

## Original Research Article

# Switching portal technique in anterior cruciate ligament reconstruction: use of an extra low and medial portal

Abhishek Agarwal\*, Ekansh Debuka, Dharmendra Kumar, Vineet Sharma

Department of Orthopedic Surgery, King George's Medical University, Lucknow, Uttar Pradesh, India

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### \*Correspondence:

Dr. Abhishek Agarwal,

E-mail: [abhishekaragwalortho@gmail.com](mailto:abhishekaragwalortho@gmail.com)

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### ABSTRACT

**Background:** Long term success of ACL reconstruction depends on accurate surgical technique of anatomic tunnel placements and proper rehabilitation protocol followed, and for accurate tunnel positioning various arthroscopic landmark should be visible clear with the use of various portals.

**Methods:** All 112 surgeries were performed by a single surgeon in King Georges Medical University, Lucknow Orthopedic department operation theatre during July 2016- December 2018. An extra low and medial portal is created and then portal were switched between anteromedial and low medial one.

**Results:** With the use of this portal the average surgical time was observed to be 43 minutes and no malpositioning of tunnel was encountered.

**Conclusions:** This switching portal technique provides an excellent view of the femoral tunnel plot and gives consistent results with minimum complications.

**Keywords:** Switching portal, Residents ridge, Working portal

### INTRODUCTION

With the increasing rate of arthroscopic ACL reconstruction being performed everywhere, the incidence of failure and decreased longevity of the reconstructed graft is being encountered very frequently. Although there can be variety of reasons behind this failure- biological failure, new trauma, faulty surgical technique, the most important reason is due to malposition of tunnel placement more frequently that of femoral tunnel.<sup>1-2</sup> According to a data from Multicentre ACL revision society (MARS) 80% of all ACL failure is because of faulty femoral tunnel.<sup>3</sup> Anatomic ACL reconstruction is now the method of choice as compared to transtibial technique, the later involves tibial tunnel dependant femoral tunnel placement.<sup>4-6</sup> Every fraction of millimeters is important as far as accurate positioning tunnel placement is concerned for both entry point as

well as the correct trajectory. And to get this we need to see whole plot accurately neat and clear as even minor variation in these principles can lead to bad to worse outcomes.

By the use of quadrant method the ACL femoral foot print is located 28-32% of the long axis of the quadrant and 35% of the short axis. There should not be any part of tunnel anterior to the resident's ridge.<sup>7,8</sup>

The center of the tibial foot print should be at the level of posterior edge of anterior horn of lateral meniscus antero-posteriorly and in between interspinous area (40-60 ratio) mediolaterally.<sup>9,10</sup> Surgeons are using standard two portal technique for single bundle ACL reconstruction since time. The purpose of the study is to emphasize the role of an extra low and too medial portal to reconstruct ACL reliably with accurate femur and tibial tunnel positioning.

**METHODS**

This open ended prospective study was conducted over a period of two and a half years during July 2016 to December 2018 in Department of Orthopaedics, King Georges Medical University, Lucknow.

**Inclusion criteria**

Inclusion criteria were individuals with age 14-55 yrs; anterior instability of knee after trauma >3 weeks duration.

**Exclusion criteria**

Exclusion criteria were age <14 and >55 yrs; duration <3 weeks or with swelling; any other co morbidities; patient unwilling to give consent.

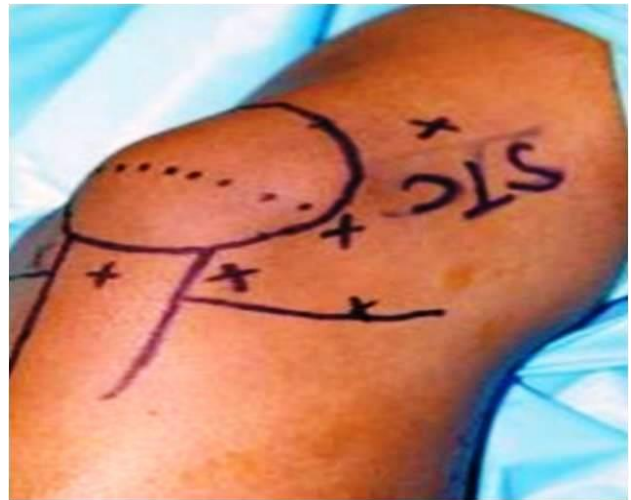
All surgeries were performed by single surgeon. Written informed consent from the patients and Ethical approval from research cell King George’s medical university has been taken.

