

Arthroscopic suture repair of torn meniscus characteristics and results in a Vietnamese hospital

V.T. Toan and P.N. Thi

Department of Orthopedic and Trauma Surgery, Thong Nhat Hospital, Ho Chi Minh city, Vietnam

Corresponding author: V.T. Toan
E-mail: vothanhtoan1990@yahoo.com

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ABSTRACT. We evaluated the results of treatment of meniscus tear injury by arthroscopy to determine the influence of age, gender and cause of injury in patients undergoing endoscopic suturing. This was a prospective study conducted from 7/2006 to 7/2013. We followed 90 patients, from 17 to 50 years old attended at Thong Nhat hospital (Ho Chi Minh City). All of them were diagnosed with a torn meniscus and were treated with arthroscopic meniscus suturing by outside-in, inside-out and all inside techniques. Early results, including evaluating the side effects during surgery and after surgery and results after 6 months were collected. Among the 90 patients in our study, men accounted for 62%, almost two times higher than percentage of women. The main reason was due to sports injuries, accounting for 65%. The most common age was between 21 and 30 (46.7%). Results after surgery: 32/90 were very good, 52/90 (good, 4/90 medium, and 2/90 bad. The indication of suturing meniscus tear due to trauma gives superior results for knee function for patients, reducing long-term complications such as osteoarthritis.

Key words: Meniscus suture repair; Endoscopic suturing; Knee trauma; Torn meniscus; Arthroscopic methods

INTRODUCTION

Especially due to sport activities, the number of joint injuries, especially meniscus injuries, have grown significantly. The knee joint is reported to be the most common joint injured by young sports participants. The complexity of the knee joint structure and the multidirectional forces imposed on the knee joint during sporting activities may explain why knee injuries are often more severe than injuries to other body regions. Traumatic torn meniscus (TTM) in the knee accounts for 68 – 75 % of the most common injuries, much higher than torn meniscus caused by other factors (Orengo and Zahlaoui, 1999). The average annual incidence of meniscal injuries per 10 thousand inhabitants has been reported to be 9.0 in males and 4.2 in females (Hede et al., 1990). The TTM often requires surgery or extensive rehabilitation before the knee functions at a pre-injury level. The high economic cost of knee injuries to the individual and society is of particular concern in developing countries, where limited access to appropriate services and high healthcare costs are major barriers to appropriate management of youth sports knee injuries. In addition, such knee damage increases the risk of developing osteoarthritis of the knee significantly after 20 years (Vaishya, 2019; Papalia et al., 2019). Moreover, excising of the menisci also leads to developing knee osteoarthritis (OA) and knee deformities such as ridge formation, joint space narrowing, and flattening of the femoral condyle at an increased rate (Fairbank, 1948; Tapper and Hoover, 1969; Roos et al., 1998;). The OA, a degenerative joint disease, is a major public health problem in the general population because it is highly prevalent among the elderly and is associated with considerable disability. OA can affect multiple joints in the body, but it is commonly found in the knee. The recent data from the National Health and Nutrition Examination Survey III reveal that approximately 35% of women and men aged 60 years and above had OA of the knee.

Although risk factors for prevalence of OA have been well studied in American and European regions, little data are available for Asian populations. According to the latest data in a Chinese population aged ≥ 60 years, the prevalence of knee OA was 22% in men and 43% in women, and this prevalence was 45% higher than that in USA population. In a Japanese rural population, the prevalence of knee OA was 30% in women and 11% in men. Simultaneously, in Vietnam, a country with a population of 90 million, the prevalence of OA has not been studied, but the prevalence of knee pain was 18% among people aged 16 and above. Knee pain and decreased function have been reported at long-term follow-up after partial or total meniscectomy (Tapper and Hoover, 1969). Therefore, meniscal repairs are preferable over partial or total meniscectomies as they aim to restore a functional meniscus and possibly prevent early degenerative changes.

