



Arthroscopic partial medial meniscectomy

Artroskopska parcijalna medijalna meniscektomija

Žarko Dašić*, Dragan Radoičić†

*Clinical Centre Podgorica, Orthopedics and Traumatology Clinic, Podgorica, Montenegro; †Military Medical Academy, Orthopedics and Traumatology Clinic, Belgrade, Serbia

Abstract

Background/Aim. Meniscal injuries are common in professional or recreational sports as well as in daily activities. If meniscal lesions lead to physical impairment they usually require surgical treatment. Arthroscopic treatment of meniscal injuries is one of the most often performed orthopedic operative procedures. **Methods.** The study analyzed the results of arthroscopic partial medial meniscectomy in 213 patients in a 24-month period, from 2006, to 2008. **Results.** In our series of arthroscopically treated medial meniscus tears we noted 78 (36.62%) vertical complete bucket handle lesions, 19 (8.92%) vertical incomplete lesions, 18 (8.45%) longitudinal tears, 35 (16.43%) oblique tears, 18 (8.45%) complex degenerative lesions, 17 (7.98%) radial lesions and 28 (13.14%) horizontal lesions. Mean preoperative International Knee Documentation Committee (IKDC) score was 49.81%, 1 month after the arthroscopic partial medial meniscectomy the mean IKDC score was 84.08%, and 6 months after mean IKDC score was 90.36%. Six months after the procedure 197 (92.49%) of patients had good or excellent subjective postoperative clinical outcomes, while 14 (6.57%) patients subjectively did not notice a significant improvement after the intervention, and 2 (0.93%) patients had no subjective improvement after the partial medial meniscectomy at all. **Conclusion.** Arthroscopic partial medial meniscectomy is minimally invasive diagnostic and therapeutic procedure and in well selected cases is a method of choice for treatment of medial meniscus injuries when repair techniques are not a viable option. It has small rate of complications, low morbidity and fast rehabilitation.

Key words:

menisci, tibial; wounds and injuries; arthroscopy; postoperative complications; treatment outcome.

Apstrakt

Uvod/Cilj. Povrede meniskusa su česte u profesionalnom i rekreativnom sportu, kao i tokom svakodnevnih aktivnosti. Lezije meniskusa obično zahtevaju hirurško lečenje ukoliko dovedu do smanjenja fizičke sposobnosti. Artroskopsko lečenje povreda meniskusa jedna je od najčešće izvođenih ortopedskih operativnih procedura. **Metode.** U radu su prikazani rezultati artroskopske parcijalne medijalne meniscektomije izvedene kod 213 bolesnika u periodu od 24 meseca, od 2006. do 2008. godine. **Rezultati.** U našoj seriji artroskopski tretiranih lezija medijalnog meniskusa bilo je 78 (36,62%) vertikalnih kompletnih *bucket handle* lezija, 19 (8,92%) vertikalnih nekompletnih lezija, 18 (8,45%) longitudinalnih raskida, 35 (16,43%) kosih raskida, 18 (8,45%) kompleksnih degenerativnih, 17 (7,98%) radijalnih raskida i 28 (13,14%) horizontalnih lezija. Srednji preoperativni *International Knee Documentation Committee* (IKDC) skor bio je 49,81%, mesec dana nakon parcijalne artroskopske medijalne meniscektomije srednji IKDC skor bio je 84,08%, a 6 meseci nakon operacije srednji IKDC skor bio je 90,36%. Šest meseci nakon procedure 197 (92,49%) bolesnika imalo je dobar ili odličan postoperativni ishod, 14 bolesnika (6,57%) subjektivno nije imalo značajno poboljšanje nakon intervencije, a dva bolesnika (0,93%), nisu imala nikakva subjektivna poboljšanja nakon parcijalne artroskopske meniscektomije. **Zaključak.** Artroskopska parcijalna medijalna meniscektomija je minimalno invazivna dijagnostičko-terapijska procedura. Kod dobro odabranih bolesnika, i kada tehnike reparacije nisu primenjive, predstavlja metod izbora za lečenje povreda medijalnog meniskusa. Prati je niska učestalost komplikacija, nizak morbiditet i brza rehabilitacija.

