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Poster# 116

SAGITTAL TIBIAL TUBERCLE-TROCHLEAR GROOVE DISTANCE PREDICTS PATELLOFEMORAL CHONDRAL LESION SIZE

Andrew S. Bi, MD, Jairo Triana BS, Zachary I. Li BA, Daniel J. Kaplan MD, Kirk A. Campbell MD, Michael J. Alaia MD, Eric J. Strauss MD, Laith M. Jazrawi MD, Guillem Gonzalez-Lomas MD

I (and/or my co-authors) have something to disclose.

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Background

- Coronal tibial tubercle-trochlear groove (TT-TG) distance has been heavily studies in patellar instability
- **Sagittal TT-TG (sTT-TG)** is a relatively new quantitative measure of the tibial tubercle position relative to the nadir of the trochlea in the sagittal plane
- A more posterior tibial tubercle, or negative sTT-TG, has been implicated with increased incidence of patellofemoral lesions

Investigations & Diagnostics

The Sagittal Tibial Tubercle–Trochlear Groove Distance as a Measurement of Sagittal Imbalance in Patients with Symptomatic Patellofemoral Chondral Lesions

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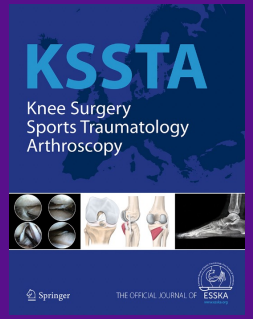
Drew A. Lansdown[1], David Christian[2], Brett Madden[2], Michael Redondo[2], Jack Farr[3], Brian J. Cole[2], and Adam B. Yanke[2]



KNEE

Posterior tibial tubercle measured by the sagittal TT-TG distance correlates with increased risk for patellofemoral chondral lesions

Daniel J. Kaplan[1] · Edward S. Mojica[1] · Paola F. Ortega[1] · Jairo Triana[1] · Eric J. Strauss[1] · Laith M. Jazrawi[1] · Guillem Gonzalez-Lomas[1]

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Objective

The purpose of this study was to quantify the association between sTT-TG distance and patellofemoral lesion size.

Methods

- Retrospective cohort study; single tertiary academic medical center
- Study period: 2010-2020
- Included skeletally mature patients who underwent **osteochondral allograft (OCA) transplantation** or **autologous chondrocyte implantation (ACI/MACI)**
  - Preoperative MRI present
  - Minimum 2-year follow-up
- Patient information/ postoperative course:
  - Demographics: Age, sex, body mass index (BMI)
  - Complications
- Lesion Characteristics
  - **Size** (MRI and intraoperative) and grade (Outerbridge classification)

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Methods

- sTT-TG Measurements:
  - Measured preoperatively on axial T2-weighted MRI
  - Measured by two authors at least two weeks apart
  - Interclass correlation coefficients (ICC) calculated for both intra- and inter-rater reliability

