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An Useful Patient Related Outcome Measurement Tool in People who had an Arthroscopic Partial Menisectomy: The Responsiveness of Turkish Version of the Knee Injury and Osteoarthritis Outcome Score

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Abstract

Aim: The arthroscopic partial meniscectomy (APM) is one of the most commonly performed orthopedic procedure for meniscal tears. Patient-reported outcome measurements regarding health and function, have become useful tools for diagnostic and therapeutic procedures. The Knee Injury and Osteoarthritis Outcome Score (KOOS) is commonly used as a primary condition specific health status measurement for the assessment of knee related disability. The aim of this study was to assess the measurement property of KOOS by examining in patients who had a partial meniscectomy for meniscal injury.
Study Design: Cross-sectional study.
Methods: Patients who were complaining of knee pain consistent with a meniscal injury, were assessed for eligibility. Thirty nine patients whose symptom duration was >6 months were included in the study. A standard operation protocol was used. Home exercise program was given to all patients for 6 weeks after meniscectomy. The KOOS was administered to all patients preoperatively and at 3-and 6- weeks postoperatively. The effect size and standardized response mean were calculated for the assessment of responsiveness of KOOS. All data were analyzed by SPSS for Windows program.
Results: Twenty one patients (54%) were male. The mean age was 33.7 ±12.5 years. The effect sizes varied from 0.52 to-1.20 and from 1.36 to-2.23 at 3- and 6- months after surgery, respectively. Standardized response means varied from 0.39 to-0.89 and from 1.03 to-1.83 at 3- and 6-weeks post-meniscectomy, respectively. All of the subscales of KOOS showed significant improvement after meniscectomy (p=0.00). The most responsive subscales were activities of daily living and symptoms. The least responsive one was the quality of life subscale.
Conclusion: As a result, the Turkish version of KOOS is a responsive measure for the assessment of the patients after partial menisectomy. All of the patients showed a significant improvement after surgery.
Key words: Knee Injury and Osteoarthritis Outcome Score, meniscal injury, partial meniscectomy, responsiveness

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Introduction

Meniscal tears can be categorised as traumatic or degenerative tears. Traumatic tears are typically longitudinal tears and result from an acute sports-related injury in young active individuals (1). Alternatively, degenerative tears are generally observed as horizontal-cleavage lesions or flap tears in middle-aged and older populations (2,3). These degenerative tears are suggested as the first sign of knee osteoarthritis (4). The arthroscopic partial meniscectomy (APM) is one of the most commonly performed orthopedic procedure for meniscal tears (5,6). For many years, the menisci were thought to be rudimental structures and were liberally removed. Removing of the menisci increases joint contact forces by 100% to 300% and frequently leads to knee osteoarthritis (7) . Degenerative process after partial arthroscopic menisectomy of knee seems to show a slow progress; while a previous knee surgery was associated with knee joint space narrowing at a rate of 21% this rate was only 11% without surgery (8).

There are some studies which have suggested that partial menisectomy has little benefit in patients with advance osteoarthritis (9,10) , but some benefit in those with mild to moderate osteoarthritis (11). A controversial article was recently published in the New England Journal of Medicine titled "Arthroscopic Partial Meniscectomy Versus ShamSurgery for a Degenerative Meniscal Tear" by Sihvonen et al. They conducted the combination of knee pain and a meniscal tear confirmed on MRI does not warrant an arthroscopic partial menisectomy (12). Their data are persuasive to extrapolate a conclusion that partial menisectomy inappropriate for all patients with degenerative meniscal tears, however it is difficult to determine whether the patients were symptomatic from their osteochondral degeneration or their degenerative meniscal tear. Therefore the primary indication for arthroscopic partial meniscectomy remains symptoms of well-localized joint line pain with acute onset and mechanical symptoms such as catching or locking that have failed comprehensive nonoperative management (13).

While debates continues, in another study, Lyman and collegues shared significant variation exists among practicing orthopaedic surgeons with regard to decision making for arthroscopic partial meniscectomy. They conducted the 3 clinical factors that most influenced a surgeons decision to recommend for APM, these were normal radiologic findings, failed nonoperative treatment and the presence of positive physical examination findings (14,15).

