Int J Clin Exp Med 2016;9(6):12115-12119
www.ijcem.com /ISSN:1940-5901/IJCEM0025280

Original Article

Impact of arthroscopic percutaneous poking reduction-fixation on affected limb function and quality of life of patients with fracture of tibial plateau

Yong Cui, Wu Wang, Tao Huang, Zhong Yan Wu, Hu Zhang, Sheng Zhai

First Department of Orthopedics, The Fifth Affiliated Hospital of Xinjiang Medical University, Urumqi, China

Received January 30, 2016; Accepted April 27, 2016; Epub June 15, 2016; Published June 30, 2016

Abstract: Objective: This study aims to analyze the effect of Impact of Arthroscopic Percutaneous poking reduction-fixation on affected limb function and quality of life of patients with fracture of tibial plateau. Methods: 106 cases of fractures of tibial plateau patients were enrolled in the study. According to visit numbers, they were divided into the observation and control groups. They were treated with arthroscopic percutaneous poking reduction-fixation and conventional surgical treatment. After surgery the data, including size of trauma, operative time, blood loss, complications, function and quality of life within six months of follow-up, were compared between groups. Results: Gender, age, fracture to operation time, causes of injury and other data were compared between the two groups, and there was no significant difference (P>0.05). Wound size, operative time, blood loss, concurrency disease incidence and other data in observation group were significantly better than that in the control group (P<0.05). The average score of knee function in the two groups were 93.6±3.8 and 82.5±5.6, respectively. The observation group had significant advantages (P<0.05). The average quality of life score were 79.6±8.5 and 65.8±8.6, respectively. The observation group had significant advantage (P<0.05). Conclusion: Arthroscopic Percutaneous poking reduction-fixation on tibial plateau fractures can reduce complications, shorten operative time and improve limb function and quality of life.

Keywords: Arthroscopy, percutaneous poking fixation, fractures of tibial plateau, limb function, quality of life

Introduction

Fractures of tibial plateau were articular fractures with high incidence in clinical. It is often accompanied by ligaments and meniscus injury, which easily lead to traumatic arthritis, knee stiffness, knee varus, valgus, and other complications affecting the joints and limbs function, and thereby affecting the quality of life [1]. Conventional open reduction and plate fixation are able to jointly ensure anatomic reduction, but the surgery need to cut the joint cavity, increasing the risk of surgery. With the development of minimally invasive techniques, arthroscopic percutaneous poking reduced fixation has been demonstrated in research and clinical, but fractures of tibial plateau often accompanied with relevant section of surface collapse, increasing the difficulty of surgery and thereby affecting its clinical efficacy, resulting in controversy in its application. For clinical treatment, it still need research data to support [2]. In this study, fractures of tibial plateau patients were the subjects for the study of arthroscopic percutaneous poking reduced fixation and the open reduction joint treatments. The suffering limb function and quality of life were compared for clinical treatment guidance. Now the research process and conclusions were outlined below.

Subjects and methods

Selection criteria

Inclusion and exclusion criteria were developed according toe fractures of tibial plateau diagnostic criteria and related research requirements: (1) inclusion criteria: ① in line with tibial plateau fractures diagnostic criteria, and fractures within 1 week [3]; ② preoperative diagnosis its liver and kidney function, cardiac

function etc and they all adapted to surgical requirements; ③ singh index in classification III level and above [4]; ④ meet the principle of informed consent and medical associations to develop research ethics requirements; (2) Exclusion criteria: ① open or comminuted fracture [5]; ② with severe osteoporosis or hemostatic dysfunction; ③ with severe medical illness and surgery contraindications; ④ lost to follow-up and all causes that lead to lack of clinical data [6].

General information

According to the above selection criteria, fractures of tibial plateau patients were screened and 106 cases were studied. The general information were as follows: (1) Gender: male 62 cases, female 44 cases; (2) Age: The average age was (36.8±5.6) years; (3) Time from fracture to surgery: average (4.5±1.3) d; (4) Causes of injury: 48 cases of falls, 32 cases of fall injury; 26 cases of traffic injuries.

