioperative complication and earlier weight bearing.
- Keywords:** Subtrochanteric fractures of femur, dynamic condylar screw, 95° BP
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List of abbreviations: BP = Blade plate, DCS = Dynamic condylar screw, MHHS = Modified Harris Hip Score, ORIF = Open reduction internal fixation, RTA = Road traffic accidents

Introduction

The subtrochanteric fracture of the femur is defined as a fracture that occurs in the proximal one-third of the femur from

the center of lesser trochanter to center of isthmus of femur ⁽¹⁾. It occurs between lesser trochanter and a point 5 cm distally ⁽²⁾. Subtrochanteric fractures account for approximately 10-30% of all hip fractures, and they affect persons of all ages ⁽³⁾. These fractures occur in three specific patient populations: young patients involved in high-energy trauma, older osteoporotic patients involved in low-energy trauma, and patients exposed to chronic or high-dose bisphosphonate therapy. There is often overlap between the second and third patient population groups, as bisphosphonates are typically used to treat osteoporosis; however, patients with malignancies that are predisposed to bony metastasis occasionally fall into this category as well. Bisphosphonate-related subtrochanteric fractures are often the result of low-energy trauma, but have also been reported as spontaneous fractures ⁽²⁾. The objective of this study is to evaluate the surgical treatment of subtrochanteric fracture of femur using dynamic condylar screw (DCS) versus a 95° blade plate (BP).

Methods

Prospective comparative study was conducted from November 2015 to November 2017 at the Department of Orthopedic Surgery in Al-Imamein Al-Kadhimein Medical City, in which 40 patients with subtrochanteric fractures were recruited, twenty patients treated with open reduction internal fixation (ORIF) using DCS and other 20 patients treated with ORIF using a 95° BP.

Inclusion criteria were Subtrochanteric fractures (occurs between lesser trochanter and a point 5 cm distally), type IA, IB, IIA and IIB classified according to Russell-Taylor's classification. Skeletally mature patients (closed greater trochanter and femoral head physis). All patients have a closed fracture.

Exclusion criteria were multiple fractures in a limb or in-patient, presence of active local or remote infection, pathological fracture, and patient with severe medical comorbidities interfere with anesthesia.

The mode of injury, site and type of fracture, age of patients, operating time, and blood loss, union rate, complication of implants, functional result according to the MHHS were compared between the groups.

Data entry and analysis were performed using SPSS (Statistical Package for Social Sciences) version 24 and Microsoft excel. Means, standard deviation and frequencies were calculated for quantitative variables. Categorical data presented as frequency and percentage tables. A chi-square test of significance of association was performed to assess relations between categorical variables. Student t-test test the significant difference between the mean of two continuous variable. A level of p-value less than 0.05 was considered statistically significant.

Results

A total of 40 patients with subtrochanteric fractures were managed, (20) patients treated with ORIF using DCS and other (20) patients treated with ORIF using a 95° BP, of which 14 (35%) females and 26 (65%) males, their mean age was 60.2±13.5 years (range: 35-80 years). Of the total patients, right side affected in 24 (60%) patients while 16 (40%) patients got left side fracture. Mechanism of injury was trivial trauma, mostly falling on ground that observed in 28 (70%) patients, road traffic accidents (RTA) observed in 12 (30%) patients. Subtrochanteric fractures classified according to Russell-Taylor's classification, out of (40) patients', majority of fractures are type IB that observed in 16 (40%) patients, least number of cases was type IIB that observed in 2 (5%) patients as shown in table (1).

Table (2) shows independent t-test to assess the difference of mean age between two variety of ORIF using DCS and a 95° BP. There was no significant difference in mean age between patients treated by DCS and a 95° BP (p=0.7). The mean operation time of DCS (83±4.3 min) was lower than for 95° BP and this relation was statistically significant (p<0.001). Mean blood loss from DCS variety (365±63.0 cc) was lower than for 95° BP and this relation was statistically significant (p=0.007).

Table 1. Distribution of the patients according to their mode of injury, site and type of fracture

Patients medical characteristics		Frequency	%
Side of fracture	Right	24	60
	Left	16	40
Mode of injury	Full on ground	28	70
	RTA	12	30
Type of fracture (Russell-Taylor's classification)	IA	3	7.5
	IB	16	40
	IIA	14	35
	IIB	2	5
	Unclassified	5	12

RTA=Road traffic accidents

Table 2. Mean difference of age of patients, operating time and blood loss between Open Reduction Internal Fixation (ORIF) types

Variable	Type of ORIF	Mean	±Std. Deviation	P value
Age	DCS	59.5	11.9	0.7 ^{NS}
	95° BP	60.8	15.4	
Operating time (min)	DCS	83	4.3	<0.001*
	95° BP	95	9.4	
Blood loss (cc)	DCS	365	63	0.007*
	95° BP	440	99.4	

*Significant association ($p < 0.05$), NS=non-significant, DCS=Dynamic condylar screw, BP=Blade plate

Infection occurred less frequently in patients who treated by DCS (1 case) than those treated by 95° BP (6 cases), all were superficial infection and were treated with antibiotics and

not required debridement or implant removal and this relation was statistically significant ($p=0.03$) (Table 3).

