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Research Article

THE DETERMINATION OF FREQUENCY OF NON-UNION POST-DOUBLE FIBULAR-GRAFTING WITHOUT CANCELLOUS HIP-SCREW FIXATION WHILE TREATING NEGLECTED FEMORAL NECK FRACTURES

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Abstract:

Objectives: The research objective is the determination of non-union frequency after double-fibular bone-grafting without the fixation of cancellous hip-screw while treating the neglected femoral neck-fractures.

Materials & Methods: We conducted this descriptive case-series study at the Orthopaedic Department of Services Hospital, Lahore from March to November 2017. We selected 117 patients with NFF, from both genders, having (20 – 50) year's age. We excluded patients having aseptic non-union, pathological fractures, medical co-morbidity (Chronic steroid, CLD, CRF etc.). We did DFB grafting without CHS fixation among all patients. We continued post-operation follow-up until the outcome for all patients.

Results: The number of male and female patients was 72.65% (85), and 27.35% (32) out of 117 respectively (Male-to-female ratio of 2.6:1) with the mean age of (35.1 ± 7.6) years. We found fracture's mean duration as (1.4 ± 0.89) months among most (88) patients having more (≤ 03) months. The number of patients with non-union and union was 13.6% (16) and 86.32% (101) respectively.

Conclusion: Our study concludes an outcome with a low frequency of non-union after DFB grafting without CHS fixation while treating NFNF.

Keywords: Neglected Femoral Fracture (NFF), Neglected Femoral Neck Fractures (NFNF), Double Fibular Bone (DFB), Femoral Neck Fractures (FNF), Cancellous Hip Screw (CHS), and Non-union.

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INTRODUCTION:

The fracture of hips belongs to femoral fracture which occurs almost at the end of a long bone of thigh (femur) near the hip [1]. The classification of fractures includes intra-capsular fractures (neck, femoral-head), extra-capsular fractures (trochanteric, sub- & inter-trochanteric). Patient's pre-existing physical condition matter but the location and amount of combination, and angulation of a fracture defines the morbidity intensity of a patient [2]. Some fractures are extremely rare like the proximal femur, where accidents with a high-energy motor-vehicle or in-activity trauma of significant level cause them. Normal causes include fibrous dysplasia, bone cysts, or Gaucher disease [3]. The treatment of NFNF among less than 60 adults is challenging. The word "neglected" refers to Myers et al. term of (≥ 30) days delay in the injury report. Among young, active patients, preserving femoral head is of significant importance [4]. These fractures end-up in non-union due to delay. Such neglected fractures result in non-union between (10% – 30%) rate [5, 6]. Surgery done with delay may cause neck-absorption with various degrees, disuse osteoporosis, and proximal migration of distal fragment. It becomes even harder to achieve stable-fixation and closed reduction with these factors [6]. Non-union of femoral neck among youngsters is uncommon and a serious complicated state for management and patient both. There are several options of operative-treatment with a different success rate for this [7]. The goal of treatment is to preserve the supply of blood to bone-fragments, stable fixation, anatomic reduction, and mobilizing action to avoid stiffness [8]. Options for treatment include hemi-arthroplasty, hip-arthroplasty, osteosynthesis, and osteotomy with/without bone-grafting (free vascularised/non-vascularised fibula, and muscle-pedicle) [8, 9]. Avascular-necrosis and non-union are common complications [10]. Certain advantages relate to Fibular-bone-grafting, like sub-chondral collapse prevention, acts as revascularization channel and biological implant. Using Smith Peterson Nail principle because of its shape (trephine), it stabilizes fracture-reduction [11]. While treating NFNF, Jaiswal A et al. found 12.5% non-union outcome after DFB grafting without CHS fixation [12]. The research objective was the determination of the frequency of non-union after DFB grafting without CHS fixation while treating NFNF among the local population. Being a common complication after NFNF, non-union still has scarce literature available where this study will add up into existing literature, as well as provide local statistics. To reduce morbidity, the study will adopt the technique with the least non-union outcomes.

FNF:

Patients with FNF (break in bone continuity viewed AP and Lateral of radiography) with duration of (> 01) month.

Non-union:

Obvious unhealed bones radio-logically after three months of injury on AP/Lateral both, having an absence of continuation of Trabecular across fracture-line.

MATERIAL AND METHODS:

We conducted this descriptive case-series study at the Orthopaedic Department of Services Hospital, Lahore from March to November 2017. We included 117 patients with NFF, from both genders, having (20 – 50) year's age. We excluded patients having aseptic non-union, pathological fractures, medical co-morbidity (Chronic steroid, CLD, CRF etc.), and those who were not willing to be the part of the study.

