Effect of Early Vs Late weight-bearing on outcome after plate osteosynthesis of tibial plateau fractures-A Pilot study

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INTRODUCTION:

The current post-operative rehabilitation protocols for TPF vary widely, ranging from immediate permissive weight-bearing (EPWB) to Late weight-bearing (LWB) for up to 16 weeks. The concept of restrictive weight-bearing after osteosynthesis stems from the fear of loss of reduction. However, evolution in terms of fracture understanding, which is substantiated by surgical technique and modern angle-stable anatomical low-profile periarticular implants, had led to this paradigm shift from delayed to early weight-bearing of these patients.

Studies by Williamson et al and Thewlis et al have found EPWB equivocal to late weight bearing in their retrospective case series. Hypothetically, EPWB has been said to provide early physical reconditioning, reduced duration of hospital stays, expedited functional recovery, and earlier return to work. However, worldwide consensus among surgeons with regard to EPWB versus LWB in fractures of the tibial plateau is yet to established.

While innumerable studies exist on the evaluation of the radiological or clinical outcome of knee in surgically treated tibia plateau fractures. However, effect of timing of weight-bearing on the outcome of tibial plateau never studied prospectively. Therefore, in the current study we aimed to evaluate the effect of EPWB compared to LWB protocol on synovial milieu incite the cartilage degeneration and recovery of gait.

METHODS:

Current studies were done in compliance to Helsinki Declaration. All the adult patients with displaced tibial plateau fracture underwent open reduction and internal fixation (ORIF) from 1st July 2019 to 30th June 2020 were randomly allocated to EPWB or LWB protocol. Patient were asked to comply with the rehabilitation protocol. The rehabilitation protocol was explained by physiotherapists and a written protocol was made available to the patients. The protocols regarding knee ROM and strengthening were similar except for timeline for weightbearing.

Group I – EPWB consisted of patients were instructed to weight bear as tolerated on POD-1

Group II –LWB consisted of those patients that were either non- weight-bearing or touch- down weight-bearing for the first 12 postoperative weeks.

The demographic details, BMI, fracture patterns (Schatzker classification, column, and quadrant classification) and quality articular reduction at 6 months of follow-up were recorded in excel sheet (Table-1). 17 patients with healed fracture were evaluated for the recovery of the gait under various parameter and synovial levels of biomarkers mentioned below at 6 months of follow-up.

Parameter for gait recovery

Gait analysis (BTS SMART-Clinic software) – Velocity, duration of stance and swing phase, stride length and step length.

Gait symmetry using Robinson formula for duration of stance, swing phase, step length

Tampa's Kinesiophobia scores

Synovial Biomarkers

Aggrecan – Marker of proteoglycan depletion

MMP-13 – Maker of inflammation

RESULTS:

During the study period N=17 (n=7 EPWB, n=10 LWB) patients recruited for gait analysis and N=15 (n=5 EPWB, n=7 LWB) patients for synovial fluid analysis. 2 patients gave negative consent for an invasive procedure, and both were belonging to the EPWB group. Both the groups were comparable demographically, BMI, fracture pattern, articular reconstruction, and follow-up period (Table 1).

It was observed that in comparison to the reference value for the normal gait; mean stance phase was increased (63.77 ± 4.65 vs 56.24-69.9), swing phase, step length & stride length were reduced in all the patients and comparable changes were seen on the unaffected side. Gait velocity was reduced compared to the reference value (3.6 to 5.04 km/hour) in both the group. The mean gait velocity in the EPWB group was 3.00 ± 0.808 km/hour while in the LWB group was 2.39 ± 0.715 km/hour. The mean velocity of walking was more in the EPWB group compared to the LWB group. However, there was statistically no significant difference between the two groups. On regression analysis, reduction in stride length (R=0.934) was the most dominant factor contributing to reduced gait velocity followed by step length on the affected side (R=0.909). Variable degree of gait asymmetry was identified in all phases of the gait cycle in both the groups (Table 3).

Kinesiophobia on Tampa's scale was present in 57% (n=4) of the patients in EPWB and 72% (n=8) in the LWB group. The mean Kinesiophobia Score in the EPWB weight-bearing group was 38.14 ± 10.823 while in the LWB

group was 36.80 ± 2.898. However, numerical (p=0.309) and categorical analysis (p=0.769) were comparable among both the groups (Table 3).

Synovial fluid biomarker evaluation was done at the final follow-up, from the affected side for 15 patients as the. The mean Human Aggrecan synovial concentration was 68.14 ± 32.93 while in the LWB group, it was 79.91 ± 33.56ng/ml. The mean Human MMP-13 synovial concentration was 529.58 ± 86.09 while in the LWB group, it was 511.33 ± 159.86. Aggrecan and MMP-13 were raised in both groups compared to the reference value (Aggrecan 0.025 nanograms/ml and 0.061nanograms/ml[16]) and were found statistically comparable in both the group.

DISCUSSION AND CONCLUSION:

In our pilot study, we identified that the EPWB protocol was comparable to the LWB protocol regarding the clinical and radiological outcome, recovery of gait pattern, and synovial levels of biomarkers after osteosynthesis of tibia plateau fractures. It will be safe and feasible to plan a RCT with adequate sample size to study the effect of EPWB vs LWB protocol after stable plate osteosynthesis of tibial plateau fractures.