# Evolution of clinical and functional results after arthroscopic treatment of Discoid Meniscus. A case series study of 31 cases.

**Purpose:** To evaluate the evolution of clinical and functional outcomes of symptomatic discoid lateral meniscus treated arthroscopically over time and to investigate the relationship between associated intra-articular findings and outcomes.

**Methods:** Of all patients treated arthroscopically between 1995 and 2010, patients treated for symptomatic discoid meniscus were identified in the hospital charts. Baseline data (demographics, previous trauma of ipsilateral knee, and associated intra-articular findings) and medium term outcome data from clinical follow-up examinations (pain, locking, snapping and instability of the operated knee) were extracted from clinical records. Telephone interviews were conducted at long term in 28 patients (31 knees). Interviews comprised clinical outcomes as well as functional outcomes as assessed by the International Knee Documentation Committee Subjective Knee Evaluation Form (IKDC).

**Results:** All patients underwent arthroscopic partial meniscectomy. The mean follow-up time for data extracted from clinical records was 11 months (SD ± 12). A significant improvement was found for pain in 77% ($p<0.001$), locking in 13%, ($p=0.045$) and snapping in 39 % ($p<0.005$). The mean follow-up time of the telephone interview was 60 months (SD ± 43). Improvement from baseline was generally less after five years than after one year and functional outcomes of the IKDC indicated an abnormal function after surgery (IKDC mean= 84.5, SD ± 20). In some patients, 5 year-outcomes were even worse than

their preoperative condition. Nonetheless, 74% of patients perceived their knee function as improved. Furthermore, better results were seen in patients without any associated intra-articular findings.

**Conclusions:** Arthroscopical partial meniscectomy is an effective intervention to relieve symptoms in patients with discoid meniscus in the medium-term; however, results trend to deteriorate over time. A trend towards better outcome for patients with no associated intra-articular findings was observed.

**Level of Evidence:** Therapeutic case series, Level IV.

**Key Words:** Discoid Meniscus, arthroscopy, meniscectomy, IKDC form, saucerization.

## Introduction

Discoid meniscus is a congenital abnormality of meniscal shape most often seen in the pediatric and adolescent population. 90% of cases involve the lateral meniscus (1;2). According to tibial plateau covering and stability, Watanabe classified three types of discoid menisci: Type I is complete and stable; type II is incomplete (covers < 80% of the tibial plateau) and stable; type III, also called Wrisberg discoid meniscus, has a normal shape and size but lacks posterior meniscal attachments. Type III of discoid meniscus is unstable, as it is only anchored and stabilized posteriorly by the meniscofemoral ligament of Wrisberg (3). Besides the abnormal shape, discoid menisci are also characterized by a lower collagen fiber density compared with normal menisci (3). Considerable regional variations in the occurrence of discoid meniscus have been described. The highest prevalence of 8.1% to 16.6% has been reported in Japan and Korea (4-6). Lower prevalence rates of 0.9% to 1.6% have been reported among Caucasians (7;8). The first report about discoid menisci was published by Young in 1887(3). Clinical manifestations of discoid meniscus include knee pain, locking, giving way, effusion, loud-click and articular cartilage degeneration (3).

Nowadays, surgical treatment is the preferred intervention once clinical symptoms manifest. The main goal is to preserve as much anatomically shaped meniscal tissue as possible (9). Nonetheless, no consensus has yet been reached about the best surgical technique. Partial meniscectomy performed arthroscopically is more widely used than total meniscectomy (3;9-16). The latter is usually reserved for rare cases in which the entire

meniscus is deemed to be unsalvageable (3). Clinical and functional outcomes after partial meniscectomy have been reported to be good in the medium- (14;16-20) and long-term (9;21;21); however, all those studies have only included one follow-up time point.

Discoid menisci are often associated with further intra-articular pathologies, such as meniscal tears, meniscal instability or chondral damage. These intra-articular findings are believed to be associated with an inferior clinical outcome (14;22). Effects on long- term clinical or functional outcomes have not yet been studied in detail.