Ključne reči:

meniskus tibije; povrede; artroskopija; postoperativne komplikacije; lečenje, ishod.

Introduction

The mean annual incidence of meniscal tears is 60 to 70 per 100 000¹. Meniscal tears are more common in males.

The male : female ratio ranges from 2.5 : 1 to 4 : 1. Meniscal injuries are a common problem in sports and they are the most frequent injury to the knee joint. Such injuries are especially prevalent among competitive athletes, particularly

those who play football, basketball, volleyball and sometimes tennis. In the past 25 years, with increasing popularity of professional and recreational sports the number of people participating in sports has greatly increased, resulting in a higher number of knee injuries². If meniscal lesions lead to physical impairment they usually require surgical treatment. Arthroscopic treatment of meniscal injuries has become one of the most often performed orthopedic operative procedure. In order to properly diagnose and treat meniscal injuries, understanding of meniscal anatomy and function is necessary.

Medial meniscus is C-shaped, with the posterior horn larger than the anterior horn in the anteroposterior dimension. Johnson et al.³ mapped the bony insertion sites of the meniscus. They noted that the anterior horn of the medial meniscus has the largest insertion site surface area (61.4 mm²) and the posterior horn of the lateral meniscus, the smallest (28.5 mm²). The capsular attachment of the medial meniscus on the tibial side is referred to as the coronary ligament. A thickening of the capsular attachment in the midportion spans from the tibia to the femur and is referred to as the deep medial collateral ligament.

The meniscus has a fibrocartilaginous structure. The orientation of collagen fibers is mainly circumferential, with some radial fibers at the surface and within the midsubstance. This orientation allows compressive loads to be dispersed by the circumferential fibers, while the radial fibers act as tie fibers to resist longitudinal tearing. Collagen is 60% to 70% of the dry weight of the meniscus. The majority of collagen (90%) is type I, with types II, III, V, and VI present in much smaller amounts. Elastin accounts for approximately 0.6% and noncollagenous proteins, for 8% to 13%⁴. The cells of the meniscus are fibrochondrocytes because of their appearance and the fact that they synthesize a fibrocartilaginous matrix.

The menisci are important in many aspects of knee function, including load sharing, shock absorption, reduction in joint contact stresses, passive stabilization, increasing congruity and contact area, limitation of extremes of flexion and extension and proprioception⁵. Many of these functions are achieved through the ability of the menisci to transmit and distribute load over the tibial plateau. The medial and lateral menisci transmit at least 50% to 70% or at times more of the load when the knee is in extension; this increases to 85% with 90° of knee flexion⁶. Removal of the medial meniscus results in a 50% to 70% reduction in femoral condyle contact area and in a 100% increase in contact stress⁷.

The onset of symptoms and mechanism of injury were often of utmost importance for the diagnosis. Meniscal lesions often occurred during a rotational injury or hyperflexion event, and they in most cases presented with acute pain and swelling. Complaints of locking or catching were also present, and loss of motion with a mechanical block to extension⁸. Degenerative tears of the medial meniscus were mostly noted in older patients (> 40 years). These tears were often associated with some degree of osteoarthritis.

Though not always absolutely exact clinical evaluation is a very useful tool in the diagnosis of meniscal pathology. Weinstabl et al.⁹ found that joint line tenderness was the best

clinical sign of a meniscal tear, with a 74% sensitivity and 50% positive predictive value.

Plain radiographs should be obtained before any further diagnostic studies are undertaken, although these radiographic views cannot confirm the diagnosis of meniscal lesion, they are important in defining bony pathology and in evaluating the knee for joint space narrowing.

Magnetic resonance imaging is the imaging method of choice for diagnosing meniscal tears¹⁰. Accuracy for detecting meniscal tears was commonly reported at 80% to 90%¹¹. With improved technology and increased experience in reading these scans, the accuracy of detection is now considered to be approximately 95% or better¹².

Classification of meniscal lesions—commonly described patterns of meniscal lesions include vertical (complete vertical – bucket handle tears) or incomplete – longitudinal, oblique, often called flap or parrot beak tears, complex – including degenerative, transverse (radial) and horizontal. With increasing age, degenerative complex tears are more frequently seen.

