Journal of Orthopaedic Science and Research

Open Access

Research Article

Comparison of Functional Outcome between Early and Usual CPM Physiotherapy in Healing Tibia Plateau Fracture

Payam Mohammadhoseini[1*], Mohammad Fakoor[1], Seyed Mohammad Mohammadi[1], Hanon Sadoni[1], Hamed Bahrami Yarahmadi[1], Seyed Sina Shariati[1], Mohammad Mahdi Farzinezhadi Zadeh[1]

[1]Department of Orthopedics, School of Medicine, Ahvaz Jundishapur University of Medical Sciences, Ahvaz Iran

[*]**Corresponding Author:** Payam Mohammadhoseini, Department of Orthopedics, School of Medicine, Ahvaz Jundishapur University of Medical Sciences, Ahvaz Iran; Email: p13601467@gmail.com

Received Date: 01-09-2022; **Accepted Date:** 20-09-2022; **Published Date:** 27-09-2022

Abstract

Objective: In order to determine the functional outcome of surgically treated tibia plateau fractures using routine and early CPM physiotherapy following operative treatment a descriptive prospective study was carried out.

Methods: 120 patients with tibia plateau fractures were initially included in this study. 18 patients were excluded from the study according to the exclusion criteria and the remaining 102 patients were followed for 1 year. There were 76 men and 26 women in this investigation. The mean age was 39 years old. Fractures were classified according to Schatzker classification algorithm. A 1-year follow-up was done on these 102 patients. Functional outcome of the patients was graded with HSS and SF-36 functional scores. Statistical analysis was performed by means of SPSS analysis software version 22.

Results: The average time to union was 13 weeks. A mean ROM of 125 degrees for routine physiotherapy and 140 degrees for early CPM physiotherapy treated patients one year after injury. Functional results showed a mean HSS score of 80 points (Range: 19-100). Schatzker type I, II, III and IV fractures showed statistically significant better results compared to Schatzker type V and VI fractures. With regard to SF-36 score, 1 year after injury of eight SF-36 subscales, the results were better in the patients in 6 subscales in early CPM physiotherapy treated patients compared with routine physiotherapy group. The majority of the patients were

Citation: Mohammadhoseini P, et al. Comparison of Functional Outcome between Early and Usual CPM Physiotherapy in Healing Tibia Plateau Fracture. J Ortho Sci Res. 2022;3(3):1-14.

DOI: https://doi.org/10.46889/JOSR.2022.3303

able to perform most of the pre-injury daily activities after 1 year. The most important independent factors influencing functional results in this study were doing early rehabilitation procedures, age of the patients and fracture type.

Conclusion: Functional results after open reduction and internal fixation of tibia plateau fractures seem to be excellent according to HSS score. However, the overall patient function is more satisfactory in early CPM physiotherapy treated patients' in comparison with routine physiotherapy group.

Keywords

Tibia Plateau Fracture; Functional Outcome; HSS Score; SF36 Subscales; CPM Physiotherapy

Introduction

The knee joint is the largest and most complex joint in our body. This joint, like other joints in the body, is prone to injury because it has a wide range of motion and can withstand a lot of weight and pressure. Intra-articular fractures of the proximal tibia are usually named as tibial plateau fractures. They are completely frequent injuries and account for 1% of all fractures in adults. The average age of the cases prone to these types of fractures is approximately 52 years [1]. There are two major age groups of these patients. The first class is young male cases with injuries following high-energy trauma (road traffic accidents) and the second is older female cases who have these fractures following low-energy trauma (simple falls) [2]. The high-energy trauma causes are an increment in axial and/or torsional forces to the proximal tibia. The fragility of the bone with low energy as result of osteoporosis, is the main causative factor in older group of patients [3].

It is completely identified that these types of fractures have an important influence on the quality of life and the health care providers [4]. Fracture diagnosis is generally carried out based on the following steps: patient history, physical examination and plain radiograph. A wide range of treatments have been proposed for distal femoral intra-articular fractures, including non-surgical treatment, fixation with external fixator, open surgery and internal fixation with various instruments and approaches, minimally invasive surgery and knee replacement. In this fracture type patients are not enabled to return to daily activities for 3-4 months following surgical fixation [5]. Post- operative complications such as wound, infection, bleeding, progression of arthritis, muscle and bone atrophy and joint stiffness, ongoing functional problems and increased socio-economic burden are common consequences [6,7]. Physical therapy is a very significant portion of the patients' rehabilitation process during their return to normal activity levels similar to pre-injury or as close as they can to that state. It can help

Citation: Mohammadhoseini P, et al. Comparison of Functional Outcome between Early and Usual CPM Physiotherapy in Healing Tibia Plateau Fracture. J Ortho Sci Res. 2022;3(3):1-14.

