Patellar Microfracture: Internal Stabilization
House-on-Stilts Technique to Achieve Better Results
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Abstract: Microfractures are the common first choice for the treatment of osteochondral lesions, because of their high efficacy and low cost and operating time compared with other surgical techniques. Results of microfractures for retro-patellar chondral defects are subpar compared with other compartments of the knee, despite the patellofemoral compartment being the second most common compartment for such lesions. One major reason for the inferiority is the mobility of the patella, which is most prominent when the patient’s knee is extended, as is the case in this type of surgery. Traditionally, this obstacle was dealt with by applying manual pressure, which is unreliable and prone to technical difficulties, such as skiving of the awl and a narrowed operating view, as well as complications such as fractures. This Technical Note introduces a new technique, which we have named “house-on-stilts,” that uses multiple Kirschner wire fixations through the patella and femur to immobilize the patella and is essentially an internal stabilization. This technique aids not only the microfracturing process but also the preceding debridement stage, at no increased cost or operating time.

Osteochondral lesions are common articular cartilage injuries that indicate surgical treatment. A wide range of surgical techniques exist to treat these lesions, most commonly microfractures (MFx), autologous chondrocyte implantation (ACI), autologous matrix-induced chondrogenesis (AMIC), and characterized chondrocyte implantation (CCI). Many controlled studies have demonstrated the relative superiority of one technique over another, depending on factors such as the size of the cartilage defect, albeit with minor differences in clinically meaningful parameters. From these observations, MFx has been favored over the others for reasons such as requiring a shorter operating time, the ability to be performed arthroscopically, significantly lower cost, and the quicker recovery time.

Specifically within the knee, the patellofemoral compartment has been found to be the second most frequent location for the chondral lesions, after the medial femoral condyle. An important factor identified that may influence the superiority of ACI over MFx is the localization of the defect: MFx were found to have less favorable results with patellofemoral lesions. Another study attributed this finding to the complexity of the surgical technique, where the mobility of the patella and the relative position of the joint surface can lead to skiving of the awl,
sometimes requiring a conversion into an open arthrotomy to complete the MFx.11

Traditionally, microfractures for retropatellar chondral lesions are performed with the patient in a supine position. The knee is fully extended in this position, and

![Image](image1.png)

**Fig 2.** Illustration of right knee, viewed from the lateral side. Demonstration of the correct position of first K-wire at the edge of the chondral defect on the retropatellar surface. When the second K-wire is placed across the defect, this configuration will provide the greatest stability due to the greater distance between the K-wires. K-wire, Kirschner wire.

![Image](image2.png)

**Fig 3.** The patient is in a supine position, and the camera is viewing from the anteromedial portal. A curette, or any blunt instrument, can be used to apply counterpressure against the retropatellar, to facilitate the drilling of the first K-wire. K-wire, Kirschner wire.

| Pearls                                      | Pitfalls                                                                 |
|---------------------------------------------|--------------------------------------------------------------------------|
| Use an aiming device in the initial learning phase | Drilling Kirschner wire (K-wire) into femoral articular cartilage, especially with first K-wire |
| Use a minimum of 1.2-mm² K-wire for rigidity  | Placement of K-wires too close to each other, leading to poor fixation |
| Use 30° scope to avoid disorientation       | Double-penetrating the femur with the K-wire, leading to damage to the femoral artery |

Table 1. Pearls and Pitfalls

![Image](image3.png)

**Fig 4.** Illustration of right knee, viewed from the lateral side. Demonstration of the correct site of penetration of the K-wire away from the articular surface of the femur (to prevent unnecessary damage to the articular cartilage). K-wire, Kirschner wire.

the relaxation of the quadriceps femoris allows for significant horizontal translation of the patella. This hypermobility of the patella is classically overcome with manual stabilization and counterpressure by an assistant, to permit the awl to penetrate the subchondral plate, which is tedious and unreliable. Too much pressure closes down the operating field, whereas too little pressure prohibits penetration of the awl. This is further compounded by the need of awls of significant angles of 70° or 90°, which makes penetration even more difficult owing to the difference of the hammering forces. A previous cadaveric study has shown that even experienced arthroscopists struggle with the microfracture technique,12 indicating the necessity of a more reliable
method. Specific technical advice for patellar microfracture is lacking in the current literature. This Technical Note aims to introduce a new technique for performing microfractures specifically for retropatellar chondral lesions, to enhance immobilization and optimize preparation of the chondral defect and penetration of the subchondral plate, which are different key stages of microfracture. No additional material or costs is incurred.

Indications

1. Acute retropatellar localized chondral and subchondral injuries;
2. Localized lesion <2.5 cm²;
3. Central retropatellar lesions.

Technique

In the supine position, the standard anterolateral and anteromedial anterior portals are initiated with 2 separate limited capsulotomies (Video 1). No special pieces of equipment are required to perform this technique, the steps of which follow:

1. Localize the site of the chondral defect.
2. Use any arthroscopic aiming device and pass the first Kirschner wire (K-wire) to the edge of the chondral defect (so that the exit trajectory of the K-wire will not enter an important area of the femoral cartilage) (Figs 1 and 2; Table 1).
3. (a) Use a blunt instrument, from inside the joint, to apply counter pressure against the entering K-wire.