Even nowadays, more than 100 years since discoid meniscus was first described, its etiology and treatment options are still discussed controversially. The purpose of the present study is to evaluate the evolution of clinical and functional outcomes for symptomatic lateral discoid meniscus treated by arthroscopic meniscectomy in the medium- and long-term. In addition, the relationship between associated intra-articular findings (meniscal tears, meniscal instability or chondral damage) and outcomes is investigated.

## Materials and Methods

### Patient recruitment and data collection

A retrospective study was conducted including patients who had undergone arthroscopic treatment for symptomatic discoid meniscus. Institutional Review Board approval was obtained prior to start of the data collection. Informed consent had been collected from all patients or – if they were younger than 18 years – from their legal representative prior to surgery to seek permission to use information from their clinical records for research purposes. The study was carried out in a Colombian reference center with broad experience in pediatric orthopedic diseases. All surgeries were performed by specialized knee surgeons. According to the hospital charts, 471 patients were treated arthroscopically for meniscal problem between 1995 and 2010. Within this population we searched for all patients who fulfilled inclusion criteria as follows: symptomatic discoid meniscus confirmed by MRI, treatment by arthroscopy, and at least one clinical follow-up. Exclusion criteria were: patients with Juvenile Rheumatoid Arthritis, discoid meniscus as part of a syndrome, knee infection, knee ligament injury and previous knee surgery. This strategy identified 58 potentially eligible patients (67 knees). Next, we tried to initiate contact with all these patients by phone for a long-term evaluation. Contact could be established in 28 patients (31 knees).

Data collection from clinical records comprised (A) Demographic data such as age at time of surgery, gender, and affected knee; (B) study specific clinical data such as previous trauma of the ipsilateral knee, preoperative presence of pain, locking, snapping or giving

way (defined as instability in this study) of the affected knee; and (C) intraoperatively collected data such as the type of discoid meniscus according to Watanabe, and associated intra-articular findings such as meniscal tears, meniscal instability and chondral injuries. Further, postoperative clinical outcomes (D), including pain, locking, snapping and instability of the operated knee, were extracted from the patient's charts.

After receiving IRB approval, we tried to contact all 58 patients by phone. 28 patients (31 knees) could be contacted and were interviewed on the phone. These interviews took place at a mean follow- up time of 60 months (SD ± 43) after the intervention. Data collected during these interviews on one hand included information on pain, locking, snapping and instability in the operated knee as well as information on further treatment of the affected knee. This information corresponded to the data captured during hospital visits. On the other hand, the questions comprised functional parameters, which were collected by means of the International Knee Documentation Committee (IKDC) Subjective Knee Evaluation form (23)(E). The IKDC score is a validated and consistent knee-specific measure of symptoms, function, and the ability to perform activities of daily living, including sports. It has adequate test-retest reliability, content validity, criterion validity, responsiveness, construct validity, and internal consistency to justify its use as an outcome measure in patients treated for injuries of the knee, including meniscal damages, as well as ligament and cartilage lesions and patella-femoral chondropathy [23;26]. The IKDC comprises four questions related to symptoms such as pain, swelling, giving way and locking; six questions related to function during activities of daily living such as ability to ascend and descend stairs, kneel on the front of the knee, squat, sit with the knee bent, and to rise from a chair; three questions related to function during sports activities such as ability to run straight

ahead, jump and land on the involved leg, stop and start quickly; four questions related to participation in activities including sports or work , and one question related the current and pre-surgery function of the knee. The maximum obtainable score is 100 whereas the minimum is 18 such that higher scores represent higher levels of function and lower levels of symptoms. An IKDC score of 100 is interpreted to indicate no limitation with activities of daily living or sports activities and the absence of symptoms (23).

