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Title: Comparing the Accuracy of Tunnel Placement and Patient Reported Outcome Measures when doing Arthroscopic ACL Reconstruction with and without Indigenously Designed Grid and Image Intensifier

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Disclosures: NONE

- AIM - “Evaluate the accuracy in the femoral and tibial tunnel placement after use of fluoroscopy & indigenously designed grid method for ACL Reconstruction as compared to the tunnel placement without using them”

  – *Validate the findings with 3D CT scan done postoperatively along with*

Secondary Objective - assessing the functional outcome – at 3 yrs

Among various causes of failure

- Inaccurate tunnel placement is assumed to be one of the most important intraoperative variables and is directly influenced by the operating surgeon

- studies have confirmed significant variation in tunnel placement, even in the hands of experts to the tune of 10% to 40%.

Solution

- Placing ACL graft in a more anatomical location on the tibia and femur - having graft in a more horizontal orientation - believed to provide better rotational and translational stability

- Intraoperative fluoroscopy guided guide wire placement is documented to increase the accuracy of tunnel placement

Seo SS, Kim CW, Lee CR, Park DH, Kwon YU, Kim OG, et al. Intraoperative fluoroscopy reduces the variability in femoral tunnel placement during single-bundle anterior cruciate ligament reconstruction. Knee Surg Sports Traumatol Arthrosc. 2020 Feb 1;28(2):629–36.

Material and Method

Inclusion Criterira

- Aged - 18 and 45 years and with a confirmed diagnosis of ACL injury
- Underwent primary ACLR using quadruple looped hamstring autograft (semitendinosus and gracilis) between June 2016 and January 2019 in the Department of Orthopaedics.

Exclusion Criterira

- bilateral ACL tear, Concomitant any other ligament or meniscal injury, Revision surgeries, Un-consenting subjects.

Kumar S, Kumar A, Kumar R. Accurate positioning of femoral and tibial tunnels in single bundle anterior cruciate ligament reconstruction using the indigenously made Bernard and hurtle grid on a transparency sheet and C-arm. Arthrosc Tech 2017;6:e757-e761.

- 113 patients
- Group A - 53 consecutive patients - underwent ACLR using intraoperative fluoroscopy along with an indigenously designed grid.
- Group B - 60 consecutive patients who underwent ACLR without using fluoroscopy intraoperatively.

- 3-D CT position of femoral tunnel in AP and proximal distal planes, tibial tunnel in AP and mediolateral planes - in percentage,

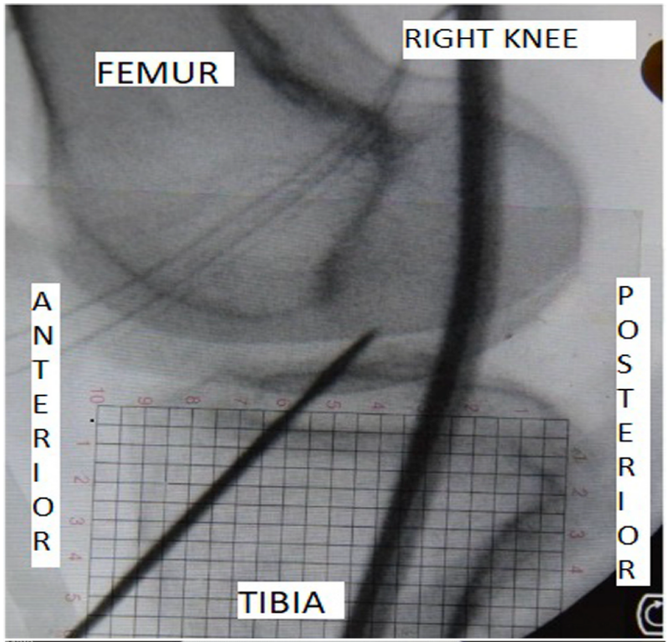
- PROs- the Tegner Lysholm Knee (TLK) score, Knee injury and Osteoarthritis Outcome Score (KOOS), and International Knee Documentation Committee (IKDC) subjective knee score, measured at 36 months.

