



Surgical technique for treatment of concomitant grade II MCL lesion in patients with ACL rupture

Fabian BLANKE, Lutz VONWEHREN, Geert PAGENSTERT, Victor VALDERRABANO, Martin MAJEWSKI

From the Department of Orthopaedics, University Hospital Basel, Basel, Switzerland

Combined lesions of anterior cruciate ligament (ACL) and medial collateral ligament (MCL) are frequent in athletes. While surgical treatment of ACL injury is mandatory treatment regime of concomitant grade II MCL lesions remains unclear with tendency to surgical intervention. Standardized surgical technique is lacking. Present study wants to introduce surgical technique for treatment of concomitant grade II MCL lesion and report short term outcome results. 5 Patients with acute ACL rupture and grade II MCL-lesion were included. All patients received surgical treatment of concomitant MCL lesion by distinct surgical technique and ACL reconstruction. We evaluated valgus instability, anterior instability and range of motion (ROM) according to international knee documentation committee (IKDC) and Lysholm-Score both preoperative and after 6, 16 weeks and 9 months postoperative. All Patients showed excellent clinical results at final follow-up. Valgus and anterior stability could be restored in all patients.

1 patient (20%) lost 15° in flexion of ROM at final follow up. However in all 5 patients (100%) the findings were graded as normal or nearly normal according to IKDC knee examination form. Lysholm-Score averaged 94,6. Therefore presented surgical technique improved both, valgus and anterior stability, and led to excellent short term results at final follow up.

Keywords : MCL ; ACL ; reconstruction ; surgical technique ; grade II.

INTRODUCTION

The medial collateral ligament (MCL) and the anterior cruciate ligament (ACL) are the most commonly injured ligaments of the knee (20). Combined ACL and MCL lesions are frequent (4,6). While surgical treatment of ACL injury is well established to allow individuals to return to demanding activities treatment of concomitant MCL lesions is discussed controversial in literature (7,25, 29). Conservative treatment of concomitant grade I MCL lesions and surgical treatment of concomitant grade III MCL lesions are generally accepted (6,7). Treatment regime of concomitant grade II MCL lesions remains unclear with tendency to surgical intervention (7,19,32). However, a standard surgical technique for grade II MCL lesions does not exist. This study wants to suggest a surgical technique for grade II concomitant MCL lesions and present short term outcome results.

-
- Fabian Blanke, MD.
 - Lutz von Wehren, MD.
 - Geert Pagenstert, MD.
 - Victor Valderrabano, MD, PhD.
 - Martin Majewski, MD, MBA.

Department of Orthopaedics, University Hospital Basel, Basel, Switzerland.

Correspondence : Fabian Blanke, Department of Orthopaedics, University Hospital Basel, Spitalstrasse 21, 4031 Basel, Switzerland. E-mail : Fabian.Blanke@usb.ch

© 2015, Acta Orthopædica Belgica.

SUBJECTS AND METHODS

Subjects

5 patients who sustained acute ACL rupture and grade II MCL-tear were included. All patients gave informed consent to participate in the study. This clinical study had been approved by the institutional review board of our hospital before commencement. All patients underwent beside single bundle ACL-reconstruction surgical treatment of MCL in below described technique. The Indication for surgical treatment of MCL were determined 6 weeks posttraumatic when patients showed persisting grade II lesion of MCL according to Fetto and Marshall (6). All surgeries were performed by 1 senior surgeon and the same protocol was used for postoperative rehabilitation. All patients were followed up after 6, 16 weeks and 9 months postoperative. Patients with concomitant meniscal or chondral lesions, history of other knee injuries or of surgical treatment of lower extremity as well as patients with general diseases were excluded. The 5 patients included 2 men and 3 women with a mean age of 39.6 years (range, 28-49 years) at the time of surgery. All causes of injury were sports-related injuries.

