Research Article

Research on Influencing Factors of Clinical Efficacy of Meniscus Resection Based on Logistic Regression Analysis

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In order to solve the factors affecting the clinical efficacy of meniscus resection, a method based on logistic regression analysis is proposed. From May 2019 to May 2020, 60 patients with discoid meniscus who underwent arthroscopic surgery in the Joint Department of the Second Hospital of a certain city were selected as the research objects; the surgical methods are divided into partial meniscus excision and plasty and total meniscus resection. The Lysholm function score was used to evaluate the clinical efficacy of arthroscopic surgery for discoid meniscus injuries before and 3, 6, and 12 months after surgery and postoperative application of Ikeuchi score and Tegner exercise ability score to assess age, gender, body mass index (BMI), duration of symptoms, and the influence of meniscus injury types and surgical methods on the efficacy of arthroscopic surgery for discoid meniscus injuries. Experimental results show that Ikeuchi’s assessment of the excellent and good rate of arthroscopic knee joints was significantly higher than that of the control group, the incidence of postoperative pain was significantly lower than that of the control group, and the difference was statistically significant ($P < 0.05$). Postoperative pain and premature weight-bearing of discoid meniscus injury of knee joint, factors such as noncold compress after operation, articular cartilage damage, age, and time from onset to operation are closely related; the difference was statistically significant ($P < 0.05$). Postoperative evaluation according to Ikeuchi score: excellent in 38 cases, good in 14 cases, 8 cases were poor, and the excellent and good rate was 86.7%. The patient’s age, type of meniscus tear, and duration of symptoms have a certain impact on the postoperative clinical efficacy of discoid meniscus injury; BMI and surgical methods have no significant impact. Logistic regression analysis results show that postoperative pain and premature weight-bearing of discoid meniscus injury of the knee joint, no cold compress after operation, accompanied by articular cartilage damage, age, and factors such as onset to operation time are closely related; the difference was statistically significant ($P < 0.05$). It proves that arthroscopic surgery for discoid meniscus injury has the advantages of less damage and faster recovery, it is the first choice for the treatment of discoid meniscus injury, and the postoperative effect is significant in young patients and those with short duration of symptoms; mixed tears have a greater impact on the postoperative recovery of patients with discoid meniscus injury; therefore, patients with discoid meniscus injury should undergo surgery as soon as possible and perform active rehabilitation exercises after the operation.

1. Introduction

The discoid meniscus of the knee joint is also known as discoid cartilage; it means that its meniscus is thicker and larger than normal, and its shape is abnormal, especially on the body; it is disc-shaped, often on the lateral meniscus; it is a rare clinical meniscus deformity, and the high-risk population is male young adults [1]. The disc-shaped meniscus of the knee joint is mostly caused by torsional external force; there is pain and discomfort in the meniscus of the knee joint. Bounce occurs in the complete type with complex damage and extensive damage, while the complete type is less likely to be interlocked. Studies have pointed out that arthroscopic treatment of discoid meniscus injury of the knee joint significantly improves the patient’s joint function; premature weight-bearing, postoperative noncold compress, and articular cartilage damage are closely related to postoperative pain and other factors [2].