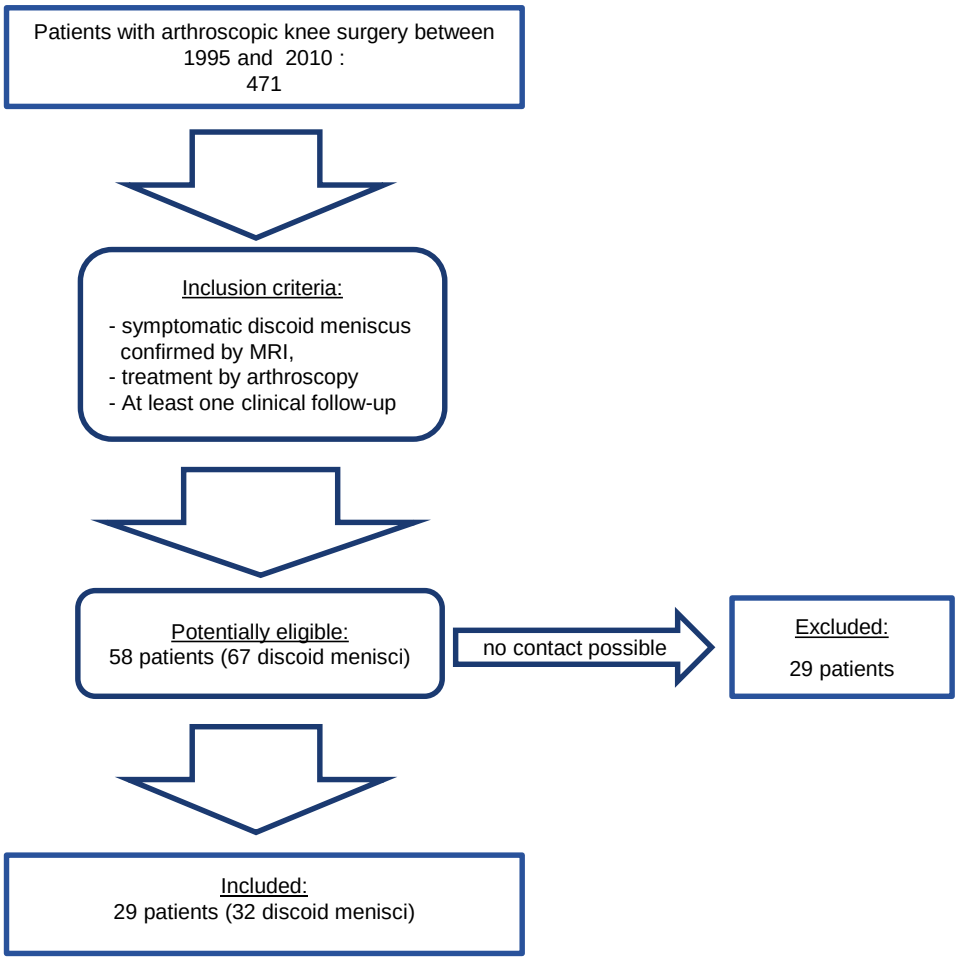


Figure 1. Patient-inclusion flow diagram

## Surgical Technique

Each patient was positioned in a supine position and a tourniquet was applied to the knee that was to be operated. After surgical disinfection and sterile covering, anterolateral and anteromedial portals were created with stab incisions. Interventions started with an arthroscopy confirming the diagnosis of discoid meniscus. Partial meniscectomy was performed in all patients by first removing the central part of the meniscus through the anteromedial portal (saucerization). Then, anterior and posterior horns were regularized. Meniscal stability was assessed both before and after the partial meniscectomy. In the case of meniscal instability, refixation by an in-out or out-in technique was performed (25). Meniscal tears were managed with saucerization whenever possible, or - if saucerization was not sufficient- with further remodeling by means of a shaver, whereas the peripheral rim was maintained.

## Postoperative care and follow-up assessment

The postoperative care included cooling with ice as well as wrapping the operated knee with an elastic bandage for 5 days. Patients were allowed to walk on crutches for 3 weeks with partial weight bearing, followed by guided rehabilitation for another four weeks. Instructions for home therapies were given whenever clinically indicated. No sports activities were allowed for 6 months post-intervention. The patients were reviewed by the surgeon at one, three, six and twelve months. If needed, further appointments at the outpatient clinic were arranged. Clinical outcomes regarding pain, snapping, locking and instability in the operated knee were recorded at each follow-up visit, along with any

complications affecting the operated knee and necessitating a surgical re-intervention. No further visits were scheduled once the patients had resumed their normal activities.