Surgical Procedure

After the knee was examined under general anesthesia, a routine diagnostic arthroscopic procedure was done through anterolateral portal with the tourniquet inflated. Longitudinal Incision was made over pes anserinus with cranial extension to prepare semitendinosus tendon graft harvesting as well as distal and medially part of MCL. (Fig. 1) Single-bundle ACL reconstruction was performed in outside-in technique by transtibial drilling for tibial socket and anteromedial drilling for femoral socket. Femoral and tibial fixation was done by Flip-Tack technique. After ACL reconstruction subtle preparation of MCL was continued and independent of location of the MCL-lesion the medially part of the MCL was doubled and loaded with two fiber wire sutures in circumferential cross stitch technique (Fig. 2). Then MCL was detached distally and tibial head was debrided with cortical microfracturing. Subsequently MCL was tensioned and pulled distally while continuous varus stress was applied to ipsilateral knee joint. After that MCL was reattached with one or two blocking screws in foot print area and surplus ligamentous material was distally removed (Fig. 3). Finally above layers were reconstructed to allow regular healing and prevent tissue adhesion.



Fig. 1. — Preparation of tendon graft and MCL

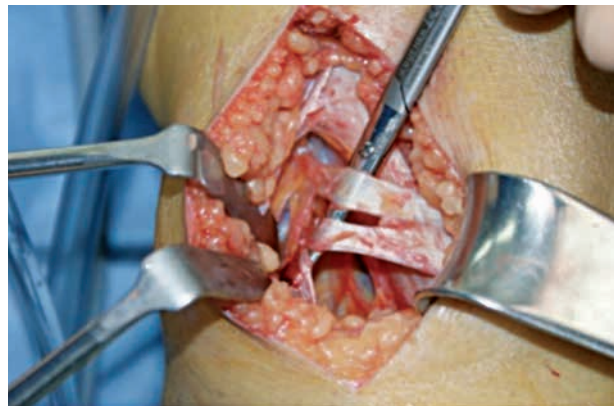


Fig. 2. — Loading of MCL in cross stitch technique

Clinical Evaluation

Preoperative and in follow-up visits all patients underwent examination with the Valgus-Stress-Test, Lachman-Test, Pivot-Shift-Test and Range-Of-Motion (ROM) assessment; additionally International Knee Documentation Committee (IKDC) scores were evaluated. Valgus-Stress testing and classification of grade of MCL lesion was done according to Fetto and Marshall (6). Concerning the overall evaluation of the knee, the International Knee Documentation Committee (IKDC) evaluation form and Lysholm-Knee-Scoring-Scale were used to evaluate postoperative knee function such as symptoms, stability and daily activities (12,30). Complications, including allograft failure and infection were documented.

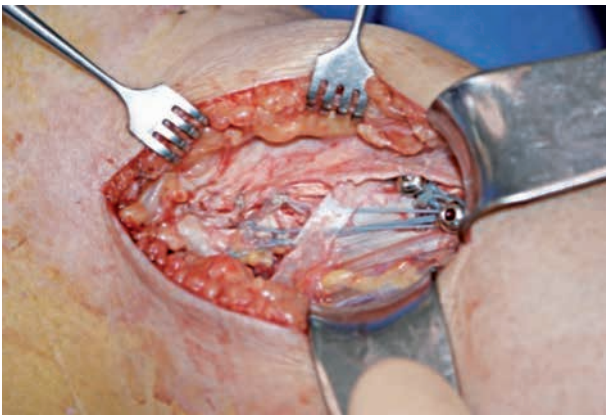


Fig. 3. — Reattachment of MCL with blocking screw

Postoperative Care and Rehabilitation

A compressive ice wrap was applied first 24 to 48 hours after surgery, to eliminate swelling. All Patients were allowed to have active-assisted or passive mobilization allowing F/E 0-10°-70° of range of motion 24 hours after surgery. During the first 4 weeks weight bearing with 20 kg was permitted and the knee was protected with a knee brace allowing above mentioned range of motion. From 4 to 6 weeks the patients were allowed to perform active ROM exercises and weight bearing was permitted within the patients' tolerance. After 6 weeks mobilization with full range of motion was allowed. After 3 months the patients started progressive activities and were weaned off brace use gradually.