Arthroscopic meniscus plasty can maximize the preservation of the load transmission capacity of the meniscus; at
the same time, the horizontal shear force is eliminated to promote the local biomechanics of the knee joint to return to normal; during the operation, the meniscus was removed under arthroscopic monitoring; it is helpful to accurately assess the scope of resection and prevent blind resection or residual damage. So far, the etiology of discoid meniscus is still controversial at home and abroad [3]. Zheng put forward the hypothesis of growth arrest; he believes that the disc shape is normal during embryonic development, but during the fetal period, its central part is not completely absorbed; this leads to the occurrence of congenital discoid meniscus [4]; Wu found that the ultrastructure of the outer disc-shaped meniscus is significantly different from that of the normal meniscus; the reduction and imbalance of discoid meniscus collagen fibers increase the incidence of discoid meniscus tears. In addition, the relatively weak attachment of the posterior horn of the disc-shaped meniscus to the joint capsule, the increase in thickness of the meniscus, and the insufficient blood supply are also factors that cause the disc-shaped meniscus to be easily damaged. With the movement of the knee joint, the meniscus will also show adaptive fretting, and the normal meniscus has the ability to bend and contract deformity [5]. Elagib found by MRI imaging that, compared with normal meniscus, the discoid meniscus is thick and lacks ligament restriction; as a result, the deformability of the disc-shaped meniscus is weakened. At the same time, the lateral discoid meniscus often merges with lateral intercondylar crista dysplasia, changes such as knee inversion and valgus; this causes the disease of the discoid meniscus; this may be one of the mechanisms of discoid meniscus injury. At present, the etiology research of discoid meniscus mainly focuses on two kinds of congenital and acquired factors; most scholars believe that congenital factors play an important role in the discoid meniscus [6]. It is very important to analyze the clinical effect of arthroscopic treatment of the discoid meniscus of the knee joint and the factors affecting postoperative pain; therefore, this study selected patients with discoid meniscus injury of the knee joint who were treated from May 2019 to May 2020; the arthroscopic treatment was performed, and the clinical effects and factors affecting postoperative pain were analyzed; the results are satisfactory. The current research is as follows.

2. Materials and Methods

2.1. General Information. A total of 60 patients with lateral discoid meniscus injury who were treated from May 2019 to May 2020 were selected; all were unilateral injuries, including 29 males, accounting for 48.3%; 31 cases were female, accounting for 51.7%. There were 27 cases on the left knee, accounting for 45%, and 33 cases on the right knee, accounting for 55%; the age was 18-50 years old, with an average of 32.04 years old. All patients had knee-related symptoms before surgery, such as pain, snapping, locks, and restricted movement; no relevant treatment was given. X-ray and magnetic resonance imaging (MRI) examinations of the affected limbs were performed before the operation and the Watanabe classification: 24 cases of complete type, accounting for 40%; 36 cases of incomplete type, accounting for 60%, 0 cases of Wrisberg ligament type. Meniscus tear types: 19 cases of horizontal tear, accounting for 31.7%; 20 cases of longitudinal or radial tear, accounting for 33.3%. There were 21 cases of mixed tear, accounting for 35%. According to the severity of meniscus injury, it was divided into meniscus total resection group and meniscus resection group, 30 cases in each [7].

2.2. Surgical Methods. The patient takes a supine position, place an airbag tourniquet on the upper 1/3 of the affected femur, and perform epidural anesthesia; and after the anesthesia takes effect, perform routine iodophor disinfection of the surgical area, and spread sterile towels and sheets; the affected limb will be bleeding, the tourniquet will be inflated, and the affected limb will be abducted and hung under one side of the operating table; bend the knee 90° and perform standard anteromedial and anterolateral surgical approaches, inject normal saline into the joint to expand the joint cavity, and insert the probe; a comprehensive exploration of the knee joint with the assistance of the probe hook, the sequence is as follows: the suprapatellar capsule, the patellofemoral joint surface, the medial and lateral condyles, and the medial and lateral spaces. Put the “4” position to explore the lateral meniscus and lateral space, bend the knee 30° and turn the knee joint out to explore the medial meniscus and medial space, exploring and removing hyperplastic synovial tissue at the same time, take out the loose body in the joint to fully expose the field of vision, and carefully observe the degree, extent, and type of damage to the disc-shaped meniscus [8]. For those with a small torn meniscus, a lighter degree of damage, and most of the red zone and the red-white junction area, partial meniscus excision and plasty; use blue forceps to bite away the free part of the meniscus injury, the planing knife trims the edge of the meniscus and absorbs free meniscus fragments, ensure that the edge is smooth, the periphery is thickened, and the free edge becomes thinner, to form a slope to adapt to the shape of the femoral condyle, try to preserve the synovial margin 6-8 mm, and finally loosen the adhesion tissue in the joint. And for the severe degree of meniscus tear, involving the peripheral tissues of the meniscus, at the same time as the torn meniscus is removed, part of the peripheral tissue of the meniscus is removed, and all meniscus fragments are removed; a total meniscus surgery was performed. After the operation, after confirming that there is no residue in the joint cavity and the stump is smooth, wash the joint cavity with a large amount of normal saline and flex and extend the knee joint, check the bounce, whether the symptoms such as strangulation disappear, leave a negative pressure drainage tube, full-layer sutures on both sides of the wound, covered with sterile accessories, compression bandage with elastic bandage, digital chuck adjustable brace fixes the affected limb in the straight position. After the operation, the affected knee can be iced for 24 to 48 hours to reduce bleeding and relieve pain [9].