We selected 117 patients with permission of Ethical

Review Committee who fulfilled inclusion criteria and took their informed, written consent. A consultant Orthopaedic surgeon (with 5-years post-fellowship experience) carried out DFB grafting without CHS fixation among all patients. Until the outcome (non-union) we carried a follow-up (post-operatively) continually for three months and collected data using pre-designed proforma.

We used SPSS software to enter collected data and analyse it. We presented quantitative data (height, age, fracture duration, BMI, and Weight) as mean \pm SD while presented qualitative data (gender, non-union, and diabetes mellitus) as percentage and frequency. We used Chi-square test for variable comparison (non-union) among patients and took P-value of (≤ 0.05) as significant. Using stratification, we controlled effect-modifiers (Gender, age, fracture duration, BMI of ≤ 30 kg/m² as Obese & > 30 kg/m² as non-obese, and diabetes mellitus 'Yes/No') and applied Chi-square post-stratification. We considered P-value of (≤ 0.05) as significant.

RESULTS:

The number of male and female patients was 72.65% (85), and 27.35% (32) out of 117 respectively (Male-to-female ratio of 2.6:1) with the mean age of (35.1 ± 7.6) years. The age range of patients was (20 – 50) with mostly 41% (48) having (30 – 40) year's age. We found fracture's mean duration as (1.4 ± 0.89) months among most (88) patients having more (≤ 03) months. We distributed patients using their status (co-morbid condition). We treated all patients with DFB grafting

without CHS fixation. We found 13.6% (16) and 86.3% (101) patients with non-union and union outcome respectively. Age, gender, and fracture duration, groups did not show the significant

difference after stratification. However, diabetes mellitus and BMI stratification showed significance statistically.

Table – I: Patients' distribution relative to age (117)

Age & Gender		Number	Percentage
Age	20 – 30 Years	41	35.04
	31 – 40 Years	48	41.03
	41 – 50 Years	28	23.93
Gender	Male	32	27.35
	Female	85	72.65