According to these discussions we think the treatment of meniscal tears is still a subject of interest and we wanted to emphasize another aspect of the subject. Functional disability and quality of life are the key outcomes that influence patients' compliance and satisfaction after treatments (16). The importance of including patients' views on treatment outcome in orthopaedics has been well established in recent years and a variety of patient-reported measures are available (17) . Patient-reported outcomes regarding health and function, have become useful

tools for the assessment of the outcomes by adding valuable information to physiologic measurements (18). The most common orthopaedic patient-reported outcome (PRO) tools have been extensively analysed regarding their validity and reproducibility (19-21) . More recently researchers have turned to assess the responsiveness and floor/ceiling effects (22,23)

Generally the instrument should be standardized, brief, adequate and sensitive to clinical change, for both patients and clinicians (24).

Responsiveness, or "sensitivity to change", an essential property of measuring instrument, is defined as the ability to detect a clinically meaningful change such as a change that clinicians or patients think is discernable and important. Changes may be spontaneous, due to the progression of the disease or may be induced by a therapeutic intervention (25,26).

There are various outcome mesurements that evaluate knee related disability. The Knee Injury and Osteoarthritis Outcome Score (KOOS) is one of condition-specific health status measurement that commonly used as a primary tool for the assessment of knee-related disability (27). It is developed originally in English and Swedish (28-29). Currently it is available in different languages. The psychometric properties of the KOOS have been tested in various clinical conditions and found to be satisfactory in terms of validity, internal consistency and temporal stability (27).

In this study we aimed to assess the measurement property of KOOS by examining its responsiveness in the patients who had a partial meniscectomy and the improvement of the knee function after surgery.

Materials and Methods

We retrospectively reviewed 39 prospectively followed patients who underwent arthroscopic partial menisectomy between 01.01.2005 and 01.06.2005 at Istanbul Physical Medicine and Rehabilitation Training Hospital. Patients who were older than 18 years old, had symptoms due to meniscal injury for more than 6 months and did not respond to conservative treatments were scheduled for an arthroscopic partial meniscectomy by orthopedic surgeons.

Patients who had a ligament injury, axial lower extremity malalignments, cartilage lesions or-osteochondritis dissecans were excluded from the study. Twenty six (67%) patients had a history of a significant trauma, including five patients who were older than 45 years.

Preoperatively, all patients were evaluated with clinical examination, standing knee plain radiographs and knee magnetic resonance imaging (MRI). Pain evoked by palpitation or compression (forced flexion) of the medial and lateral tibiofemoral joint line or a positive McMurray sign and characteristic meniscal signal at the inferior, superior or free edge of the meniscal surface in magnetic resonance imaging scans were considered as a meniscal injury. There was a medial meniscus lesion in 56% of patients and a lateral mensical lesion in 44 %.

The arthroscopic examination of the knee was performed under spinal or general anesthesia, according to the routine practice of the hospital, using standard

anterolateral and anteromedial portals with a 4 mm arthroscope. Arthroscopic partial meniscectomies were performed by the same orthopedic surgeons. The orthopedic surgeon evaluated the medial, lateral and patellofemoral joint compartments. During the arthroscopic partial menisectomy the damaged and loose parts of the meniscus were removed with the use of a mechanized shaver and meniscal punches until solid meniscal tissue was reached. The meniscus was then probed to ensure that all loose and weak fragments and unstable meniscus had been successfully resected, with preservation of the meniscus tissue. No other surgical procedure was performed and no medication was instilled into the knee during arthroscopy. Active range of motion exercises was started immediately after the removal of the surgery. Range of motion was gradually increased as tolerated by patient. Full weight bearing was allowed at the second postoperative day. Isometric exercises for the quadriceps and straight leg raising were given to all patients as a home exercise program for 6 weeks after meniscectomy. Patients were instructed to take over-the-counter analgesic agents as required.

The Turkish version of KOOS (KOOS-T) was administered to the patients before the surgery and at 3 and 6 weeks after surgery. All assessments were performed by the same physician. She also checked the questionnaires and returned any uncompleted form for proper completion, in order to minimize the rate of multiple and missing responses. The KOOS is a 42-item, self administered knee specific questionnaire that assesses pain (9 items), symptoms (7 items), activities of daily living (ADL,17items), sport and recreation function (5 items) and knee related quality of life (QOL, 4 items) in five subscales. Each item is responded to by marking one of the five response options on a Likert scale. A score from 0 (extreme problems) to 100 (no problems at all) is calculated separately for each subscale.

