

Arthroscopic Techniques

Tips and tricks of meniscal repair

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ABSTRACT

With the well-established fact that meniscectomy predisposes patients to early osteoarthritis, there has been an increase in the incidence of meniscal repairs in recent years, even in active older patients, and in avascular zones. Although many techniques have been described for meniscal repair, even experienced surgeons face difficulties in certain scenarios. In this technical note, we present some techniques to facilitate the arthroscopic treatment of meniscal repair in general and introduce some novel techniques in some special scenarios.

Keywords: Meniscal repair, Arthroscopy techniques, Complex meniscal tears

INTRODUCTION

Meniscal surgeries are one of the commonly performed surgeries in the knee. With a better understanding of the role of the meniscus in knee kinematics, there is a shift in the approach of dealing with meniscal tears with the repair rather than excision irrespective of the age of the patient.^[1] Although many techniques were described, few scenarios are hard to deal with. In this technical note, we present some techniques to facilitate the arthroscopic treatment of meniscal repair in general and introduce some novel techniques in some special scenarios.

CAN WE PREDICT MENISCAL REPAIRABILITY, PREOPERATIVELY?

The ability to identify patients suited for meniscal repair preoperatively would be ideal but the decision to perform either a meniscectomy or a meniscal repair is usually made intraoperatively during diagnostic arthroscopy. Prediction of meniscus repairability is useful for surgeons to optimize surgical scheduling so that both the surgeon and the patient know what shall be the probable results after surgery and the duration of rehabilitation. In this scenario, ORTHO-ONE Prediction of Repairability of Meniscal Tears Scoring System has been proved to be a useful tool to predict meniscal repairability.^[2] Various clinical and radiological components are taken into consideration to assess the repairability [Table 1].

A score of ≤ 6 predicts meniscal repair and a score of ≥ 7 predicts meniscectomy.

It predicts medial meniscus repair with a sensitivity of 90.9% and a specificity of 93.2% and medial meniscectomy with a sensitivity of 93.2% and a specificity of 90.9% and lateral meniscus repair with a sensitivity of 69.2% and lateral meniscectomy with a sensitivity of 78.8% of cases.

It shall be a useful tool to the armamentarium of an arthroscopy surgeon.

AVOIDING A MEDIAL INCISION FOR MEDIAL MENISCUS REPAIR IN INSIDE-OUT REPAIR

Meniscal repairs along with anterior cruciate ligament reconstruction (ACLR) are quite common and it gives a better outcome, but often requiring multiple incisions for both procedures.

We propose a novel technique that does not require a posteromedial incision for meniscal repair^[3] [Video 1].

Surgical technique

After routine diagnostic assessment using standard arthroscopic ports, identify the medial meniscus tear and proceed for repair with inside-out technique using zone specific cannulas. Before securing the sutures over the

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capsule, proceed for the ACLR and fix the graft proximally and distally.

Now retrieve the FiberWire sutures through the anteromedial tibial tunnel wound in the plane between the capsule and the fatty layer using right angled forceps and blunt dissection. Secure the meniscus over the capsule using sliding knots. Close the wound in layers.

Since the plane of dissection for tying the sutures is beneath the fatty layer, there is less chance of injuring the saphenous vein and nerve [Figure 1]. Another point to note is that this modification can only be done with concomitant ACLR.

ZONES SPECIFIC CANNULAS OR ZONES “SWITCH” CANNULAS?

While performing inside-out repair, it is common to use zones specific cannulas. Usually, they come as 6 thin, fluid venting, barrels right and left sided (with respect to medial meniscus) with varying curvature; anterior being more curved, middle moderately curved, and posterior less curved [Figure 2]. But, are they really zone specific as described? For instance [Video 2], we can switch posterior cannulas with anterior cannulas to repair the posterior end tear leading to a much anterior exit of the needle due to excessive curvature resulting in a safer course away from the posterior neurovascular structures and a minimal posterior release incision.

DO WE HAVE TO OPT FOR MENISCECTOMY IN COMPLEX TEARS INVOLVING AVASCULAR ZONES?

Although meniscal repair is a well-established treatment for tears located in the periphery/outer one-third region, excision is a preferred option in many cases of white-white zone tears/

complex parrot beak tears extending from white-white zone to red-white/red-red zone. Excision in such cases will lead to a near total meniscectomy. It is important to stabilize the knee and save the meniscus as much as possible with the goal of return to active physical activity and the prevention of osteoarthritis.

We propose few novel techniques in certain special scenarios for meniscal repair.

REPAIR OF LARGE FULL-THICKNESS RADIAL TEARS

Radial tears of the meniscus are relatively common. These tears disturb the circumferential fibers of the meniscus leading to improper weight distribution.^[4] With new advances, management has shifted from the traditional meniscectomy to repair of radial tears, but in case of large tears, the repair is difficult even to experienced surgeons.