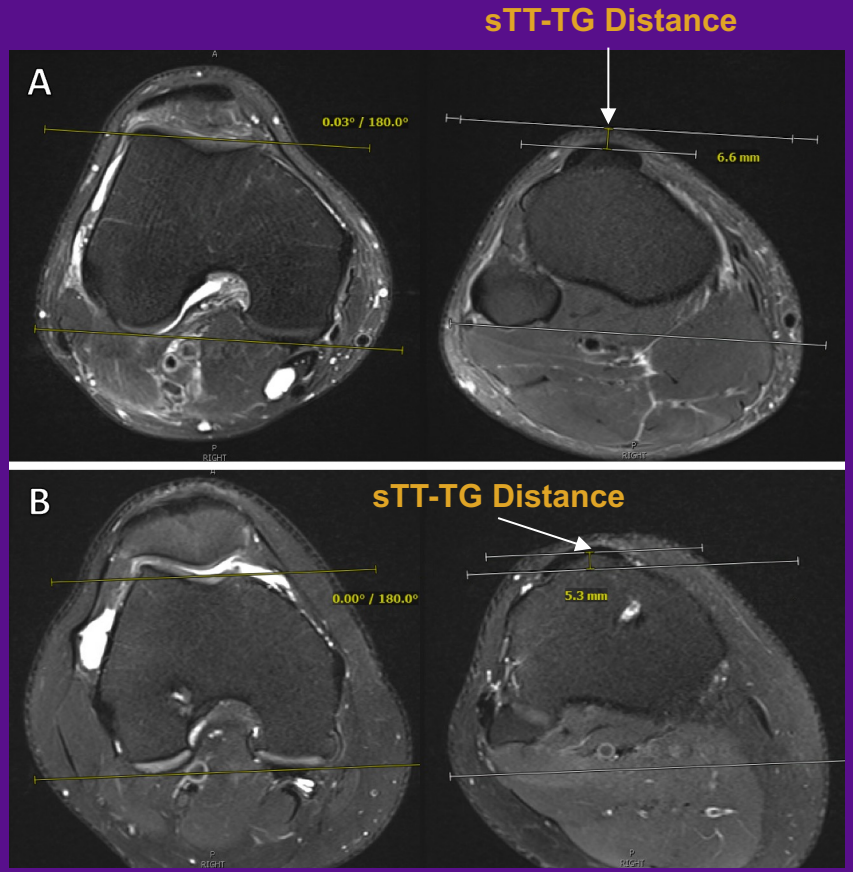
- Statistical analysis (SPSS): Chi-square for categorical variables, independent t-test for continuous variables. Linear regression model was used for relationship between sTT-TG and lesion size

Methods – sTT-TG measurement

1. Nadir of the trochlear groove is identified on axial magnetic resonance image (MRI) and a line is drawn parallel to the posterior condylar axis.

2. The most prominent aspect of the tibial tubercle with patellar tendon attachment is marked on the axial MRI.

3. The sTT-TG is measured between these parallel lines perpendicular to the posterior condylar axis, as shown in the overlay image.



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Results- Patient Demographics

Age	31.5±10.4
Sex	
Female, n	49 (57.6%)
Male, n	36 (42.4%)
BMI	27.0±5.9
Follow-up (months)	61.5±21.4
Laterality	
Left	43 (51%)
Right	42 (49%)
Cartilage Procedures	
ACI	44 (51.8%)
OCA	41 (48.2%)

- Mean CDI = 1.1±0.2 (range 0.68 – 1.63)
- Mean cTT-TG = 12.3±5.3 mm
- Trochlear dysplasia: 38 (44.7%)
  - 12 Dejour D's
  - 11 Dejour B's
  - 8 Dejour A's
  - 7 Dejour C's

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Results – Concomitant Procedures

Number of Patients	67 (78.8%)
Procedure Type	
ACLR	1 (0.7%)
DFO	1 (0.7%)
HTO	1 (0.7%)
Lateral lengthening	49 (36.3%)
Loose body removal	5 (3.7%)
Meniscectomy or meniscal repair	5 (3.7%)
MPFLR or MQTFLR	13 (9.6%)
MCLR	1 (0.7%)
MFC microfracture	1 (0.7%)
MFC OCA	1 (0.7%)
TTO	55 (40.7%)
45˚ Cut	18
60˚ Cut	35
90˚ Cut (pure anteriorization)	2
Unicondylar Arthroplasty	1 (0.7%)

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Results – Rater Reliability

Rater 1 sTT-TG (mm)	-5.0±5.0		
Rater 2 sTT-TG (mm)	-4.6±5.0		
Combined Rater sTT-TG (mm)	-4.8±4.9		
sTT-TG Measurement Interclass Correlations Coefficients			
	ICC	95% CI	p-value
Rater 1	0.99	0.986-0.994	<.001
Rater 2	0.99	0.994-0.986	<.001
Between Raters	0.95	0.927-0.969	<.001