2.3. Postoperative Rehabilitation Exercise. After 24 hours, you can perform quadriceps strength exercises and ankle pump exercises on the bed to promote blood circulation in the lower limbs; it is beneficial to reduce the swelling of
the affected limb and prevent the formation of deep vein thrombosis in the lower limbs. On the second day after surgery, quadriceps strength exercises and straight leg raising exercises are available, and the digital chuck adjustable brace is used to passively move the knee joint. Limit passive flexion to 90° within 2 weeks after operation, while avoiding active flexion. Increase by 10° per week, 4 weeks of joint flexion and extension to 90°, 8 weeks to restore normal flexion angle. Partial weight-bearing can be carried out in 3 weeks after operation, and the weight-bearing weight can be gradually increased, and full weight-bearing can be carried out in 6 weeks. Knee joint function will gradually improve in 3-9 months, but within 4-6 months after surgery, weight-bearing exercises such as knee rotation, squatting, and large flexion should be avoided. [10]

2.4. Postoperative Functional Evaluation. All patients were followed up effectively after the operation, and the Ikeuchi score was used for evaluation after the operation. Excellent: normal range of motion, no mechanical symptoms (snap, lock), no pain; good: normal range of motion, no mechanical symptoms (snap, lock), and occasional mild pain during or after exercise; possible: normal range of motion, mechanical symptoms (snap, lock), mild pain during or after exercise; poor: limited range of motion, mechanical symptoms (snap, lock), pain during rest and exercise. At the same time, the Lysholm function score was used before surgery and 3, 6, and 12 months after surgery to evaluate the clinical efficacy of arthroscopic surgery for discoid meniscus injuries; the Ikeuchi exercise performance score was used to evaluate the functional recovery of the knee joint after surgery [3].

2.5. Statistical Analysis. Use SPSS 17.0 statistical analysis software for statistical analysis, and use the χ² test for count data; the measurement data was measured by t-test, and logistic regression analysis was performed on the related factors of postoperative pain in patients with knee discoid meniscus injury; take the occurrence of postoperative pain as the dependent variable, and the basic data of the patient as the independent variable; multivariate linear regression analysis was used as the standard for screening variables in stepwise regression [11].

3. Results

All 60 patients were followed up effectively, and the knee joint function was improved to varying degrees after surgery; there were no serious complications such as knee joint infection and no cases of surgical revision. There was no significant difference in Lysholm score before arthroscopic partial meniscus resection and arthroscopic total meniscus resection (P > 0.05). The difference was statistically significant at 3 months after operation (P < 0.05). There was no significant difference between 6 months and 12 months after operation (P > 0.05); see Table 1. According to the Ikeuchi score, 38 cases were excellent, 14 cases were good, and 8 cases were poor; the excellent and good rate was 86.7%. The patient’s age, type of meniscus tear, and duration of symptoms have a certain impact on the postoperative clinical efficacy of discoid meniscus injury: the younger the patient’s age, the shorter the duration of symptoms, and the single type of meniscus tear, the better the recovery of knee joint function after surgery. However, gender, BMI, and surgical methods have no significant effects on postoperative clinical results. See Tables 2–6 and Figure 1.

3.1. Logistic Regression Analysis Results. The postoperative pain of discoid meniscus injury of the knee is closely related to factors such as premature weight-bearing, no cold compress after operation, articular cartilage injury, age, and time from onset to surgery; the difference was statistically significant (P < 0.05).

