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ORIGINAL ARTICLE

Comparison of Transverse Cancellous Lag Screw and Ordinary Cannulated Screw Fixations in Treatment of Vertical Femoral Neck Fractures

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ABSTRACT

Aim of the Work: To compare the clinical therapeutic effect of transverse cancellous lag screw (TCLS) fixations and ordinary cannulated screw (OCS) fixations for vertical femoral neck fractures.

Patients and Methods: This prospective randomized controlled study was conducted in Ain Shams University hospitals and El-Zaitoun hospital in Cairo. It included twenty two cases, who sustained femoral neck fractures. Patients were divided into 2 groups; Group A: using ordinary cannulated screws as a method of fixation. Group B: using transverse lag screws as a method of fixation. A randomized controlled study involved twenty two cases, who complained of fracture neck femur femoral neck fractures.

Results: There was statistically significant slightly improved in TCLS group compared to OCS group. The results showed 5 patients out of 22 having complications, 2 patients (18.2%) belong to TCLS Group compared to 3 patients (27.3%) belong to OCS group, with avascular Necrosis 1 patient (9.1%) in TCLS regarding Neck Shortening 1 patient (9.1%) in TCLS and 2 patients (18.2%) OCS group. Regarding Non Union 1 patient (9.1%) in OCS group, there were high complications in OCS group compared to TCLS group but insignificant.

Conclusion: A new study suggests that using the TCLS method to treat vertical femoral neck fractures may improve hip function and reduce neck shortening rates. Type III femoral neck fractures in Pauwels patients may benefit from this study's findings.

Keywords: transverse cancellous lag screw, ordinary cannulated screw, fixation, vertical femoral neck, fractures

INTRODUCTION

Femoral neck fractures are those that occur between the femoral head and the basal region of the femoral neck, and are therefore referred to as such. A hip fracture is one of the most common injuries, and it can be caused by a variety of different circumstances (1, 2). Mental health problems are growing more common as people live longer lives, and this is particularly true among the elderly population. The femoral neck fracture accounts for 3.8 percent of all adult fractures in the older population(3) (4). Osteoporosis is the most common cause of femoral neck fractures, which can occur at any age (5). (7). High-energy trauma, such as sports injuries, automotive accidents, and falls from considerable heights, is the most common cause of femoral neck fractures in young people (8).

Since the 1930s, when it was originally discovered, femoral neck fractures have been extensively examined using Pauwels' classification, particularly in young people (9). Type I fractures have a verticality of less than 30 degrees, type II fractures have a verticality of 30–50 degrees, and type III fractures have a verticality of more than 50 degrees. (10) (11) (12) Because of the mild trauma and consistent fixation outcome, femoral neck fractures are commonly treated with a combination of closed reduction and internal fixation with many cannulated screws. (14) (15) (16) The majority of specialists now recommend using three cannulated screws instead of two to better stabilise the fracture and speed up healing (18). Three cannulated screws have been proven to be effective in treating femoral neck fractures (19). (20). (21).

We predicted that transverse cancellous lag screws (TCLS) would be preferable to ordinary cannulated screws (OCS) in the treatment of Pauwels' type III femoral neck fractures because of their greater functional recovery and fewer sequelae than OCS. Earlier investigations had found this to be the case.

PATIENTS AND METHODS

In the period between February 2019 and April 2021, a prospective randomized controlled study was conducted in Ain Shams University hospitals and El-Zaitoun hospital in Cairo. This prospective study involved twenty two cases, who sustained femoral neck fractures. The study was carried out on patients above 18 years with Pauwels' type III femoral neck fractures:

The study included patients aged 18–65 years old who are willing and consented for the operation, postoperative follow-up time of 1 year, time from injury till surgery within (6-12hours) and polytraumatized patient unilateral or bilateral fracture neck femur. After fulfilling inclusion and exclusion criteria, patients divided into two subgroups with 11 patients in each group: **Group A**: using ordinary cannulated screws as a method of fixation and **Group B:** using transverse lag screws as a method of fixation.

A thorough medical history and clinical examination were conducted on every patient in this investigation. Each patient underwent a thorough general and local examination, with specific attention paid to the following: Examination of the affected limb to the fullest extent possible.

Harris hip score (HHS): It is possible for physicians and other competent health care providers to administer the HHS, which is based on clinical evidence. (22). The first edition of this book was published in 1969. (23).