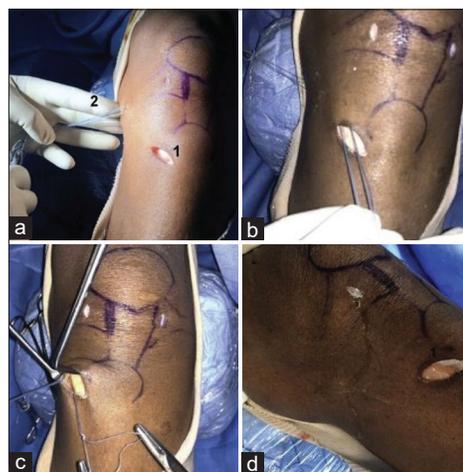


Figure 1: (a) (1) Anteromedial tibial tunnel wound. (2) Fiber wires retrieved percutaneously. (b) Fiber wire retrieved through the tibial tunnel wound subcutaneously. (c) Sliding knot. (d) Final wound picture after placing knots.

Table 1: Ortho-One PROMT score.		
Criteria	Characteristics	Score
Age	<20 years	0
	20–30 years	1
	30–40 years	2
	>40 years	3
Chronicity	<1 year	0
	>1 year	1
Plain radiograph (KL grading)	0, 1	0
	2, 3, 4	3
Zone of the tear	Red-red	0
	Red-white	1
	White-white	3
Pattern of the tear	Lateral, horizontal	1
	Radial, oblique	2
	Complex	3
	Displaced bucket handle tear	4

PROMT: Prediction of reparability of meniscal tears, KL: Kellgren and Lawrence system

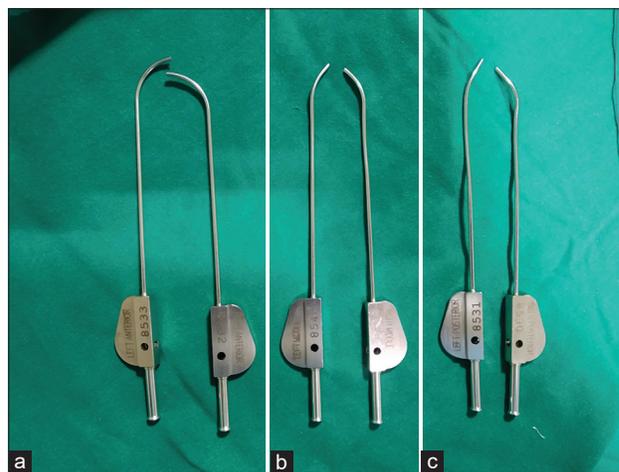


Figure 2: (a) Anterior. (b) Middle. (c) Posterior.

This technique is intended to shorten the gap by drawing each stump of the meniscus in the direction of circumference, thus enabling the repair-“radial tear approximation and repair” technique.

Surgical technique

Arthroscopic evaluation is performed using standard anterior knee portals. The meniscus is carefully evaluated; edges freshened with a rasp to promote healing. Suture loaded knee-specific meniscal piercing suture retriever is introduced through contralateral port vertically penetrating the anterior stump of the meniscus from the lower surface to the upper surface. Later, the superior limb of the wire loop was fed through the device again. The suture retriever was rotated 180° at the posterior stump to allow the suture to pass from the superior to the inferior surface of the meniscus. Both the inferior limbs of the suture were tightened with a sliding knot which goes inferior to the meniscus resulting in an approximation of the two stumps, thus enabling the repair using horizontal mattress sutures [Figure 3] and [Video 3].

REPAIR FULL-THICKNESS RADIAL TEARS NEAR TO POSTERIOR HORN

Repair of large radial tears in the posterior zone near to the root is challenging. Repairing such tears with the above-mentioned “radial tear approximation and repair technique” can approximate the stumps but cannot prevent the extrusion of the meniscus. In such cases, a modification of the above described technique with a “centralization stitch” using a tibial tunnel is required.

Surgical technique

Tear location is assessed initially and a tibial tunnel is drilled such that it exits midway between the tear and the midbody of the meniscus [Figure 4]. The radial tear is approximated in a similar way to the “radial tear

approximation and repair” technique except that instead of sliding knot inferior to the tear, both the inferior ends of the sutures are pulled through the tibial tunnel and tied over a button onto the tibial cortical surface ensuring the central stay of the meniscus [Video 4].

REPAIR OF COMPLEX PARROT BEAK TEARS

In this novel technique, we call “CROWN FEATHER STITCH,” repair of complex tears extending from white-white zone to red-white/red-red zone is described.

