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Analysis of the Efficacy of Arthroscopy-Assisted Treatment for Tibial Plateau Fractures

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Abstract: *Objective*: To explore the efficacy of arthroscopy-assisted treatment for patients with tibial plateau fractures. *Methods*: A total of 80 patients with tibial plateau fractures in our hospital from January 2024 to January 2025 were selected as the research subjects. The patients were divided into an observation group and a control group based on their admission numbers, with 40 patients in each group. Relevant treatment indicators were compared between the two groups. *Results*: The total effective rate of the observation group was higher than that of the control group, and the incidence of complications was lower than that of the control group ($P < 0.05$). The surgical indicators (incision length, time to ambulate, fracture healing time, hospital stay) of the observation group were all better than those of the control group ($P < 0.05$). After treatment, the HSS score and modified Lysholm score of the observation group were higher than those of the control group ($P < 0.05$). The maximum angles of knee extension and flexion in the observation group were greater than those in the control group after treatment ($P < 0.05$). The GQOL-74 scores (material living status, physical, psychological, and social) of the observation group were significantly higher than those of the control group ($P < 0.05$). *Conclusion*: Arthroscopy-assisted minimally invasive surgery is effective in the treatment of tibial plateau fractures. It can not only optimize surgical indicators but also improve knee function and range of motion, which is beneficial for improving patients' postoperative quality of life. The promotion of this treatment is feasible.

Keywords: Arthroscopy; Tibial plateau fracture; Knee function; Efficacy

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1. Introduction

Clinically, tibial plateau fractures are a type of traumatic fracture of the knee joint with a high risk of clinical onset. External injuries such as car accidents or falls from heights are the main causes of the condition [1]. For the human body, the knee joint plays a key role in weight-bearing, and tibial plateau fractures can directly affect its function and stability. Surgical treatment is the main approach for such patients. The application of open reduction and internal fixation can ensure the treatment effect, but patients need to bear large trauma, and many complications may occur after surgery, resulting in slow fracture healing [2]. In recent years, arthroscopy technology has achieved significant development results, with small trauma and fast postoperative recovery, and is gradually being used in the clinical treatment of fractures. Therefore, it is of certain practical significance to conduct in-depth research and analyze the value of arthroscopic minimally invasive surgery for patients with tibial plateau fractures.

2. Materials and methods

2.1. Clinical data

Eighty patients with tibial plateau fractures treated in our hospital from January 2024 to January 2025 were selected. The patients were divided into an observation group (n = 40) and a control group (n = 40) based on their admission numbers. In the control group, there were 22 male and 18 female patients, with an age range of 18–67 years and an average age of 50.62 ± 10.14 years. The fracture side was evenly distributed, with 20 cases on the left and 20 cases on the right. In the observation group, the male-to-female ratio was 21:19, with a maximum age of 76 and a minimum age of 27, and a median age of 50.64 ± 10.16 years. There were 23 left-sided fractures and 17 right-sided fractures. Comparison of the two groups' data showed $P > 0.05$, indicating significant comparability.

Inclusion criteria: Patients diagnosed with tibial plateau fractures by X-ray; patients with normal physical indicators; patients with complete clinical data.

Exclusion criteria: Pathological fractures; patients with malignant tumors; patients with cognitive dysfunction.

2.2. Methods

Patients in the control group underwent conventional surgery. Examination was completed with the assistance of CT or X-ray. An arcuate incision was made at the distal extension of the tibia, the fracture site, and beside the patella. After these operations, 1–3 screws were used for fixation. The fixation and reduction were confirmed by X-ray, and a drainage tube was placed after confirmation, followed by suturing the incision.