Method of treatment

Control subjects were treated with conventional surgery; specific operations were as follows: (1) Conventional continuous epidural anesthesia and thigh hemostasis were conducted; (2) Incise from the outside of the knee, open the patella, retract fat pad, fully reveal the lateral meniscus; (3) Cut the anterior tibial ligament, and outwardly retract meniscus and ligament, fully reveal the tibial plateau; (4) The appropriate reduction surgery was conducted based on fracture type; for fracture with collapse cavity bone graft was taken; elderly patients were treated with "T" support; (5) When reduction achieve at least function reduction, repair damaged meniscus and cruciate ligament, wash the surgical field, conventionally suture the wound and bandage; (6) After surgery, on the basis of routine care, knee joints received passive movement after 48 h; 1 week later, according to the patient's recovery, getting out of bed, weight training and functional exercise were promptly given.

Observation group were treated with arthroscopic percutaneous poking reduction-fixation; specific operations were as follows: (1) Before treatment, by imaging means, the fracture, articular surface, meniscus and ligament injuries were comprehensively understood, as a basis for surgical planning; (2) After conventional continuous epidural anesthesia and thigh hemostasis, treatment was carried out by surgery program; (3) The appropriate reduction operation was performed according to the type of fracture: ① Split displaced fracture: Under longitudinal traction, closed reduction was conducted; and then after temporarily fixed by the towel forceps, the reduction was observed with arthroscopy; when the reduction reached the standard, percutaneous cannulated screw fixation was conducted; ② Split compression fracture: at bone block a 1.0 cm-long incision was made; the depth reached bone surface; under arthroscopic guidance Kirschner wire was fragment inserted into the beneath edge of fragment until the bone underneath of the collapse surface; along Kirschner direction drilling was performed with a hollow drill to form cortical window; under arthroscopy equipment was implanted; poking reduction of displaced and collapse bone was conducted, temporarily fixed with Kirschner wire; when fracture reduction reached the standard and articular surface was smooth, it was fixed by percutaneous cannulated screw. In the center of the fracture fragments, 1.0 cm incision was made and three 7.0 mm cannulated screws were used for fixation; ③ Simple compression fracture: make a hole in the top of the tibia, insert bone impactor through the hole to the underneath of collapse fracture fragment, lift the collapse fracture fragment and conduct bone grafting; detect the reduction by arthroscopy; when the reduction reached the standard and articular surface was smooth, fix it with bone screws; (4) Under arthroscopy, repair ligament, meniscus and ligament damage, wash the surgical field, bandage. The care operations and postoperative functional exercise were referring to the control group.

Evaluation items and standards

To ensure the scientific and simplicity for comparisons of research data and components, evaluation items and evaluation criteria were developed. The specific were as follows: (1) baseline data: information about gender, age, time from fracture to surgery and causes of injury etc were compared between groups; (2) data of surgery: wound size, operative time, blood loss and complication rate were the data for comparisons for surgery [7]; (3) knee func-

Table 1. Baseline data comparison between the two groups

Parameter		Observation group (53)	Control group (53)	T (X^2)	P
The male to female ratio		30:23	32:21	2.972	0.076
The average age of (Year)		36.5±6.2	36.8±5.8	1.865	0.123
Fracture and operation time (d)		4.6±1.3	4.5±1.6	1.782	0.132
Causes (cases)	Hurt	25	23	2.365	0.083
	Falling injury	15	17	2.586	0.068
	Traffic injury	13	13	0.865	0.162

Table 2. Operation data comparison between two groups

	Wound size (cm)	Operation time (min)	The bleeding (ml)	Complication rates (%)
Observation group (53)	3.6±1.2	48.6±15.8	76.5±17.6	18.9 (10)
Control group (53)	5.3±1.5	65.8±18.3	122.6±20.5	30.2 (16)
T (X^2)	4.986	5.682	6.356	5.984
P	0.046	0.038	0.028	0.036

Table 3. Knee joint function score comparison between two groups (points)

	The highest	The minimum	Average
Observation group (53)	96	89	93.6±3.8
Control group (53)	88	78	82.5±5.6
T			5.468
P			0.040

tion: the Lysholm knee function score was used for 6 months follow-up patients. The higher the score was, the better the knee function was [8]; (4) quality of life: after six months follow-up, WHO recommended quality of life score table SF-36 was used for quality of life evaluation. The score and quality of life was in positive proportion [9].