Surgical indications for arthroscopic treatment of meniscal pathology include: symptoms of meniscal injury that affect activities of daily living, work and/or sports, positive physical findings of joint line tenderness, joint effusion, limitation of motion and provocative signs, such as pain with squatting or a positive flexion McMurray or Apley grind test, failure to respond to nonsurgical treatment, including activity modification, medication, and a rehabilitation program, and the absence of other causes of knee pain identified on plain radiographs or other imaging studies.

Osteoarthritic changes after meniscectomy have been reported in up to 89% of patients⁸. Numerous studies have shown that knee osteoarthritis is more common after total meniscectomy, and that partial meniscectomy is associated with less radiographic and clinical signs of osteoarthritis over time compared with total meniscectomy⁹⁻¹³. Crawford et al.¹⁴ showed that the International Knee Documentation Committee (IKDC) score has an overall acceptable psychometric performance for outcome measures of meniscus injuries of the knee. The aim of the study was to demonstrate that arthroscopic partial medial meniscectomy in well selected cases is a method of choice for treatment of medial meniscus injuries that are not amenable to repair, because it has small rate of complications, low morbidity and fast rehabilitation.

Methods

This study analyzed the results of arthroscopic partial medial meniscectomy in 213 patients (68 patients in the Orthopedics and Traumatology Clinic, Clinical Center in Podgorica, Montenegro, and 145 patients in the Orthopedics and Traumatology Clinic Military Medical Academy in Belgrade, Serbia) in a 24-month period, from 2006 to 2008.

A decision about the treatment of medial meniscal lesion was made according to patient factors and type of meniscal injury. In our institutions we perform various techniques of meniscal reparation but in this study we only presented series of medial meniscus injuries with partial arthroscopic meniscectomy.

Three primary methods of diagnosing medial meniscal injury were anamnesis, physical examination and magnetic resonance imaging (MRI).

Physical examination – numerous specialized tests have been described that may aid in making the diagnosis of meniscal tear. We mainly relied on joint line palpation, the flexion McMurray test, the Apley grind test.

In 58 (27.2%), cases we used general and in 155 (72.8%) regional anesthesia. Perioperative antibiotics administered were in most cases cefazolin, ceftriaxone or in the case of a documented penicillin or cephalosporin allergy gentamycin, amikacin or clindamycin. Some patients received intraarticular injection of hyaluronic acid intraoperatively.

Partial resection of the medial meniscus is advocated when other treatment modalities are not attainable. We followed Metcalfs et al.¹³ general guideline for arthroscopic resection that applies to most resectable meniscal lesions: all mobile fragments that could be pulled past the inner margin of the meniscus into the center of the joint were removed, the remaining meniscal rim was smoothed to remove any sudden changes in contour that might lead to further tearing, the probe was used repeatedly to gain information about the mobility and texture of the remaining rim, we tried to protect meniscocapsular junction and the peripheral meniscal rim during resection (this maintains meniscal stability and is vital in preserving the load transmission properties of the meniscus), a perfectly smooth rim was not mandatory since a re-

peated arthroscopy showed rim remodeling and smoothing at 6 to 9 months. We used both manual and motorized resection instruments, in uncertain situations, more rather than less intact meniscal rim was left to avoid segmental resection, which essentially results in a total meniscectomy.

During rehabilitation full range of motion was immediately allowed, 50% weight bearing and forearm crutches were used for 2–4 days. Afterwards the patients progressed to full weight bearing according to pain tolerance and swelling. Physical therapy exercises to achieve complete range of motion and optimal muscle strength were recommended to athletes and patients with long lasting complaints (in most cases those were patients older than 40 years). We suggested to all patients to suspend sports participation for approximately three weeks.

In comparison of pre- and postoperative results, we used a 2000 IKDC subjective knee evaluation form.