Table 3. Relationship between types of Open Reduction Internal Fixation (ORIF) and infection rate of the patients

Types of ORIF	Infection rate	
	Yes	No
DCS	1 5%	19 95%
95° BP	6 30%	14 70%
P value	0.03*	

*Significant association ($p < 0.05$), DCS=Dynamic condylar screw, BP=Blade plate

Mean time of union rate for patients who treated by DCS (15.75±2.4) weeks ranged from (12-20) weeks, while for cases treated with 95° BP the mean time for union was (17.5 ± 3.1)

weeks ranged from (14-22) weeks, which is statistically not significant with p-value (0.07) as shown in table (4).

Table 4. Relationship between types of Open Reduction Internal Fixation (ORIF) according to the union rate

Type of ORIF	Mean (weeks)	Std. Deviation (weeks)	Range (weeks)
DCS	15.75	2.4	12-20
95° BP	17.5	3.1	14-22
p-value		0.07 ^{NS}	

NS=non-significant, DCS=Dynamic condylar screw, BP=Blade plate

Out of 20 cases treated with DCS, (1 case) (5%) was ended with superior cut out while in 20 cases treated with 95° BP (1 case) (5%) ended with plate breakage and (1 case) ended with

varus deformity and shortening about 2 cm. This result was statistically not significant with p-value of (0.2) as shown in table (5).

Table 5. Relationship between types of Open Reduction Internal Fixation (ORIF) according to the complication of implants

Types of ORIF	Complication of implant		
	Cut through	Breaking of plate	Malunion and shortening
DCS	1 5%	0 0%	0 0%
95° BP	0 0%	1 5%	1 5%
P value		0.2 ^{NS}	

NS=non-significant, DCS=Dynamic condylar screw, BP=Blade plate

In the current study, functional outcome assessed based on modified Harris hip score that applied at the end of 6 months. There were 6 (30%) patients with DCS and 3 (15%) patients with 95° BP showed excellent results. Good results observed in 8 (40%) patients with DCS and 7 (35%) in 95° BP group. Fair results observed in three (15%) patients with DCS, 5 (25%) patients in 95° BP group. Poor results were two (10%) in patients with DCS, 4(20%)

patients in 95° BP group. Failed result were one (5%) in patients with DCS, and same result in patients with 95° BP group.

Table (6) shows Pearson Chi square test that test the significance of association between types of ORIF and functional result according to the Modified Harris Hip Score (MHHS).

There was no association between types of ORIF treatment variety and functional result according to the MHHS (p=0.52).

Table 6. Relationship between types of Open Reduction Internal Fixation (ORIF) and functional result according to the Modified Harris Hip Score (MHHS)

Types of ORIF	Functional result according to the MHHS				
	Excellent	Good	Fair	Poor	Failed
DCS	6 30%	8 40%	3 15%	2 10%	1 5%
95° BP	3 15%	7 35%	5 25%	4 20%	1 5%
P value	0.52 ^{NS}				

*Significant association (p< 0.05), NS=non-significant, DCS=Dynamic condylar screw, BP=Blade plate

Discussion

Subtrochanteric fractures account for approximately 10-30% of all hip fractures, and they affect persons of all ages ⁽⁴⁾. The characteristic anatomy, the biomechanical stress and forces acting at the subtrochanteric region makes it difficult to manage these fractures ⁽³⁾.

In current study, the average age was 60.2 years (ranges: 34-80 years), most of them were elderly patients, which was comparable with Sn *et al.* ⁽⁴⁾.

Present study found that male was predominant (65%), which was similar to what was found by Sn *et al.* who reported (85%) of the patients were male ⁽⁴⁾.

Current study found that most of the side that affected was right; Chaturvedi *et al.* ⁽⁵⁾ reported similar result.

In this study, the mechanism of injury was trivial trauma, mostly falling on ground in 70% Of the injuries. This may be due to most of patient were elderly osteoporotic patients, which was in agree with what was found by Chaturvedi *et al.* ⁽⁵⁾.

In this study, the mean operating time (from skin incision to skin closure) was 83 minutes for the DCS, which was more than for 95°BP (95 minutes), this due to easier operative technique for DCS, while BP need additional exposure to place plating and accurate reduction. This result was comparable to Halwai *et al.* who reported 80 min for the DCS ⁽⁶⁾. While Sharma *et al.* reported 92.2 min duration of surgery with DCS ⁽⁷⁾. Similarly, Neher *et al.* reported the duration as 108 min

of surgery with 95°BP ⁽⁸⁾. Also, in agreement with present study, Vashisht *et al.* reported mean duration of surgery for DCS was 82.2 minutes (Range 72-90), mean duration of surgery for 95° BP was 104.47 minutes (Range 95-115) ⁽⁹⁾.

