

# Fish Mouth Closure of Horizontal Cleavage Tear of the Meniscus using Self-locking Modified Racking Hitch Knot (HitPat knot). – A Technical Note

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## Learning Point of the Article:

Time-saving and cost-effective solution for closure of horizontal cleavage tears of the meniscus.

## Abstract

**Introduction:** Horizontal cleavage tears (HCT) of the meniscus are treated with fish-mouth closure with sutures using different methods. Using a no. 0 fiber wire and taking bites through both the flaps using a suture passing device and tying multiple knots is a cost-effective technique. A racking hitch knot is an option for all inside repairs of HCT. It needs multiple half hitches for locking the knot.

**Surgical Technique:** We used a modification of the racking hitch knot (HP knot), making it a self-locking knot, so it does not need half hitches. Loop of no. 0 fiber wire is passed across both the flaps of the meniscus and a modified racking hitch knot tied in one goes closing the fish mouth.

**Conclusion:** This modification (HP knot) saves operative time, it is cost-effective and has the distinct advantage of a reduction in the size of the final knot construct.

**Keywords:** Horizontal cleavage tears, fish mouth closure, racking hitch knot.

## Introduction

Horizontal cleavage meniscus tears are a common orthopedic injury [1]. Horizontal cleavage tears (HCT) of the meniscus are treated with debridement of the flaps, rasping the edges, and closure of the flaps with sutures to achieve stable repair. Various methods are used to accomplish the repair, including an all-inside device [2, 3] or using a suture passing device [4, 5] and taking a bite through both flaps of the meniscus, using a sliding knot and half hitches. We used a modification of the racking hitch knot for repair of horizontal cleavage tear of the meniscus.

The patient is supine under spinal anesthesia with lateral thigh support applied at the level of the tourniquet. Standard arthroscopy portals are created for meniscus repair. Pie crusting of the medial collateral ligament is done to prevent the scuffing of the cartilage. The portals are switched to get a proper trajectory for the passage of the suture passing device.

After debridement of the horizontal cleavage tear (Fig. 1a), a single bite is taken through both the flaps with a no. 0 fiber wire using the antegrade suture passing device (Fig. 1b). The fiber wire loop is then delivered through the working portal (Fig. 1c). Then, the surgeon places the thumb and index finger down to up through the loop, and the same strands of thread are held to make a double loop (Fig. 2a, b, and c). The loop should look similar to

## Surgical Technique

## Author's Photo Gallery



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Website:  
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DOI:  
<https://doi.org/10.13107/jocr.2024.v14.i04.4408>

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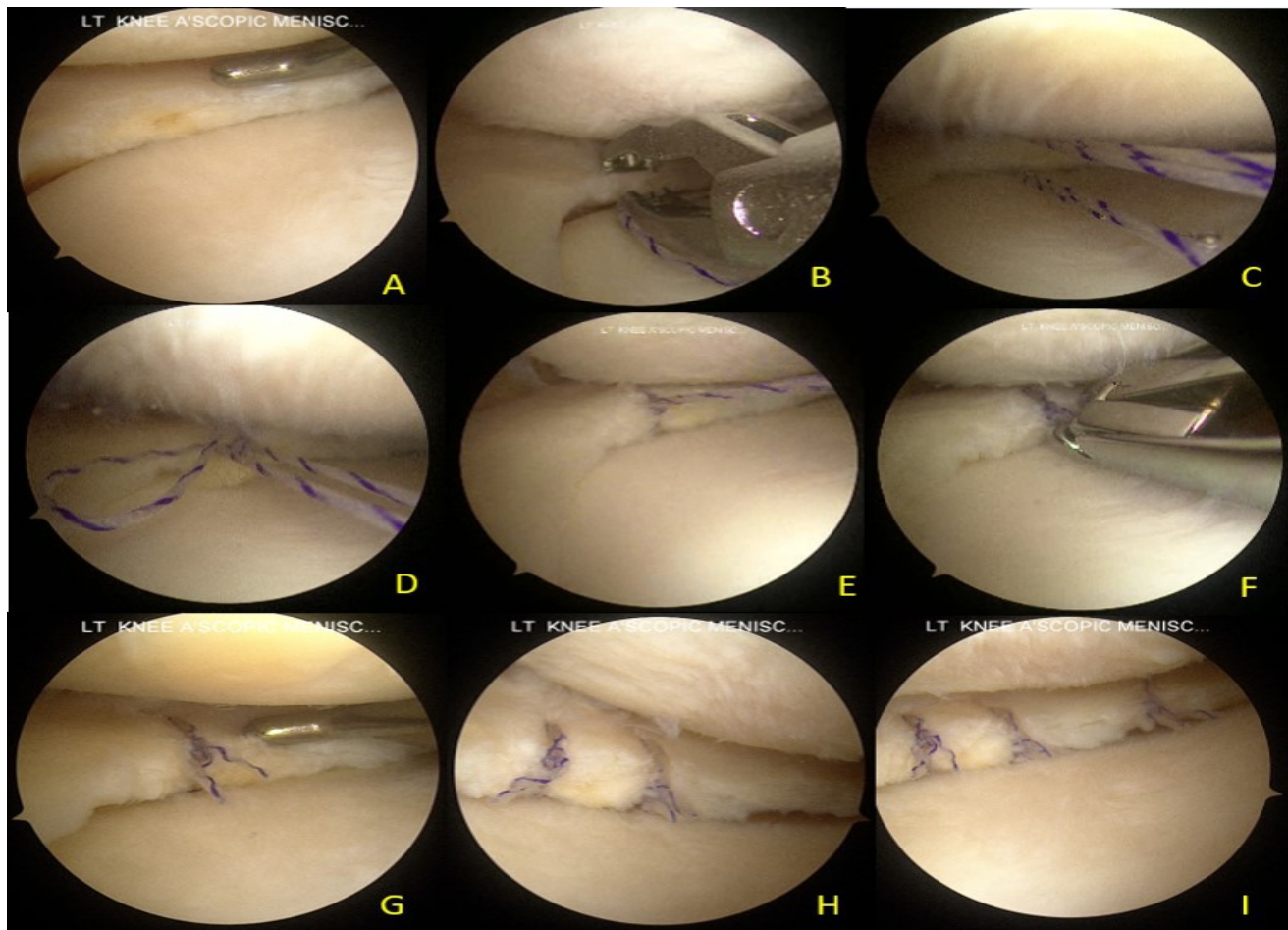
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Submitted: 27/01/2024; Review: 13/02/2024; Accepted: March 2024; Published: April 2024

