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Original Article

Arthroscopic meniscoplasty versus meniscectomy for knee meniscal injuries in elderly patients

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Abstract: Objective: To compare the clinical efficacy of arthroscopic meniscoplasty and meniscectomy in the treatment of knee meniscal injuries in elderly patients, with an aim to find an optimal minimally invasive therapy for knee meniscal injuries in elderly patients. Methods: A total of 90 elderly patients with unilateral meniscal injuries admitted to the Department of Orthopedics in our hospital from January 2014 to December 2015 were recruited in this study. In terms of a random number table, the patients were randomly assigned to the observation group or the control group, with 45 patients in each group. The patients in the observation group received arthroscopic meniscoplasty, whereas those in the control group underwent conventional arthroscopic meniscectomy. The operative duration, length of hospital stay and clinical outcomes were compared between the two groups. The Lysholm knee and IKDC scores, the knee functions and the rates of overall complications were compared between the two groups before surgery and at 6-month follow-up, respectively. Results: No significant differences were noted in the operative duration between the two groups (P=0.761); hospital stay was remarkably shorter in the observation group than in the control group (P=0.024); the effective rate was strikingly higher in the observation group (P=0.032); the Lysholm knee and IKDC scores of both groups after operation were substantially higher than those before operation (both P<0.05), with greater improvements in the observation group (both P<0.05); the excellent-and-good rate of knee functions was strikingly higher (P=0.020), but the rate of overall postoperative complications were significantly lower in the observation group (P=0.044). Conclusion: Arthroscopic meniscoplasty is effective in treating meniscal injuries in elderly patients, with shorter hospital stay, more significant improvements in knee functions and a lower rate of overall postoperative complications.

Keywords: Meniscal injury, elderly patients, meniscoplasty, meniscectomy, arthroscopy

Introduction

Meniscus, a relatively avascular structure, plays a crucial role in protecting knee joint [1]. It is reported that meniscal injuries are increasingly prevalent, and the disease is associated with knee pain, swelling, dysfunction, and even traumatic arthritis and knee degeneration [2, 3]. The meniscal injuries in elderly patients are primarily manifested as degeneration and wear, different from those in young and middle-aged porpulation. Currently, arthroscopic meniscoplasty or meniscectomy is the primary minimally invasive technique for the treatment of meniscal injuries [4, 5]. Although arthroscopic meniscectomy could achieve some of the prespecified goals of treatment, it failed to maintain the stability inside the knee joint after removal of meniscus, and the functions of joint-guidance, transmission or load absorption were impaired in the patient; in such case, the patient is susceptible to secondary injury [6, 7]. Partial functions of meniscus remain after arthroscopic meniscoplasty, which is paramount in sustaining equilibrium in the knee joint [8, 9]. Nevertheless, whether the elderly patients with degenerative meniscal lesions can heal after meniscus suture repair and how the effect of the repair remains controversial [11]. In this study, in order to find the optimal minimally invasive technique for treatment of knee meniscal injuries in elderly patients, 90 elderly patients with meniscal injuries were recruited as participants and assigned to

Table 1. Baseline characteristics of patients

Variable	Case	MA (year)	Gender (M/F)	L/R knee (n)	IS (n)			DC (year)
					Ant 1/3	Med 1/3	Post 1/3	
OG	45	67.4 ± 3.8	29/16	24/21	10	18	17	2.5 ± 0.6
CG	45	65.9 ± 3.2	27/18	26/19	9	20	16	2.3 ± 0.4
t/χ^2		0.523	0.189	0.180		0.188		0.480
P		0.629	0.664	0.671		0.910		0.656

Note: MA denotes mean age, M/F male/female, L/R left/right, IS injury site, Ant anterior, Med Medial, Post Posterior, DC Disease course, OG observation group, and CG control group.

Table 2. Operative duration and hospital stay of patients

Variable	Case	OD (min)	HS (d)
OG	45	34.6 ± 5.5	6.2 ± 1.4
CG	45	36.1 ± 5.8	12.4 ± 3.9
t		0.325	2.883
P		0.761	0.024

Note: OD denotes operative duration, HS hospital stay, OG observation group, and CG control group.

receive arthroscopic meniscoplasty or meniscectomy; finally, the clinical outcomes of arthroscopic meniscoplasty and meniscectomy were compared among the participants.