DOI: https://doi.org/10.46889/JOSR.2022.3303

prevent some of these problems or focus on areas that these patients need, to achieve better outcomes [8].

Surprisingly, in the literature, there is not a lot of information about the rehabilitation of these patients [9]. Most of the investigations concentrate on either the type of fixation of the tibia plateau fractures or the clinical outcomes following fixation [10]. This study focuses on the physiotherapy that these patients should receive. Thus, the aim of this study is to compare the influence of early and late (two weeks after surgery) CPM regarding the rehabilitation of patients who sustained a tibia plateau fracture and treated surgically, with the view to provide some guidance especially on the main subjects: the range of motion exercises of the knee joint, immobilization, weight bearing and ongoing rehabilitation.

Patients and Methods

Study Design

This quasi-experimental interventional study was performed on two groups of patients with tibia plateau fracture: one group instantly received postoperative CPM physiotherapy meanwhile for the second group routine postoperative physiotherapy treatment was prescribed. The study was performed on all patients who were referred to Imam Khomeini and Golestan hospitals in Ahvaz during 2020-2021 and underwent knee surgery after obtaining informed consent and the necessary permits from the Research Council and approval of the University Ethics Committee (IR.AJUMS.HGOLESTAN.REC1399.133). At first, all patients who underwent knee surgery were selected using random sampling method and were divided into two groups. Inclusion criteria included all the patients who consented to participate in the study in a regular manner and exclusion criteria also included patients who had thromboembolism complication and knee joint abnormalities. It also included patients who were reluctant to participate in the study, as well as patients with unstable fractures. Furthermore, patients with acute osteoarthritis of the joints, loss of sensation and uncontrolled and untreated infections were excluded. Once informed consent for both surgical therapy and research work inclusion was provided, the patients were randomized. Block randomization was carried out by a computer-generated random order of allocated treatments in blocks of four that were placed in sealed envelopes prepared by a study staff member not involved in subject enrollment. Surgical approach and method of fixation were determined by the operating surgeon in each case.

Citation: Mohammadhoseini P, et al. Comparison of Functional Outcome between Early and Usual CPM Physiotherapy in Healing Tibia Plateau Fracture. J Ortho Sci Res. 2022;3(3):1-14.

DOI: https://doi.org/10.46889/JOSR.2022.3303

Sample Size Calculation

In this study, based on the obtained resulted from previous investigations and regarding the error level of 5% (α = 0.05) and the statistical power of 80%, the sample size in each group was calculated based on the following formula [11,12].

$$N = \frac{(Z_{1-\alpha/2} + Z_{1-\beta})^2 (S_1^2 + S_2^2)}{(\mu_1 - \mu_2)^2}$$

B= 0.2 و Z_1-β = 1.96 = $\alpha^{/2-1}$ Z و (α= 0.05)

According to the above formula, the sample size in each group was estimated to be 51 and in total 102 patients were calculated in both groups.

Statistical Analysis

Data was analyzed using IBM SPSS 22.0 statistical software. The Shapiro-Wilk test was applied to assess the normal distribution of measurement data, the range of motion, the amount of bleeding, the healing time, the HSS knee function evaluation, the knee flexion angle, etc. The homogeneity of variance was expressed as X. The Comparison of the groups of measurement data was performed by two independent sample T tests and the difference was considered as statistically significant at P < 0.05.

Results

Of the 102 patients, sixty four were below 45 years. The gender distribution includes 26 female and 76 male. All of them had history of fracture occurred by road traffic accidents, of this thirty four had fracture on right side of knee joint. Of the one hundred two patients, twelve of them are diagnosed as Type-IV Shatzker classification of tibia plateau fracture, twenty three patients were Type II. The fracture pattern distribution of other patients is shown in Table 1.

Fracture Type	CCA	MCA	PCA	Other	Total (%)
Schatrzker I	6	8	11	3	28 (27.4%)
Schatrzker II	4	10	7	2	23 (22.5%)
Schatrzker III	3	1	3	3	10 (9.8%)
Schatrzker IV	5	8	5	3	21 (20.5%)
Schatrzker V	4	5	2	1	12 (11.7%)
Schatrzker VI	2	5	3	2	12 (11.7%)

Table 1: Patient characteristics based on fracture type and lesion mechanism.