The observation group underwent minimally invasive surgery assisted by arthroscopy. After admission, patients underwent CT/X-ray examination. A standard-sized incision was made on the anterior position of the knee joint of the affected limb to explore the joint cavity and perform irrigation. With the help of arthroscopy, the morphology of the fracture site, as well as the specific direction and degree of displacement, could be systematically understood. Reduction was achieved through a probe trench by prying and lifting the fracture site. Subsequently, Kirschner wires were temporarily used to fix the fracture blocks. The accuracy of anatomy and the precision of fracture block reduction were explored based on X-ray conditions. Screws were screwed in along the direction of the Kirschner wires for fixation. To ensure the smoothness of the articular surface, appropriate pressure was applied to the screws to prevent fracture block fragmentation. After the operation, negative pressure drainage was performed on the patients. The reduction was confirmed under X-ray fluoroscopy. After ensuring the accuracy of the above operations, pressure could be applied with a bandage, and the negative pressure drainage device was removed two days later.

2.3. Evaluation indicators

(1) Systematic evaluation of patient treatment effects and complications.

(2) Comparison of surgical indicators, changes in HSS score and modified Lysholm score, knee joint range of motion, and postoperative GQOL-74 score between groups.

2.4. Statistical analysis

Statistical software SPSS 23.0 was used to analyze the data, and $P < 0.05$ indicated a significant difference.

3. Results

3.1. Comparison of the therapeutic effect between the two groups

The total effective rate of the observation group was higher than that of the control group, with $P < 0.05$ (**Table 1**).

Table 1. Treatment effect in the two groups of patients [*n* (%)]

Group	*n*	Markedly effective	Effective	Ineffective	Total effective rate
Observation group	40	24 (60.0)	15 (37.5)	1 (2.5)	39 (97.5)
Control group	40	20 (50.0)	12 (30.0)	8 (20.0)	32 (80.0)
χ^2					6.1346
P					0.0132

3.2. Comparison of complication rates between the two groups

The overall complication rate in the observation group was lower than that in the control group, with $P < 0.05$ (**Table 2**).

Table 2. Complication rates in the two groups of patients [*n* (%)]

Group	*n*	Incision infection	Knee joint adhesion	Joint stiffness	Total incidence rate
Observation group	40	1 (2.5)	1 (2.5)	0 (0.0)	2 (5.0)
Control group	40	3 (7.5)	3 (7.5)	3 (7.5)	9 (22.5)
χ^2					5.1647
P					0.0230

3.3. Comparison of surgical indicators between the two groups

The surgical indicators of the observation group were better than those of the control group, with $P < 0.05$ (**Table 3**).

Table 3. Surgical indicators in the two groups of patients (mean ± standard deviation)

Group	*n*	Incision length (cm)	Time to ambulation (d)	Fracture healing time (w)	Hospital stay (d)
Observation group	40	6.04 ± 0.24	3.02 ± 0.83	11.02 ± 2.01	14.53 ± 3.09
Control group	40	14.43 ± 3.22	6.03 ± 1.46	13.76 ± 2.26	19.44 ± 3.32
t		16.4336	11.3353	5.7296	6.8468
P		0.0000	0.0000	0.0000	0.0000

3.4. Analysis of HSS scores and modified Lysholm scores before and after treatment in the two groups

Before treatment, there was no significant difference in scores between the groups, with $P > 0.05$. After treatment, all scores in the observation group were better than those in the control group, with $P < 0.05$ (**Table 4**).

Table 4. Comparison of changes in HSS and modified Lysholm scores between the two groups (mean ± standard deviation)

Group	*n*	HSS score (points)		Modified Lysholm score (points)	
		Before treatment	After treatment	Before treatment	After treatment
Observation group	40	54.47 ± 6.18	80.98 ± 6.42	53.53 ± 5.16	84.02 ± 7.14
Control group	40	54.52 ± 6.14	62.29 ± 5.53	53.57 ± 5.13	64.13 ± 6.05
t		0.0363	13.9504	0.0348	13.4418
P		0.9711	0.0000	0.9724	0.0000

3.5. Analysis of knee joint range of motion in the two groups

The maximum knee extension and flexion angles in the observation group were better compared with those in the control group, with $P < 0.05$ (**Table 5**).