RESULTS

Valgus Instability

Preoperative stress valgus testing of the injured knee showed grade II medial instability respectively no firm endpoint in 30° flexion in all cases. The medial stability had distinctly improved at recent follow-up with valgus instability grade A in all patients according to IKDC (Tables I and II). Regarding IKDC medial instability scores all patients (5 patients) had grade A postoperatively, whereas 1 patient (20%) showed grade C and 4 patients (80%) grade B preoperatively.

IKDC ROM Score and Lysholm Score

Before our surgical treatment all patients had full extension and flexion, which were graded as normal. At final follow-up all patients had no problems in activities of daily living with normal ROM (Table I). All Patients (n = 5) reached full range of motion in flexion and extension equivalent to grade A according to IKDC-Score. The overall Lysholm-Score averaged 94.6 ± 3.57 points (range, 90-100 points) postoperatively.

Anteroposterior Instability and Pivot Shift Test

The results of clinical examination regarding the Lachman- and Pivot-Shift-Tests were clearly improved when compared to preoperative status. At final follow-up 5 of 5 patients (100%) had a negative Lachman-Test or grade A IKDC result and all patients had a negative Pivot-Shift-Test and were graded as A according to IKDC-Scores.

Other complications

No infections, wound complications or other complications were found at our recent follow-up. No revision surgery needed to be done.

DISCUSSION

Presented surgical technique improved both, valgus and anterior stability and led to excellent short term results in patients with concomitant grade II MCL lesion. Insufficient treatment of concomitant MCL lesion can lead to persistent instability or failure of reconstructed ACL (1,15,26,31). Therefore invasive treatment of concomitant MCL lesions has to be considered especially in sports-active patients. In ACL-rupture and concomitant grade I MCL tear most authors are agreed that conservative treatment for MCL is recommended (7,17,19). Equally in concomitant grade III lesion there is a consensus for reconstructive treatment because of complete damage to superficial und deeper layers of MCL and good results after surgical treatment (2,3,14,22,27). Treatment regime of concomitant grade II MCL lesions remains unclear with tendency to surgical

Table I. — ROM Score at final follow-up (IKDC)

	ROM	
	extension deficit	flexion deficit
A	4	5
B	1	0
C	0	0
D	0	0

intervention (7,19,24,25,32). In case of surgical treatment most authors describe repair of concomitant MCL-lesion (10,11,14,21,27,28). Some authors reported good clinical results with reconstruction and tendon augmentation (13,31). Especially in chronic MCL lesions with or without ACL rupture reconstruction with tendon augmentation is an accepted first choice procedure (16,23). In grade III MCL lesions it was shown that reconstruction of deeper layers (POL, posteromedial corner) is of prime importance (14). However standardized surgical technique for concomitant MCL lesion in patients with ACL rupture does not exist in literature. A grade II MCL lesion means complete rupture of superficial MCL and a clinical valgus instability in 30° flexion with preserved stability in 0° flexion (6). The superficial layer of the MCL is the primary restraint to valgus forces and plays a significant role in restraining external rotation (8,9). Therefore complex instability can occur in grade II MCL lesion. In this case singular ACL-reconstruction could be lacking in restoring stable knee joint kinematics. Thus surgical treatment of concomitant grade II MCL lesion is often necessary. The authors of this study prefer indication for surgical treatment six weeks posttraumatic. There is evidence in literature that early surgical treatment in combined ACL/MCL injuries can lead to arthofibrosis and persistent impairment of range of motion (7,24,25). Therefore surgical treatment after six weeks seems rational, furthermore the opportunity for conservative healing of MCL is given (18,21,24). Because of the collagenous microstructure of MCL and posttraumatic lengthening of the ligament local suturing after six weeks seems not senseful (5,6). Reconstruction by autologous or allogeneous tendons seems not necessary in acute grade II MCL lesions. In our opinion strengthening and reattachment of the ligament is more suggestive

Table II. — Incidence of anterior and valgus instability

	valgus instability	anterior instability
preoperative	5 (100%)	5 (100%)
final follow-up	0 (0%)	0 (0%)

because of thickness and rigidity of collagenous structures. Location of MCL injury is not important with this surgical technique. All Patients who were treated with presented surgical technique showed excellent clinical results at the follow-up examinations. All patients showed valgus instability grade A according to IKDC. Most patients had normal range of motion and in all 5 patients (100%) the findings were graded as normal or nearly normal according to IKDC knee examination form.

