

# **Physeal Sparing ACLR with Hamstrings Autograft in Prepubescent Patients with Open Physes: Preliminary Clinical and Radiological Results**

Prof. Edoardo Monaco  
University of Rome La Sapienza  
Sant'Andrea Hospital

SISTEMA SANITARIO REGIONALE



**AZIENDA OSPEDALIERO-UNIVERSITARIA  
SANT'ANDREA**



**SAPIENZA**  
UNIVERSITÀ DI ROMA

DISCLOSURE: Consultant for Arthrex

# Pediatric ACL Number

*5.7-fold increase in  
pediatric ACL reconstruction rates  
in the U.S. over a decade*

PAN  
EPI  
D E M I C

# FACTORS TO CONSIDER



**Knee stability**



**Associated tears**



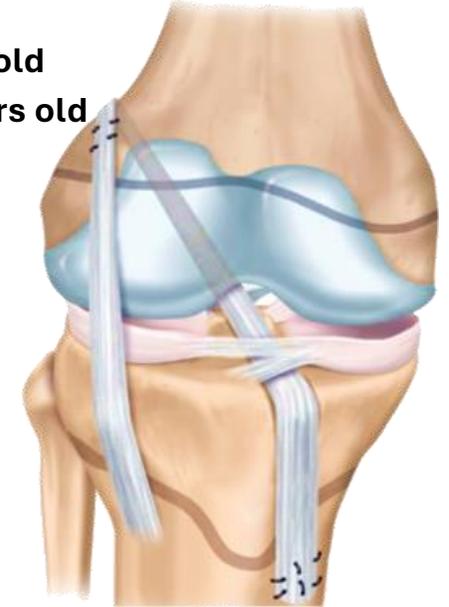
**Bony growth**



**Sexual maturity**

## Pre-adolescents

- Tanner 1 and 2
- Males  $\leq$  12 years old
- Females  $\leq$  11 years old



**Fascia lata – based combine intra and extra-articular reconstruction**

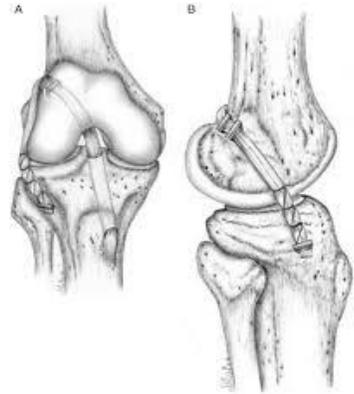
**Kocher MS et al. Outcomes of Physeal-Sparing ACL Reconstruction with Iliotibial Band Autograft in Skeletally Immature Prepubescent Children  
J Bone Joint Surg Am 2018**

**237 patients (240 knees)  
graft rupture rate: 6.6%**

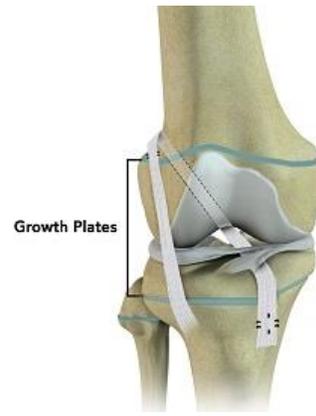
## Technical Note

### Arthroscopic Physeal Sparing Anterior Cruciate Ligament Reconstruction and Lateral Extra-articular Tenodesis With Semitendinosus and Gracilis Tendons