Surgical technique

This is an inside-out technique. The meniscus is viewed from the ipsilateral port and the working portal is the contralateral port. Initially, a single bite of the stitch was taken through the anterior flap’s center using an appropriate cannula and an open eyed needle loaded with multiple suture threads. All the threads were retrieved from outside. Now, the other ends of the suture threads were sequentially loaded through the needle and the bites were taken through the posterior aspect of the flap in a radial pattern. These ends were retrieved from outside and secured over the capsule using sliding knots [Video 5].

A single bite through the center minimizes damage to the flap and multiple radial bites give the stability and also the appearance of a crown feather [Figure 5].

AUGMENTED EXCISION BALANCING WITH REPAIR

In complex tears with components involving both avascular zone and periphery/double bucket handle tears, traditionally excision is a preferred choice leading to subtotal meniscectomy. Instead, avascular zone, irreparable and irreducible tears can be balanced out and residual tears in the

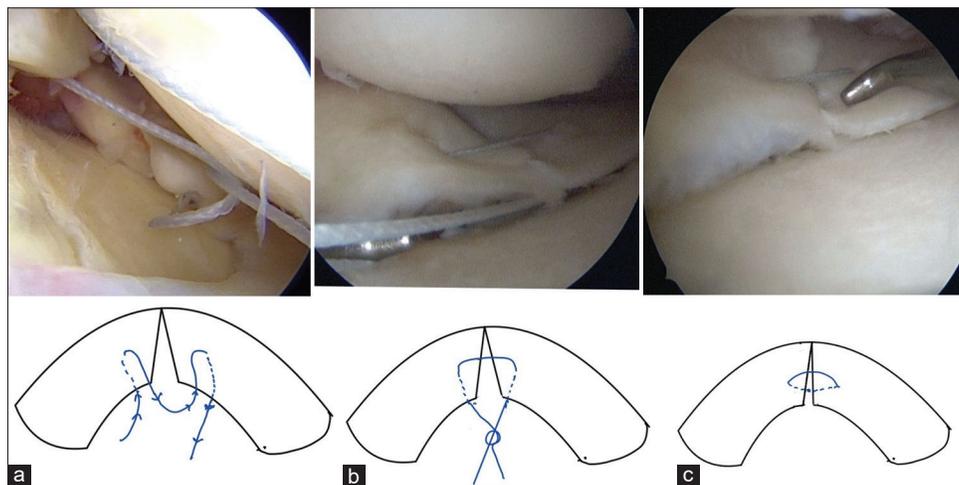


Figure 3: (a) Bites through the meniscal stumps, dotted lines representing the suture inferior to meniscus. (b) Sliding knot. (c) Final image of radial tear approximation.

periphery can be repaired thus preserving the meniscus as much as possible [Video 6].

INVERTED BURIED SUTURES FOR HORIZONTAL TEARS

Conventionally, horizontal tears were managed with either single flap or dual flap excision. However, with a better

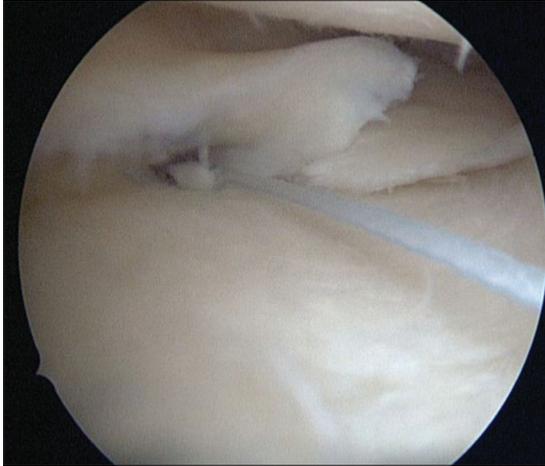


Figure 4: Tibial tunnel drilled between the meniscal tear and body of the meniscus.

understanding of knee kinematics, there is a recent trend for the repair of these horizontal tears whenever possible. Although many surgical techniques were proposed, most of them have the disadvantage of kinking or crumpling of the meniscus.

We propose an inverted buried suture technique to avoid meniscal kinking and to have a better approximation of the flaps.

Technique

This is an inside-out technique. The first bite is taken through the undersurface of the superior flap passing the suture through the substance of the meniscus and retrieving from outside. The inner end of the suture is loaded onto the needle and the second bite is taken through the upper surface of the inferior flap. This end is also passed and retrieved outside in a similar way tightening the two ends outside the capsule making a buried loop over the inner surface of the flaps leading to a good approximation of the flaps [Figure 6].