Materials and methods

Patients

In this study, we obtained approval from the Hospital Ethics Committee, and all the patients or their families provided written informed consent before surgery. From January 2014 to December 2015, 90 elderly patients with knee meniscal injuries admitted to the Department of Orthopedics in our hospital were recruited in this study. All the enrolled patients had confirmed knee meniscal injuries on MRI or arthroscopy and were randomly assigned to the observation group (n=45) or the control group (n=45). The patients in the observation group underwent arthroscopic meniscoplasty, while those in the control group received arthroscopic meniscectomy. Patients older than 60 years were eligible for enrollment if they had normal alignments in the knee joints, the femorotibial angle of 170-180 degrees, unilateral meniscus lesion, no obvious knee degeneration, and no contraindications to knee arthroscopy.

Patients were excluded if they had underlying diseases (hepato-nephric dysfunction, or cardiopulmonary insufficiency), rheumatic arthritis, severe articular cartilage injury, cruciate ligament injury or depression resulting in joint instability, severe osteoporosis, refused to provide written informed consent or did not meet the ethics criteria in this study.

Operation methods

All the patients received epidural anesthesia. Placed in a supine position, the patient was given routine disinfection and draping. An arthroscope was inserted into the patient by the standard approach to knee arthroscopy, and then normal saline was injected to fully dilate the joint cavity, followed by a thorough examination of the sites and severity of meniscal injuries. The patients in the observation group received arthroscopic meniscoplasty. Efforts were made to remain the meniscal tissues at the width of approximately 6-8 mm, and the residual meniscus was repaired to restore to the original intact status, in concomitant with repair of meniscal edges. By contrast, the patients in the control group underwent arthroscopic meniscectomy. Meniscectomy is classified into en bloc resection and partial subtotal resection. For en bloc resection, a hook knife was utilized to open the meniscus, cutting from the anterior to the posterior direction. The meniscus was cut off and clamped out with the basket forceps. In case of partial subtotal resection, the meniscus was bit off with the basket forceps and the fragments in the knee joint were sucked out with negative pressure. The joint cavity was washed at the completion of the operation inside the joint cavity, followed by instrument removal and drainage tube placement.

The drainage tube was removed within 48 hours after operation, and the patients were encouraged to conduct quadriceps femoris isometric contraction and straight leg raise training as early as possible after surgery. The

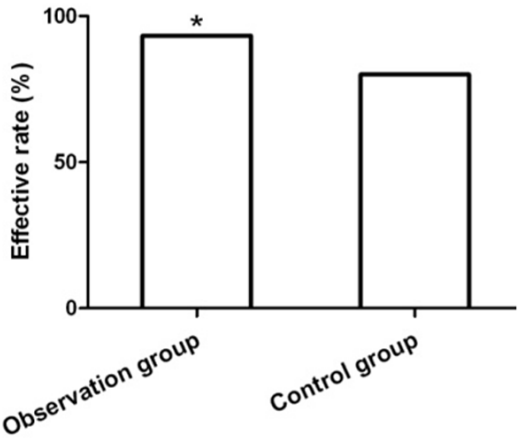

Figure 1. Clinical efficacy of patients in the two groups. Compared with the control group, *P=0.032.

patients did knee joint exercise on the second day and ambulated with the help of walking sticks on the third day.

Outcome measures

The operative duration and length of hospital stay of patients were compared between the two groups. The clinical response was also observed in the two groups. The clinical response criteria were as follows: Effectiveness was defined as the patient had no or slight adverse reactions after operation, with fully-recovered knee functions; ineffectiveness was defined as the patient could not straighten the knee joint for a long time. At 6 months after follow-up, the Lysholm knee and the IKDC scores of patients before and after surgery were compared between the two groups. The Lysholm knee scoring scale was employed to evaluate the quantification of the knee joint activities in the patients. The Lysholm knee scoring scale, with scores ranging from 0-100, included the items of pain (25 points), instability (25 points), locking (15 points), swelling (10 points), limp (5 points), stair-climbing (10 points), squatting (5 points) and support (5 points). The IKDC score was a scale of 100, utilized to assess the subjective symptoms and objective signs of the knee joint system in patients. The knee functions of patients were evaluated by the hospital for special knee scores (HSS), and compared between the two groups. Scores ranged from 0 to 100, with 86 points or above indicating excellent performance status, 76 to 85 indicating good status, 60 to 75 fair status and less than 60 poor status. The rates of complications at 6 months after surgery were compared between the two groups.