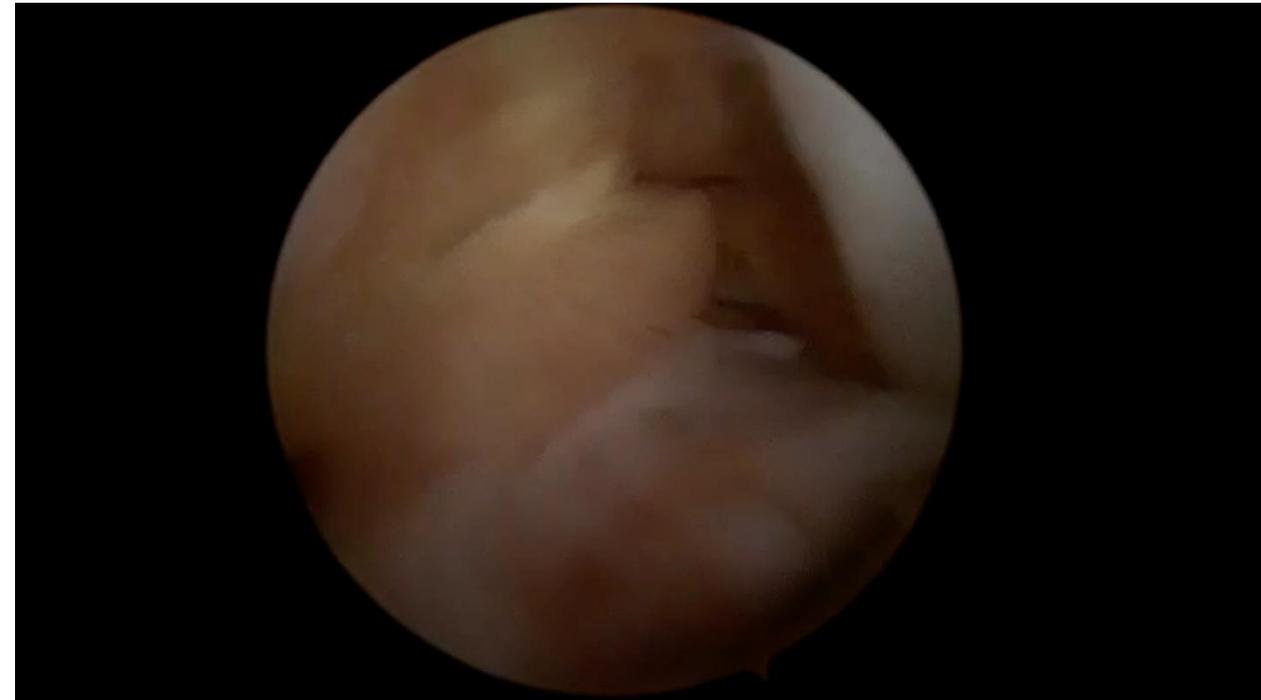
Edoardo Monaco, M.D., Matteo Romano Cantagalli, M.D., Matt Daggett, D.O.,  
Alessandro Carrozzo, M.D., Alessandro Annibaldi, M.D., Natale Criseo, M.D.,  
Luca Labianca, M.D., Ph.D., and Andrea Ferretti, M.D.



Marcacci-Zaffagnini  
technique



Kocher-Micheli  
technique



# Pre-op evaluation

X-ray



Tanner stage  
1/2



Physical  
exam.



# Material and Methods

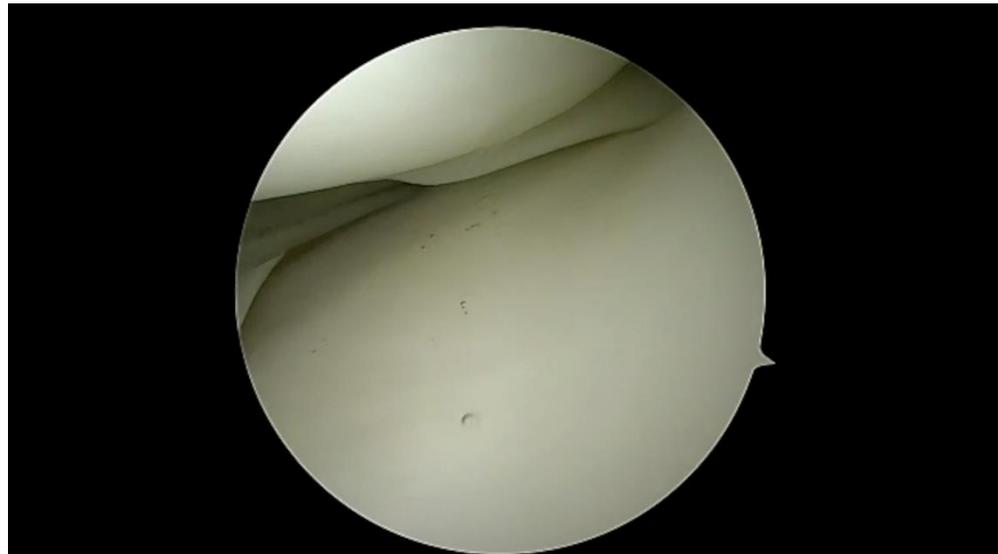
From 2022:

**8 patients (9 knees)**

- sex: 8/8 males
- mean age: 11 (min 9 - max 13)
- Tanner stage:
  - 1 (5 pts)
  - 2 (4 pts)
- mean height: 145 cm (+/- 7 cm)
- mean weight: 37 kg (+/- 6 cm)
- Sport activity preop: 9/9 soccer
- Injury mechanism:
  - contact 4/9 knees
  - non-contact: 5/9

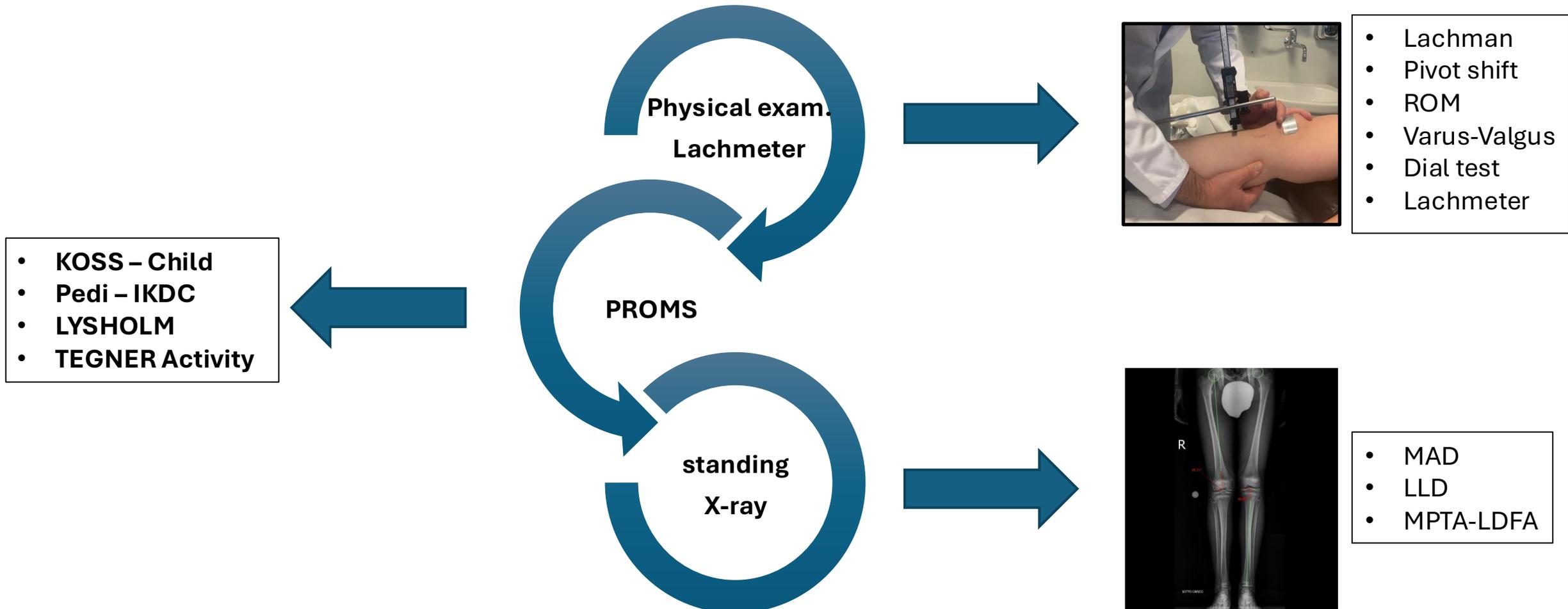
**mean injury to surgery interval: 166 days (min 20 – max 815)**

Meniscal tears (n: 8)	Type	Treatment
MM (n: 4)	3 Ramp	suture with hook
	1 Long. posterior horn	suture all-inside
LM (n: 4)	2 posterior Root	pull-out fixation
	1 radial	suture in-out
	1 Long. posterior horn	suture all-inside