**Statistical Analysis**

Clinical outcomes were analyzed for data collected during hospital visits (medium term FU) and for data collected by phone (long term FU). Associations between different baseline characteristics or between baseline characteristics and outcomes were assessed using the Fisher exact test. Changes in status for outcomes between baseline and follow-up were assessed using the McNemar test (binary outcomes), or exact symmetry test (an extension of the McNemar test to multiple categories). Analysis was carried out using STATA statistical, version 12.0. A p-value of less than 0.05 was considered statistically significant.

## Results

### Patient Demographics and Surgical Details

Baseline characteristics are presented in Table 1. The mean follow-up (FU) time for data collected at the hospital ("medium term FU") was 11 months (SD ± 12) and for data collected during phone interviews ("long term FU") it was 60 months (SD ± 43). Median age at surgery was 10 years (interquartile range: 7-13), whereas 89% of patients were under 20, 7% between 20 and 50 and 4% older than 50 years.

The most common pre-operative symptom found in the affected knee was pain, present in 29 knees (94%), followed by snapping in 13 knees (42%), intermittent locking in 4 knees (13%), and clinical evidence of knee instability in 2 knees (6%).

In all patients, arthroscopic partial meniscectomy was performed by one of two surgeons. According to the Watanabe classification, 14 (45%) of menisci were complete, 8 (26%) incomplete and 6 (19%) were of the Wrisberg type.

Several adverse intra-articular findings were encountered during arthroscopy: in 21 knees (68%), associated meniscal tears were present, which could be removed by saucerization of the lesion in 9 cases (43%). The remaining 12 menisci (57%) underwent extended remodeling by means of shaving, whereas the peripheral rim was maintained.

In 14 knees (45%), meniscal instability was present. Of these, 11 (79%) were refixated by the in-out technique and 3 (21%) by the out-in technique. No data on the employed technique was available for one patient.

In 15 knees (49%), chondral damage was visible (Table 1). The type of treatment depended on the damage as classified by Outerbridge (26). Grade I damages were present in 3 knees (20%) and did not receive any special treatment. Grade II lesions were present in 11 knees (73%) and were remodeled. No data was available in 1 patient (7%). Moreover, chondromalacia patellae was detected at surgery in a patients whose age was 22 years.

**Clinical Outcomes**

In the medium-term FU (Table 2), all clinical outcomes showed an improvement after surgery, which was statistically significant in most parameters: 24 patients (77%) improved with respect to pain ($p<0.001$), 4 patients (13%) with respect to locking ($p=0.045$), and 12 patients (39%) with respect to snapping ($p<0.005$). All patients with knee instability improved after surgery; however, since this only applied to two patients, no statistical significance could be shown.

Results for the long-term follow-up are shown in Table 3. For all clinical outcomes, the degree of improvement was lower after five years compared to one year after surgery: While 77% of the patients with preoperative pain had improved at the one-year follow-up, this percentage decreased to 65% at the 5-year assessment. A similar decrease in the post-surgical improvement over time was observed for locking (13% at 1 year vs. 10% at 5 years), snapping (39% at 1 year vs. 23% at 5 years) and knee instability (6% at 1 year vs.

3% at 5 years). Surprisingly, at the long term FU, some patients (13-29% depending on the type of symptom) developed clinical symptoms that had not been present before surgery (Table 3).

Functional outcomes were obtained at the long-term FU only. The mean IKDC score was 84 (SD ± 20). An additional analysis was performed comparing current patient perception of knee function with that prior to surgery; whereas 21 patients (72%) rated their knee function as improved.

**Associated intra-articular findings**

In the majority of patients, pathological intra-articular findings were detected at surgery. They comprised meniscal tears, chondral damage and/or meniscal instability. The relationship of these findings to clinical outcome was assessed by means of the Fisher's exact test, but no significant association could be found. Table 4 shows a comparison between clinical/functional outcomes and the number of associated injuries. In three knees (10%), no intra-articular findings were seen; in 13 knees (42%) at least one; in 8 knees (26%) two; and in 7 knees (23%) three intra-articular findings were seen at the time of surgery. No correlation of age and presence of intra-articular findings was found, likewise no clear relationship between the number of associated injuries and any of the outcomes was seen.