- The aim is to keep guide wire at –
  - Femoral condyle - at 27% in proximal-distal and 34% in anterior-posterior direction for femur
  - For tibia pleatue - tunnel centre at 43% in front-back and 47% in medial-lateral planes from the medial cortex.

Bird JH, Carmont MR, Dhillon M, Smith N, Brown C, Thompson P, et al. Validation of a New Technique to Determine Midbundle Femoral Tunnel Position in Anterior Cruciate Ligament Reconstruction Using 3-Dimensional Computed Tomography Analysis. Arthroscopy: The Journal of Arthroscopic & Related Surgery. 2011 Sep 1;27(9):1259–67.

Amis AA, Jakob RP. Anterior cruciate ligament graft positioning, tensioning and twisting. Knee Surg Sports Traumatol Arthrosc. 1998;6 Suppl 1:S2-12.

Pinczewski LA, Salmon LJ, Jackson WFM, von Bormann RBP, Haslam PG, Tashiro S. Radiological landmarks for placement of the tunnels in single-bundle reconstruction of the anterior cruciate ligament. J Bone Joint Surg Br. 2008 Feb;90(2):172–9.


RIGHT KNEE
FEMUR
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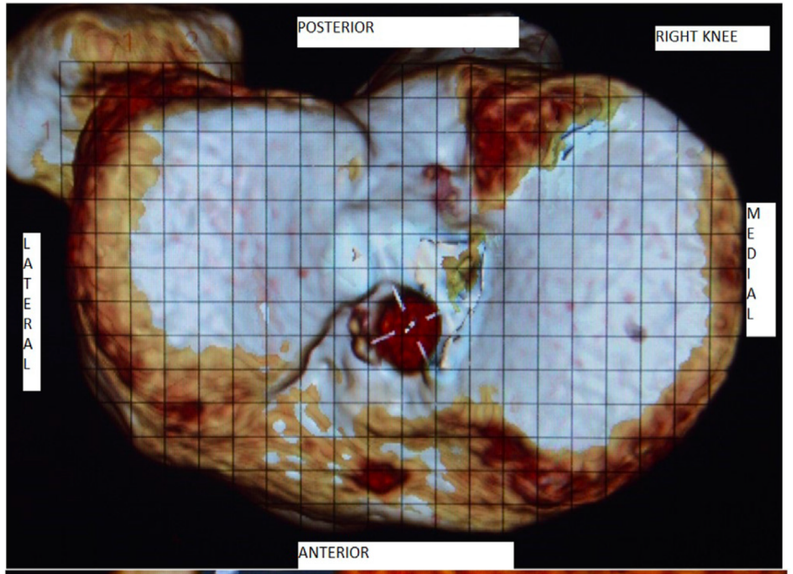
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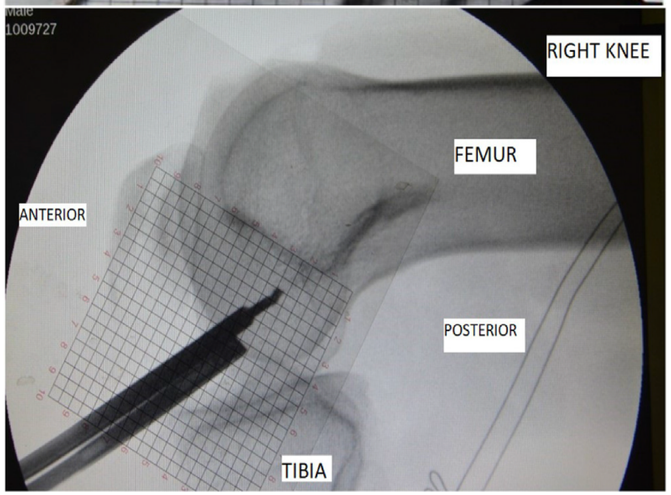
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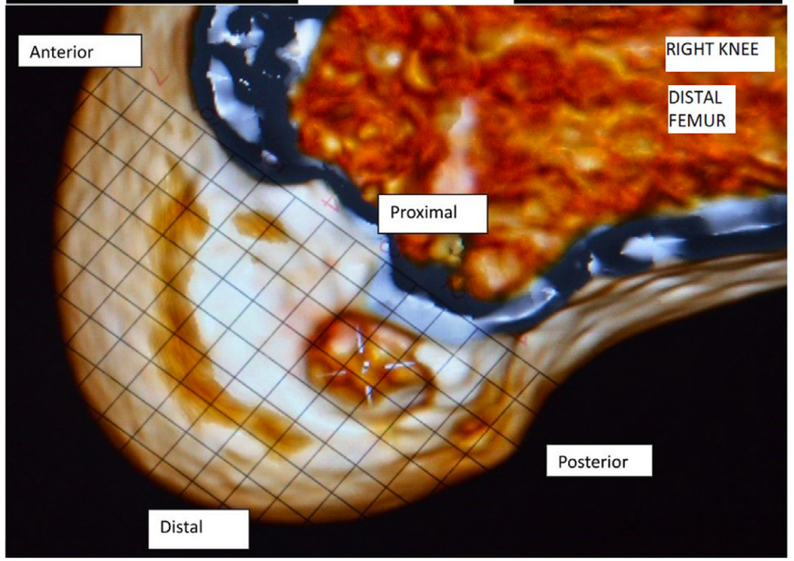
Anterior
RIGHT KNEE
DISTAL FEMUR
Proximal
Posterior
Distal