**Surgical technique**

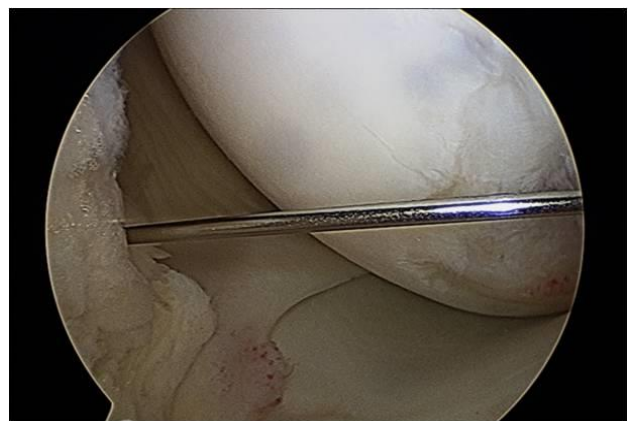
Patient was positioned supine with Bolster over OT Table so that 60 degree flexion at hip and 90 degree at knee can be achieved whenever required. After giving anaesthesia (GA/RA) a tourniquet was tightened over thigh and surface marking of the knee was done with knee in 90 degree flexed position. High anterolateral visual portal was created just at the level lower pole of patella lateral to patellar tendon by vertical stab incision and dilating with straight artery. Entry was made with blunt trochar and cannula to minimize the damage to the articular cartilage Diagnostic round of the whole knee was performed and confirmation of ACL tear was made. The high anteromedial working portal was made(which would be switched to visual portal when doing femoral tunnel) (Figure 1). A 3<sup>rd</sup> new low and more medial (approximately 2 cm to patellar tendon) working portal is made under arthroscopic vision with spinal needle which would reach the proper femoral foot print seen through high medial portal. Femoral tunnel is first drilled with guide wire in free hand technique and then drilled to required diameter according to the diameter of the graft size (keep knee in maximum flexion to prevent tunnel going too posterior)(care should be taken to ensure at least 2.5 mm bony ridge between the tunnel wall and the proximal and posterior wall) it is important to drill approximately 10 mm farther to the desired graft length in the femoral tunnel to allow easy flipping of the endobutton and at least 8 mm of the lateral cortex to be intact to prevent tunnel blowout (Figure 3 and 4) (Table 3). Tunnel is secured with fiber wire with Beathpin.

Switching back to anterolateral portal tibial tunnel is drilled with usual recommended technique in outside in fashion (Figure 5) the graft is then passed and endobutton

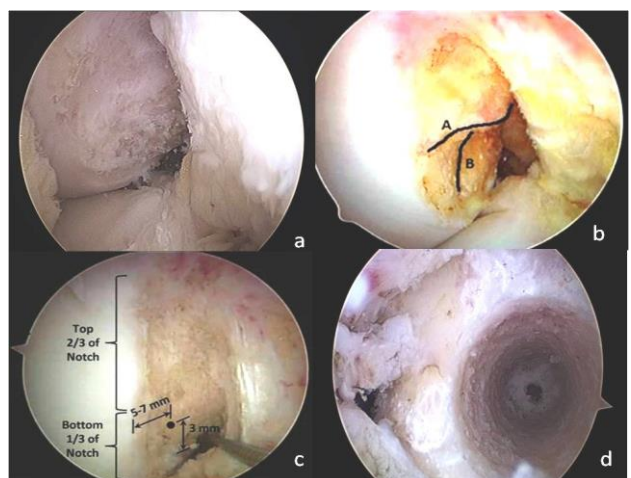
is flipped towards the femoral side and is secured and tightened with a bioscrew towards the tibial side.



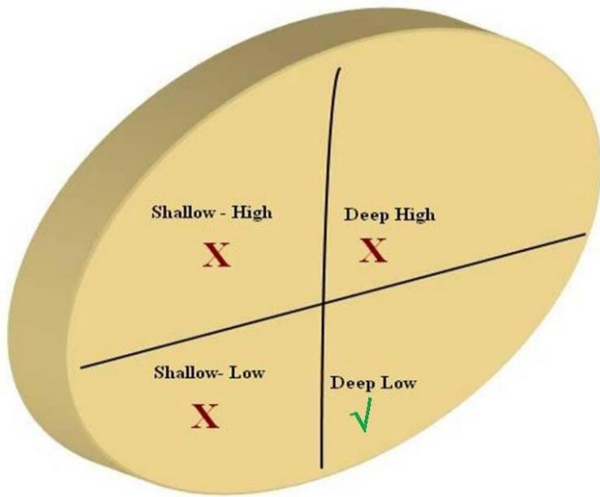
**Figure 1: Portal locations marked on skin as for ACL reconstruction.**



**Figure 2: Arthroscope in anterolateral portal.**



**Figure 3: Arthroscope in high anteromedial portal; (A) medial surface of lateral femoral condyle, (B, C) measurements over lateral femoral condyle, (D) final femoral tunnel.**



**Figure 4: Anatomical verses arthroscopic representation (We want femoral foot print to be low and deep).**



**Figure 5: Arthroscope in anterolateral portal showing preparation for tibial tunnel.**

**Statistical analysis**

Data are reported as mean ± SD or proportions and 95% confidence intervals.