Citation: Mohammadhoseini P, et al. Comparison of Functional Outcome between Early and Usual CPM Physiotherapy in Healing Tibia Plateau Fracture. J Ortho Sci Res. 2022;3(3):1-14.

DOI: https://doi.org/10.46889/JOSR.2022.3303

The surgical technique included standard anteromedial or anterolateral approaches depending on the type of fracture. To perform the surgery, after the necessary preparation in the operating room, the fracture place was exposed and opening reduction and internal fixation were performed with T-Plate or screw alone. In cases where correction of joint surface depression was required, the joint surface was raised and a bone graft was used. In one group of patients, the splint was removed for two weeks after surgery and then the patients' splint and sutures were removed and the patients underwent physiotherapy and were advised to perform active and passive movements of the knee and avoid full weight bearing until full fracture healing. Another group underwent early CPM physiotherapy immediately after surgery.

In this study, the mean time for fusion was 14 weeks for patients with routine physiotherapy and 11 weeks for patients with early physiotherapy. Also, the average fusion time based on the type of fracture was calculated for both groups and is shown in Table 2,3.

Fracture Type (Schatrzker)	Union average time (Week)
I	12 wk ± 1.1
II	14 wk. ± 2.9
III	13 wk. ± 1.58
IV	14 wk. ± 1.25
V	16 wk. ± 2.44
VI	16 wk. ± 2.82

Table 2: Mean union time based on fracture type in patients with routine physiotherapy.

Fracture Type (Schatrzker)	Union Average Time (Week)
I	10 wk. ± 0.9
II	11 wk. ± 1.7
III	10 wk. ± 1.41
IV	10 wk. ± 1.13
V	12 wk. ± 1.83
VI	12 wk. ± 1.98

Table 3: Mean fusion time based on fracture type in patients with early CPM physiotherapy.

The mean fusion time based on the age of the patients in the two groups treated with routine physiotherapy and early CPM is shown in Table 4,5.

Citation: Mohammadhoseini P, et al. Comparison of Functional Outcome between Early and Usual CPM Physiotherapy in Healing Tibia Plateau Fracture. J Ortho Sci Res. 2022;3(3):1-14.

DOI: https://doi.org/10.46889/JOSR.2022.3303

Patients Age	The Average Time for Union (Week)
< 30 yr	10 wk. ± 1.41
30-50 yr	13.2 wk. ± 2.32
≥ 50 yr	15.43 wk. ± 2.60

Table 4: Mean union time based on age of patients in the group treated with routine physiotherapy.

Patients Age	The Average Time for Union (Week)
< 30 yr	8 wk. ± 1.06
30-50 yr	10.1 wk. ± 1.43
≥ 50 yr	12.1 wk. ± 1.24

Table 5: Mean union time based on age of patients in the group treated with early CPM physiotherapy.

The mean Range of Motion (ROM) of the traumatized knee after one year was generally 125 degrees in patients treated with routine physiotherapy and 143 degrees in the group treated with early CPM. Based on different fracture types, the average ROM in these two groups is shown in the following tables (Table 6,7).

Fracture Type (Schatrzker)	Average ROM (Degree)
I	130 ± 8.32
II	125 ± 7.29
III	123 ± 6.58
IV	124 ± 8.86
V	120 ± 5.44
VI	118 ± 7.7

Table 6: Range of Motion (ROM) based on fracture type in patients treated with routine physiotherapy.

Fracture Type (Schatrzker)	Average ROM (Degree)
I	149 ± 7.28
II	147 ± 6.88
III	146 ± 6.97
IV	141 ± 7.65
V	134 ± 5.75
VI	130 ± 6.84

Table 7: Range of Motion (ROM) based on fracture type in patients treated with early CPM physiotherapy.

Citation: Mohammadhoseini P, et al. Comparison of Functional Outcome between Early and Usual CPM Physiotherapy in Healing Tibia Plateau Fracture. J Ortho Sci Res. 2022;3(3):1-14.

DOI: https://doi.org/10.46889/JOSR.2022.3303

Table 8 and 9 show the mean ROM of patients in the two groups based on age distribution.

