



CIRCULAR PIE-CRUSTING RELEASE OF THE MCL OF KNEE FOR SURGICAL TREATMENT OF ARTHROSCOPIC MEDIAL MENISCUS REPAIR

Orthopaedics

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ABSTRACT

Introduction : An arthroscopic view of the knee is usually a narrow space for performing procedures related to medial meniscus . So to perform the procedures we need to open up the space , as MCL is the main structure resisting for opening of knee joint we release the superficial fibres of MCL for proper visualization of knee joint in 30 degree of extension . It is then evaluated through intra op and radiological evaluation with widening of medial joint space. **Methods ;** Ten patients with injury of the medial meniscus tear were reviewed. All patients were prepared for arthroscopic pie crust release of superficial fibres of the MCL . Seven patients were treated with meniscectomy and rest three were treated for meniscal repair . So for evaluating the opening of medial space , the width of the before and after released were measured . During follow up the medial stability was measured by radiographic evaluation of joint width space . Knee functions were evaluated IKDC (International knee documentation committee) , lysholm score and Tegner score . **Results :** In all patients, meniscus operations were performed without any cartilage injury. After superficial MCL release, the arthroscopic width of the medial space was satisfactorily larger as compared to before and after procedures performed . **Conclusion :** Circular release of the superficial MCL increases the medial space and improves visibility of the knee under arthroscopy, as it does not cause residual instability of the knee and does not affect the clinical results at follow-up.

KEYWORDS

Pie crusting , medial meniscus tear, arthroscopic repair

INTRODUCTION :

A medial meniscus injury is a regular cause of knee joint pain. So it has to be treated in time, to prevent degenerative changes that occur in the cartilage of the internal part of the knee joint [1]. With the fast improvement of minimally invasive arthroscopic techniques, these lesions of the medial meniscus can be treated by micro repair or suturing in different types of lesions, eventually preventing the development or progression of osteoarthritis . [2]. However, in arthroscopic surgery, the medial space of the knee joint is narrow and the view of the posterior meniscus is often unclear, resulting in imprecise manipulation of instruments, iatrogenic cartilage damage, severe meniscal tear, and severe failure of meniscus suture.[3] The medial limiting structures of the knee joint include the MCL, as well as the posterior oblique ligament (POL) and the joint capsule, also known as the posteromedial complex (PMC) [2-6]. During arthroscopic surgery of the posterior medial meniscus and the knee joint in the extended position, the medial and posterior structures of the knee have little effect on knee extension. In this study, we performed a pie crust release on the medial parts of the knee joint .

Method :

The inclusion criteria are (1) age $\square < 40$ years, (2) pain on the medial side , (3) injury of the posterior part of the medial meniscus .

The exclusion criteria were (1) degenerative injury of the meniscus, (2) Multi ligament injuries . The patients were treated with pie-crusting release of the superficial release of MCL fibres under arthroscopy to improve the field of view of the posteromedial space of the knee. Meniscectomy were performed in 7 patients, and suturing was performed in 3 patients.

Surgical Technique :

Under spinal anesthesia, anterolateral (AL) and anteromedial (AM) portals were made to visualise meniscus, cartilage and ligaments. For patients with medial meniscus injury, the visualization of the medial compartment was done through the AL port with the knee joint in valgus and external rotation force was applied to the leg [7]. When the medial compartment was narrow, the posterior part of the medial meniscus was not clearly visible, and it was difficult to smoothly insert the probe into the posterior space. Then outside-in controlled multi-point pie-crusting release of the superficial fibres of MCL was performed. The procedure was as follows: (1) The probe was inserted into the medial joint space through AM portal and the width of the posteromedial gap was evaluated (Fig. 1a). (2) At the level of the

medial joint line, percutaneous pie-crusting piercing of the superficial fibres of the MCL was done with an 18-G needle was done (Fig. 1b). (3) Now valgus force was given and was stopped when the posteromedial space was opened. Now at this time the medial meniscus could be clearly seen and the probe tip could easily pass through the narrow space in the vertical fashion (Fig. 1c).

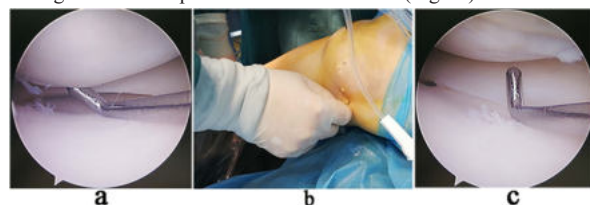


Fig. 1
a Knee joint in valgus stress , before release . **B** Pie-crusting release of the superficial fibres of MCL with an 18-G needle. **c** After release, the probe passed vertically through and the visual field was improved

Post Operative Management :

After wear off from anaesthesia, isometric exercises of the quadriceps and straight leg raising training were advised . Patients who underwent meniscectomy , were advised to wear long knee brace and were advised for full-weight bearing and ROM exercise after 7 days of operation. Patients who underwent meniscal repair were advised to walk without weight-bearing on the operated leg and was made to wear an ROM brace and walker . After one month of operation, patients were allowed partial weight-bearing activities, full weight-bearing activities were advised after 6 weeks post op and full return to sports was allowed after 6 months .