4. Discussion

4.1. Classification and Clinical Significance of Discoid Meniscus. There are many ways to classify discoid meniscus. According to the shape of the inner edge of the meniscus, the axial plane can be divided into “cape-shaped” or “bay-shaped”; the coronal plane can be divided into “plate shape” or “wedge shape.” According to the tear form of discoid meniscus, it can be divided into simple tear, complex tear, horizontal tear, radial tear, degenerative tear, and compound tear. At present, the most widely used is the Watanabe classification, in which based on the Watanabe classification discoid meniscus can be divided into complete types. The meniscus is disc-shaped, thick, and large and completely covers the lateral articular surface of the tibial plateau, and it is connected to the posterior joint capsule, and the thickness of the inner and outer edges is not much different. Incomplete type: it also has a disc shape and is also connected to the posterior joint capsule; it is different from the complete type; the meniscus does not completely cover the lateral articular surface of the tibial plateau; the free edge of the medial side presents a double concave notch; there is a protrusion protruding to the center of the joint between the two depressions. Wrisberg type: the structure of the meniscus is similar to that of the normal meniscus, but the middle part is significantly wider, and it is not connected with the posterior joint capsule, only connected by the Wrisberg ligament. Among them, the complete type is the most common type, and the Wrisberg type is relatively rare [12].
In this group of data, 24 cases are of complete type, 36 cases are of incomplete type, and there is no Wrisberg type. There were 19 cases of horizontal tear, 20 cases of longitudinal or radial tear, and 21 cases of mixed tear. For patients with horizontal tears, due to their small injury range, partial meniscus resection and angioplasty are often used; for patients with severe radial tears and mixed tears, because of its serious degree of tear, involving the peripheral tissues of the meniscus, a total meniscectomy was used.

### Table 2: The effect of age on the treatment of discoid meniscus injury by arthroscopic surgery.

| Group          | n  | Tegner athletic ability score | Ikeuchi score | Excellent | Good | Poor |
|----------------|----|------------------------------|---------------|-----------|------|------|
| <20 years old  | 31 | 7.38 ± 1.49                 |               | 21        | 8    | 2    |
| 20–40 years old| 16 | 5.48 ± 1.72                 |               | 9         | 4    | 3    |
| >40 years old  | 13 | 4.45 ± 1.63                 |               | 8         | 2    | 3    |
| P              |    | 0.001                       |               | 0.548     |      |      |

### Table 3: The influence of gender on the curative effect of arthroscopic surgery for discoid meniscus injury.

| Group | n  | Tegner athletic ability score | Ikeuchi score | Excellent | Good | Poor |
|-------|----|------------------------------|---------------|-----------|------|------|
| Man   | 29 | 5.52 ± 1.81                 |               | 18        | 8    | 3    |
| Women | 31 | 5.13 ± 1.50                 |               | 20        | 6    | 5    |
| P     |    | 0.209                       |               | 0.662     |      |      |

### Table 4: The effect of BMI on the curative effect of arthroscopic surgery for discoid meniscus injury.

| Group               | n  | Tegner athletic ability score | Ikeuchi score | Excellent | Good | Poor |
|---------------------|----|------------------------------|---------------|-----------|------|------|
| BMI < 24            | 33 | 4.43 ± 1.59                 |               | 24        | 5    | 4    |
| BMI ≥ 24            | 27 | 4.72 ± 1.37                 |               | 14        | 9    | 4    |
| P                   |    | 0.297                       |               | 0.201     |      |      |

### Table 5: The effect of duration of symptoms on the efficacy of arthroscopic surgery for discoid meniscus injury.

| Group          | n  | Tegner athletic ability score | Ikeuchi score | Excellent | Good | Poor |
|----------------|----|------------------------------|---------------|-----------|------|------|
| <1 year        | 34 | 6.20 ± 2.58                 |               | 25        | 6    | 3    |
| >1 year        | 26 | 2.33 ± 1.52                 |               | 13        | 8    | 5    |
| P              |    | 0.001                       |               | 0.168     |      |      |

### Table 6: The influence of surgical methods on the curative effect of arthroscopic treatment of discoid meniscus injury.

| Group             | n  | Tegner athletic ability score | Ikeuchi score | Excellent | Good | Poor |
|-------------------|----|------------------------------|---------------|-----------|------|------|
| Meniscus plasty   | 30 | 5.67 ± 1.67                 |               | 21        | 6    | 3    |
| Total meniscus    | 30 | 5.82 ± 1.71                 |               | 17        | 8    | 5    |
| P                 |    | 0.628                       |               | 0.547     |      |      |

### Figure 1: The influence of the type of meniscus injury on the curative effect of arthroscopic surgery for discoid meniscus injury.