DOI: <https://doi.org/10.13107/jocr.2024.v14.i04.4408>

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**Figure 1:** Intraoperative view. (a) Meniscus tear rasped. (b) Bites are taken through both the flaps with a no. 0 fiber wire using the antegrade suture passing device. (c) The fiber wire loop is then delivered through the working portal. (d) By pulling the two ends of the threads knot is brought into the joint. (e) By “To and Fro” motion knot gets locked and it closes meniscus flap. (f) Remaining sutures are cut. (g) Stability is confirmed. (h) Second bite. (I) Third bite.

what is shown in Fig. 2d.

Both suture tails are passed through the double loop in opposite directions to each other (Fig. 2e, f, and g). The two ends of the suture are pulled, drawing a knot into the joint (Fig. 1d and Fig. 2h). This maneuver closes the meniscus flaps on each other (Fig. 1e and Fig. 2i).

The knot is self-locking and gets tightly secured by making the suture tails rock in a “To and Fro” fashion. With the help of a suture cutter, the remaining threads are cut (Fig. 1f and Fig. 2j). This procedure is repeated multiple times as per the extent of tear (Fig. 1h and i).

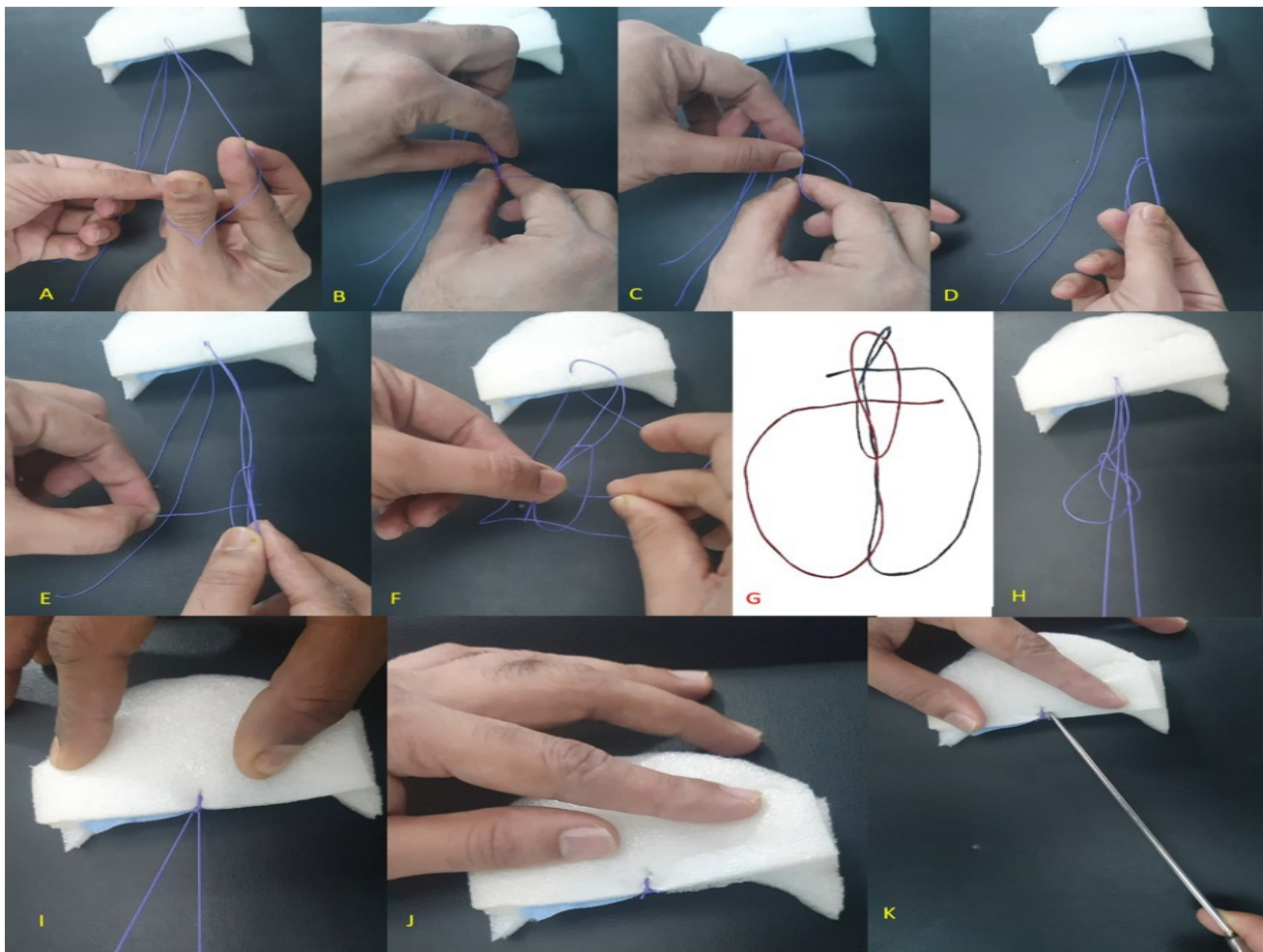
### Discussion

Clinical reports on horizontal cleavage tear repair had shown

good results [6, 7]. Kurzweil et al. in their systematic review reported a 78% healing rate [7]. Options available for fish mouth closure of horizontal cleavage tear of medial meniscus are either take one superior and one inferior capsular bite by inside out or all inside device such as fast fix or pass fiber wire through both the flap of the meniscus using suture passing device and tie the knot manually. Though it is time-saving, there is always a cost concern for using all inside devices. The inside-out technique needs the use of a safety incision, which adds to the operative time [8]. Passing fiber wire through the meniscus flap and manually tying the knot is cost-effective, but it needs multiple knots to secure it. Hence, it adds time to operative procedures, especially in tight joints. Furthermore, the final knot could be bulkier.

Sanada et al. [9] used a raking hitch knot [10, 11] for all-inside