Results

All presented cases underwent partial arthroscopic medial meniscectomy (Figures 1 and 2). In the series of arthroscopically treated medial meniscus tears we noted 78 (36.62%) vertical complete bucket handle lesions, 19 (8.92%) vertical incomplete lesions, 18 (8.45%) longitudinal tears, 35 (16.43%) oblique tears, 18 (8.45%) complex degenerative lesion, 17 (7.98%) radial lesions and 28 (13.14%) horizontal cleavage lesions. There were 171 men (80.28%)



Fig. 1 – Bucket handle tear and partial meniscal resection

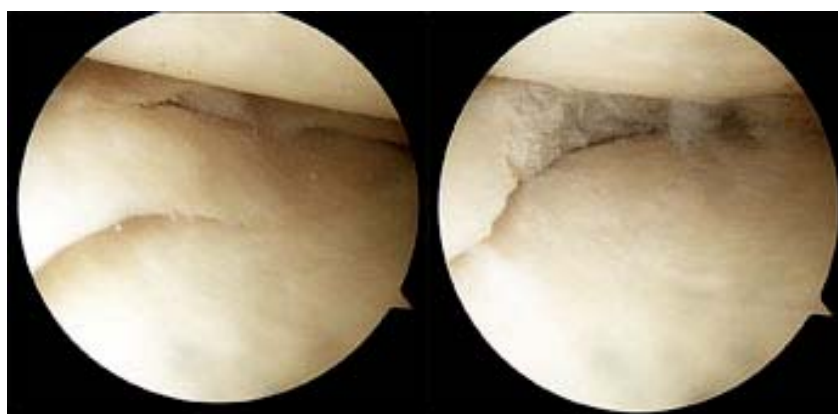


Fig. 2 – Oblique tear pre- and post partial meniscectomy

and 42 women (19.72%). Mean patient age was 36.6 years (range from 15 to 81 years).

In our study we had correlation between positive McMurray and/or Apley test and arthroscopic confirmation of medial meniscal tear in 78% of the presented cases. Joint line tenderness was positive in 86% of the patients who underwent arthroscopic meniscectomy.

Medial meniscus lesion was arthroscopically treated in 119 left knees and in 94 right knees. A total of 89% of presented arthroscopic meniscectomies were performed as one day surgery. A total of 51 (23.94%) of patients received intra-articular injection of hyaluronic acid following arthroscopic partial meniscectomy.

In 39 (18.30%) cases of medial meniscus lesion during arthroscopy, we found signs of a complete or partial rupture of the ACL while in 8 cases (3.75%) we noted that medial meniscus tear was accompanied with lateral meniscus tear.

Totally 175 of 213 patients underwent knee MRI previous to arthroscopy and in 6 cases medial meniscal tear was not seen on MRI. In our series of arthroscopic partial medial meniscectomy the accuracy of preoperative MRI was 96.57%.

Mean preoperative IKDC score was 49.81%, a month after arthroscopic medial meniscectomy the mean IKDC score was 84.08%, and 6 months after the mean IKDC score was 90.36%; 6 months after the procedure 197 (92.49%) patients had good or excellent subjective postoperative clinical outcomes; 14 (6.57%) patients subjectively did not notice a significant improvement after the intervention, and 2 (0.93%) patients had no subjective improvement after partial medial meniscectomy at all.

In our series we had 6 (2.81%) complications. In 2 (0.93%) cases we had knee hemarthros which were resolved by puncture, 2 (0.93%) cases of instrument failure (arthroscopic knife breakage) and 2 (0.93%) patients had infection (cultures were positive for *Staph. aureus*) which was resolved by rearthroscopy and with high doses of *iv* antibiotics.

Discussion

In the past two decades numerous advances in meniscal repair and meniscal transplantation techniques were achieved, mostly with the intention of achieving long-term delay of knee degenerative changes. In some cases, however, partial meniscectomy is still required, and is the treatment of choice^{15, 16}.

Medial arthroscopic partial meniscectomy in general is considered as a safe and reliable procedure. Major advantages of partial arthroscopical meniscectomy over meniscal repair include decreased hospitalization, shorter rehabilitation and a reduction in health care system costs. Numerous studies on arthroscopic partial meniscectomy reported 80% to 90% satisfactory clinical results.

Burks et al.¹⁷ reported both clinical and radiographic results of patients with a nearly 15-year follow-up after partial meniscectomy. They reported 88% good or excellent clinical outcome and minimal degenerative radiographic changes compared with the untreated knee.