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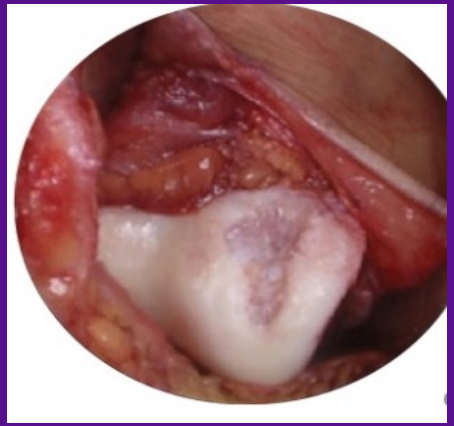
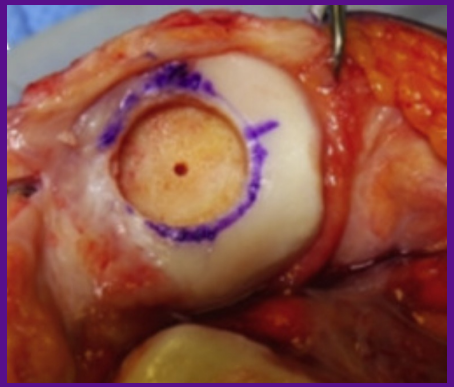
Results – Lesion Characteristics

Total number of lesions	107
Unipolar, n	63 (74%)
Bipolar, n	22 (26%)
Mean Lesion Size (cm^2)	
Patella	3.2±1.3
Trochlea	2.9±1.9
Unipolar (patella/trochlea only)	3.1±1.4
Bipolar (total lesion area)	6.0±3.3
Outerbride Grade	
Grade 4, n	102 (95%)
Grade 3, n	5 (5%)





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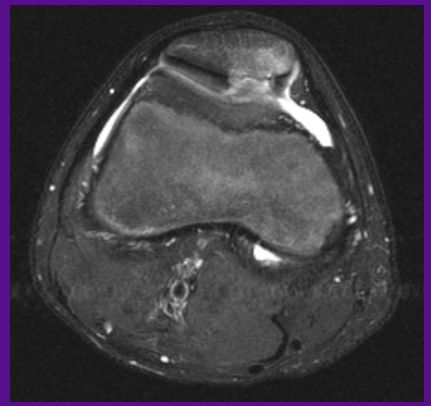
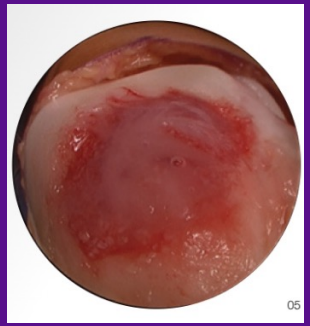
Results – sTT-TG Correlates With Patellar Lesion Size

	Pearson Coefficient	95% CI	p-value
Patellar Lesions	-0.34	-0.529, -0.083	0.01
Trochlear Lesions	-0.09	-0.377, 0.212	0.561
Total Lesion Area (cm^2)	-0.215	-0.409, -0.002	0.048
Bone edema presence	-0.002	-0.215, 0.212	0.989
Bone edema depth (mm)	0.133	-0.145, 0.392	0.347