**Complication and Reoperation**

No complications were reported in either assessment. Two patients (6.2%) needed a re-intervention: The first patient complained of persisting pain and was re-operated 8 years

after index surgery; the second patient complained of locking and snapping and was re-operated 2 years after index surgery. The latter patient also suffered from recurrent patella dislocation. In both patients no details about the re-operation could be obtained. These patients reported the lowest IKDC scores of the whole group.

## Discussion

In our study, we saw a clear, statistically significant improvement of clinical symptoms caused by discoid meniscus after arthroscopic partial meniscectomy in the medium term. At the long-term, clinical outcomes tended to deteriorate.

Whereas other studies dealing with the treatment of discoid menisci have only included one follow-up time point (13;14;16-18;27), we were able to assess the development of outcome at two different time points in the same population: At medium term (11 months SD ± 12, range 1 to 41) and at long term (60 months SD ± 43, range 27 to 191). Whilst at 1 year, the clinical parameters pain, locking, snapping and knee instability had improved significantly, these outcomes deteriorated over time. To our great surprise an even greater proportion of patients reported intermittent locking and knee instability five years postoperatively than at baseline. Two possible reasons might explain this phenomenon: Firstly, the procedure is complex, thus it is not always possible to completely restore the normal meniscal anatomy. Secondly, a discoid meniscus is a congenital condition not only characterized by its abnormal shape. It also possesses a lower collagen fiber density compared with a normal meniscus (3). Since the histomorphological properties are likely to have an influence on disease progression, a mere restoration of the normal shape may not suffice to prevent the natural progression of the disease.

The functional outcome five years post-surgery was assessed with the IKDC score and reached 84 points. According to Irrgang et al, that score mean an abnormal global rating of function; however, the evaluation was realized to assess outcome following anterior

cruciate ligament reconstruction (Irrgang). 74% of patients reported to perceive the knee function as improved compared to baseline.

These results are consistent with several other studies presenting outcomes after comparable time frames, i.e., after eleven months to five-years of follow-up, with good results for both clinical and functional outcomes (13;14;16-18;27) Oğüt et al. reported good to excellent clinical results according to the Ikeuchi grading system for 11 knees treated for discoid meniscus with arthrosopic partial meniscectomy 4.5-year after surgery (17). Wong et al. evaluated functional outcome in 32 torn discoid lateral menisci, with an average follow-up time of 53 months: 84% had a good to excellent results, 16% fair, and none poor. The mean IKDC score was 71.7±12.4 (range 41.3 to 86.2 points) (16). Furthermore, Carter et al. reported complete relief of symptoms and reliable restoration of both knee motion and function in 38 patients treated with partial meniscectomy and 24 patients treated with partial meniscectomy and stabilization after an average follow-up of 15 months (27).

Other studies with a mean follow-up time greater than five years have also shown good clinical results after surgical treatment of lateral discoid menisci in children and adolescents (9;21;28-31), although results tended to be inferior in older patients (29;31). Kim et al. retrospectively analyzed outcomes from a series of 125 complete and incomplete discoid menisci managed with partial or total arthroscopic meniscectomy, some with medium term (mean: 50 months) and some with long term follow-up (mean: 90 months). In patients with type I of discoid meniscus (complete form) no differences were found between total and partial meniscectomy in clinical and functional results after long-term follow-up. For type II of discoid meniscus (incomplete form), partial meniscectomy gave better clinical and

functional results for both medium and long-term follow-up. (9). Aglietti et al. reported results of arthroscopic total/partial meniscectomy for symptomatic lateral discoid menisci after 10 years follow-up for 17 adolescents. 12 knees were rated as excellent, 4 were rated as good, and 1 was rated as fair according to the Ikeuchi rating system(28).

Krause et al. compared the outcome of discoid meniscus treated with mini- arthrotomy vs. arthroscopical treatment. Five years after surgery, they saw a trend for a superior IKDC and less revision surgeries in patients who had undergone a mini- arthrotomy. However, confounding of the results appears possible because the distribution of partial and total index meniscectomy differed between the groups: In the mini-arthrotomy group, significantly more partial meniscectomies had been carried out (21).

In our clinic, arthroscopic partial meniscectomy is the standard procedure to treat discoid meniscus. Total meniscectomy remains to be reserved for cases in which the entire meniscus is deemed unsalvageable.