The KOOS is a valid and reliable patient-relevant questionnaire for patients with knee injury and knee osteoarthritis (30). The KOOS appears to be responsive to change in patients with a variety of conditions that have been treated with non-surgical and surgical interventions (31). The reliability and validity of the Turkish version of KOOS (KOOS-T) has been studied (32).

Responsiveness

Different approaches have been used to calculate responsiveness, and there is still no consensus as to which method is the best (18). Responsiveness was determined using the distribution based methods in this study.

The effect size is a standardized measure of change over time, calculated on the whole sample by dividing the difference between the pretest and posttest scores by the pretest standard deviation (SD). The effect size represents the individual change in terms of the number of pretest SDs, with values 0.20, 0.50 and 0.80 representing small, moderate and large changes respectively. The standardized response mean also referred as the responsiveness-treatment coefficient or efficacy index, is the ratio between individual change and the standard deviation of that change (33). Responsiveness measured by effect size

and standardized response mean, gives a standardized score, which is unit free and allows comparison between different measurement scales (34).

This study is approved by the local Ethics Committee. Written informed consent was obtained from the patients.

Statistical Analysis

All data were analyzed by SPSS for Windows program. Data analysis included frequencies, mean ± standard deviation, minimum and maximum that were used as descriptive statistics to summarize the data. The Friedman test, Paired T test and Pearson correlation test were used for the comparison of parametric and non-parametric results on preoperative and postoperative weeks 3 and 6. $P<0.05$ was considered as statistically significant.

Results

Twenty-one patients (54%) were male. The mean age was 33.7±12.5 years. The mean symptom duration was 9,00 ± 6,61 (6-36) months. Fifty-six percent of the patients had a medial meniscal lesion and 44% had a lateral meniscal lesion. Clinical characteristics of the patients were presented in Table 1. The study procedures were well accepted by all patients who did not raise any specific questions during the instruction phase or the administration of the questionnaires.

Effect size and standardized response mean values at 3- and 6. weeks after meniscectomy were summarized in Table 2. The most responsive KOOS subscales were ADL(ES 2.23; SRM 1,73) and Symptoms (ES 2.21; SRM 1.83). The least responsive subscale was QOL (ES 1.36; SRM 1.03).

All KOOS subscale scores were significantly improved at the 3- and 6-weeks follow up visits (Table 3).

Table 1. Clinical characteristics of the patients*

	Frequency	Percent
Pain	21	54
Pain and Tenderness	5	13
Pain and Locking	7	18
Locking	5	13
Clicking	1	2
Tenderness	20	52
McMurray Test	15	38
McMurray Test and Tenderness	4	10

*Desciptive statistics were used.

Table 2. Effect sizes and Standardized Response Mean (SRM) at 3 and 6 weeks post-meniscectomy

Subscale	Effect Size 3 weeks	Effect Size 6 weeks	SRM 3 weeks	SRM 6 weeks
KOOS Pain	1.07	1.86	0.81	1.42
Symptoms	1.2	2.21	0.89	1.83
ADL	0.66	2.23	0.44	1.73
Sport/Rec	0.74	1.53	0.51	1.19
QOL	0.52	1.36	0.39	1.03

Distribution based methods were used. ADL: Activity of Daily Living, Sport/Rec: Sport and Recreational activities, QOL: Quality of Life

Table 3. Summary statistics for clinical symptom at baseline, at the 3rd week and 6th week follow up

KOOS	Baseline	3 weeks	6 weeks	P value
Pain	47.15 (19.95)	67.59 (18.75)	80.91 (16.70)	0.00
Symptoms	52.47 (20.32)	68.22 (17.54)	78.94 (15.69)	0.00
ADL	52.38 (21.89)	66.25 (20.57)	81.82 (17.59)	0.00
Sport/Rec	23.59 (23)	41.79 (26.72)	58.33 (22.92)	0.00
QOL	28.20 (19.34)	38.62 (20.9)	51.28 (14.63)	0.01

Paired Student's t test was used for statistics. $P<0.05$ was considered as statistically significant.
ADL: Activity of Daily Living, Sport/Rec: Sport and Recreational activities, QOL: Quality of Life

Discussion

To our knowledge, this is the first study that evaluates the responsiveness of KOOS-T after meniscectomy. The results showed that the Turkish version of KOOS is a responsive measure for the follow-up of the patients who had arthroscopic meniscectomy. The changes in all of the subscales of KOOS were large to moderate following partial meniscectomy. In the assessment of the responsiveness at the 6th month, the daily life activity subscale showed the largest effect size.