Joint space width (JSW) measured intra op during arthroscopy

The intraoperative width of the medial space before and after release of the MCL was measured as follows. The probe was inserted through the anteromedial portal , and its vertical tip was placed against the shallow point of the femur condyle in the confined space. Before release, the vertical tip (4 mm) formed an acute angle with the articular surface , The width of the narrowest space (h1) can be calculated by the sine formula ($h1 = 4 \text{ mm} \times \sin A$), where A is the angle between the tip and the articular surface (Fig. 2a). After release, the medial space was enlarged, and the tip could pass easily through the narrow space, and the new width (h2) where H1 is the old height of the tip of the hook under arthroscopy and H2 is the new height between the tip of

the hook and the lowest point of the femoral condyle under microscopy (Fig. 2b). H1-H2 is the new combined width.

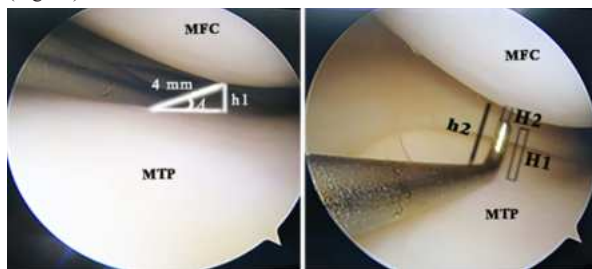


Fig. 2
a Before pie-crusting release.
b After Pie-crusting release

Radiographic measurements of the JSW

Patient on x ray table with the knee 20 degree flexed, an AP view of the knee joint is taken. JSW was calculated using a picture archiving and communication system (PACS) [9]. On an AP X-ray film, a line was drawn to connect the subchondral bone of the medial and lateral tibial condyle. From this line to the most last point of the medial femoral condyle, a perpendicular line was drawn. Then with the help of PACS software the distance of this new height was recorded on JSW.



(Fig. 3).

The distance of JSW (perpendicular line) was measured using PACS software. **a** The JSW was 5.41 ± 0.41 mm preoperatively. **b** 11.02 ± 0.41 mm in the 1st week postoperatively. **c** 5.31 ± 0.41 mm by the 3rd month postoperatively

Analysis of MRI

Based on MRI study, if there is no signal intensity then the meniscus is completely healed, if an intra meniscal signal is present on one articular surface then it is considered as incomplete healing and if there is signal hyperintensity from one end of the articular cartilage to other then it is considered as not healed [8].

Evaluation clinically

The improvement of the visual field on arthroscopic pie crusting release of the superficial fibres of the MCL by comparing the before and after medial joint width space were measured. By evaluating the pre op radiographs 1 week, 4 week and 3 months post operatively the medial opening and stability of the knee joint was followed up. The repaired meniscus tear and MCL healing was followed up with MRI of the affected knee. To evaluate knee joint functions Lysholm score [9], Tegner score [10], and IKDC score [11]

Results as follows

Following pie-crusting release of the superficial fibres of MCL of the knee joint, the intraoperative posteromedial gap was increased. As calculated from the arthroscopic photographs and formula, the medial width was 2.7 ± 0.5 mm ($1.8-4$ mm) before release and 5.6 ± 0.5 mm ($5-8$ mm) after release, and the difference was significant according to statistically ($p < 0.01$) (Fig. 4a).

The surgery was uneventful and the location and structure of the medial meniscus was clearly visible

At the last follow-up, of the 10 patients with meniscus repair, the difference in the joint space width was very significant ($p < 0.01$); however, there was no significant variance between the preoperative width and that at 3 months postoperatively ($p > 0.05$) (Fig. 3, Fig. 4b) MRI analysis gives meniscus healing.

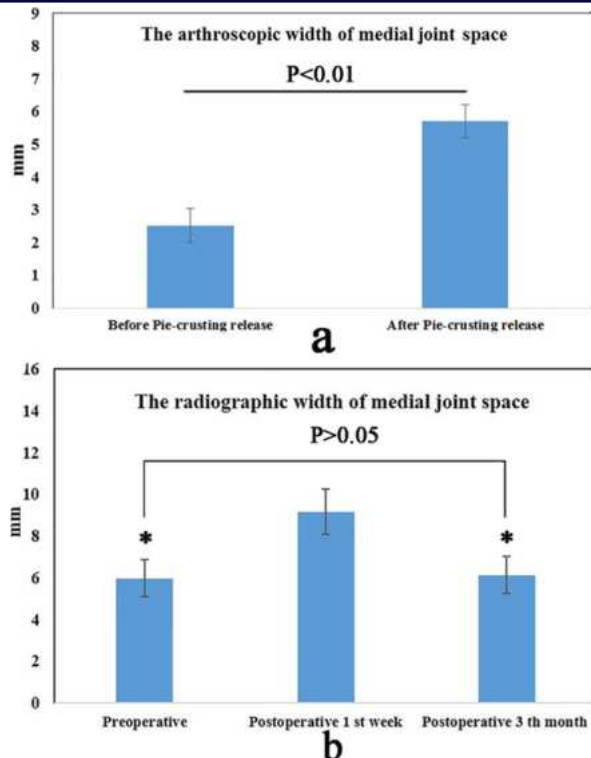


Fig. 4
a) arthroscopic before and after release
b) Follow up with radiographic findings