In our population, we saw a slight trend for better outcome in patients with no associated intra-articular findings, which appeared to be unrelated to age. The most common associated intra-articular findings were meniscal tears in 42 knees (63%), which is in accordance with other publications (3). The high prevalence of meniscal tears in patients with discoid meniscus may be explained by several factors: On one hand, through its abnormal shape, any force exerted on the discoid meniscus will lead to unphysiological loading. Its frequently insufficient ligamentous fixation may also contribute to injurious

loading. On the other hand, its lower density of collagen fibers (compared with normal menisci) possibly makes it more susceptible to mechanical damage. (3).

There are some limitations of this study. Firstly, the retrospective data collection of clinical outcomes from hospital records could have led to selective data collection. Secondly, selective recording of information in the hospital records could bias associations between potential predictors and outcomes of interest. Thirdly, since it was not possible to contact all patients, our sample size is relatively small. And finally, for both the retrospective and prospective components, missing data restricted the inclusion of patients. This could have led to selection of a non-representative sample and thereby introduced an information bias. Moreover, since no clinical examinations were performed to support the telephone interview findings, any information on clinical findings such as locking and snapping relied purely on the patient's subjective perception.

The results of the present study confirm that partial meniscectomy is an effective intervention for the treatment of discoid menisci. Nonetheless, the deterioration of clinical outcome over time appears to be an important drawback as it was even observed in patients with excellent short term results. Therefore, regular long term follow-up examinations might be advisable. Although a trend towards better clinical and functional outcomes in patients without associated intra-articular findings was seen, no clear relationship could be demonstrated. This may be explained by the small sample size which did not provide sufficient power to detect potential differences. Nevertheless, it adds to the discussion

whether surgery should be performed as soon as possible after diagnosis to prevent secondary injury (32). Further trials are needed to investigate this relationship in more detail.

## CONCLUSION

Partial arthroscopic meniscectomy is an effective intervention to relieve symptoms in patients with discoid meniscus in the medium-term. However, after long-term these good results tend to deteriorate, highlighting the need for critical assessment and careful long-term monitoring of this patient group. Furthermore, we saw a trend for better clinical and functional results in patients without any associated adverse intra-articular findings. This adds to the debate on the best possible timing for this type of intervention.

## Disclosure

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Appendix.

**TABLE 1.** Baseline characteristics and associated intraarticular injuries

| | | Study Population* n= 31 |
|---|---|---|
| Medium-term follow-up time in months, mean (range) | | 11 (1-41) |
| Long-term follow-up time in months, mean (range) | | 60 (27 - 191 ) |
| Age at surgery in years, median (range) | | 10 (4 - 43) |
| Gender ** | Male | 19 (68%) |
| | Female | 9 (32%) |
| Side | Right | 15 (48%) |
| | Left | 16 (52%) |
| Watanabe´s Classification | Complete | 14 (45%) |
| | Incomplete | 8 (26%) |
| | Wrisberg | 6 (19%) |
| | No record | 3 (10%) |
| Previous trauma ipsilateral knee | Yes | 4 (13%) |
| | No | 27 (87%) |
| | No record | 0 |
| Meniscal Tears | No | 8 (26%) |
| | Yes | 21 (68%) |
| | No record | 2 (6%) |
| Meniscal Stability | Stable | 10 (32%) |
| | Instable | 14 (45%) |
| | No record | 7 (23%) |
| Chondral Injury | No | 10 (32%) |
| | Yes | 15 (49%) |
| | No record | 6 (19%) |

* Frequencies are calculated from the number of menisci

** Calculated from the number of patients (28 patients)

**TABLE 2.** Cross- tabulation of clinical scores at the pre-operative and 1 year post-operative assessments (medium-term follow-up)

| | Postoperative pain | | | | |
|---|---|---|---|---|---|
| Preoperative pain | No<br>n (%) | Low<br>n (%) | Moderate<br>n (%) | Total n(%) | P value* |
| No | 2 (6) | 0 | 0 | 2 (6) | <0.001 |
| Low | 22 (71) | 5 (17) | 0 | 27 (88) | |
| Moderate | 2 (6) | 0 | 0 | 2 (6) | |
| Total | 26 (83) | 5 (17) | 0 | 31 (100) | |