Statistical analysis

All the statistical data analyses were conducted applying the SPSS statistical software, version 21.0. Measurement data were presented as mean ± standard deviation; the independent samples t-tests were employed for inter-group comparisons and the paired-samples t-tests for intra-group comparisons of the data regarding the Lysholm knee and the IKDC scores before and after surgery. Count data were described as rates, and the chi-square tests were utilized to make inter-group comparisons. $P<0.05$ was set as statistically significant.

Results

Baseline characteristics of patients

The baseline characteristics of patients including age, gender ratio, the course of disease and the sites of meniscal injuries were largely well-balanced between the observation group and the control group, so they were comparable ($P>0.05$; **Table 1**).

Perioperative outcomes

All the patients in both the observation group and the control group successfully completed the surgeries. No significant disparities were observed in operative duration between the two groups ($P=0.761$). The length of hospital stay was substantially shortened in the observation group versus the control group ($P=0.024$; **Table 2**).

Therapeutic effects of patients

In the observation group, 42 patients were effective after operation and 3 were ineffective, with an effective rate of 93.3%. In the control group, 35 patients were effective after operation, and 10 were ineffective, with an effective rate of 77.8%. Thus, the effective rate differed greatly between the two groups ($\chi^2=4.614$, $P=0.032$), as reported in **Figure 1**.

Lysholm knee and the IKDC scores

Before arthroscopic meniscus surgery, the Lysholm knee and the IKDC scores of the

Table 3. Lysholm knee and the IKDC scores of patients before and after surgery

Variable	Case	LKS		t	P	IKDC score		t	P
		Pre-S	Post-S			Pre-S	Post-S		
OG	45	60.9 ± 8.2	86.8 ± 8.7	3.752	0.020	52.7 ± 6.2	84.1 ± 9.1	4.405	0.012
CG	45	61.3 ± 8.5	76.5 ± 7.9	3.587	0.005	53.8 ± 6.9	74.2 ± 7.4	3.492	0.025
t		0.059	2.910			0.026	2.855		
P		0.956	0.010			0.979	0.011		

Note: LKS denotes Lysholm knee score, Pre-S pre-surgery, Post-S post-surgery, OG observation group, and CG control group.

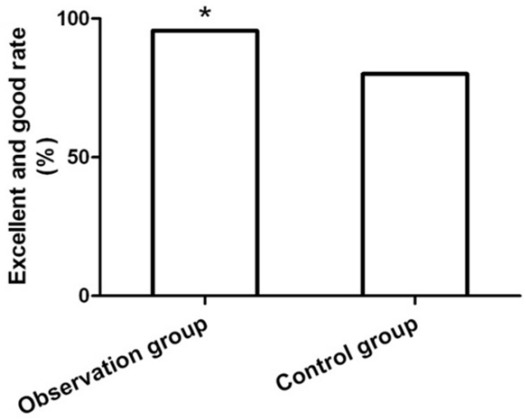

Figure 2. Excellent and good rates in the two groups. Compared with the control group, *P=0.020.

patients were insignificantly different between the observation group and the control group (P>0.05); after surgery, the patients in the two groups had substantially higher Lysholm knee and IKDC scores (P<0.05). The Lysholm knee and the IKDC scores of patients in the observation group increased more significantly when compared with those of the patients in the control groups (P<0.05; **Table 3**).

Evaluation of knee functions

At 6-month follow-up, according to the HSS scores, 32 patients in the observation group had excellent knee functions, 11 had good knee functions, with an excellent and good rate of 95.6%. In the control group, 20 patients had excellent knee functions, 16 had good knee functions, with an excellent and good rate of 80%. The excellent and good rate was remarkably different between the two groups (χ^2=5.439, P=0.020), as shown in **Figure 2**.

Complications of patients

Within 6 months after surgery, ankyloses occurred in 1 patient, reactive synovitis in 1 patient, but no meniscus cyst occurred in the observation group, with a rate of overall complications of 4.4%; by contrast, in the control group, ankyloses occurred in 3 patients, reactive synovitis in 3 patients, and meniscus cyst in 2 patients, with a rate of overall complications of 17.8%. The rate of overall complications was strikingly lower in the observation group (χ^2=4.305, P=0.044; **Figure 3**).