On the other side a number of studies have questioned whether partial meniscectomy is a procedure without delayed consequences. Ronger et al.¹⁸ evaluated patients who had undergone arthroscopic partial meniscectomies at an average of 4 years and found increased radiographic changes of osteoarthritis in 38% of the patients who had undergone partial medial meniscectomy, however, they noted that these changes did not correlate with subjective postoperative results because 86% to 91% of patients had good or excellent clinical outcomes. Glatthorn et al.¹⁹ have shown that quadriceps weakness exists 6 months after arthroscopic partial meniscectomy. However, in our series 6 months postoperatively in most cases we found quadriceps weakness only in knees with concomitant ACL deficiency. Fabricant and Jokl²⁰ have shown in their study that patient age and sex have no significant association with any clinical or radiographic outcome variables at 8.5, 12, and 15 years, that osteoarthritis progressed more after medial partial meniscectomy in patients older than 40 years than in younger patients, and that the best radiographic results in patients who underwent medial meniscectomy occurred in valgus knees compared with varus knees.

In our series a full range of motion was immediately allowed, 50% weight bearing and forearm crutches were used for 2–4 days, patients were encouraged to return to normal daily activities and sports three weeks after the intervention, and we did not note any problems during study with this rehabilitation regime. Lubowitz et al.²¹ in the study of return to activity after arthroscopy concluded that most patients had no knee-related activity restrictions 4 weeks after arthroscopy. Hempfling²² found that intra-articular hyaluronic acid after knee arthroscopy leads to a lasting improvement in pain and functional impairment being a suitable way of achieving long-term stabilisation of the treatment outcome. We applied intra-articular injections of hyaluronic acid following arthroscopic partial medial meniscectomy in 51 cases, and found a significant reduction in pain in the first month after arthroscopy compared to the group of patients who had not underwent postarthroscopical viscosupplementation. In order to obtain adequate assessments we used IKDC score. The IKDC is considered a reliable and valid instrument for use in a broad patient population¹⁵. There are also other scoring systems available, such as Lysholm knee score and Tegner activity scale for patients with meniscal injury of the knee that have demonstrated acceptable psychometric performances as outcome measures for patients with a meniscal injury of the knee¹⁶.

Complication related to arthroscopical partial meniscectomy can be divided into those related to arthroscopy in general and those specific for partial meniscectomy. Small²³ reported on the complications of 21 arthroscopists over 19-month period and found that complication rate for medial meniscectomy was 1.78%, and that instrument failure represents 2.9% of all arthroscopic complications. We had 6 (2.81%) complications. Aside from the general complications of knee arthroscopy (hemarthrosis and infection) partial meniscectomy was in our series complicated by instrument failure in only 2 (0.93%) cases; we had none of other reported com-

plications as knee ligament or neurovascular injuries or patients with the persistent pain after partial meniscectomy.

Conclusion

Arthroscopic partial medial meniscectomy is minimally invasive diagnostic and therapeutic procedure.

In most cases, arthroscopic partial medial meniscectomy surgery stands as an ideal procedure for the concept of one day surgery.

Whenever the diagnosis of meniscal tear is less clear, preoperative knee MRI should be obtained, thanks to its accuracy, opportunity for errors is significantly reduced.

In well selected cases, when repair techniques are not viable option, partial medial meniscectomy is a method of choice for treatment of medial meniscus injuries. It has small rate of complications, low morbidity and fast rehabilitation. Well performed partial medial meniscectomy results in alleviation of knee pain, improvement in knee function, and good patient satisfaction.