Responsiveness measured by effect size and standardized response mean, gives a standardized score, which is unit free and allows comparison between different measurement scales. ES and SRM were interpreted using the Cohen's criteria indicating the larger effect size as the greater change or response to treatment (34). Responsiveness is crucial for the outcome measures used in treatment efficacy trials where the scoring should reflect changes over time (35). If a questionnaire is not sufficiently responsive to the construct being assessed, it will not capture changes at follow-up (36). This study had direct relevance to measuring PRO following meniscectomy where patient function changes markedly in the early post-operative phase.

In a study of Giesinger K et al. showed the highest responsiveness in terms of the joint-specific scores after total knee arthroplasty (37).

Patient-reported outcomes regarding health and function, have become useful tools for the assessment of the outcomes by adding valuable information to physiologic measurements (18). The most common orthopaedic patient-reported outcome (PRO) tools have been extensively analysed regarding their validity and reproducibility (19-21). KOOS is one of condition-specific health status measurement that commonly used as a primary tool for the assessment of knee-related disability (27) . Paradowski et al. reported that the Polish version of KOOS was a reliable, valid and responsive tool for the patients who underwent ACL reconstruction (38). The study, which is conducted by Monticone et al. showed that the KOOS is a responsive measure to detect the important changes in people undergoing rehabilitation after total knee arthroplasty. Moreover, they reported that the effect sizes varied from 0.83 to-1.35 and the standardized response means varied from 0.76 to-1.22, in the same study (35).

In this study the effect sizes for partial menisectomy ranged between 0.52 and -1.20 at the 3rd -weeks after surgery and between 1.36 and -2.23 at the 6-th weeks after meniscectomy. In a previous study it was reported that the effect size of KOOS estimated the responsiveness from moderate to large, for total knee artroplasty; from 1.31 to-2.8 at three months after surgery, from 1.18 to 2.86 at 6-months after surgery and from 1.08 to 3.54 at 12- months after surgery (39).

Arthroscopy can be an effective, especially in those without articular cartilage damage (40). Patients with non-degenerative meniscal tears are more satisfied with their knee function after arthroscopy than those patients with degenerative meniscal tears (41). There is an increased risk of developing tibiofemoral osteoarthritis for

individuals older than 40 years old after arthroscopic partial meniscectomy, and therefore exercise treatment could be recommended as an treatment choice. Arthroscopic partial meniscectomy may result in a decreased range of motion, muscle atrophy, and decreased stability of the knee joint consequently to pain and joint effusion (42,43) . For this reason a variety of rehabilitation programs have been used to treat patients recovering from arthroscopic meniscectomy and allow them to return to premorbid activity level in a safe and timely manner (44). Some studies stated that postoperative exercise therapy was an efficient treatment in patients who underwent surgery for degenerative meniscus damage (45,46) . Exercise may be an effective strategy to reduce the greater medial knee joint load distribution observed after arthroscopic partial meniscectomy (47).

An important finding of this study was the improvement of the knee-related pain and other symptoms, ADL, sports and recreational functions and QOL as measured by the KOOS-T after surgery and home exercise program.

This study has some limitations. First of all, the sample size did not allow calculating responsiveness estimates on the subgroups, determined by using baseline scores, therefore it was not possible to define exactly whether the subjects with more disability at baseline were more likely to achieve important improvements [48]. Secondly, the responsiveness was calculated for the subjects who received rehabilitation after a partial menisectomy and further researches are needed to calculate the estimates before and after surgery as well as after a longer follow up period.

In conclusion pain and other symptoms, activities of daily living, sport and recreational activities and quality of life improved significantly after a partial menisectomy. KOOS-T is a responsive test for measuring the improvement.

Conflict of interest: None

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