Discussion

Meniscal injury is a most common injury of the knee joint. Elderly patients with meniscal injuries tend to have no clear history of trauma, but complicated symptoms and a long course of disease [12]. The meniscal injuries in elderly patients often complicated by meniscus degeneration, and wear-and tear of meniscus might be aggravated in case of long-term conservative treatment [13]. Meniscectomy was used more frequently in clinical practice when it was initially introduced. With the development of arthroscopic techniques, the findings of in-depth studies on the biomechanical functions of meniscus further reveal that meniscectomy changes the original biomechanics of meniscus, resulting in increased stress in the regions on the contact knee joint surface, even in permanent dysfunction of the knee joint if severe [14]. For this reason, clinically, arthroscopic meniscoplasty use is on the rise. Arthroscopic meniscoplasty has shown to have good curative effects in young patients with meniscal injuries [15, 16]. Nevertheless, its efficacy is unclear in elderly patients with meniscus injuries. The injured menisci in elderly patients gradually become less moistened, thinner, less elastic but more brittle. What's worse, it is complicated by synovitis, the elevated levels of inflammatory cytokines in the articular cavity affect traumatic healing, and synovial proliferation is adverse to the arthroscopic operation; all these affect the efficacy of the surgery in

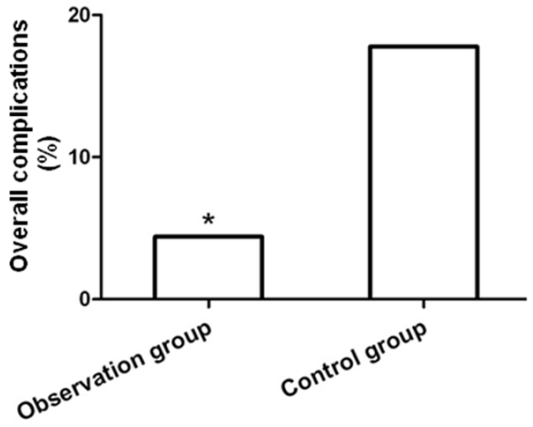

Figure 3. Rates of overall complications. Compared with the control group, *P<0.05.

elderly patients with meniscus injuries [17, 18]. Other scholars argue that menisci functions little in the knee joints of elderly patients, and meniscoplasty is not so effective for elderly patients with meniscal injuries [19]. The results of our current study demonstrated that the effective rate of arthroscopic meniscoplasty was 93.3% in elderly patients with knee meniscus injuries, considerably higher than that of arthroscopic meniscectomy.

We also found that both arthroscopic meniscectomy and meniscoplasty were successfully completed in elderly patients with knee meniscal injuries. No great differences in operative duration were noted between the two groups. The hospital stay of the patients after arthroscopic meniscoplasty was significantly shorter than that of the patients with arthroscopic meniscectomy. At 6 months after surgery, the HSS scores of the knee functions indicated that the excellent and good rate of the observation group was 95.6%, substantially higher than 80% of the control group. These results suggest that the knee functions got greater improvements with meniscuoplasty than with meniscectomy. This might be attributed to the retained menisci which still have the functions of filling and conduction, which is conductive to diminishing the rapid degeneration on the articular cartilage surface [20].

Arthroscopic meniscectomy is associated with ineffective and unstable conduction of the loads on the knee joints, accelerated degeneration of the articular cartilage surface, and the presence of traumatic arthritis. Conversely, arthroscopic meniscoplasty minimizes the interference or destruction of menisci. During the operation, arthroscopy allows comprehensive and accurate assessments and maintenance of exact width and thickness of the menisci, which contributes to the rehabilitation of patients [21, 22]. Our current study revealed that the Lysholm knee and the IKDC scores of both groups at 6 months after surgery were significantly higher than those before surgery, with greater improvements in the observation group than in the control group. Additionally, the comparison of postoperative complications between the two groups indicated that the rate of overall complications of the patients was markedly lower with arthroscopic meniscoplasty than with arthroscopic meniscectomy. This suggests that arthroscopic meniscoplasty led to improved knee joint functions and lower rates of postoperative complications, which are aligned with the results reported in the previous studies [23].

In summary, for elderly patients with knee meniscal injuries, compared with arthroscopic meniscectomy, arthroscopic meniscuoplasty is associated with more reliable curative effects, shorter hospital stay, more significantly improved knee joint functions, as well as a lower rate of postoperative complication; hence it has better clinical implications. However, the indications should be managed strictly. This study is not free of limitations, such as a small sample size, a single center, and lack of long-term follow-ups with regard to changes in knee functions of patients. Therefore, additional studies are required for further validation.

Disclosure of conflict of interest

None.

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