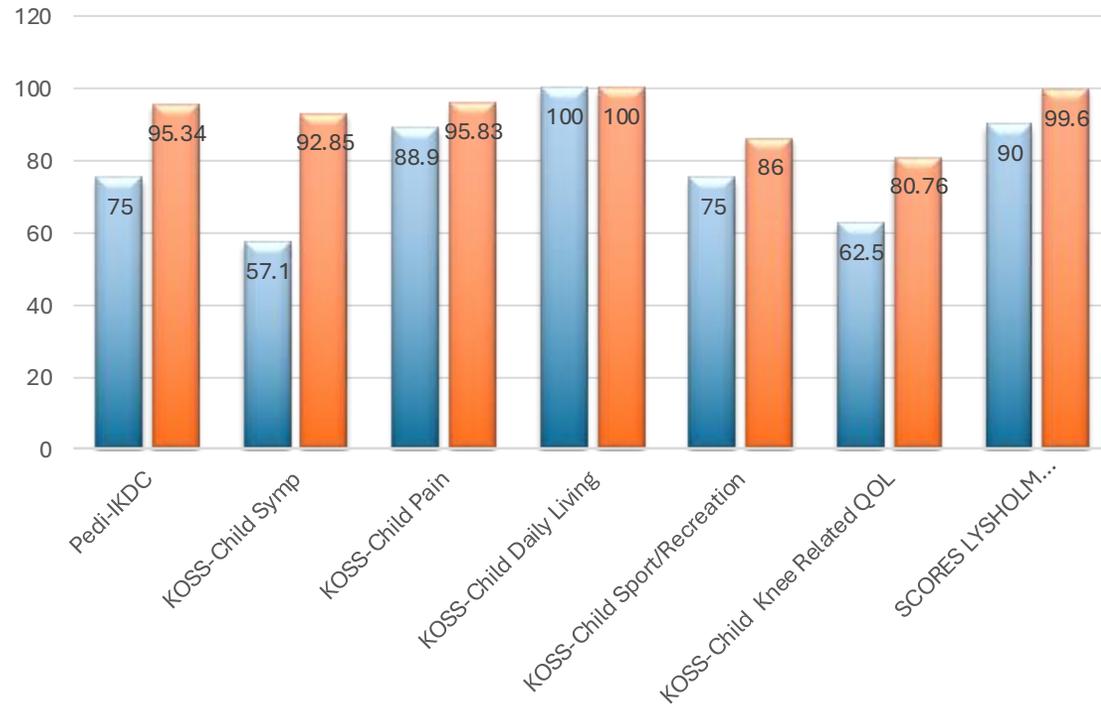
# Results

6 patients with a minimum 2 years of FU  
**primary outcomes**

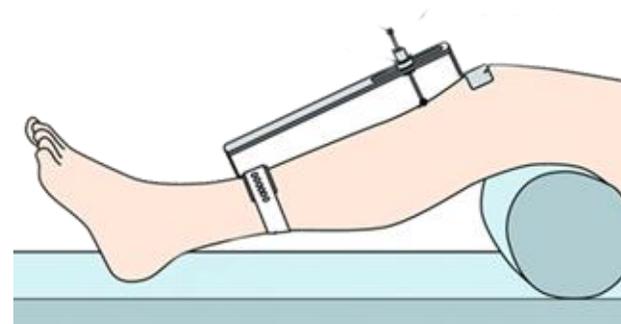