Table 5. Knee joint range of motion before and after treatment in the two groups (mean ± standard deviation)

Group	*n*	Maximum knee extension angle (°)	Maximum knee flexion angle (°)
Observation group	40	-0.74 ± 0.11	135.24 ± 5.23
Control group	40	-0.42 ± 0.24	120.04 ± 5.35
t		7.6659	12.8492
P		0.0000	0.0000

3.6. Comparison of postoperative GQOL-74 scores between the two groups

All indicator scores in the observation group were higher than those in the control group, with $P < 0.05$ (**Table 6**).

Table 6. Analysis of postoperative GQOL-74 scores in the two groups (mean ± standard deviation)

Group	*n*	Material life status score (points)	Physical function score (points)	Psychological function score (points)	Social function score (points)
Observation group	40	85.64 ± 5.21	84.28 ± 5.11	84.29 ± 5.33	83.57 ± 4.55
Control group	40	77.69 ± 4.29	75.96 ± 4.82	73.58 ± 4.25	75.39 ± 3.79
t		7.4501	7.4909	9.9363	8.7365
P		0.0000	0.0000	0.0000	0.0000

4. Discussion

Tibial plateau fractures are influenced by factors such as car accidents, trauma, and strenuous activities, and their clinical incidence is increasing year by year. A fracture directly affects joint function, significantly increasing the risk of blood vessel rupture and soft tissue damage [3]. This type of fracture has a significant impact on patients, and due to the complex anatomical structure of the surrounding tissue, it is necessary to attach great importance to clinical treatment [4]. At the same time, attention should also be paid to soft tissue damage. Surgical treatment is the preferred method for clinical treatment of tibial plateau fractures, and the most common surgical method is open reduction and internal fixation. During treatment, patients' ligamentous soft tissue and meniscus are subjected to traction, which can lead to damage to cartilage tissue and articular surfaces [5]. Moreover, this surgical method is more traumatic for patients, slowing down their postoperative recovery and making it difficult to detect other knee joint injuries in a timely manner. As a result, patients undergoing this surgical method have a higher incidence of postoperative complications, which adversely affects the treatment effect [6].

In recent years, modern medical technology has achieved promising developments, and minimally invasive arthroscopic surgery has been widely used in clinical practice [7]. This surgical approach does not severely damage the body's soft tissues and local nerves. With the assistance of arthroscopy, the anatomical structure of the tissues surrounding the patient's fracture can be displayed, providing a clear surgical field for the surgeon [8]. Clinically, arthroscopic minimally invasive surgery allows for detailed observation of the scope, size, and surrounding involvement of the patient's fracture, preserving the function of the meniscus as much as possible [9]. Additionally, patients treated with this surgical approach can enhance the reduction effect, and effectively control the direction of screw insertion and the degree of compression. The use of arthroscopy provides a more intuitive observation of the damage to the cruciate ligaments and meniscus in patients with tibial plateau fractures, allowing for targeted treatment measures [10]. Based on this, arthroscopy can be used to repeatedly clean the joint cavity, enabling the removal of bone fragments and blood clots without opening the joint capsule, thereby significantly reducing the risk of infection [11–13].

Based on the above research data, it is understood that the observation group had significantly better HSS scores, modified Lysholm scores, and knee joint range of motion compared to the control group ($P < 0.05$). This confirms that arthroscopy-assisted minimally invasive surgery significantly improves knee joint function in patients with tibial plateau fractures. The surgical indicators of the observation group were significantly better than those of the control group ($P < 0.05$). The reason for this is that this surgical approach can avoid further trauma to the patient, does not severely damage their body, and accelerates their postoperative recovery [14]. The treatment effect, GQOL-74 score, and complications in the observation group were significantly better than those in the control group ($P < 0.05$). This indicates that arthroscopy-assisted treatment allows for systematic observation of fracture conditions, effective removal of bone fragments and blood clots, ensures precise reduction, significantly promotes postoperative recovery, and benefits the optimization of quality of life [15].

5. Conclusion

Overall, during surgical treatment of tibial plateau patients, the use of arthroscopy for minimally invasive surgery significantly improves knee joint function and postoperative quality of life, with fewer complications and high clinical value for promotion and application.

Disclosure statement

The author declares no conflict of interest.

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