R E F E R E N C E S

1. *Nielsen AB, Yde J.* Epidemiology of acute knee injuries: a prospective hospital investigation. *J Trauma* 1991; 31(12): 1644–8.
2. *Koski JA, Ibarra C, Rodeo SA.* Meniscal injury and repair: clinical status. *Orthop Clin North Am* 2000; 31(3): 419–36.
3. *Johnson DL, Swenson TM, Livesay GA, Aizawa H, Fu FH, Harner CD.* Insertion-site anatomy of the human menisci: gross, arthroscopic, and topographical anatomy as a basis for meniscal transplantation. *Arthroscopy* 1995; 11(4): 386–94.
4. *McDevitt CA, Webber RJ.* The ultrastructure and biochemistry of meniscal cartilage. *Clin Orthop Relat Res* 1990; (252): 8–18.
5. *Greis PE, Bardana DD, Holmstrom MC, Burks RT.* Meniscal injury: I. Basic science and evaluation. *J Am Acad Orthop Surg* 2002; 10(3): 168–76.
6. *Radin EL, de Lamotte F, Maquet P.* Role of the menisci in the distribution of stress in the knee. *Clin Orthop Relat Res* 1984; (185): 290–4.
7. *Fukubayashi T, Kurosawa H.* The contact area and pressure distribution pattern of the knee. A study of normal and osteoarthrotic knee joints. *Acta Orthop Scand* 1980; 51(6): 871–9.
8. *Rangger C, Kathrein A, Klestil T, Glötzner W.* Partial meniscectomy and osteoarthritis. Implications for treatment of athletes. *Sports Med* 1997; 23(1): 61–8.
9. *Weinstabl R, Muellner T, Vecsei V, Kainberger F, Kramer M.* Economic considerations for the diagnosis and therapy of meniscal lesions: can magnetic resonance imaging help reduce the expense? *World J Surg* 1997; 21(4): 363–8.
10. *Major NM, Beard LN Jr, Helms CA.* Accuracy of MR Imaging of the Knee in Adolescents. *AJR Am J Roentgenol* 2003; 180(1): 17–9.
11. *Matava MJ, Eck K, Totty W, Wright RW, Shively RA.* Magnetic resonance imaging as a tool to predict meniscal reparability. *Am J Sports Med* 1999; 27(4): 436–43.
12. *Helms CA.* The meniscus: recent advances in MR imaging of the knee. *AJR Am J Roentgenol* 2002; 179(5):1115–22.
13. *Metcalfe RW, Burks RT, Metcalfe MS, McGinty JB.* Arthroscopic meniscectomy. In: *McGinty JB, Caspari RB, Jackson RW, Poebling GG*, editors. *Operative arthroscopy*. 2nd ed. Philadelphia, PA: Lippincott-Raven; 1996. p. 263–97.
14. *Cranford K, Briggs KK, Rodkey WG, Steadman JR.* Reliability, validity, and responsiveness of the IKDC score for meniscus injuries of the knee. *Arthroscopy* 2007; 23(8): 839–44.
15. *Higgins LD, Taylor MK, Park D, Ghodadra N, Marchant M, Pietrobon R, et al.* International Knee Documentation Committee. Reliability and validity of the International Knee Documentation Committee (IKDC) Subjective Knee Form. *Joint Bone Spine* 2007; 74(6): 594–9.
16. *Briggs KK, Kocher MS, Rodkey WG, Steadman JR.* Reliability, validity, and responsiveness of the Lysholm knee score and Tegner activity scale for patients with meniscal injury of the knee. *J Bone Joint Surg Am* 2006; 88(4): 698–705.
17. *Burks RT, Metcalfe MH, Metcalfe RW.* Fifteen-year follow-up of arthroscopic partial meniscectomy. *Arthroscopy* 1997; 13(6): 673–9.
18. *Rangger C, Klestil T, Glötzner W, Kemmler G, Benedetto KP.* Osteoarthritis after arthroscopic partial meniscectomy. *Am J Sports Med* 1995; 23(2): 240–4.
19. *Glatthorn JF, Berendts AM, Bizzi M, Munzinger U, Maffiuletti NA.* Neuromuscular function after arthroscopic partial meniscectomy. *Clin Orthop Relat Res* 2010; 468(5): 1336–43.
20. *Fabricant PD, Jokl P.* Surgical outcomes after arthroscopic partial meniscectomy. *J Am Acad Orthop Surg* 2007; 15(11): 647–53.
21. *Lubowitz JH, Ayala M, Appleby D.* Return to activity after knee arthroscopy. *Arthroscopy* 2008; 24(1): 58–61.e4.
22. *Hempfling H.* Intra-articular hyaluronic acid after knee arthroscopy: a two-year study. *Knee Surg Sports Traumatol Arthrosc* 2007; 15(5): 537–46.
23. *Small NC.* Complications in arthroscopic meniscal surgery. *Clin Sport Med* 1990; 9(3): 609–17.

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