| | Postoperative lock | | | |
|---|---|---|---|---|
| Preoperative lock | No<br>n (%) | Yes<br>n (%) | Total n(%) | P value* |
| No | 27 (87) | 0 | 27 (87) | 0.045 |
| Yes | 4 (13) | 0 | 4(13) | |
| Total | 31 (100) | 0 | 31 (100) | |

| | Postoperative snap | | | |
|---|---|---|---|---|
| Preoperative snap | No<br>n (%) | Yes<br>n (%) | Total n(%) | P value* |
| No | 18(58) | 0 (0) | 18 (58) | <0.005 |
| Yes | 12 (39) | 1(3) | 13(42) | |
| Total | 30 (97) | 1 (3) | 31 (100) | |

| | Postoperative instability | | | |
|---|---|---|---|---|
| Preoperative instability | No<br>n (%) | Yes<br>n (%) | Total n(%) | P value* |
| No | 29 (94) | 0 | 29 (94) | 0.15 |
| Yes | 2 (6) | 0 | 2(6) | |
| Total | 31 (100) | 0 | 31 (100) | |

* P values calculated using the symmetry test

**TABLE 3.** Cross- tabulation of clinical scores at the pre-operative and 5 year post-operative assessments.

| | Postoperative pain | | | | Total |
|---|---|---|---|---|---|
| Preoperative pain | No<br>n (%) | Low<br>n (%) | Moderate<br>n (%) | Severe<br>n (%) | n (%) |
| No | 1 (3) | 0 | 1 (3) | 0 | 2 (6) |
| Low | 19 (62) | 1 (3) | 7 (23) | 0 | 27 (87) |
| Moderate | 1 (3) | 0 | 0 | 1 (3) | 2 (6) |
| Severe | 0 | 0 | 0 | 0 | 0 |
| Total | 21 (68) | 1 (3) | 8 (26) | 1 (3) | 31 (100) |

| | Postoperative locking | | Total n(%) | P value* |
|---|---|---|---|---|
| Preoperative locking | No n (%) | Yes n (%) | | |
| No | 19 (61) | 8 (26) | 27 (87) | 0.13 |
| Yes | 3 (10) | 1 (3) | 4 (13) | |
| Total | 22 (71) | 9 (29) | 31 (100) | |

| | Postoperative snap | | Total n(%) | P value* |
|---|---|---|---|---|
| Preoperative snap | No<br>n (%) | Yes<br>n (%) | | |
| No | 14 (45) | 4 (13) | 18 (58) | 0.36 |
| Yes | 7 (23) | 6 (19) | 13 (42) | |
| Total | 21 (68) | 10 (32) | 31 (100) | |

| | Postoperative instability | | Total n(%) | P value* |
|---|---|---|---|---|
| Preoperative instability | No<br>n (%) | Yes<br>n (%) | | |
| No | 23 (74) | 6 (20) | 29 (94) | 0.05 |
| Yes | 1 (3) | 1 (3) | 2 (6) | |
| Total | 24 (77) | 7 (23) | 31 (100) | |

* P values calculated using the symmetry test

**TABLE 4.** Differences between clinical/functional outcomes and number of associated injuries at the end of the follow-up.

| Clinical outcomes | Number of associated injury | | | | Total patients |
|---|---|---|---|---|---|
| | 0<br>n=3 | 1<br>n=13 | 2<br>n=8 | 3<br>n=7 | n=31 |
| Postoperative mean VAS | 0 | 1.92 | 1.8 | 2 | 1.68 |
| Postoperative lock | 0 (0%) | 5 (38%) | 1 (12%) | 3 (43%) | 9 (29%) |
| Postoperative snap | 1 (33%) | 7 (54%) | 1 (12%) | 1 (14%) | 10 (32%) |
| Postoperative instability | 0 (0%) | 4 (31%) | 1 (12%) | 2 (29%) | 7 (23%) |
| Postoperative mean IKDC score | 94.33 | 79.69 | 89 | 81.83 | 83.83 |
| (sd) | (7.38) | (21.88) | (12.3) | (26.32) | (19.55) |

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