A lot of different techniques such as outside-in, inside-out, and all-inside have been described in the literature for the treatment of the menisci tears (Bender et al., 2002; Laupattarakasem et al., 2004; Miller and Hart, 2005; Selby et al., 2007). All of them have as advantages as well as disadvantages. For example, the outside-in technique is used for anterior and middle-segment meniscal tears. Simultaneously, the main disadvantage of this technique is that a 1–2 cm skin incision is required, and knots are tied subcutaneously over the capsule (Cho, 2014). The inside-out technique is a novel standard in meniscal surgery. Nevertheless, problems of such method include the need for an accessory incision, and potential injuries to the medial saphenous, peroneal nerve, or lateral popliteal neurovascular bundle (Petrone, 1982; Johnson and Weiss, 2012). The all-inside technique usually is used

to repair the posterior horns and middle segments of the meniscus. The arthroscopic all-inside techniques include pullout suture repair and suture anchor repair. At the same time, for this technique a special meniscal repair device is required, which is expensive (Cuellar et al., 2015; Jenkins et al., 2019).

Knee arthroscopy was firstly adopted in 1955 by Watanabe (Dubos, 1999) and since that time has been dramatically developed (Osti et al., 1994; Dragoo, 2019). Today this method is gradually improving and widely applied with many advantages, not only for the accurate diagnosis of internal injuries in the knee, but also for managing those injuries. The patient has a reduced hospital stay and rehabilitation after surgery, quickly returning to normal activities (Martens et al., 1986; Hulet et al., 1999; Frosch et al., 2005; Dürselen et al., 2011). But, meniscus injuries, until now, still require surgical excision. Due to the understanding of blood supply and histopathology of meniscus, it has been shown that meniscus tear can be restored, which helps to reduce postoperative complications such as increased risk of degenerative joint and improve knee function (Metcalf, 1991; Panisset et al., 1999).

In Vietnam, before 1994, there were many complications due to open knee surgery. Since 1994, arthroscopy techniques have been applied, but due to the lack of facilities, they are only diagnostic function. In recent years, knee arthroscopy has really grown and achieved encouraging results in the diagnosis and treatment of meniscus injuries. However, there are no studies about endoscopic suturing. The purpose of this study was to document the effects of age, gender, cause of injury in patients undergoing endoscopic suturing and evaluate the results of treatment of meniscus tear injury by arthroscopy.

MATERIAL AND METHODS

Object of the study

A study was made of 90 patients who were diagnosed and treated by arthroscopic suture in Thong Nhat hospital – Ho Chi Minh city (from July 2006 to July 2013). All the patients agreed to participate in the experiment and do not deny the results of the experiment to be provided in the research paper. All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000, and were approved by the institutional ethics committee. The patients signed informed consent forms.

Surgical indications

The lesion in the 'red-red zone' and the 'red-white zone' (denoting area of vascularity), with younger patients considering treatment in the "white-and-white zone".

A new tear under 8 weeks. For younger patients consider torn over 8 weeks.

Method of surgery and result evaluating

Meniscal suture technique: Meniscal suture technique depends on lesion and we use inside-out, outside-in, all-inside suture techniques.

Result evaluation:

Early result: Evaluating the side effects during surgery and after surgery.

Result after 6 months of surgery: follow up after 3 months and 6 months based upon Lysholm score.

Data processing: SPSS 16.0.

RESULTS

Age and gender

The study group had more males than females, with 62.2% and 37.8%, respectively (Table 1). Knee injury cause meniscus tear due to traffic accidents, competing in sport and the percentage of males is higher than that of females. In fact, women's sport intensity is also lower.

Among our study groups, ages ranged from 17 to 50 years, with an average age of 36.2 years. The most common age groups were 21 to 30 (46.7%) and 31 to 40 (31.1%). This is also the same age in other studies (Orengo and Zahlaoui, 1999) with the rate of trauma in those aged from 17 to 40 being 90%. On the other hand, the mean age of the study was not significantly different when compared with other authors, such as Hulet et al. (1999), with an average age 38 years for lateral meniscus and 34 years for medial meniscus. In general, this injury is more common in active-age patients.

Table 1. Distribution according to age and gender of patients with torn meniscus trauma.

Gender	Age				N	Total %
	17-20	21-30	31-40	41-50		
Male	N 4	26	18	8	56	62.2
	% 4.4	28.9	20	8.9		
Female	N 4	16	10	4	34	37.8
	% 4.4	17.8	11.1	4.4		
Total	N 8	42	28	12	90	100
	% 8.9	46.7	31.1	13.3		

The reason of trauma

The cause of sport injuries (62.2%) and traffic accidents (24.4%) is quite high, while other causes such as living activities and other are not (Table 2).