# Results

## Subjective evaluation PROMS



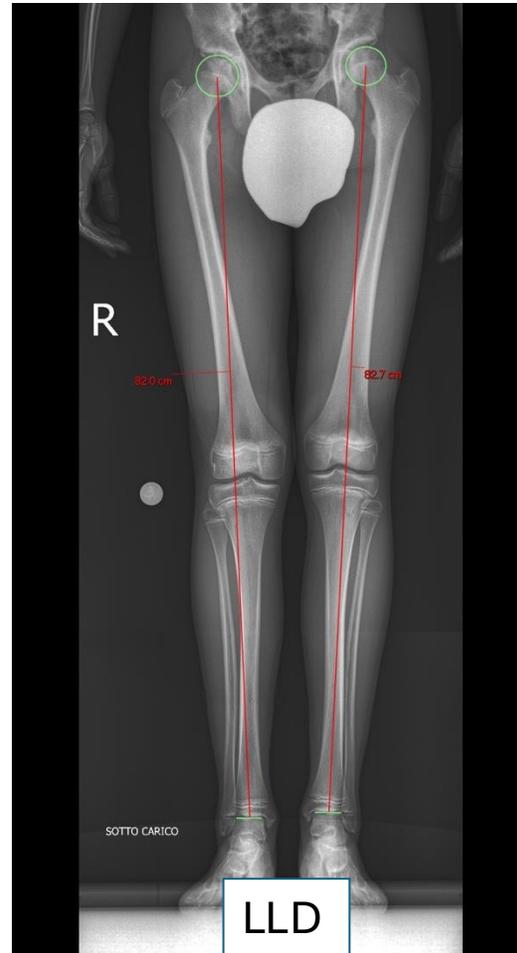
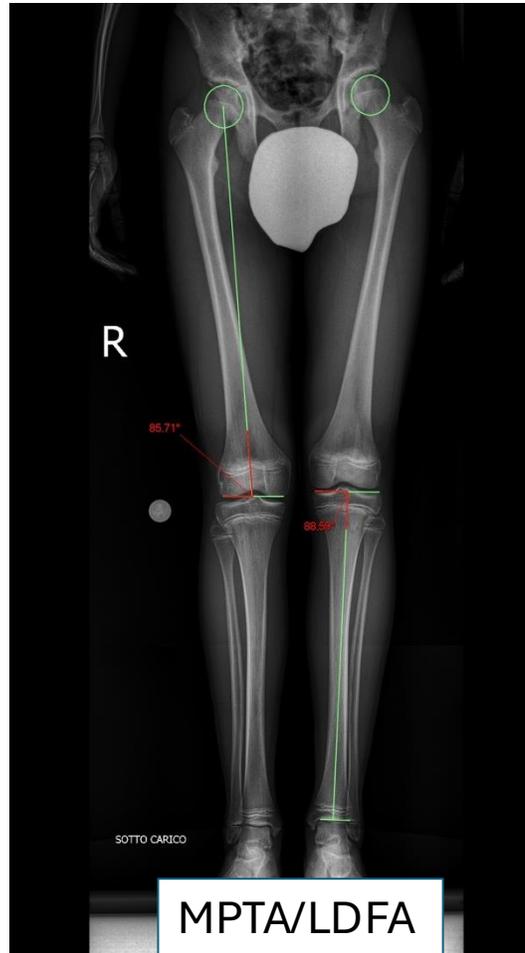
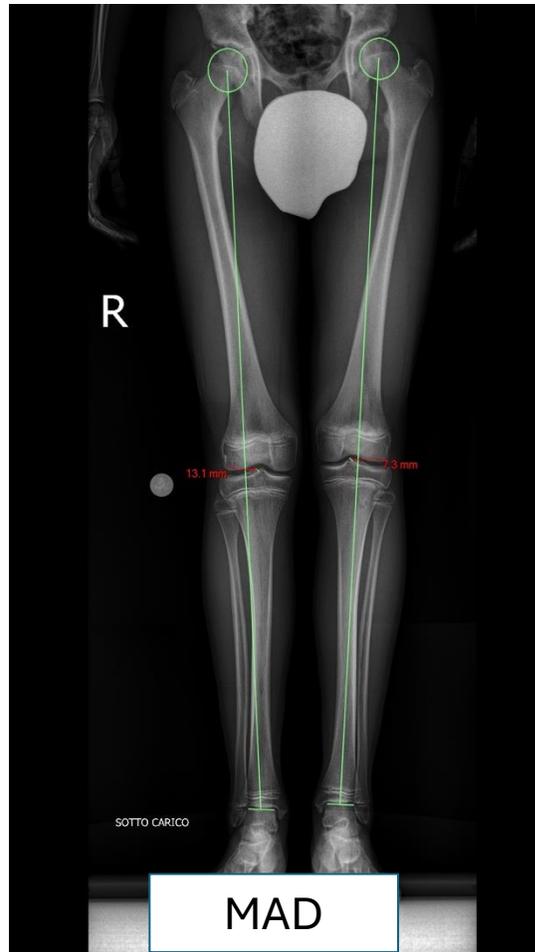
## Objective evaluation