Patient Age	ROM Average (Degree)
< 30 yr	131 ± 6.84
30-50 yr	124 ± 3.72
≥ 50 yr	120 ± 2.53

Table 8: Knee average range of motion based on the age of patients in the conventional physiotherapy group.

Patient Age	ROM Average (Degree)
< 30 yr	145 ± 5.7
30-50 yr	142 ± 2.89
≥ 50 yr	139 ± 2.76

Table 9: Knee average range of motion based on the age of patients in the early CPM physiotherapy group.

Mean HSS functional score of knee in two groups of patients is compared in the following two tables (Table 10,11).

Fracture Type (Schatrzker)	HSS Score
I	84 ± 4.61
II	80 ± 3.72
III	82 ± 6.16
IV	82 ± 4.45
V	76 ± 2-81
VI	75 ± 3.54

Table 10: Knee HSS functional score based on fracture type in the group treated with routine physiotherapy.

Fracture Type (Schatrzker)	HSS Score
I	88 ± 5.32
II	89 ± 4.29
III	89 ± 5.07
IV	87 ± 5.68
V	84 ± 1.98
VI	85 ± 4.76

Table 11: Knee HSS functional score based on fracture type in the group treated with early CPM physiotherapy.

Citation: Mohammadhoseini P, et al. Comparison of Functional Outcome between Early and Usual CPM Physiotherapy in Healing Tibia Plateau Fracture. J Ortho Sci Res. 2022;3(3):1-14.

DOI: https://doi.org/10.46889/JOSR.2022.3303

The mean time of fusion and HSS score by gender in the two treated groups are depicted in Table 12,13.

Gender	Time to Union (Week)	HSS
Men	13.28 ± 2.34	80 ± 4.45
Women	13.87 ± 2.76	81 ± 3.87

Table 12: Union time and HSS score by gender in the conventional physiotherapy group.

Gender	Time to Union (Week)	HSS
Men	10.54 ± 1.86	89 ± 3.76
Women	11.34 ± 2.34	87 ± 5.86

Table 13: Union time and HSS score by gender in the early CPM physiotherapy group.

The mean of each of the eight SF-36 subscale in the two groups of treated patients is as follows Table 14,15.

	Mean	Std. Dev	Norm	P-value
Physical Functioning (PF)	60	4.35	85	0
Role Physical (RP)	55	2.47	80	0
Bodily Pain (BP)	75	2.74	75	0.88
General Health (GH)	65	2.35	70	0
Vitality (VT)	55	2.86	60	0
Social Functioning (SF)	80	2.53	85	0
Role- Emotional (RE)	82	4.43	85	0.75
Mental Health (MH)	73	4.15	75	0

Table 14: Mean of eight components of SF-36 in the treated group with routine physiotherapy and also in normal population.

	Mean	Std. Dev	Norm	P-value
Physical Functioning (PF)	73	3.64	85	0.43
Role Physical (RP)	67	1.87	80	0.38
Bodily Pain (BP)	58	3.12	75	0.93
General Health (GH)	83	2.76	70	0.32
Vitality (VT)	77	2.17	60	0.21
Social Functioning (SF)	92	3.35	85	0
Role- Emotional (RE)	94	5.32	85	0.89
Mental Health (MH)	89	3.84	75	0.31

Table 15: Mean of eight components of SF-36 in the treated group with early CPM physiotherapy and also in normal population.

Citation: Mohammadhoseini P, et al. Comparison of Functional Outcome between Early and Usual CPM Physiotherapy in Healing Tibia Plateau Fracture. J Ortho Sci Res. 2022;3(3):1-14.

DOI: https://doi.org/10.46889/JOSR.2022.3303

A statistical significant difference was seen between early (24.3±6.075) and routine CPM physiotherapy treatment (68±12.546) in the patients of the current study (Mean difference-80.231, p-0.038) in all functional scores.

The results also revealed that the early CPM had great effect in post-operative treatment for tibial plateau fractured patients and assisted to increase the knee joint AROM (P-value 0.000) (Table 2). The results showed that early CPM should be started as soon as possible after the procedure. The immobilization alone after plate fixation does not show to be related to any benefits to the patients. The weight-bearing status of the patients was the most controversial in the literature with the early weight-bearing gaining ground at the most recent studies. Tibia plateau fractures can have detrimental influence on the patients' life style, thus continuous rehabilitation with focus on early CPM exercises is recommended (Fig. 1-5).