For larger defects, 4 K-wires may be used to maximize the rigidity of the fixation. K-wire, Kirschner wire.
(to maximize the joint space before the K-wire fixes into the femoral bone) (Fig 3). (b) Avoid drilling the K-wire through articular surface of the femur, which would create unnecessary iatrogenic damage (Fig 4).

4. (a) Adjust the fixation of this K-wire into the femur until the position and orientation of the patella are at an ideal height from the femur (further adjustments of the patella position and orientation cannot be made after subsequent K-wires have been inserted) (Fig 5). (b) If the first K-wire is placed improperly (i.e., not exiting through the chondral defect), it should not be removed but can be used to guide the second K-wire with angular adjustments to exit as desired (Fig 6). Subsequent K-wire entry can be done via individual skin portals or collectively through a 1.5- to 2-cm stab skin incision on the surface of the patella.

5. The second K-wire should be aimed so that it exits the patella a maximum distance from the first, across the long axis of the defect (Fig 7).

6. (a) For smaller defects, plan for three (1.2- to 1.6-mm) K-wire fixations in a triangular configuration, with the 3 wires maximally spaced. (b) For large defects, plan for four (1.2- to 1.6-mm) K-wire fixations in a rectangular configuration, with the 4 wires maximally spaced (Fig 8) (mimicking a river house built on stilts of the type commonly seen in Asia [Fig 9]).

7. (a) Once the patella is stabilized, proceed with debridement. Consider the use of additional portals if necessary. (b) Use a curette ring to fully debride the area of the lesion down to the subchondral bone. The debridement should extend laterally until the lesion is fully surrounded by stable rim of healthy cartilage.

8. (a) After proper preparation of the lesion, proceed to microfracturing. (b) Use angled awls to produce holes through the subchondral bone, ideally placed 3 to 4 mm apart as per standard protocol (Fig 10). (c) The holes created by the K-wires themselves will count as therapeutic microfracture holes, as if intentionally done using the retrograde principle. Furthermore, peripheral areas of the cartilage defect, which can be difficult to reached with the awl, can be accurately reached with more K-wire retrodrilling.

9. (a) Check for a successful result from the microfracturing. (b) Stop inflow and ensure the flow of marrow elements from the holes, as evidenced by the presence of fat emulsifications (Fig 11). (c) All K-wires are removed once adequate bleeding is visualized.
Rehabilitation

The standard rehabilitation protocol for retropatellar microfracture surgeries should be followed: limited range of motion of 0° to 30° for 4 to 8 weeks with a limiting knee brace, full weightbearing, and a continuous passive motion machine as early as tolerable.

Discussion

The house-on-stilts technique allows for an easy and convenient method to stabilize the patella to facilitate the microfracture procedure, which can be performed by a single operator setup, as is usually the case (Tables 2). The traditional technique, which uses manual pressure by an assistant (of variable experience) to fixate the patella, is unreliable, allowing skiving of the awl, as the microfracture requires a considerable amount of force to be applied. This mobility of the patella permits much less penetrating force than that achievable for femoral or tibial lesions.

Using the K-wire, along with an intra-articular blunt instrument to counter the force during drilling, allows the patella to be immobilized at a maximal distance, above the femoral condyle. This increase in joint space can minimize the need for using a 70° arthroscope. Another advantage is that the increased joint space allows more room for maneuvering of the awl. This can help ensure that the tip penetrates the subchondral plate perpendicularly, allowing it to pierce through the full-thickness of the subchondral bone, for the microfracture hole to function (Fig 12).

Fig 11. The patient is in a supine position, and the camera is viewing from the anteromedial portal. A successful result from the microfracture is confirmed by observing for fat emulsifications (asterisks) from the new holes.

Fig 12. An increased joint space allows the awl to be positioned properly for the microfractures, at 90° to the surface of the subchondral bone (right), minimizing the risk of producing holes that are too shallow (left).
As the debridement process relies on manual tactile feedback, improved patellar fixation not only facilitates the microfracture process, but also aids in preparing the bony bed. Furthermore, the holes from the drilling can count as access to marrow stimulation elements, after the K-wires are removed. Difficult-to-reach peripheral areas of the patella are no longer an issue, and clinical results for patellar microfracture will perhaps improve compared with femoral microfracture results. Recent literature suggests that K-wire drilling is as effective as awl puncture, contrary to earlier literature. Our own experience has shown no additional costs and a reduction in operating time, which could be essential when additional procedures are needed for concurrent pathology. The technique mimics river houses built on stilts, as are commonly seen in Asia, which look flimsy but have stood the test of time.

In conclusion, this improved technique can reduce the need of conversions into an open arthrotomy and thus avoid significant morbidity. Without additional caveats such as increased operating time or cost, this technique is recommended for all microfractures performed on retropatellar chondral defects.

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