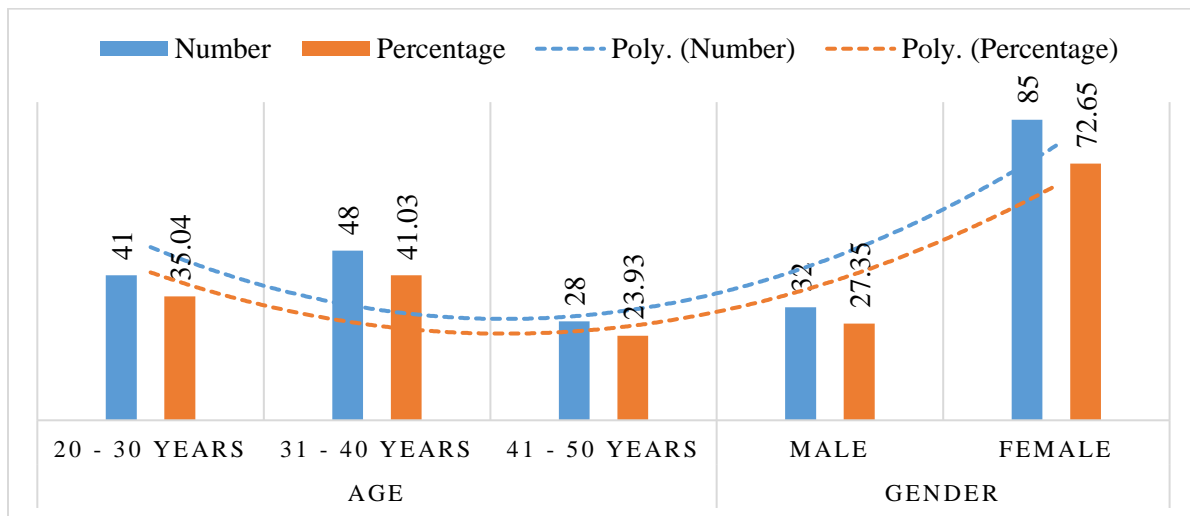
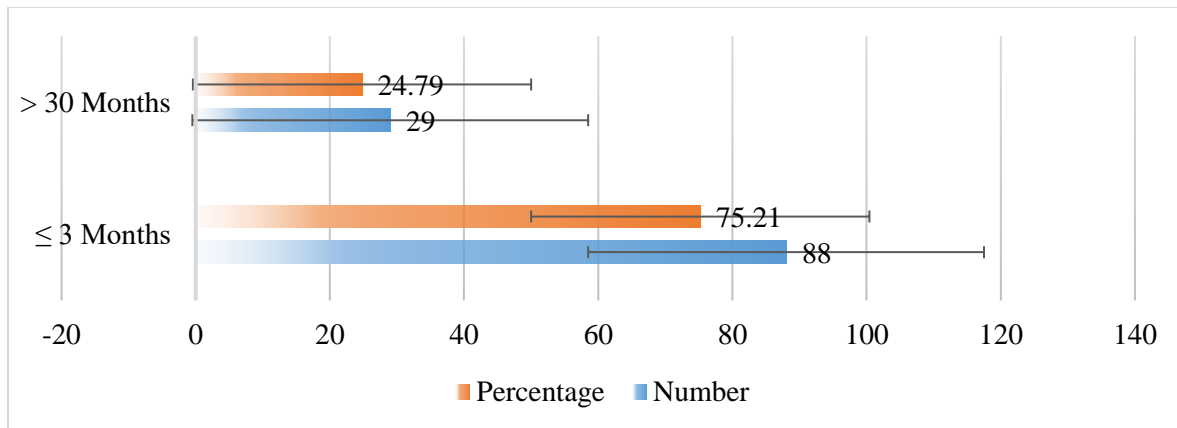
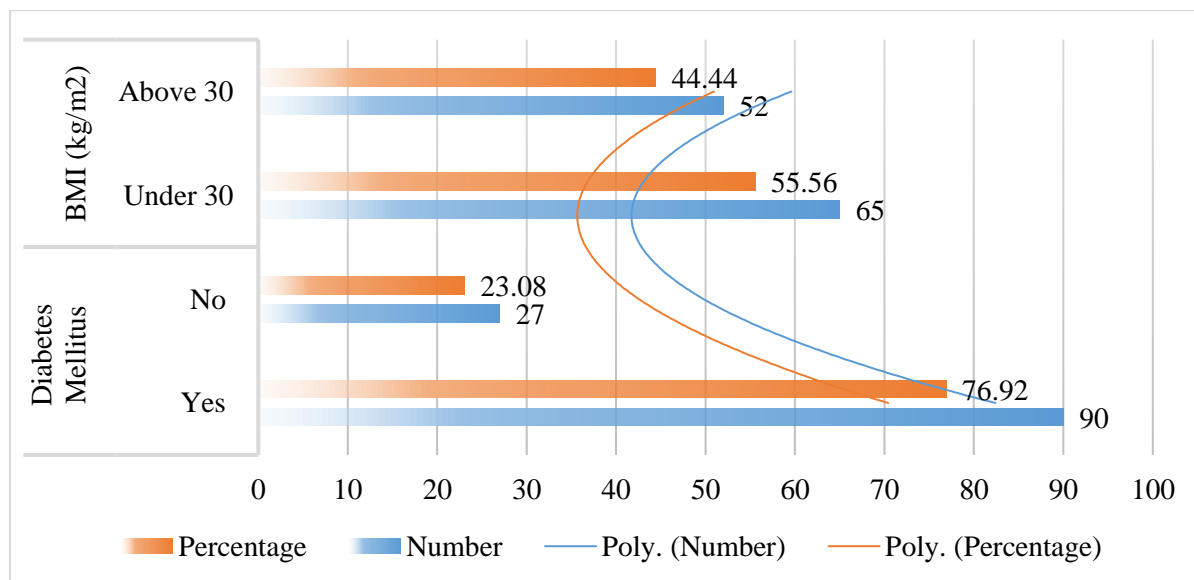


Table – II: Patients' distribution relative to Fracture Duration (117)

Fracture Duration	Number	Percentage
≤ 3 Months	88	75.21
> 30 Months	29	24.79

**Table – III:** DM and BMI Stratification (117)

Confounding Variables		Number	Percentage
Diabetes Mellitus	Yes	90	76.92
	No	27	23.08
BMI (kg/m ²)	Under 30	65	55.56
	Above 30	52	44.44

