CLINICAL OUTCOME & MORPHOMETRY OVER 2 & 5 YEARS -

data from a treatment RCT on acute ACL injury

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DISCLOSURES

RF & SL - Nothing to declare

FE, WW & MH – Owner, co-owner / employee at Chondrometrics Gmbh, where image analysis was performed

ACL INJURY

Incidence – 80 / 100 000 inhabitants & year

(Frobell et al, SJMSS 2007)

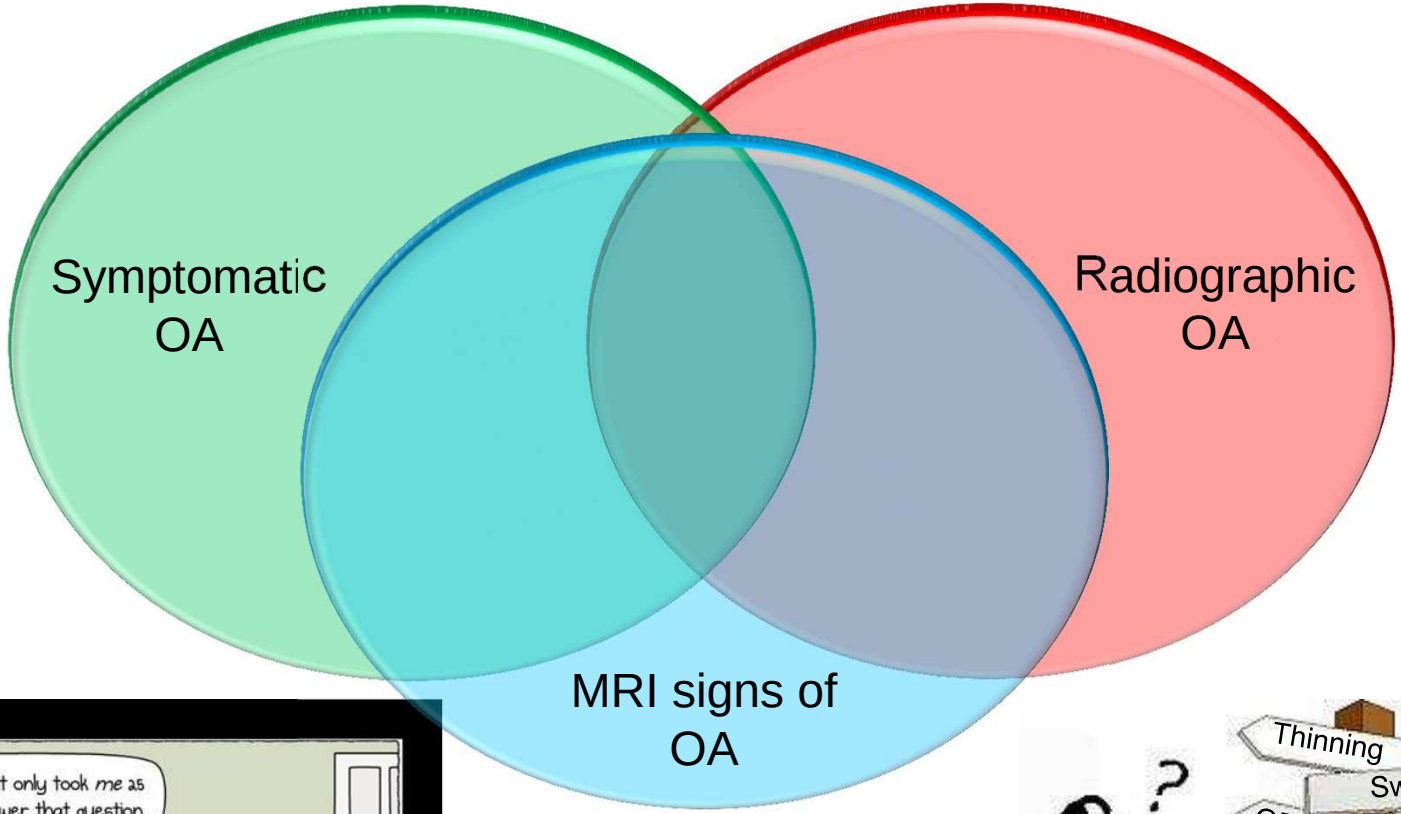
Treatment – Early ACLR + rehabilitation

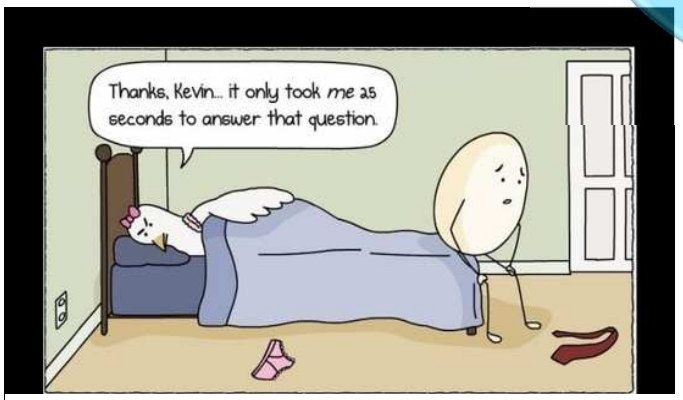
Rehabilitation + delayed ACLR if needed

Risk of OA – 0-90%, but likely 50% in general

No differences in treatment for ACL injury

(Lohmander et al, AJSM 2007)





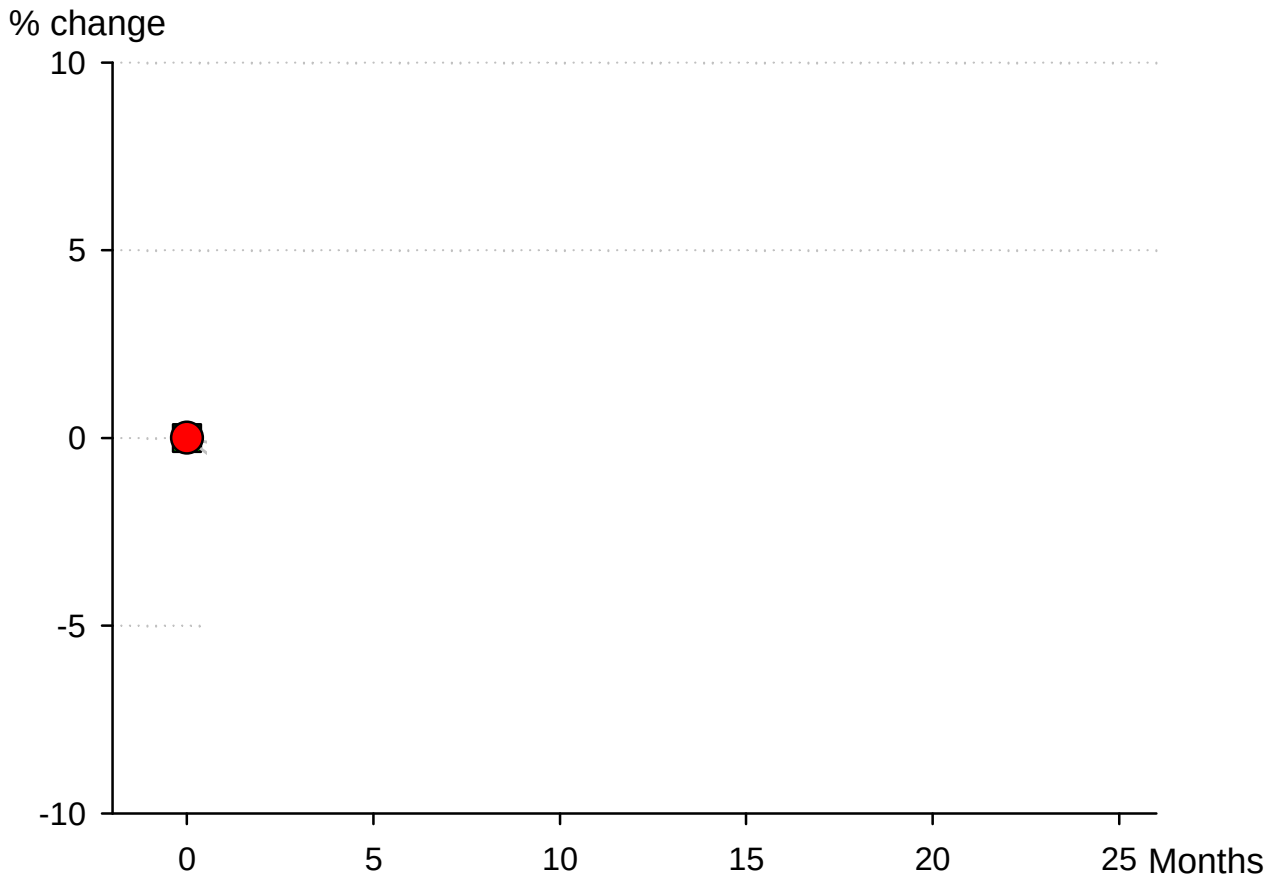
Who comes first – the hen or the egg?