Statistical methods

Research data were processed by SPSS19.2 statistical software; count data were expressed as X (%) and compared by X^2 test; measurement data were expressed as Mean ± SD and compared using *t* test; when P<0.05, there was a significant difference between the groups.

Results

Baseline information

Gender, age, fracture to operation time, causes of injury and other data were compared between the two groups, and there was no significant differenc (P>0.05); the data were comparable and the specific data were shown in **Table 1**.

Surgery data

Data on the operation of the two groups were compared between groups. In the observation group, data of wound size, operative time, blood loss and morbidity (complications included: wound infections, pulmonary embolism, fracture healing, nonunion, etc.) were significantly better than that in the control group (P<0.05). The specific data were shown in **Table 2**.

Knee function

The average score of knee function in the two groups were (93.6±3.8) points and (82.5±5.6) points. The observation group had significant advantages (P< 0.05); the specific data were shown in **Table 3**.

Quality of life

The quality of life was scored according to the rating scale table which was developed in the research. The average quality of life score were (79.6±8.5) points and (65.8±8.6) points. The observation group had significant advantage (P<0.05); the specific data were shown in **Table 4**.

Discussion

Fracture of tibial plateau will directly lead to uneven stress inside and outside of the knee, causing inflammatory changes in the joints and affecting the patient's knee and limb function, which would seriously affect their quality of life. Because fracture of tibial plateau is often accompanied by meniscal and ligament injuries, the traditional surgery needs to open joint cavity to ensure the reduction of the fracture and smooth articular surface, thereby ensuring reset standard and limb knee function. But the higher surgical complications and postopera-

Table 4. Life quality comparison between two groups (points)

	Mental impact	Social activities	Mental health	Physical effects	Average
Observation group (53)	68.5±6.3	78.8±8.5	86.9±7.8	85.7±8.2	79.6±8.5
Control group (53)	56.8±5.8	66.8±7.8	72.5±8.2	71.7±8.0	65.8±8.6
T					5.269
P					0.042

tive improvement of knee function affect the clinical application of surgical therapy [10]. With the upgrading of minimally-invasive surgical techniques and increased experience in bone surgical treatment, arthroscopic percutaneous poking reduction-fixation for the treatment of multiple fractures has achieved a significant value, but the application of arthroscopic percutaneous poking reduction-fixation in tibial plateau fracture lacks data support, so related research has important clinical values.

Arthroscopic percutaneous poking reduction-fixation uses arthroscopy on the basis of percutaneous poking reduction surgery in combination with percutaneous percutaneous fixation, not only ensuring that the fracture can achieve at least functional reduction and knee function, but also reducing surgery wound, blood loss, operative time, and surgical complications; so it has great values to enhance safety, compliance and quality of life [11]. But the knee is the body's major weight-bearing joint, and tibial plateau fractures are various, and is often accompanied by articular surface collapse, requirements on reduction and articular surface flatness are high; if not treated properly, it will affect the risk limb function and quality of life; so the application of arthroscopic percutaneous poking reduction-fixation in treating tibial plateau fractures remains controversial in clinical [12-14]. Therefore, to study the affected limb function and quality of life of patients with tibial plateau fracture after arthroscopic percutaneous poking reduction-fixation to confirm its clinical value has great values for the treatment of tibial plateau fractures and the promotion of percutaneous poking reduction-fixation.

The study results showed that in the treatment of tibial plateau fracture, in arthroscopic percutaneous poking reduction-fixation group the surgical data, affected limb function and quality of life were significantly better than those in the conventional surgery group ($P<0.05$), thus confirming the clinical value of arthroscopic percutaneous poking reduction-fixation and providing data support for clinical treatment. To ensure scientificalness and validity of the results and conclusions, the study compared subjects' gender, age, time from fracture to treatment and other baseline data and found no significant difference ($P>0.05$), so as to ensure the effectiveness of the comparison of other research data. Study selected different types of tibial plateau fractures and excluded comminuted fracture cases to ensure the safety and clinical research guiding values; although the cases were fewer, evaluation content and ways need improvement, follow-up time needs further extension, and the arthroscopic percutaneous poking reduction-fixation level, clinical experience and surgical adaptation scope need to be improved, it does not affect the statistics and comparative research data, thus ensuring the clinical guidance value of the study, and pointing out the direction for the development of related research.