Table 2. Reasons for trauma of torn meniscus among 90 Vietnamese patients.

Reason	Traffic accident	Sport	Living activities	Other	Total
N	22	56	8	4	90
%	24.4	62.2	5.5	4	100

Sport injuries are often due to lack of conditioning exercise patients come to us mainly as amateurs and easily got injured. Many patients played football. We found that the

knee was often injured as rotated lateral too much or rotated and the knee flexion excessively when jumping on the ground. Foreign authors had the patient got injuries mainly due to sports. Randall Cooper et al. (2001) said that the most common mechanism in sport is rotation of foot weight bearing on the ground.

The result of knee arthroscopy

There are several ways of evaluating post-operative outcomes. We based ours on the Lysholm score scale because of Lysholm's functional assessment.

95-100 points - Excellent with wide range motion of knee, evaluating pain, gait, need for crutch support, knee swelling, knee stability, climbing stairs and squatting. This scale does not depend on machine measurement of the knee as do other methods. The evaluation is easy to make, and is suitable for the orthopedic support system in our country.

Early and long-term results data are presented in Tables 3-5.

Table 3. Results obtained before and 3 months after surgery.

Result	Excellent	Good	Moderate	Bad	Total
N	24	58	6	2	90
%	26.7	64.4	6.7	2.2	100

Table 4. Results obtained before and several months after surgery.

Month	6-<9	9-<12	≥ 12	Total
N	4	14	72	90
%	4.4	15.6	80	100

Table 5. Results obtained before and 6 months after surgery.

Result	Excellent	Good	Moderate	Bad	Total
N	28	56	4	2	90
%	31.1	62.3	4.4	2.2	100

After 6 months of surgery, 36 patients (40%) improved from moderate to good results.

In summary (Table 6), obtained results revealed that 90 patients, the longest following up to 38 months and the shortest are 3 months. We generally gained the result based on the Lysholm score which is as follows: 32/90 excellent, 52/90 good, 4/90 medium and 2/90 bad.

Comparing obtained data with previous study, such as Dürselen et al. (2011) and Frosch et al. (2005), the results of our Lysholm scale were slightly lower than reported by those authors. Probably our patients often go to surgery late and rehabilitation procedures after surgery are not good. In addition, we had a bad outcome of two patients because they

did not follow the rehabilitation recommendations. With obesity, deformity, transverse rupture of meniscus, and age over 45, postoperative pain can last a long time.

Table 6. Summary result after knee surgery for 90 Vietnamese patients.

Result		Excellent	Good	Moderate	Bad	Total
Before treatment	N	0	0	44	46	90
	%	0	0	48.9	51.1	100
3 months later	N	24	48	14	4	90
	%	26.7	53.4	15.5	4.4	100
6 months later	N	28	54	6	2	90
	%	31.1	60	6.7	2.2	100
From 12 months	N	32	52	4	2	90
	%	35.6	66	4.4	2.2	100

CONCLUSIONS

Based on the analysis of the 90 patients in this study, we conclude that with better understanding of histopathology, blood supply and progression in knee endoscopic surgery, the indication for suturing arthroscopy of the trauma torn meniscus is increasing. Patients had better results in knee function, reducing long-term complications such as osteoarthritis.

Our results were not as good as in other investigations, probably due to delays in surgery and inadequate rehabilitation after surgery. Nevertheless, more than 35% of patients had excellent results and more than 65% had good outcomes. Therefore, we conclude, that the endoscopic method can be successfully used in Vietnam as well as in other countries. In addition, we recommend seeking surgical help as early as possible and undergoing complete rehabilitation according to the instructions of doctors.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

REFERENCES

- Bender B, Shabat S, Mann G, Oz H, et al. (2002). The double-loop technique for meniscal suture. *Arthroscopy*. 18(8): 944-947.
- Cho JH (2014). A modified outside-in suture technique for repair of the middle segment of the meniscus using a spinal needle. *Knee Surg. Relat. Res.* 26(1): 43-47.
- Cooper R, Crossley K and Morris H (2001). Acute knee injuries. In Brukner P. and Khan K. (eds.). *Clinical Sports Medicine, 2nd edition*, pp.426-462. Sydney: McGraw-Hill.
- Cuellar A, Cuellar R, Cuellar A, Garcia-Alonso I, et al. (2015). The effect of knee flexion angle on the neurovascular safety of all-inside lateral meniscus repair: a cadaveric study. *Arthroscopy*. 31(11): 2138-2144.
- Dragoo JL (2019). Outcomes of arthroscopic repair versus observation in older patients. *Orthop. J. Sports Med.* 7(suppl. 5): 2325967119S00248.
- Dubos JP (1999). *Historique de L'Arthroscopie*. Société Française d'Arthroscopie. Elsevier. 15-17.