MORPHOMETRY - CARTILAGE THICKNESS

VirtualScopics Inc.

KANON intense FUP
58 individuals
26 years
16 women
- 34 Early ACLR
- 24 Early Rehab

Frobell et al, OAC 2009

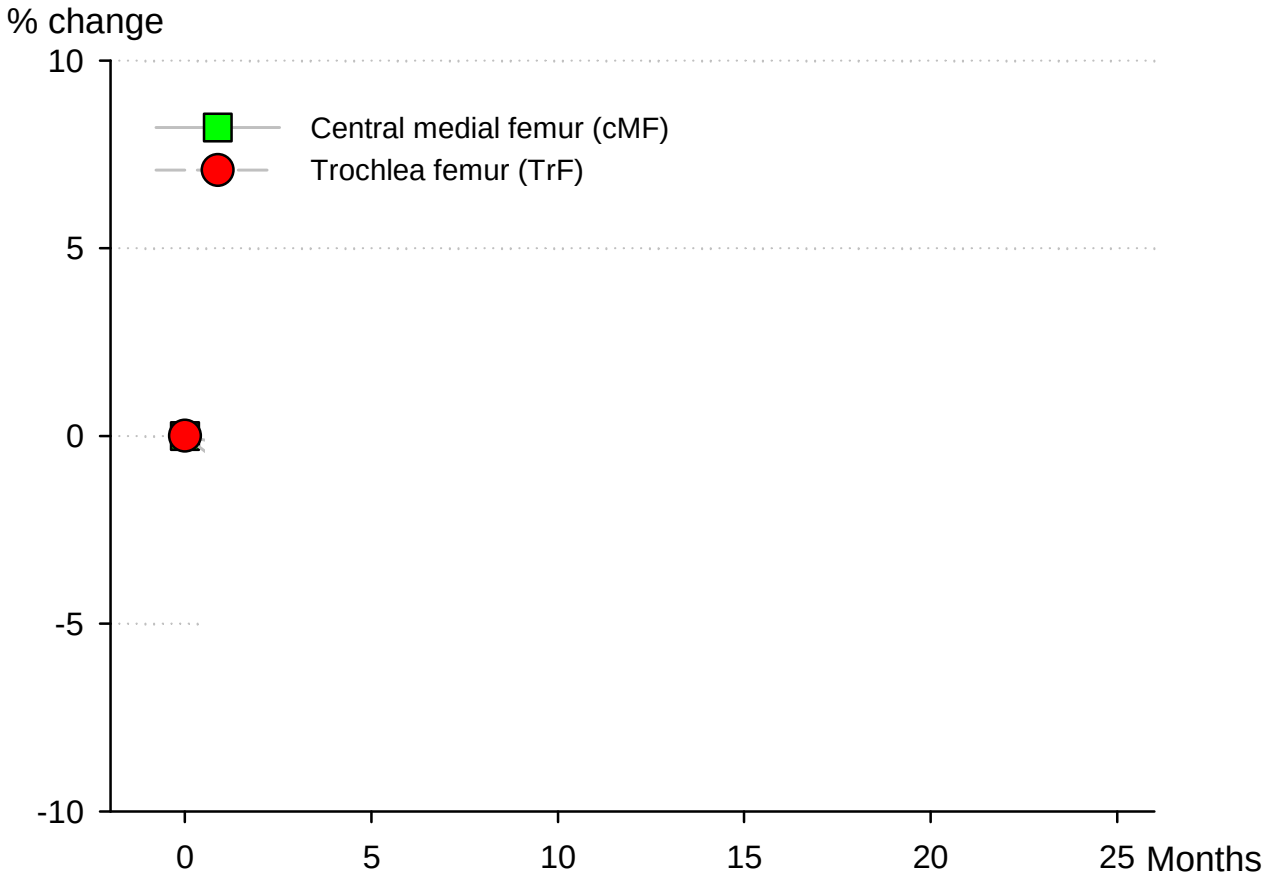


MORPHOMETRY - CARTILAGE THICKNESS

VirtualScopics Inc.
1 year
Cartilage swelling cMF
Decreased AC in TrF

Early ACLR may delay restitution

Frobell et al, OAC 2009



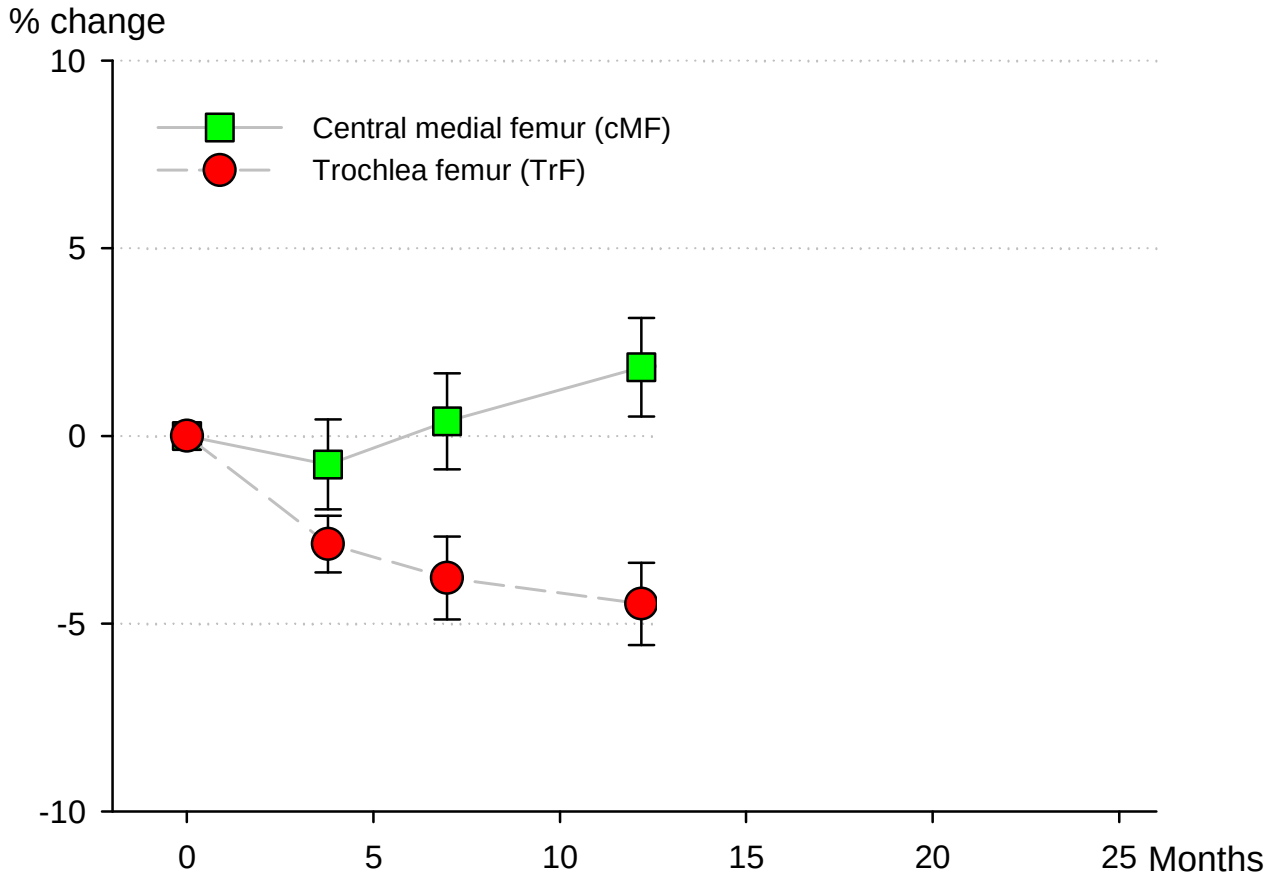
MORPHOMETRY - CARTILAGE THICKNESS

VirtualScopics Inc.
2 years
34 Early ACLR
11 Delayed ACLR
16 Rehab alone

Cartilage swelling cMF
Decreased AC in TrF

No difference between treatment groups

Frobell, JBJS 2011



OBJECTIVES

Within a treatment RCT, we followed patients with an acute ACL injury to a previously uninjured knee:

- To investigate the association between patient relevant outcomes and changes in cartilage thickness (ThC) and total area of subchondral bone (tAB) of the total femurotibial joint at 2 and 5 years