In summary, arthroscopic percutaneous poking reduction-fixation for tibial plateau fractures can reduce trauma, reduce bleeding, shorter operative time, reduce complications, and enhance the affected limb function and quality of life of patients, having an important promotion value.

Disclosure of conflict of interest

None.

Address correspondence to: Sheng Zhai, First Department of Orthopedics, The Fifth Affiliated Hospital of Xinjiang Medical University, Urumqi, China. Tel: +86-0991- 0991-7923307; Fax: +86-0991-0991-7923307; E-mail: CY3837155@SOHU.COM

References

[1] Märdian S, Landmann F, Wichlas F, Haas NP, Schaser KD, Schwabe P. Outcome of angular stable locking plate fixation of tibial plateau fractures Midterm results in 101 patients. Indian J Orthop 2015; 49: 620-9.

[2] Wang PC, Ren D, Zhou B. Surgical Technique of Anterolateral Approach for Tibial Plateau Fracture. Orthop Surg 2015; 7: 368-70.
[3] Brinkmann O, Rau M, Maenz S, Bungartz M, Matziolis G. Arthroscopic-Assisted Intraosseous Balloon-Assisted Repositioning of a Tibial Plateau Fracture: A Case Report. Acta Chir Orthop Traumatol Cech 2015; 82: 437-439.
[4] Mellema JJ, Doornberg JN, Molenaars RJ, Ring D, Kloen P; Traumaplatform Study Collaborative & Science of Variation Group. Interobserver reliability of the Schatzker and Luo classification systems for tibial plateau fractures. Injury 2016; 47: 944-9.
[5] Van Lieshout EM, Alt V. Bone graft substitutes and bone morphogenetic proteins for osteoporotic fractures: what is the evidence? Injury 2016; 47 Suppl 1: S43-6.
[6] Kraus TM, Freude T, Stöckle U, Stuby FM. Pearls and pitfalls for the treatment of tibial head fractures. Orthopade 2016; 45: 24-31.
[7] Elsøe R, Larsen P, Rasmussen S, Hansen HA, Eriksen CB. High degree of patient satisfaction after percutaneous treatment of lateral tibia plateau fractures. Dan Med J 2016; 63: A5174.
[8] Kulkarni SG, Tangirala R, Malve SP, Kulkarni MG, Kulkarni VS, Kulkarni RM, Kriplani S. Use of a raft construct through a locking plate without bone grafting for split-depression tibial plateau fractures. J Orthop Surg (Hong Kong) 2015; 23: 331-5.
[9] Hu SJ, Chang SM, Zhang YQ, Ma Z, Du SC, Zhang K. The anterolateral supra-fibular-head approach for plating posterolateral tibial plateau fractures: A novel surgical technique. Injury 2016; 47: 502-7.
[10] Shimizu T, Sawaguchi T, Sakagoshi D, Goshima K, Shigemoto K, Hatsuchi Y. Geriatric tibial plateau fractures: Clinical features and surgical outcomes. J Orthop Sci 2016; 21: 68-73.
[11] Li YS, Dong J, Yue X, Cai ZY, Kuang GX, Wu ZM, He JM, Li YF, Xu ZY. Treatment and analysis of the early postoperative complications of tibial plateau fractures. Zhongguo Gu Shang 2015; 28: 846-9.
[12] Ozdemir G, Yilmaz B, Oztermeli A. Open Reduction and Internal Fixation of the Isolated Tibial Lateral Plateau Posterior Fracture Using Direct Posterior Split Gastrocnemius Approach. Case Rep Surg 2015; 2015: 530578.
[13] Keightley AJ, Nawaz SZ, Jacob JT, Unnithan A, Elliott DS, Khaleel A. Ilizarov management of Schatzker IV to VI fractures of the tibial plateau: 105 fractures at a mean follow-up of 7.8 years. Bone Joint J 2015; 97-B: 1693-7.
[14] Huang X, Zhi Z, Yu B, Chen F. Stress and stability of plate-screw fixation and screw fixation in the treatment of Schatzker type IV medial tibial plateau fracture: a comparative finite element study. J Orthop Surg Res 2015; 10: 182.