Present study has some limitations. Sample size is small and only short term results are provided. However a concomitant grade II MCL lesion is a particular injury pattern and available data is rare. Moreover this article focus on presentation of surgical technique and short term results are of special interest in this kind of lesion because especially athletes are affected. Nonetheless further investigations with controlled trials are preferable to validate significance of this surgical technique.

CONCLUSION

Presented surgical technique improved both, valgus and anterior stability and led to excellent short term results in patients with concomitant grade II MCL lesion.

REFERENCES

1. **Abramowitch SD, Yagi M, Tsuda E, Woo SL.** The healing medial collateral ligament following a combined anterior cruciate and medial collateral ligament injury : a biomechanical study in a goat model. *J Orthop Res* 2003 ; 21 : 1124-30.
2. **Aglietti P, Buzzi R, Zaccherotti G, D'Andria S.** Operative treatment of acute complete lesions of the anterior cruciate and medial collateral ligaments : A 4- to 7-year follow-up study. *Am J Knee Surg* 1991 ; 4 : 186-194.
3. **Andersson C, Gillquist J.** Treatment of acute isolated and combined ruptures of the anterior cruciate ligament. A long-term follow-up study. *Am J Sports Med* 1992 ; 20 : 7-12.

4. **Ballmer PM, Ballmer FT, Jakob RP.** Reconstruction of the anterior cruciate ligament alone in the treatment of a combined instability with complete rupture of the medial collateral ligament. A prospective study. *Arch Orthop Trauma Surg* 1991 ; 110 : 139-141.
5. **De Maeseneer M, Van Roy F, Lenchik L et al.** Three layers of the medial capsular and supporting structures of the knee : MR imaging-anatomic correlation. *Radiographics* 2000 ; 20 : 83-9.
6. **Fetto JF, Marshall JL.** Medial collateral ligament injuries of the knee : A rationale for treatment. *Clin Orthop Relat Res* 1978 ; 132 : 206-218.
7. **Grant JA, Tannenbaum E, Miller BS, Bedi A.** Treatment of combined complete tears of the anterior cruciate and medial collateral ligaments. *Arthroscopy* 2012 ; 28 : 110-22.
8. **Griffith CJ, LaPrade RF, Johansen S et al.** Medial knee injury, part 1 : static function of the individual components of the main medial knee structures. *Am J Sports Med* 2009 ; 37 : 1762-1770.
9. **Good ES, Noyes FR, Butler DL, Suntay WJ.** Ligamentous and capsular restraints preventing straight medial and lateral laxity in intact human cadaver knees. *J Bone Joint Surg Am* 1981 ; 63 : 1257-1269.
10. **Halinen J, Lindahl J, Hirvensalo E.** Range of motion and quadriceps muscle power after early surgical treatment of acute combined anterior cruciate and grade-III medial collateral ligament injuries. A prospective randomized study. *J Bone Joint Surg Am* 2009 ; 91 : 1305-1312.
11. **Hara K, Niga S, Ikeda H, Cho S, Muneta T.** Isolated anterior cruciate ligament reconstruction in patients with chronic anterior cruciate ligament insufficiency combined with grade II valgus laxity. *Am J Sports Med* 2008 ; 36 : 333-339.
12. **Hefti F, Muller W, Jakob RP, Staubli HU.** Evaluation of knee ligament injuries with the IKDC form. *Knee Surg Sports Traumatol Arthrosc* 1993 ; 1 : 226-234.
13. **Hillard-Sembell D, Daniel DM, Stone ML, Dobson BE, Fithian DC.** Combined injuries of the anterior cruciate and medial collateral ligaments of the knee. Effect of treatment on stability and function of the joint. *J Bone Joint Surg Am* 1996. 78 ; 169-176