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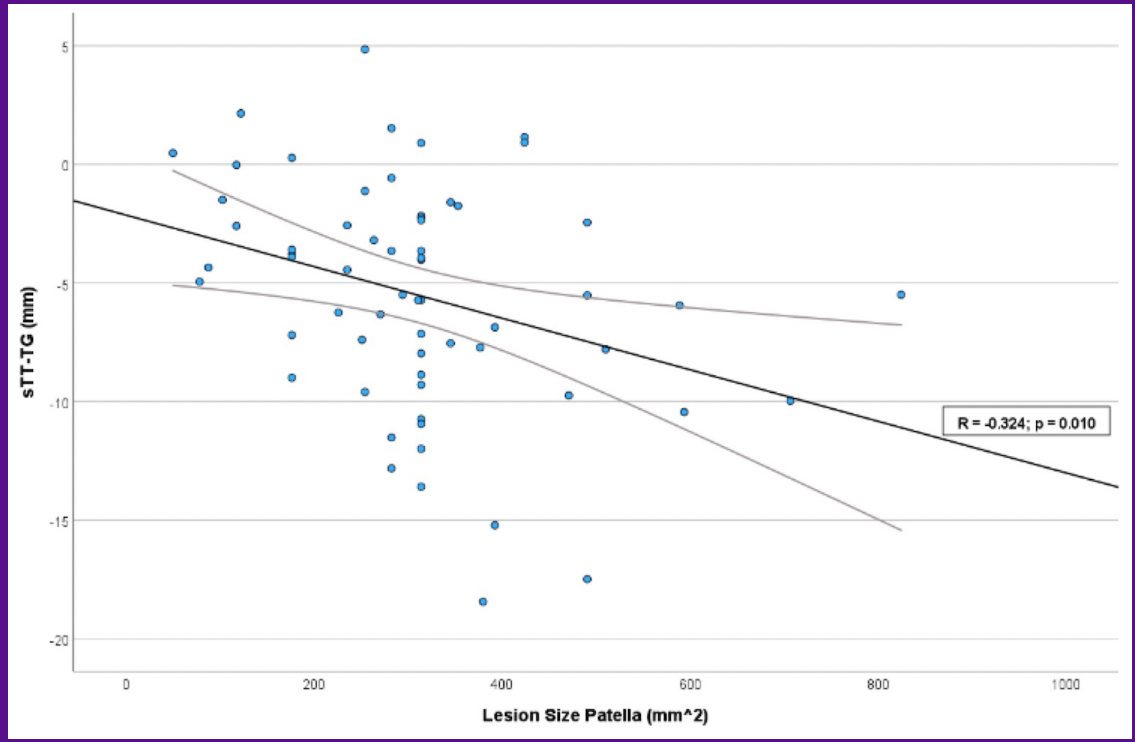
Results – More Negative (posterior) sTT-TG Is Associated With a Larger Lesion Size

- sTT-TG is an independent predictor of larger defects on MRI and intraoperative patellar lesions
  - **R= -0.324, p=0.01**
  - Variables controlled: age, sex, and BMI

- 9.3 mm^2 lesion size increase on MRI ($p<0.001$) and 9.8 mm^2 increase intraoperatively ($p=0.01$) for every 1 mm "decrease" (more posterior) in sTT-TG



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Results – sTT-TG Correlation with Complication Rates

- Complication rates (p= 0.109)
  - OCA (43.9%)
  - ACI/MACI (27.3%)

- 1 mm **increase** in sTT-TG (more anterior) **decreases the risk** of all-complications by **10.1%** (ß=0.899, p=0.043), though it did not affect the odds of graft failure (p>0.05)

- Offloading TTO rates comparable between those with/without postoperative complication (63% vs 65%, p=0.85).

Total Complications	30 (35%)
DVT	1 (3.4%)
Reoperation	28
Chondroplasty	5 (16.6%)
Hardware removal	4 (13.3%)
MUA/LOA	11 (36.6%)
Wound Dehiscence	1 (3.4%)
Graft Failure	8
Chondroplasty at graft site	1 (3.4%)
Graft extrusion (on MRI)	1 (3.4%)
OCA revision	4 (13.3%)
Total knee arthroplasty	2 (6.6%)

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Conclusion

A more **negative sTT-TG** was an independent predictor of **larger patellofemoral lesions** and increased risk for complications in patients undergoing patellofemoral cartilage restoration.

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#1 in the U.S. for Quality and Safety
#1 Hospital in New York

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By the Numbers

#4
in *U.S. News & World Report*

Clinical

34,000+
surgical procedures performed annually

450,000+
office visits annually

Advanced Technology
30+ robotics and navigation platforms systemwide

Education

Largest and one of the most diverse
orthopedic residency programs in the United States

87
residents across two accredited programs

21
fellows across six specialty programs

Research

#8
in NIH funding for orthopedic surgery

350+
peer-reviewed publications annually

2022 Vizient Quality and Accountability Ranking. Ranked #1 out of 107 participating comprehensive academic medical centers
2022 U.S. News & World Report Best Hospitals

as of October 2022