In present study, regarding blood loss intraoperatively in DCS about 365 cc, while in 95°BP about 440 cc, this due to large incision and more manipulation in BP group. This comparable to Vashisht *et al.* who reported that average amount of blood loss was 380.33 cc (Range 320-420) in cases treated with 95°BP and 342.67 cc (Range 320-380) in cases treated with DCS ⁽⁹⁾.

Neher *et al.* showed 418 cc of blood loss during surgery with 95°angle BP ⁽⁸⁾, while Mousa reported 250 cc of blood loss during surgery with DCS ⁽¹⁰⁾.

This study showed that there are seven cases of infection, one from DCS (5%) and six from 95°BP (30%), all were superficial infection and treated with antibiotics; none required debridement or implant removal. this due to excessive manipulation and longer operative time in BP group. This is comparable to Vashisht *et al.* who reported that infection occurred in one (6.67%) case of 95° BP group while none occurred in DCS group ⁽⁹⁾.

Current study found that the mean time of union is 15.75 weeks for group treated with DCS & 17.5 weeks for group treated with 95° BP, there were no significant statistical differences of the mean time union between groups (p value 0.07). This was agreed with Vashisht *et al.* who reported that radiological

union in most of the patients (14 out of 15 cases) treated with DCS plate occurred between 12-16 weeks, while in cases treated with 95°BP radiological union in most of the patients (13 out of 15) occurred between 14-18 weeks⁽⁹⁾. Rohilla *et al.* showed that union in 16 weeks⁽¹¹⁾, Neogi *et al.* in 15.6 weeks⁽¹²⁾, Laghari *et al.* in 16.5 weeks with DCS⁽¹³⁾. Boopalan *et al.* showed that union in 16 weeks⁽¹⁴⁾, Yoo *et al.* showed union in 19 weeks⁽¹⁵⁾ and Laghari *et al.* showed union occurred in 18 weeks with 95° BP⁽¹⁶⁾.

This study showed that the majority of patients 75% with DCS and 60% with 95° BP had a full weight bearing at 14 weeks. Vashisht *et al.* reported full weight bearing was started at 12-18 weeks in most of the patients (14 out of 15 cases) treated with 95° BP, while in cases treated with DCS full weight bearing was started at 14-20 weeks in most of the patients (13 out of 15)⁽⁹⁾.

In present study, functional outcome assessed based on modified Harris hip score, 30% of patients with DCS and 15% of patients with 95° BP showed excellent results. Good results were 40% in DCS and 35% in CBP group. Fair results were 15% in DCS, 25% in 95°BP group. Poor results were 10% in DCS, 20% in CBP group, and failed result were equally in both group (5% with each of them). Overall, 22.5% showed excellent, 37.5% good, 20% fair, 15% poor results and 10% failed result. Vashisht *et al.*⁽⁹⁾ stated that out of 15 patients reported excellent results were seen in 3 (20%) cases of 95° BP group and 5 (33.33%) cases of DCS group. Results were good in 7 (46.66%) cases of 95° BP group and 9 (60%) cases of DCS group. 3 (20%) patients had fair result in the 95° BP group. While poor results seen in two (13.33%) cases of 95° BP group, one (6.67%) patient had poor result in the DCS group.

Halwai *et al.* showed excellent to good results in 73.33%⁽⁶⁾, Neogi *et al.* in 95% cases⁽¹²⁾, Laghari *et al.* in 81% cases with DCS⁽¹⁶⁾. Laghari *et al.* also showed excellent to good results in 78.56% cases with 95° BP⁽¹⁶⁾.

Current study reported that one case 2.5% with malalignment with both groups this occur with 95°BP group. Chaturvedi *et al.* reported varus

angulation in one case fixation of fracture with DCS⁽⁵⁾.

This study had concluded that a DCS will be a good option for treatment of subtrochanteric femoral fractures, which is better than the 95°BP and that because of the following:

- 1-It is technically easier than 95°BP.
- 2-Possibility to correct the reduction even after insertion of condylar screw.
- 3-Less perioperative complications as infection & blood loss and less operative time.
- 4-It has had earlier radiological union and earlier weight bearing.

Although the 95° BP remains as alternative option for the internal fixation of subtrochanteric femoral fracture.

For further research, large population-based studies are recommended in order to determine the scope of this problem nationwide and a follow up study is needed to reach for the best methods for treatment of this type of fractures and to assess the relationship between the variables over time.

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Author contribution

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Conflict of interest

There was no conflict of interest.

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