**Lachmeter**  
mean: 1.5 mm  
0-3 mm: 6 pt  
3-5 mm: 0 pt  
>5 mm: 0

# Results

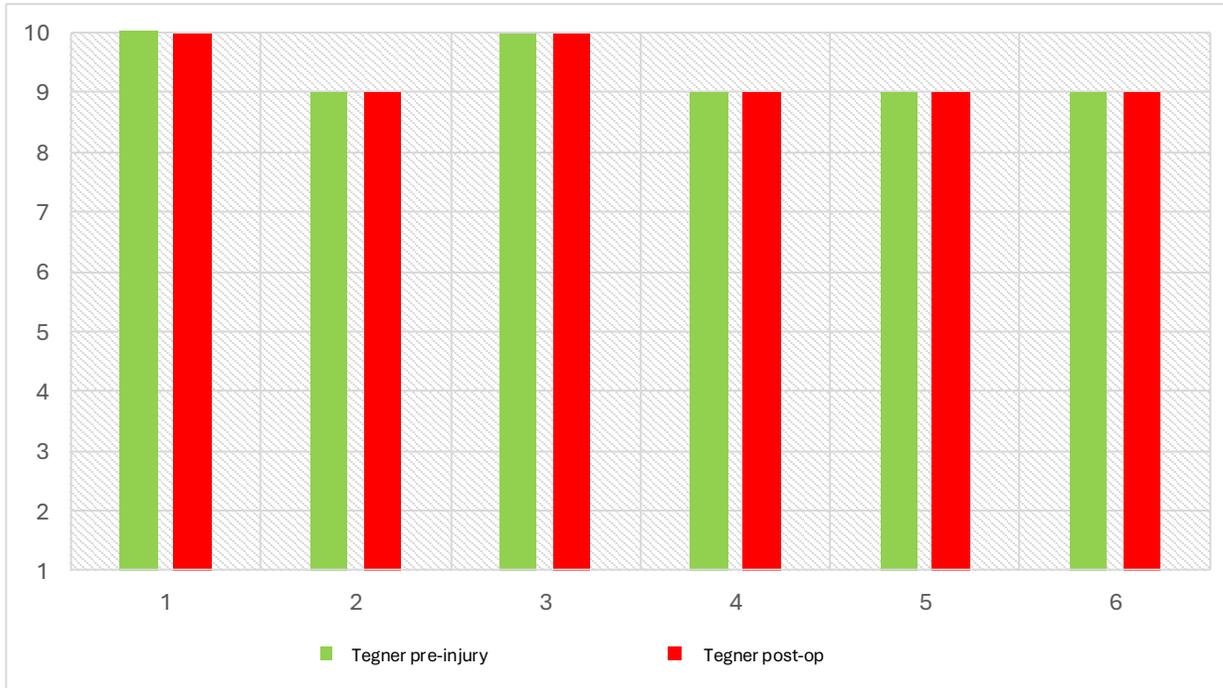
## bilateral AP standing X-ray



		Mean	SD	Minimum	Maximum	P Value
<b>Total length (cm)</b>						<b>0.34</b>
	normal	77	7,53	64,8	83,3	
	operated	76,73	8,01	64	83,6	
	<b>S/S diff.</b>	<b>0,27</b>	0,69	-0,8	0,8	
<b>mMPTA</b>						<b>0.058</b>
	normal	88,12	1,72	86,2	90	
	operated	86,37	2,18	83,3	89	
	<b>S/S diff.</b>	<b>2,08</b>	0,99	1	3,5	
<b>mLDFA</b>						<b>0.116</b>
	normal	88,17	3,10	83,1	92,7	
	operated	90,03	2,66	86,8	93,3	
	<b>S/S diff.</b>	<b>-1,87</b>	2,45	-5,8	0,9	
<b>MAD (mm)</b>						<b>0.345</b>
	normal	-3,63	7,74	-13,1	7	
	operated	-0,68	8,16	-11,2	8,5	
	<b>S/S diff.</b>	<b>7,35</b>	6,15	2,2	18,2	