- To explore these associations in subgroups of treatment actually received

SAMPLE

The KANON-trial, a randomized controlled trial comparing:

Early surgical treatment strategy (n=62)

Delayed surgery if needed strategy (n=59)

Similar rehabilitation in both groups

No differences in PRO or activity level @ 2 years

Frobell et al, NEJM 2010

No differences in PRO, activity level or ROA @ 5 years

Frobell et al, under revision July 2012

MATERIAL

107 / 121 patients of the RCT had complete set of MR images at:

- Baseline
- 2 years
- 5 years

1 / 107 was lost to clinical FUP @ 5 years – leaving 106 included in study

	All N=106
Women	26 (24%)
Right knee (%)	59 (55%)
Age, yrs (SD)	26 (5)
BMI, kg/m2 (SD)	24.2 (3.0)

MATERIAL

107 / 121 patients of the RCT had complete set of MR images at:

- Baseline
- 2 years
- 5 years

1 / 107 was lost to clinical FUP @ 5 years – leaving 106 included in study

	All N=106	Early ACLR n=57	Delayed ACLR n=25	Rehab alone n=24
Women	26 (24%)	12 (21%)	8 (32%)	6 (25%)
Right knee (%)	59 (55%)	29 (51%)	16 (64%)	13 (54%)
Age, yrs (SD)	26 (5)	27 (5)	25 (5)	26 (5)
BMI, kg/m2 (SD)	24.2 (3.0)	24.5 (3.2)	23.5 (2.0)	24.3 (3.1)

CLINICAL OUTCOME

Knee injury & **O**steoarthritis **O**utcome **S**core
0-100; worst to best

Primary outcome of RCT
$KOOS_4$; (Pain + Symptoms + Sports & Rec + QOL) / 4

	All N=107	Early ACLR n=57	Delayed ACLR n=25	Rehab alone n=24
KOOS4 @ 2 yrs	76.1 (20.3)	75.1 (20.7)	72.4 (20.7)	81.4 (18.5)

Frobell et al 2010

CLINICAL OUTCOME

Knee injury & **O**steoarthritis **O**utcome **S**core
0-100; worst to best

Primary outcome of RCT
$KOOS_4$; (Pain + Symptoms + Sports & Rec + QOL) / 4

	All N=107	Early ACLR n=57	Delayed ACLR n=25	Rehab alone n=24
$KOOS_4$ @ 2 yrs	76.1 (20.3)	75.1 (20.7)	72.4 (20.7)	81.4 (18.5)
$KOOS_4$ @ 5 yrs	80.4 (16.6)*	79.7 (16.7)	79.0 (18.0)	83.5 (14.9)

Frobell et al 2010
Frobell et al 2012 (under revision)