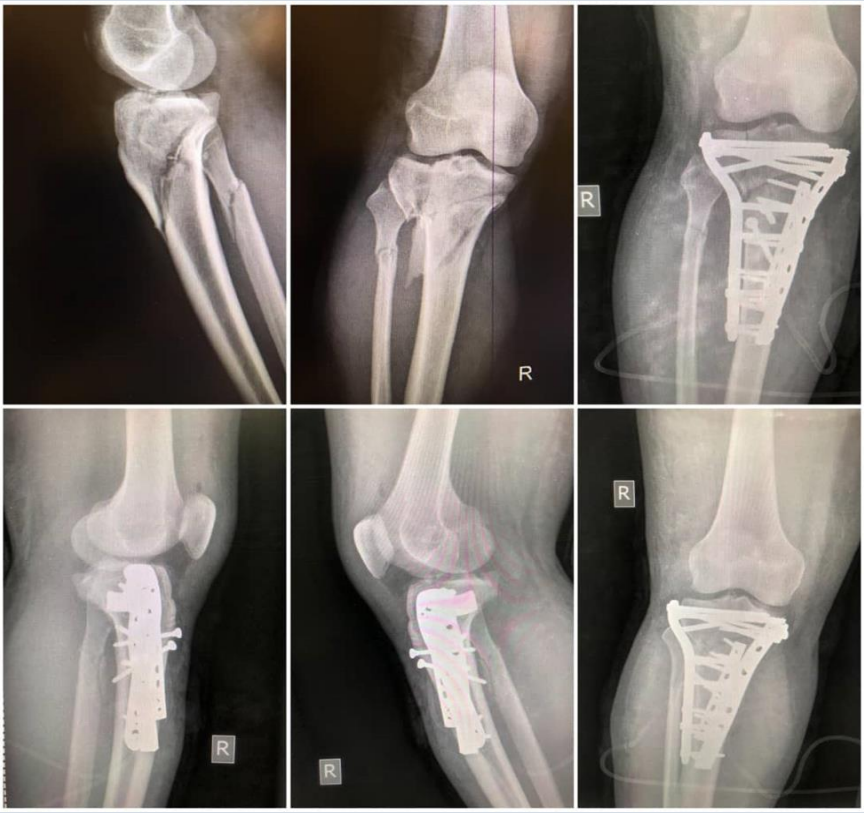

Figure 1: 48 Y/O patient with tibial plateau fx.

Citation: Mohammadhoseini P, et al. Comparison of Functional Outcome between Early and Usual CPM Physiotherapy in Healing Tibia Plateau Fracture. J Ortho Sci Res. 2022;3(3):1-14.

DOI: https://doi.org/10.46889/JOSR.2022.3303

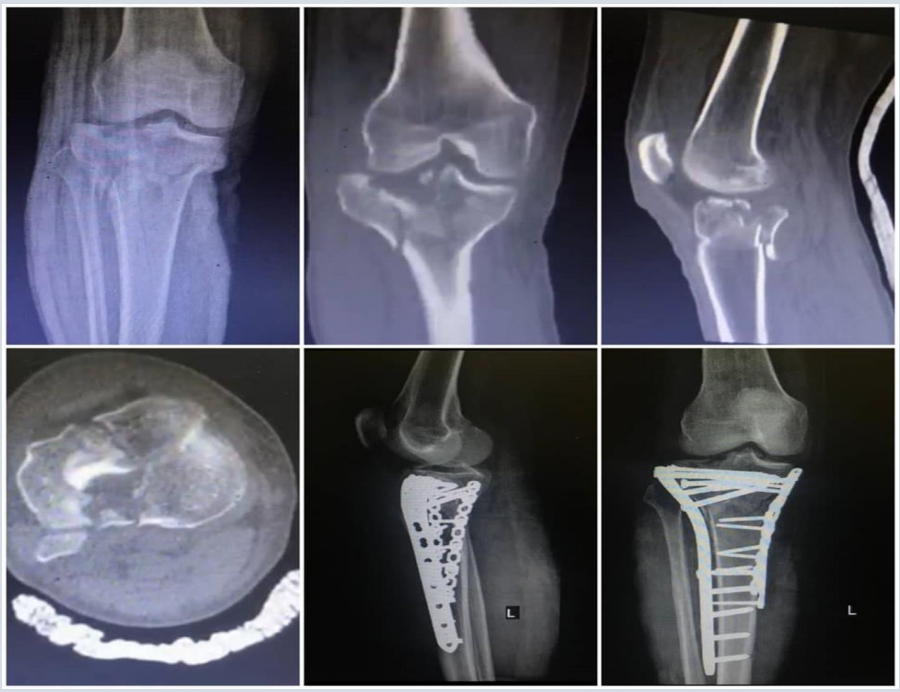

Figure 2: 54Y/O patient with tibial plateau fx.