**Table – IV:** Non-union Stratification (117)

Non-Union	Number	Percentage
Yes	16	13.68
No	101	86.32

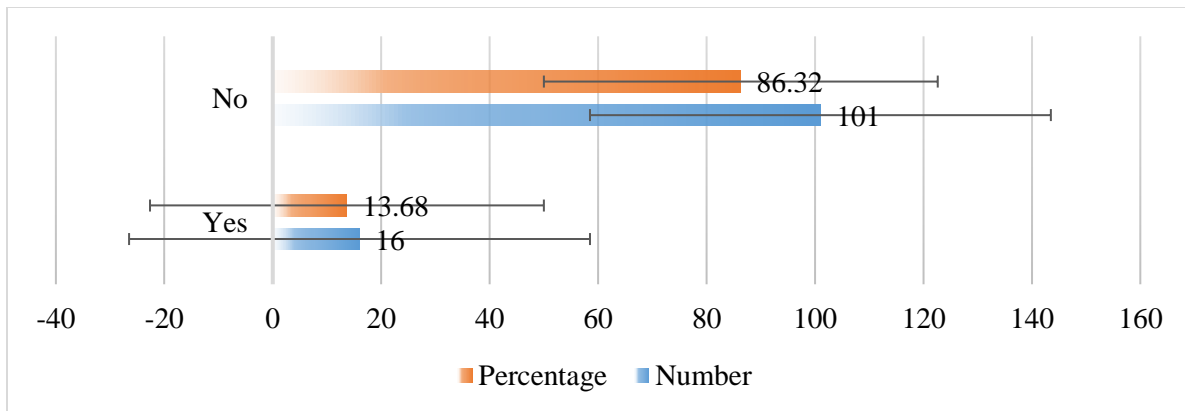
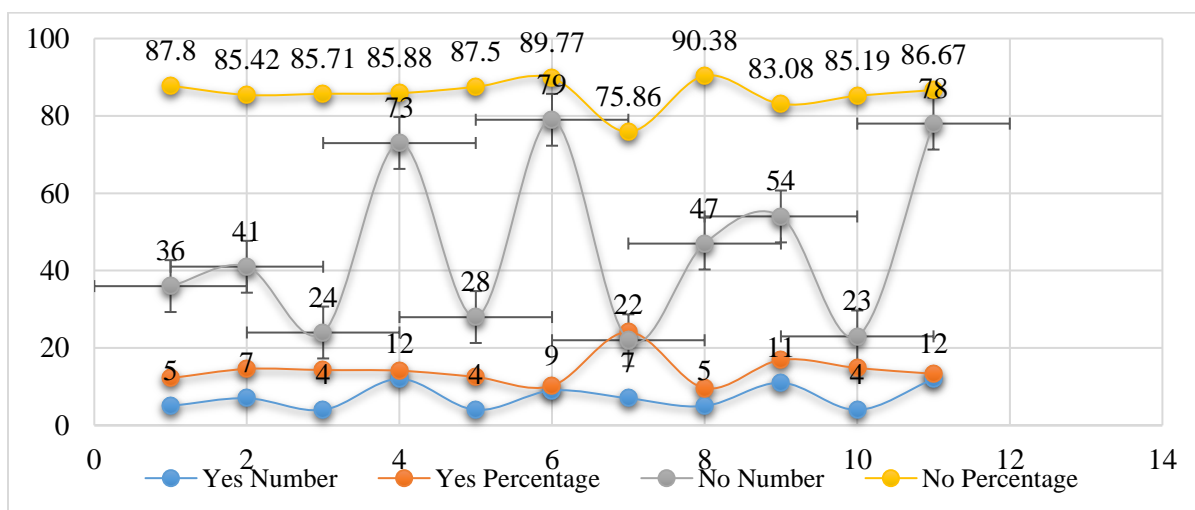


Table – V: Non-union stratification relative to DM, Obesity, Fracture Duration, Gender and Age (117)

Non-Union Stratification		Yes		No		P-Value
		Number	Percentage	Number	Percentage	
Age	20 – 30 Years	5	12.2	36	87.8	0.942
	31 – 40 Years	7	14.58	41	85.42	
	41 – 50 Years	4	14.29	24	85.71	
Gender	Male	12	14.12	73	85.88	0.82
	Female	4	12.5	28	87.5	
Fracture Duration	≤ 3 Months	9	10.23	79	89.77	0.059
	> 3 Months	7	24.14	22	75.86	
Obesity	Obese	5	9.62	47	90.38	0.253
	Non-obese	11	16.92	54	83.08	
Diabetes Mellitus	Yes	4	14.81	23	85.19	0.844
	No	12	13.33	78	86.67	



DISCUSSION:

FNF devastates the femoral head blood supply which leads to severe trauma and fracture displacement [13]. The development of Avascular Necrosis (AVN) of femoral-head concerns implicates with intra-capsular hematoma as well [13]. FNF incidents among young adult's associated with osteonecrosis with (12% – 86%) reported rate in literature. In-time anatomical-reduction and internal, stable fixation result AVN incidence reduction and vascularity [14]. AVN and non-union of femoral-head are major complications followed by FNF. These complications raise due to shear force at fracture, precarious vascularity, and inadequate fixation & reduction [14]. The resorption at end of fracture complicates non-union, leading to femoral neck shortening. Researchers have also used fracture's open-reduction, freshening the surface of fracture, placing cancellous auto-graft near fibula [15, 16]. The fibula is a cortical bone that stimulates union through biological grafting and gives mechanical strength to the union. The graft re-vascularizes, osteoblasts stimulates bone morphogenic-protein that replaces resorbed-bone. Appropriate stress on this bone leads to graft-strength that can handle load [17]. CHS and non-vascularized fibular-strut graft is a less technical and dependable alternative for NFNF among young adults. Vascularized fibular-graft show good results with higher technical demands. In our research, the age range of patients was (20 – 50) with mostly 41% (48) having (30 – 40) year's age having (35.1 ± 7.6) years mean age. The number of male and female patients was 72.65% (85), and 27.35% (32) out of 117 respectively (Male-to-female ratio of 2.6:1) with the mean age of (35.1 ± 7.6) years. We found fracture's mean duration as (1.4 ± 0.89) months among most (88) patients having more (≤ 03) months. We treated all patients with DFB grafting without CHS fixation. The number of patients with non-union and union was 13.6% (16) and 86.32% (101) respectively. Jaiswal A et al. found 12.50% non-union rate after DFB grafting without CHS fixation while treating NFNF [12]. Elgafy achieved 100% union using vascularized iliac-bone graft supported by screw fixation with clinic-radiographic results as satisfactory at follow-up of (5 – 7) years [18]. To lead a tunnel for fibula, we used one/two guide-wires. First, we create a tunnel using Triple-reamer and we fix one/two fibulae (using 02 CCS fixation). In a study, we found non-union and AVN with 33 and 11 cases respectively out of 374 patients having 11.30% rate of complication. In the introduction of structural-support and induction of osteogenesis in NFNF, the use of free fibular-grafting has been studied widely. This method has produced a rate of non-union and AVN to be between (0% – 17%) and (0-33%) respectively [19]. Nagi et al. treated 40

patients with open-reduction, fibular auto-grafting, and internal fixation for NFNF and presented hip function as excellent, good, and fair among 07, 21, and 07 respectively with 87.50% successful outcome [20, 21]. This study showed the rate of non-union and osteonecrosis to be 5% (02) and 12.50% (12). Goyal et al. reported union among 14 (11 with good and 02 with satisfactory) out of 15 patients treated with 01 fibular-graft and 02 cannulated hip-screw [22]. Yadav et al. showed 88% of excellent-to-fair outcome with non-union and osteonecrosis among 17 and 14 respectively while treating 150 patients of FNF with biological fixation by 02 fibular-grafts [23]. Damany et al. took 564 patients (15 – 50 years) with FNF in doing 18 articles' meta-analysis, found the rate of non-union treated with open-reduction, closed-reduction, and osteonecrosis as 11.20%, 4.70%, and 23% respectively with an overall rate of 8.90% [24]. A study took (18 – 48) years men (16) and women (6) having 33 years of mean age with NFNF (> 3 weeks) [10]. Patients (08) having good bone-quality (> 3 single-index) were treated closed-reduction, (120° double-angle) blade-plates fixation, and valgus-osteotomy while patients (14) with poor bone-quality (> 3 single-index) were treated with DFB grafting and internal-fixation with 01 or 02 (7 mm) cannulated CHS. Study assessed the outcome post six-month follow-up relative to Askin & Byan modified-criteria. Surgery delay was (4 – 21) week with 12 weeks mean. Study followed-up patients for (12-24) months (19 months mean) with union time of (12-52) weeks (20 weeks mean). The time to full weight-bearing was (12 – 40) weeks (18 weeks mean). Study recorded non-union in one patient (at week 20) only having blade-plate breakage with complications like fibular-graft slippage, avascular-necrosis, delayed union, limb-length discrepancy and superficial infection among 01, 02, 01, 03, and 01 patients respectively. Functional-outcome among 02, 17, and 03 was excellent, good, and poor respectively [10]. In another study, 38/40 patients of NFNF patients achieved union, treated with open-reduction and internal-fixation with fibular-graft and compression screws [25]. However, after (58.80 months) meantime, the study observed the collapse of femoral-head, coxa vara, fibular-graft fracture, screw penetration, and graft penetration among 05, 11, 04, 06, and 03 respectively [25]. We found Hip-function among 07, 21, 07, and 05 as excellent, good, fair, and poor respectively [25].

CONCLUSION:

Our study concludes that non-union frequency after DFB grafting without CHS fixation in treating NFNF is very low. So, we recommend it as primary therapy

while treating particular fractures for morbidity reduction.

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