4.2 Clinical Manifestations and Clinical Significance of Discoid Meniscus Injury. Discoid meniscus injury has no specific symptoms; pain is the most common symptom of discoid meniscus injury, followed by the knee joint flicking and snapping, swelling, joint locking, soft legs, and limited mobility. Joint space tenderness, quadriceps atrophy, and McMurray test and Apley test (+) are the more common signs of discoid meniscus injury [13]. Experiments show that male patients have a higher incidence of knee snapping, while female patients are more likely to have knee dysfunction. Most discoid meniscus are asymptomatic in childhood, and young patients may exhibit the typical “snapping knee syndrome”; it is painless at first, and then, mechanical symptoms and movement disorders appear. In clinical practice, most patients do not take effective and reasonable symptomatic treatment when they have knee discomfort; it has been sick for a long time when there are typical symptoms such as bounce and locks, and it has been accompanied by varying degrees of cartilage damage, which directly affects the clinical treatment effect [14].

4.3. The Clinical Efficacy and Influencing Factors of Arthroscopic Surgery for Discoid Meniscus Injury. Discoid meniscus injuries are mainly treated by nonsurgical treatment and surgical treatment. Among them, nonsurgical treatment mainly includes lower extremity fixation treatment, drug treatment, articular cavity puncture injection treatment, physical therapy, and Chinese medicine acupuncture treatment. Surgical treatment includes traditional cut and cut sac, meniscus surgery, and arthroscopic surgery. Patients with asymptomatic discoid meniscus injury can be treated conservatively first; if conservative treatment fails, surgical treatment is feasible. For patients with symptomatic discoid meniscus injury and no obvious symptoms but with
a clear discoid meniscus tear, surgical resection should be performed as soon as possible. Traditional surgery due to the reduction in the contact area of the tibiofemoral joint after the operation, excessive stress concentration, and softening of articular cartilage leads to narrowing of the joint space and osteophyte formation, which cause degenerative changes in the knee joint, leading to the early onset of osteoarthritis, so it has been seldom used. [15] At present, with the continuous development of arthroscopy technology, arthroscopic surgery for discoid meniscus injuries has become the most common orthopedic surgery; according to the type and location of the meniscus tear, the duration of symptoms, and the age of the patient, you can choose partial meniscus resection and plasty, meniscus suture repair, meniscus reconstruction, and meniscus talectomy; moreover, arthroscopic surgery has the advantages of less damage and faster recovery, so it has become the first choice for the treatment of discoid meniscus injury [16]. At present, there is no consensus on the research on the factors affecting the treatment of discoid meniscus injury by arthroscopic surgery. Wei et al. observed 198 patients with discoid meniscus injury who underwent arthroscopic surgery; it is believed that the patient’s age, the duration of symptoms, the degree of cartilage damage, and the choice of surgical procedures have a greater impact on the efficacy of arthroscopic surgery for discoid meniscus injuries; the type of meniscus injury has no obvious effect. Through the follow-up of 97 patients with discoid meniscus injury, Yaxi et al. found that the patient’s age and the duration of symptoms have a significant impact on the surgical effect; the gender, type of meniscus injury, and surgical procedure have no obvious influence. Through clinical observation of 21 patients with discoid meniscus injury, Wu et al. believed that the patient’s age and meniscus classification affect the clinical efficacy of discoid meniscus to a certain extent. The choice of gender, trauma history, tearing method, and surgical method has no obvious influence [17, 18].

5. Conclusion
By assessing the impact of the patient’s age, gender, BMI, duration of symptoms, type of meniscus injury, and surgical method on the efficacy of arthroscopic surgery for discoid meniscus injury, we found that age, type of meniscus tear, and duration of symptoms have a certain influence on the postoperative clinical efficacy of discoid meniscus injury; the younger the disease is, the shorter the duration of symptoms, and the single type of meniscus tear, the better the functional recovery of the knee joint after surgery; and the choice of patient’s gender, BMI, and surgical method has no significant influence on the postoperative clinical effect. Therefore, for patients with discoid meniscus injury, arthroscopic surgery should be performed as soon as possible to achieve better clinical results.

Data Availability
The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest
The authors declare that they have no conflicts of interest.

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