Femoral Tunnel Positions

Group	Antero-Posterior Plane (%)			Proximo-Distal Plane (%)		
	A	B	P value	A	B	P value
Mean	**29.66**	**21.88**		**30.98**	**42.22**	
Max.	42.00	38.00		46.00	53.85	
Min.	14.28	11.76		25.00	26.00	
SD	6.00	5.35	.00	4.36	6.40	.00
Range	27.72	26.24		11	27.85	

Tibial Tunnel Positions

Group	Medio-lateral plane (%)			Anterior-posterior plane (%)		
	A	B	P value	A	B	P value
Mean	**47.35**	**45.95**		**41.34**	**37.05**	
Max.	53.00	52.78		50.00	50.00	
Min.	40.00	33.00		27.27	25.00	
Range	13.00	19.78		22.73	25.00	
SD	2.75	3.62	.025	5.39	4.57	.00

Assessment of functional outcome – 36 months

Group	TLK			IKDC			KOOS		
	A	B	P value	A	B	P value	A	B	P value
Mean	97.88	86.881		85.46	68.78		96.43	87.94	
Max.	100	100		89.10	89.00		100	100	
Min.	95	73		79.30	44.80		88.70	63.20	
SD	1.35	5.01	.00	1.78	7.01	.00	2.63	7.62	.00
Range	5	27		9.80	44.20		11.30	36.80	

Discussions

- Significant improvement in both the femoral and tibial tunnel position after the introduction of fluoroscopy and grid in arthroscopic ACL reconstruction when compared with the nonfluoroscopy group
- Intraoperative fluoroscopy and grid assistance allowed the PRO measures to improve significantly
- There was also significant reduction in femoral tunnel variability especially in proximal - distal direction and sagittal plane tibia tunnel placement in Fluroscopy and Grid Group

Conclusion

- Fluoroscopy and Grid guided positioning using a grid technique increases the
  - accuracy of ACL tunnel positioning with decreased variability
  - associated with better PROs 3 years after surgery compared with tunnel positioning using anatomical landmarks, without Fluroscopy and Grid.