**RESULTS**

Total 112 ACL reconstructions in 112 patients with at least 3 weeks post injury instability were performed. Out of 112 patients 90 patients were males while rest 22 were females. In total 60 right knee while 52 left knee were operated. On an average mean reporting days to us was found to be 168 days and out of them 103 were only ACL injury while 09 patients were operated for multi ligamentous injury (Table 1A). Mean time in performing surgery was observed to be 43 minutes using this three portal technique. Average femoral tunnel length was found to be 38 mm. Only two cases were complicated by

femoral tunnel blow-out which were managed by mini open technique using suture disc (Table 1 B, C).

**Table 1A: The mean observed findings of demographic variables.**

Variables	N (%)	
<b>Gender distribution</b>	Male	90 (80)
	Female	22 (20)
<b>Sides of the knee</b>	Right	60 (54)
	Left	52 (46)
<b>No of ligaments injured</b>	Single	103 (92)
	Multiligamentous	9 (08)
<b>Mean timing of the reporting after the injury</b>	168 days ±(13 days)	

**Table 1B: Mean tunnel assessments and surgical time.**

Surgical variables	Mean± (Standard deviation)
<b>Femoral tunnel length</b>	38 mm±(2.4 mm)
<b>Tibial tunnel length</b>	47 mm± (4.6 mm)
<b>Femoral tunnel diameter</b>	8.4 mm± (0.6 mm)
<b>Tibial tunnel diameter</b>	9.1 mm± (0.9 mm)
<b>Surgical time</b>	43 minutes± (6.8 minutes)

**Table 1C: Complications observed during surgery.**

<b>Complications</b>	Malpositioning of femoral tunnel – none
	Malpositioning of tibial tunnel – none
	Femoral tunnel blowout –02
	Tibial tunnel blow out --none

**Table 2: Portal usage according to surgical step in Anatomical ACL reconstruction.**

	Visual portal	Working portal
<b>Diagnostic round</b>	High antero lateral portal	
<b>Femoral tunnel placement</b>	High anteromedial portal	Accessory low medial portal
<b>Tibial tunnel placement</b>	High antero lateral portal	High anteromedial portal

**Table 3: Anatomical verses arthroscopic representation in femoral tunnel placement.**

Anatomical	Arthroscopic
<b>Posterior</b>	low
<b>Anterior</b>	high
<b>Superior</b>	deep
<b>Inferior</b>	shallow

## DISCUSSION

Anatomic and accurate positioning of tunnel placement is key to success in ACL reconstruction. Although ACL anatomy has been well described by radiographs and cadaveric measurements but arthroscopic landmarks are of importance in reconstruction. Whole plot should be visible neat and clear to pin Arjuna's fish eye (A reference of accuracy in Indian mythology) and to attain this the use of high anteromedial portal for visualization and extra low medial portal to be used as working portal has been proved to be a very good technique for tunnel placement without necessitating the inadvertent use of notchplasty (Figure 2-3). In cases where remnants of ACL hinder the view of footprints, this technique is proven to be superior than two portal technique. In cases where augmentation of ACL is done while preserving the remnant ACL, the use of this extra portal has no match. Snow et al. has mentioned many advantages of anatomical tunnel placement over the ancient transtibial technique which was further reemphasized by Lubowitz.<sup>11</sup> Bedi et al. has emphasized the importance of accurate tunnel placement on the basis of footprints and landmarks.<sup>12</sup> Paulo et al described the three portal technique for double bundle ACL reconstruction. All these statements are in accordance with the technique presented in this study.

The principle for anatomical ACL reconstruction are to functionally reestablish the ACL to its native dimensions, collagen orientation and insertion sites.

## CONCLUSION

Making of one extra medial portal (3<sup>rd</sup> portal) and switching it as working portal and high medial portal as a visual portal for femoral tunnel placement is a very easy, reproducible technique which provides a meticulous view of remnants and bony arthroscopic landmarks facilitating anatomical graft placement as compared to two portal technique which limits the proper visualization of femoral insertion site (Table 2). In knee arthroscopy any numbers of portals can be made according to your comfort until you make the joint a sieve. The author suggests the use of this accessory anteromedial portal technique for ACL reconstruction.

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*Ethical approval: The study was approved by the institutional ethics committee*

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