- Dürselen L, Vögele S, Seitz AM, Ignatius A, et al. (2011). Anterior knee laxity increases gapping of posterior horn medial meniscal tears. *Am. J. Sports Med.* 39(8): 1749-1755.
- Fairbank TJ (1948). Knee joint changes after meniscectomy. *J. Bone Joint Surg. Br.* 30(4): 664-670.
- Frosch KH, Fuchs M, Losch A, and Stürmer KM (2005). Repair of meniscal tears with the absorbable Clearfix screw: results after 1-3 years. *Arch. Orthop. Trauma Surg.* 125(9): 585-591.
- Hede A, Jensen DB, Blyme P and Sonne-Holm S (1990). Epidemiology of meniscal lesions in the knee 1,215 open operations in Copenhagen 1982- 84. *Acta Orthop. Scand.* 61(5): 435-437.
- Hulet C, Locker B and Chu Caen (1999). Meniscectomies sous Arthroscopie a plus de 10 ans Epidemiologi. *Ann. Soc. Fr. Arthroscopie.* 6: 101-102
- Jenkins JM, Hopper GP and Mackay GM (2019). All-Inside Arthroscopic Meniscal Repair with the Arthrex Meniscal Cinch™ II. *Surg. Technol. Int.* 36: 331-334.
- Johnson D and Weiss B (2012). Meniscal repair using the inside-out suture technique. *Sports Med. Arthrosc. Rev.* 20(2): 68-76.
- Laupattarakasem W, Sumanont S, Kesprayura S and Kasemkijwattana C (2004). Arthroscopic outside-in meniscal repair through a needle hole. *Arthroscopy.* 20(6): 654-657.
- Martens MA, Backaert M, Heyman E and Mulier JC (1986). Partial arthroscopic meniscectomy versus total open meniscectomy. *Arch. Orthop. Trauma Surg.* 105(1): 31-35.
- Metcalf RW (1991). Arthroscopy meniscal surgery. In *Operative Arthroscopy*, ch. 15, pp. 203-235. New York: Raven Press.
- Miller MD and Hart JA (2005). All-inside meniscal repair. *Instr. Course Lect.* 54: 337-340.
- Orengo P and Zahlaoui J (1999). *Chirurgie des ménisques*. Encycl. Méd. Chir. Techniques Chirurgicales, Orthopédie-traumatologie. Paris. 44785: 4-10-06.
- Osti L, Liu SH and Raskin A (1994). Partial lateral meniscectomy in athletes. *Arthroscopy.* 10(4): 424-430.
- Panisset JC, Prudhon JL and Neyret P (1999). Méniscectomie: voies d'abord, technique stratégie Ménisque interne, Ménisque externe. Société Française d'Arthroscopie. *Elsevier.* 93-102.
- Papalia R, Torre G, Zampogna B, Vorini F, et al. (2019). Sport activity as risk factor for early knee osteoarthritis. *J. Biol. Reg. Homeost. Agents.* 33(2 Suppl. 1): 29-37.
- Pettrone FA (1982). Meniscectomy: Arthrotomy versus Arthroscopy. *Am. J. Sports Med.* 10: 355-359.
- Roos H, Lauren M, Adalberth T, Roos EM, et al. (1998). Knee osteoarthritis after meniscectomy: prevalence of radiographic changes after twenty-one years, compared with matched controls. *Arthritis Rheum.* 41(4): 687-693.
- Selby RM, Altchek DW and Di Giacomo G (2007). The Di Giacomo technique: simplified suture passing in SLAP repair. *Arthroscopy.* 23(4): 439.e1-2.
- Tapper EM and Hoover NW (1969). Late results after meniscectomy. *J. Bone Joint Surg. Am.* 51(3): 517-526.
- Vaishya R (2019). Knee Osteoarthritis: Clinical Update. *Ind. J. Orthop.* 53(4): 581.