Figure 3: 39Y/O patient with tibial plateau fx.

Mohammadhoseini P | Volume 3; Issue 3 (2022) | JOSR-3(3)-041 | Research Article

Citation: Mohammadhoseini P, et al. Comparison of Functional Outcome between Early and Usual CPM Physiotherapy in Healing Tibia Plateau Fracture. J Ortho Sci Res. 2022;3(3):1-14.

DOI: https://doi.org/10.46889/JOSR.2022.3303

Figure 4: 35Y/O patient with tibial plateau fx.

Figure 5: 29Y/O patient with tibial plateau fx.

Mohammadhoseini P | Volume 3; Issue 3 (2022) | JOSR-3(3)-041 | Research Article

Citation: Mohammadhoseini P, et al. Comparison of Functional Outcome between Early and Usual CPM Physiotherapy in Healing Tibia Plateau Fracture. J Ortho Sci Res. 2022;3(3):1-14.

DOI: https://doi.org/10.46889/JOSR.2022.3303

Discussion

The prolonged immobilization in a cast can probably increase stiffness in the joint. Early Range of Motion (ROM) of the knee and the maintenance of Non-Weight Bearing (NWB) on the affected leg reduce the postoperative complications [13]. CPM machines have been widely used after elective knee arthroplasty in an effort to improve motion [14]. Orthopedic surgeon may advice or prescribe a Continuous Passive Motion (CPM) machine with ROM exercise to increase the degree from 15 to 70, depending on incision healing. Patients are advised to use a hinged knee brace to avoid varus and valgus strain at the fracture and collateral ligaments [15]. CPM used to facilitate a more rapid achievement of knee flexion and to decrease the number of patients requiring postoperative knee manipulation [16]. Use of CPM may help decrease the development of arthrofibrosis in tibia plateau fractures [17]. The study was aimed basically to investigate the effects of CPM on tibia plateau fractured patients and the result in prognosis of knee flexion/extension ROM and the probable reduction in complications. Biyani, et al., did a study on elderly patients with tibia plateau fractures and noticed better results in patients who used a CPM for 'three' to 'seven' days after surgery compared with those who did not use a CPM [18]. Similar study which was conducted by Hill, et al., found that CPM-used-patients had greater knee flexion at 48hrs from surgery than the standard physiotherapy [19]. In this study, 102 subjects from different age groups were diagnosed as tibia plateau fracture cases, were managed with CPM machine with standard physical therapy, showed excellent recovery at the day of discharge from hospital and achieved 90° active knee range of motion, except one patient due to lack of cooperation while treatment procedure. In this study, a few patients had extensor lag during the treatment session and it was improved by vigorous exercises. All the patients had 90° knee flexion range of motion without knee extensor lag at the discharging time from the hospital. Sample size of the study was enough to derive accurate conclusion. However, the study showed significant improvement on knee flexion range of motion. Similar study needs to be conducted with larger sample of patients in a longitudinal procedure with patients suffering tibia plateau fractures.

Conclusion

The results of this study showed that CPM is in favor of patients 'treatment for post-operative mobilization. This study also concludes that the CPM machine plays a vital role in tibia plateau fracture to initiate earlier knee mobilization to gain active knee ROM and it can help the patient return to normal life pattern within shorter time span.

Citation: Mohammadhoseini P, et al. Comparison of Functional Outcome between Early and Usual CPM Physiotherapy in Healing Tibia Plateau Fracture. J Ortho Sci Res. 2022;3(3):1-14.

DOI: https://doi.org/10.46889/JOSR.2022.3303

Acknowledgement

The authors express sincere thanks to Golestan and Imam Hospitals, for their financial support. The authors also extend their thanks to all patients who participate in this study.

Funding

This work was supported by Ahvaz Jundishapur University of Medical Sciences [Grant Numbers: U99324, 2020].

Conflict of Interest

The authors declare no conflict of interest.