14. **Hughston JC.** The importance of the posterior oblique ligament in repairs of acute tears of the medial ligaments in knees with and without an associated rupture of the anterior cruciate ligament. Results of long-term follow-up. *J Bone Joint Surg Am* 1994 ; 76 : 1328-1344.
15. **Kanamori A, Sakane M, Zeminski J, Rudy TW, Woo SL.** In-situ force in the medial and lateral structures of intact and ACL-deficient knees. *J Orthop Sci* 2000 ; 5 : 567-71.
16. **Kitamura N, Ogawa M, Kondo E et al.** A novel medial collateral ligament reconstruction procedure using semitendinosus tendon autograft in patients with multiligamentous knee injuries : clinical outcomes. *Am J Sports Med* 2013 ; 41 : 1274-81.
17. **Lundberg M, Messner K.** Long-term prognosis of isolated partial medial collateral ligament ruptures. A ten-year clinical and radiographic evaluation of a prospectively observed group of patients. *Am J Sports Med* 1996 ; 24 : 160-163.
18. **Magit D, Wolff A, Sutton K, Medvecky MJ.** Arthrofibrosis of the knee. *J Am Acad Orthop Surg* 2007 ; 15 : 682-694.
19. **Miyamoto RG, Bosco JA, Sherman OH.** Treatment of medial collateral ligament injuries. *J Am Acad Orthop Surg* 2009 ; 17 : 152-161.
20. **Miyasaka KC, Daniel DM, Stone ML, Hirshman P.** The incidence of knee ligament injuries in the general population. *Am J Knee Surg* 1991 ; 4 : 3-8.
21. **Mohtadi NG, Webster-Bogaert S, Fowler PJ.** Limitation of motion following anterior cruciate ligament reconstruction. A case-control study. *Am J Sports Med* 1991 ; 19 : 620-625.
22. **Noyes FR, Barber-Westin SD.** The treatment of acute combined ruptures of the anterior cruciate and medial ligaments of the knee. *Am J Sports Med* 1995 ; 23 : 380-389.
23. **Osti L, Papalia R, Del Buono A et al.** Simultaneous surgical management of chronic grade-2 valgus instability of the knee and anterior cruciate ligament deficiency in athletes. *Knee Surg Sports Traumatol Arthrosc* 2010 ; 18 : 312-6.
24. **Petersen W, Laprell H.** Combined injuries of the medial collateral ligament and the anterior cruciate ligament : early ACL reconstruction versus late ACL reconstruction. *Arch Orthop Trauma Surg* 1999 ; 119 : 258-62.
25. **Phisitkul P, James SL, Wolf BR, Amendola A.** MCL Injuries Of The Knee : Current Concepts Review ; *Iowa Orthop J* 2006 ; 26 : 77-90.
26. **Sakane M, Livesay GA, Fox RJ et al.** Relative contribution of the ACL, MCL, and bony contact to the anterior stability of the knee. *Knee Surg Sports Traumatol Arthrosc* 1999 ; 7 : 93-7.
27. **Shirakura K, Terauchi M, Katayama M et al.** The management of medial ligament tears in patients with combined anterior cruciate and medial ligament lesions. *Int Orthop* 2000 ; 24 : 108-111.
28. **Sims WF, Jacobson KE.** The posteromedial corner of the knee : Medial-sided injury patterns revisited. *Am J Sports Med* 2004 ; 32 : 337-345.
29. **Strehl A, Egli S.** The value of conservative treatment in ruptures of the anterior cruciate ligament (ACL). *J Trauma* 2007 ; 62 : 1159-1162.
30. **Tegner Y, Lysholm J.** Rating systems in the evaluation of knee ligament injuries. *Clin Orthop Relat Res* 1985 ; 198 : 43-9.
31. **Yoshiya S, Kuroda R, Mizuno K, Yamamoto T, Kurosaka M.** Medial collateral ligament reconstruction using autogenous hamstring tendons : technique and results in initial cases. *Am J Sports Med* 2005 ; 33 : 1380-5.
32. **Zaffagnini S, Bignozzi S, Martelli S, Lopomo N, Marcacci M.** Does ACL reconstruction restore knee stability in combined lesions ? An in vivo study. *Clin Orthop* 2007 ; 454 : 95-9.