# Results

## Return To Play



Patient	FU months	sport	level	TAS
#1 V.P.	36	soccer	competition	10
#2 V.L.	32	soccer	competition	9
#3 F.F.	30	soccer	competition	10
#4 G.G.	28	soccer	competition	9
#5 A.E.	24	soccer	competition	9
#6 D.F.	24	soccer	competition	9
#7 (#4controlat.)	14	soccer	amateur	7
#8 T.C.	16	soccer	competition	9
#9 L.A.	9	/	physio	/

**all patients returned to play soccer**

# Results

## Return To Play

**1st patient**

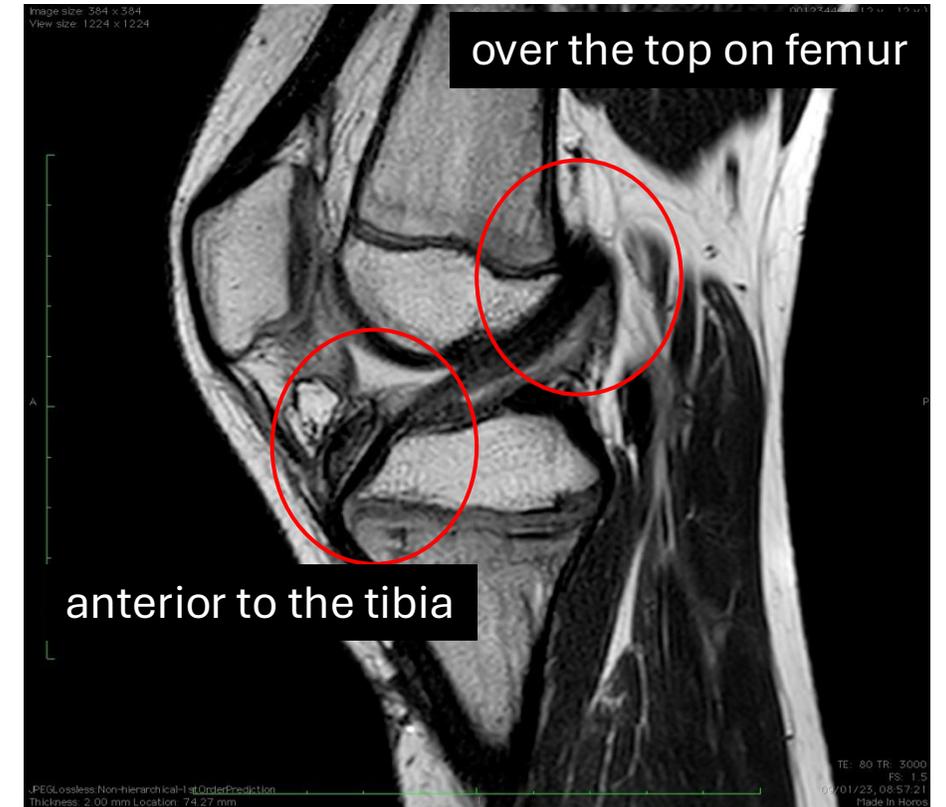


**youngest patient: 9 y.o.**



## Limitations:

- very low number of patients
- Short FU (patients have not finished growing)
- non anatomical technique
- hamstrings harvesting related morbidity



## Conclusion:

- physical sparing technique
- excellent stability
- no growth disturbances
- high rate of RTP

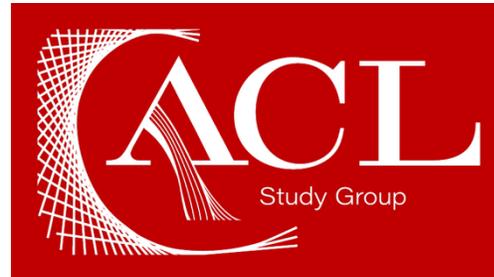




SAPIENZA  
UNIVERSITÀ DI ROMA



# Thank You!



prof.edoardomonaco



[www.legamentocrociatoroma.it](http://www.legamentocrociatoroma.it)



LEGAMENTO CROCIATO ANTERIORE