HHS score can be increased up to a maximum of 100 points. Pain receives 44 points, whilst function receives 47 points and range of motion receives 47 points, for a total of

100 points. In the larger concept of "function," daily living activities (14 points) and gait are two subcategories that fall under the umbrella term "function" (33 points). The HHS increases in direct proportion to the degree of malfunction. A student's performance is judged superior if his or her total score is between 70 and 80, 80 to 90, or 90 or higher. A student's performance is rated superior if his or her total score is between 70 and 80, 80 to 90, or 90 or higher (24).

Statistical analysis: The data were analysed using SPSS 23.0. In non-parametric distributions, the median with inter-quartile range was used instead of the mean standard deviation (IQR). Quantitative traits were represented by numbers and percentages. The data were normalised using the Kolmogorov-Smirnov and Shapiro-Wilk tests. P-values 0.05 were considered significant

RESULTS

The TCLS and OCS groups were both 52.73 and 52.82 years old, with a p-value of 0.599 indicating no statistically significant difference in age between the two groups. When it comes to gender, the TCLS and OCS groups were statistically indistinguishable in Table 1 (p=0.478). Table 1 shows that there was no statistically significant difference between the TCLS and OCS groups in terms of mechanism of harm, with a p-value of 0.170.. Only one patient (9.1%) in the OCS group was found to be a smoker, whereas five patients (45.5%) in the TCLS group were found to be smokers. The p-value (p=0.149) indicates that there is no statistically significant difference between groups.

Table 1 shows that there was no statistically significant difference between the TCLS and OCS groups in terms of side, with p=0.395, with respect to the left and right sides of 4 patients (36.4 percent) and 7 patients (63.6 percent) in the TCLS group, respectively.

There was no statistically significant difference between the TCLS and OCS groups in terms of average time to operation "hours," as shown in Table 1, with a p-value of 0.288%. A statistically insignificant difference was found between the two groups in preoperative HHS, with each group's mean-SD of 10.902.86 compared to 10.753.34 for TCLS and OCS, respectively. There was a statistically significant slightly better outcome in the TCLS Group compared to the OCS Group with a p-value (p=0.046*) of 79.81 19.24 compared to 72 21.80 in the OCS Group postoperative HHS comparison. Postoperative HHS was significantly higher in each group than preoperative HHS was, as evidenced by a p-value (HS) of 0.001. Neither a superficial wound infection nor a deep venous thrombosis occurred in any of the patients. There were five patients who experienced complication in the study of 22 patients, two of whom belonged to the TCLS group and three of whom belonged to the OCS group, although the difference was insignificant (p=0.495) as shown in Table 4.

3 patients (27.3 percent) achieved excellent, 5 patients (45.5 percent) achieved good, and 2 patients (18.2%) received fair or poor results in the TCLS Group, while only one patient (9.1 percent) in the OCS Group achieved excellent, 7 patients (63.6 percent) received good, and 2 patients (18.2%) received fair or poor results.

Table 1: Comparison Between TCLS Group and OCS group according to demographic data

Demographic	Demographic	TCLS Group	OCS Group	Test value	P-value
Age (years)	Mean±SD	52.73±9.34	52.82±17.27	FE	0.599
	Range	39–71	25–75		
Sex	Female	3 (27.3%)	6 (54.5%)	FE	0.387
	Male	8 (72.7%)	5 (45.5%)		
Mechanism of Injury	High	9 (81.8%)	6 (54.5%)	FE	0.361
	Low	2 (18.2%)	5 (45.5%)		
Smoking	No	6 (54.5%)	10 (90.9%)	FE	0.149
	Yes	5 (45.5%)	1 (9.1%)		
Side	Left	4 (36.4%)	7 (63.6%)	FE	0.395
	Right	7 (63.6%)	4 (36.4%)		
Operation time	Mean±SD	3.64±0.67	3.27±0.90	-1.063	0.288
	Range	3–5	2–5		

Using: z-Mann-Whitney test; Fisher's Exact p-value>0.05 NS, Using: Fisher's Exact; p-value>0.05 NS

Table 2: Relation between outcome of results according to smoking and time tooperation "hours." in