For all patients Lysholm, IKDC and Tegner scores were 84.05 ± 3.51 (70–85), 85.18 ± 4.66 (70–91) and 5.48 ± 0.79 (4–7), respectively, showing notable difference compared with the preoperative scores [46.15 ± 4.12 (40–55), 54.32 ± 4.01 (43–58) and 3.25 ± 0.67 (2–4), respectively, $p < 0.01$] (Table 1).

Table 1 Clinical results

	Pre op	Last follow-up	P value
Lysholm score	46.15 ± 4.12	84.05 ± 3.51	0.00
IKDC score	54.32 ± 4.01	85.18 ± 4.66	0.00
Tegner score	3.25 ± 0.67	5.48 ± 0.79	0.00

Typical cases were shown in Fig. 5 and Fig. 6.

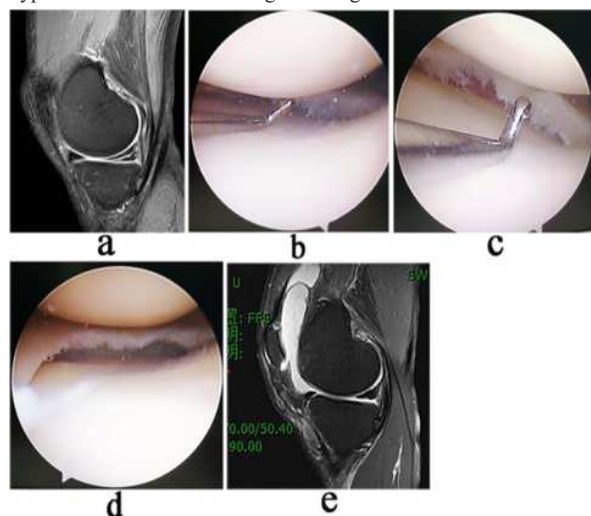


Fig. 5

a Preoperative MRI. **b** Arthroscopic visual field was not enough to perform the surgery. **c** The visual field was improved after release, the probe tip could pass through the restricted gap, **d** Meniscectomy was performed. **e** After 11 months follow-up, the medial meniscus was repaired completely

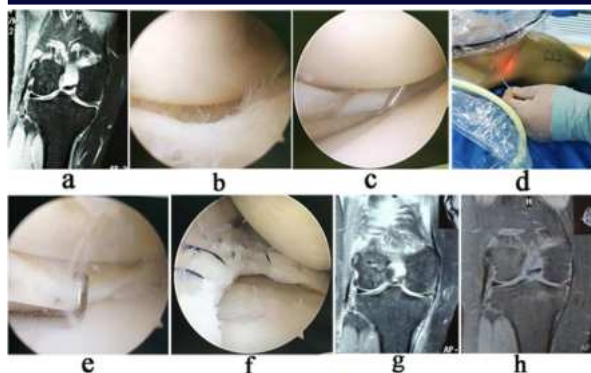


Fig.6

a Preop MRI appearance shows tear of the medial meniscus. **b** Tear noted during arthroscopy. **c** The injured meniscus was brought down, but the probe tip could not pass in medial gap. **d** Multi-point release of the MCL. **e** The probe tip passed vertically through the narrow gap. **f** The meniscus was repaired. **g** & **h** Postoperative and follow up MRI showed a healing of the meniscus and MCL

DISCUSSION;

Arthroscopic procedure is often required for injury of the medial meniscus which is also associated with clinical symptoms. Because of the difficulty in viewing of the posterior part of the medial meniscus as there is lack of space, so it creates a difficulty while operating as arthroscopic instruments are difficult to pass [2–6]. So to enlarge the medial space of the knee arthroscopic surgeons have to find ways to facilitate easy and comfortable operative techniques, so for that medial pie crust release of the superficial fibres of the MCL is done [12,13,14]. Bellemans et al formulated the use of 18 G needle for the release of superficial layers of MCL in the joint line in circular fashion [14]. In this study under the valgus force at the knee joint in 20 degree flexion the superficial fibres of the MCL were released in circular fashion which helped us opening up of the medial joint space and better visual field was available for easy access of the meniscus which helped in better repair of the meniscus. Some of the important factors which did not affect the stability of the knee joint were 1) Only superficial fibres of MCL were released, where as deep fibres were intact. 2) Post op patients were made to wear long knee brace up to 4 weeks and good supplements of vit c was given for facilitating the healing of the cartilage. 3) The intra op release and opening of joint space was well within the limits of grade I injury.

CONCLUSION :

Arthroscopic pie-crusting release of the MCL can significantly increase the medial space and improve the visual field of the knee joint under arthroscopy, and this technique does not produce any residual valgus instability of the knee nor affect clinical outcome at follow-up.

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