SUMMARY

With the well-established fact that complete or partial meniscectomy leads to degenerative changes in the knee, a surgeon should attempt to repair the meniscus at all times, especially in the setting of an associated ACL injury given the meniscus contribution as secondary restraint and

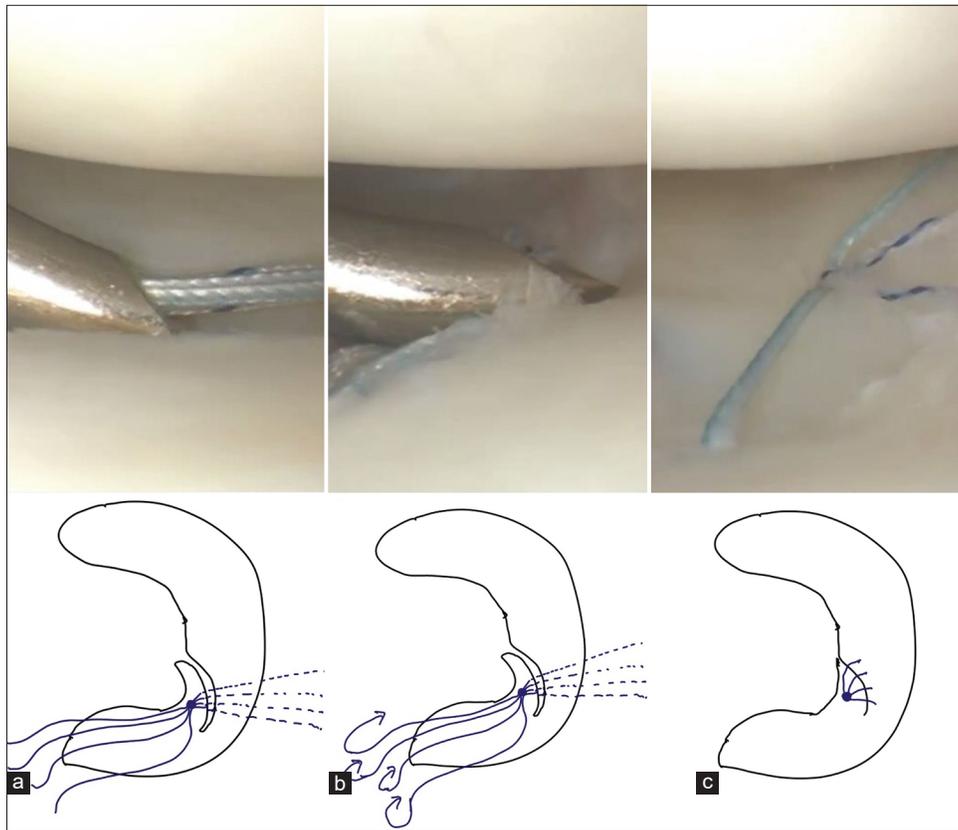


Figure 5: (a) Single bite through the center of the flap with multiple sutures passing inside out. (b) Multiple bites over the periphery using the ends of the sutures. (c) Final repair with crown feather appearance.

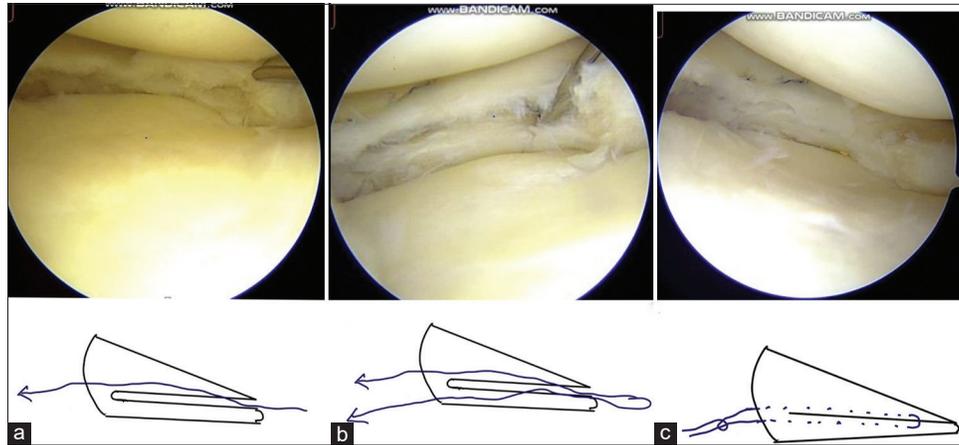


Figure 6: (a) Bite through the superior flap inside out. (b) Bite through the inferior flap. (c) Inverted buried suture with an approximation of tear flaps.

documented higher healing rates in such settings. However, scenarios like an athlete with isolated meniscal tear where the clinician must balance the desire for a quick return to sports to the longer term outcomes of meniscectomy pose a difficult conundrum. Nevertheless, surgeons should develop a range of meniscal repair techniques for the range of complex tears, especially the cost-effective ones.

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Declaration of patient consent

Patient's consent not required as there are no patients in this study.

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Conflicts of interest

There are no conflicts of interest.

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