	Transverse Lag Screw Group					
Transverse lagscrew	Quality of reduction				Test value	p- value
	Excellent (n=2)	Good (n=5)	Fair (n=3)	Poor (n=1)		
Smoking						
No	2 (100.0%)	2 (40.0%)	1 (33.3%)	1 (100.0%)	FE:3.471	0.325
Yes	0 (0.0%)	3 (60.0%)	2 (66.7%)	0 (0.0%)		
Operation Time h	4.00±1.41	3.60±0.55	3.67±0.58	3.00±0.00	H=0.679	0.226
Ordinary Cannulated Group						
Transverse Lag Screw Group	Excellent (n=1)	Good (n=7)	Fair (n=2)	Poor (n=1)	Test value	p- value
Smoking						
No	1 (100.0%)	6 (85.7%)	2 (100.0%)	1 (100.0%)		
Yes	0 (0.0%)	1 (14.3%)	0 (0.0%)	0 (0.0%)	FE:0.629	0.890
Time to operation (hrs)	4.00±0.00	3.00±0.58	3.50±2.12	4.00±0.00	H=0.604	0.633

Using: H-Kruskal Wallis test; Fisher's Exact p-value>0.05 NS, Using: H-Kruskal Wallis test; Fisher's Exact p-value>0.05 NS

Table 3: Comparison between TCLS Group and OCS Group according to Harris Hipscore.

Harris Hip Score	Method of Fixation		Mann-Whitneytest	p- value
	TCLS Group (n=11)	OCS Group (n=11)		
Preoperative Mean±SD Range	10.90±2.86 6–15	10.75±3.34 6–16	0.016	0.896
Postoperative Mean±SD Range	79.81±19.24 37.5–96.8	72.43±21.80 32.8–94.8	-2.592	0.046*
Wilcoxon test	9.386	8.583		
p-value	<0.001**	<0.001**		

Table 4: Comparison between TCLS Group and OCS Group according to complications.

Complication	Method of Fixation		Test value	p-value
	TCLS Group (n=11)	OCS Group (n=11)		
No Complication	9 (81.8%)	8 (72.7%)	2.392	0.495
Complication	2 (18.2%)	3 (27.3%)		
Avascular Necrosis	1 (9.1%)	0 (0.0%)		
Neck Shortening	1 (9.1%)	2 (18.2%)		
Non Union	0 (0.0%)	1 (9.1%)		

Using: Fisher's Exact; p-value>0.05 NS

Table 5: Comparison between TCLS Group and OCS Group according to quality ofreduction.

Quality of reduction	Method of Fixation		Testvalue	p-value
	TCLS Group (n=11)	OCS Group (n=11)		
Excellent	3 (27.3%)	1 (9.1%)	1.333	0.721
Good	5 (45.5%)	7 (63.6%)		
Fair	2 (18.2%)	2 (18.2%)		
Poor	1 (9.1%)	1 (9.1%)		

Using: Fisher's Exact; p-value>0.05 NS

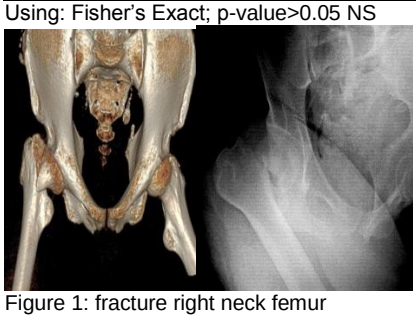

Figure 1: fracture right neck femur

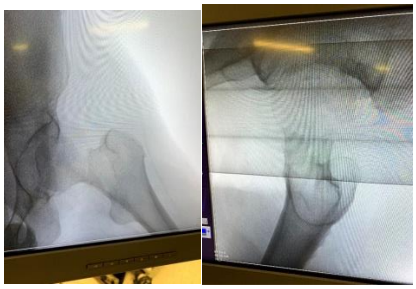

Figure 2: Intra operative images on traction table

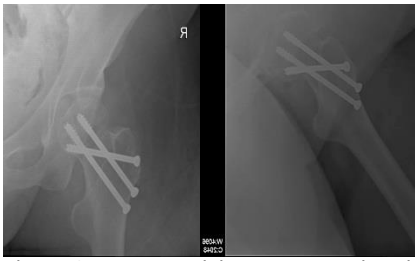

Figure 3: Post-op. plain X-ray, AP view (a) and lateral view (b), showing TLCS fixation

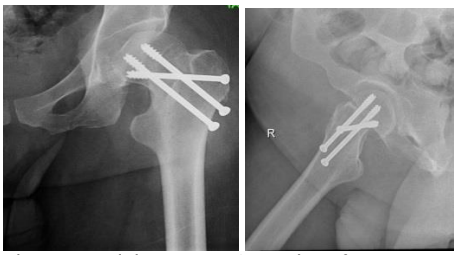

Figure 4: Plain X-ray 12 weeks after surgery, AP view (a) and lateral view (b).