**Figure 2:** Demonstration on meniscus model. (a) Place the thumb and index finger down to up through the loop. (b) Same strands of threads held. (c) It creates a double loop. (d) Lateral view of the double loop. Lateral view of the double loop. (e) One of one suture tail is passed through the loop in right to left direction. One of one suture tail is passed through the loop in right to left direction. (f) Remaining suture tail is passed through the loop in opposite direction. (g) Should look like this. (h) The two ends of the suture are pulled, drawing a knot into the joint. The two ends of the suture are pulled, drawing a knot into the joint. (i) By “To and Fro” motion knot gets locked and it closes meniscus flap. (j) Remaining sutures are cut. (k) Stability is confirmed with the probe.

repair for a radial tear at the posterior horn of the lateral meniscus. They recommended multiple half hitches to secure the knot, which adds to the time of the procedure.

We tried modifying the racking hitch knot to take advantage of all the methods, i.e., cost-effectiveness and saving operative time. Our modified racking hitch knot (HP knot) is self-locking. The knot is complete in one step, it does not need a cannula as only a single bite is taken, saving operative time, especially in tight joints. We have confirmed the stability of the knot on the model as well as intraoperatively by pulling the knot with the probe. Furthermore, the knot is relatively less bulky, so concern about rubbing it against the femoral condyle is minimized. It is cost-effective as well.

### Conclusion

Our modification of the racking hitch knot (HP knot) for fish mouth closure of horizontal cleavage tear of the meniscus is cost-effective and time-saving. The final knot is less bulky.

### Clinical Message

Modified racking hitch knot is a time-saving and cost-effective solution for closure of horizontal cleavage tear of the meniscus.

**Declaration of patient consent:** The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given the consent for his/ her images and other clinical information to be reported in the journal. The patient understands that his/ her names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

**Conflict of interest:** Nil **Source of support:** None

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**Conflict of Interest:** Nil  
**Source of Support:** Nil

**Consent:** The authors confirm that informed consent was obtained from the patient for publication of this case report

### How to Cite this Article

Patil HG, Pimprikar MV, Patil CK. Fish Mouth Closure of Horizontal Cleavage Tear of the Meniscus using Self-locking Modified Racking Hitch Knot (HitPat knot). A Technical Note. *Journal of Orthopaedic Case Reports* 2024 April;14(4): 194-197.