References

1. Chin TYP, Bardana D, Bailey M. Functional outcome of tibial plateau fractures treated with the fine-wire fixator. Injury. 2005;36(12):1467-75.
2. Thewlis D, Fraysse F, Callary SA. Postoperative weight bearing and patient reported outcomes at one year following tibial plateau fractures. Injury. 2017;48(7):1650-6.
3. Kalmet PHS, Van Horn YY, Sanduleanu S. Patientreported quality of life and pain after permissive weight bearing in surgically treated trauma patients with tibial plateau fractures: a retrospective cohort study. Arch Orthop Trauma Surg. 2019;139(4):483-8.
4. Solomon LB, Callary SA, Stevenson AW. Weightbearing-induced displacement and migration over time of fracture fragments following split depression fractures of the lateral tibial plateau: a case series with radiostereometric analysis. J Bone Joint Surg Br. 2011;93(6):817-23.
5. Haak KT, Palm H, Holck K. Immediate weight-bearing after osteosynthesis of proximal tibial fractures may be allowed. Dan Med J. 2012;59(10):A4515.
6. Williamson M, Iliopoulos E, Jain A. Immediate weight bearing after plate fixation of fractures of the tibial plateau. Injury. 2019;50(2):225.
7. Carrera I, Gelber PE, Chary G. Fixation of a split fracture of the lateral tibial plateau with a locking screw plate instead of cannulated screws would allow early weight bearing: a computational exploration. Int Orthop. 2016;40(10):2163-9.
8. Iliopoulos E, Morrissey N, Cho S. Outcomes of the Ilizarov frame use in elderly patients. J Orthop Sci. 2017;22(4):783-6.
9. Robertson GAJ, Wong SJ, Wood AM. Return to sport following tibial plateau fractures: a systematic review. World J Orthop. 2017;8(7):574-7.
10. Kraus TM, Martetschläger F, Müller D. Return to sports activity after tibial plateau fractures: 89 cases with minimum 24-month follow-up. Am J Sports Med. 2012;40(12):2845-52.
11. Quintens L, Van den Berg J, Reul M. Poor sporting abilities after tibial plateau fractures involving the posterior column: how can we do better Eur J Trauma Emerg Surg. 2019.
12. Iliopoulos E, Agarwal S, Khaleel A. Walking impairments after severe tibia plateau fractures. J Orthop Sci. 2020;25(2):276-8.

Citation: Mohammadhoseini P, et al. Comparison of Functional Outcome between Early and Usual CPM Physiotherapy in Healing Tibia Plateau Fracture. J Ortho Sci Res. 2022;3(3):1-14.

DOI: https://doi.org/10.46889/JOSR.2022.3303

13. Elsoe R, Larsen P. Asymmetry in gait pattern following bicondylar tibial plateau fractures - a prospective one-year cohort study. Injury. 2017;48(7):1657-61.
14. Warschawski Y, Elbaz A, Segal G. Gait characteristics and quality of life perception of patients following tibial plateau fracture. Arch Orthop Trauma Surg. 2015;135(11):1541-6.
15. Falzarano G, Pica G, Medici A. Foot loading and gait analysis evaluation of nonarticular tibial Pilon fracture: a comparison of three surgical techniques. J Foot Ankle Surg. 2018;57(5):894-8.
16. Egol KA, Tejwani NC, Capla EL, Wolinsky PL, Koval KJ. Staged management of high-energy proximal tibia fractures (OTA types 41): the results of a prospective, standardized protocol. J Orthop Trauma. 2005;19(7):448-55.
17. DeHaven KE, Black KP, Bronstein RD, Cosgarea AJ, Maloney MD, Sebastianelli WJ. Knee and lower leg. In: Greene WB, editor. Essentials of musculoskeletal care. 2nd Ed. Rosemont: Am Acad Ortho Surg. 2001:350.
18. Rowe PJ, Myles CM, Walker C, Nutton R. Knee joint kinematics in gait and other functional activities measured using flexible electrogoniometry: how much knee motion is sufficient for normal daily life? Gait Posture. 2000;12(2):143-55.
19. McCarthy MR, O'Donoghue PC, Yates CK, Yates-McCarthy JL. The clinical use of continuous passive motion in physical therapy. J Orthop Sports Phys Ther. 1992;15(3):132-40.

Citation: Mohammadhoseini P, et al. Comparison of Functional Outcome between Early and Usual CPM Physiotherapy in Healing Tibia Plateau Fracture. J Ortho Sci Res. 2022;3(3):1-14.

DOI: https://doi.org/10.46889/JOSR.2022.3303