DISCUSSION

Severe-energy traumas like vehicle accidents and high falls have increased the number of femoral neck fractures in young and middle-aged adults (25). In recent years, research has shown that the femoral head blood supply is protected by a rapid and stable internal fixing of the skeleton (15). These types of vertical fractures (Pauwels' type III) might be more difficult to repair and require more vigorous treatment than low angle fractures (25).The greater the number of fracture line angles, the greater the shear force at the fracture end. (27)(28) (29). (30).

The nonunion rate was 23.5 percent in Li et al's study (P=0.029) and 23.5 percent in our study (P=0.029). The Harris scores (87.82779) and our study (79.8119.24) (p=0.046*).

The postoperative Harris hip score (82.37 7.52) was greater in the cannulated screw group (P = 0.039). Tang et al. (33) found nonunion fractures and femoral head necrosis to be the most prevalent issues. Neck necrosis and shortening were both statistically significant (P-values 0.365-0.356), but not nonunion. After the follow-up, the Harris hip score was (84.4 3.2 P-value 0.05).

According to Guo et al. (34), nonunion and avascular necrosis (P 0.379). Our study's Harris hip score was (P 0.190) (p=0.046*).

(P = 0.031) and Harris hip score 80.4 9.3 (P = 0.0178). (35). No postoperative infections or DVTs.

After follow-up, Wang et al. (36), the mean Harris Hip Scores were 89.74 5.33 P=0.092.

Femoral neck shortening was common, ranging from 11.14 to 2.78 centimetres. Eight patients (23.53%) experienced nonunion, and 11 had overall problems (32.35 percent) p=0.00164.

To examine the clinical therapeutic benefits of TCLS and OCS fixations on vertical femoral neck fractures, we used a sample of 22 patients divided evenly into two groups: TCLS and OCS.

They were both 52.73 years old (p-value 0.599), showing no statistically significant age difference between the two groups.

In terms of injury mechanism, there was no statistically significant difference between TCLS and OCS groups (p=0.170). Only one patient (9.1%) in the OCS group smoked, whereas five patients (45.5%) in the TCLS group smoked. This means there is no statistically significant difference between the groups.

There is no statistically significant difference between the TCLS and OCS groups in terms of operation side (p=0.395).

On average, the TCLS group had 3.640.67 "hours" compared to 3.270.90 "hours" for the OCS group.

Preoperative HHS showed no statistically significant difference between the two groups, with mean-SD of 10.902.86 for TCLS and 10.753.34 for OCS.

The TCLS group had a somewhat superior outcome than the OCS group, with a p-value (p=0.046*) of 79.81 19.24 versus 72 21.80 in the postoperative HHS comparison.

Postoperative HHS was significantly higher in each group than preoperative HHS was, as evidenced by a p-value (HS) of 0.001.

The results showed 5 patients out of 22 having complications, 2 patients (18.2%) belong to TCLS Group compared to 3 patients (27.3%) belong to OCS group, there was high complications in OCS group compared to TCLS group but insignificant with p-value (p=0.495).

Avascular Necrosis in TCLS Group compared OCS group (1 (9.1%) vs 0 (0.0%) P=0.495)

Neck Shortening in TCLS Group compared OCS group (1 (9.1%) vs 2(18.2%) Non Union rate in in TCLS Group compared OCS group (0 (0.0%) vs 1 (9.1%)

Regarding the quality of reduction were comparable in each of TCLS Group were 3 patients (27.3%) achieved excellent, 5 patients (45.5%) achieved good, 2 patients (18.2%) achieved fair and one patient (9.1%) achieved poor compared to OCS Group were one patient (9.1%) achieved excellent, 7 patients (63.6%) achieved good, 2 patients (18.2%) achieved fair and one patient (9.1%) achieved poor, in term of quality of reduction.

CONCLUSION

A new study suggests that using the TCLS method to treat vertical femoral neck fractures may improve hip function and reduce neck shortening rates. Type III femoral neck fractures in Pauwels patients may benefit from this study's findings.

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