MR IMAGING

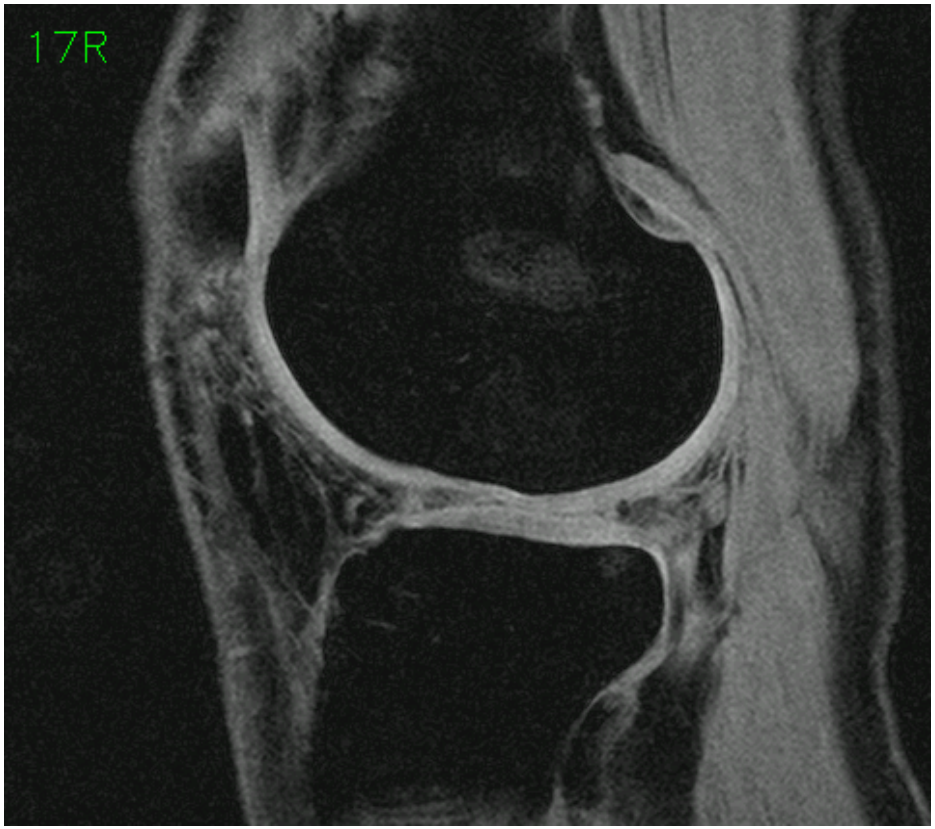
1.5T Philips Intera

Sagittal FLASH sq

- 0.29mm IPR
- 1.5mm slice spacing

Image acquisition @

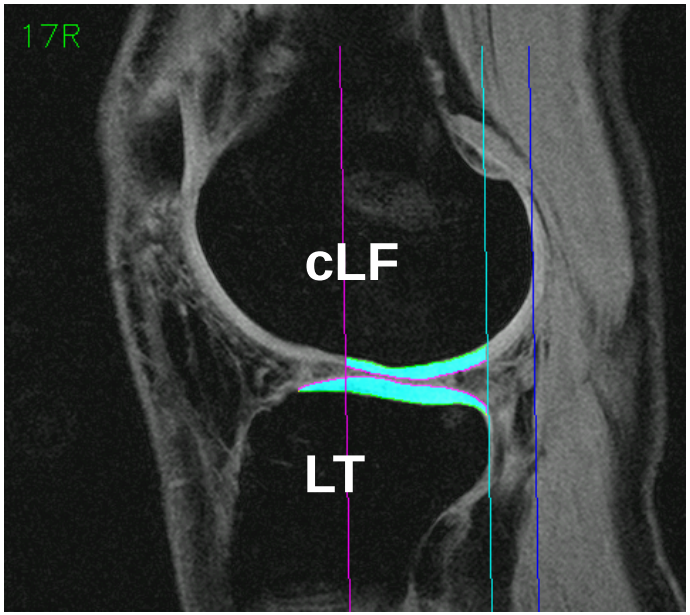
- BL (within 4 w of injury)
- 2 years
- 5 years

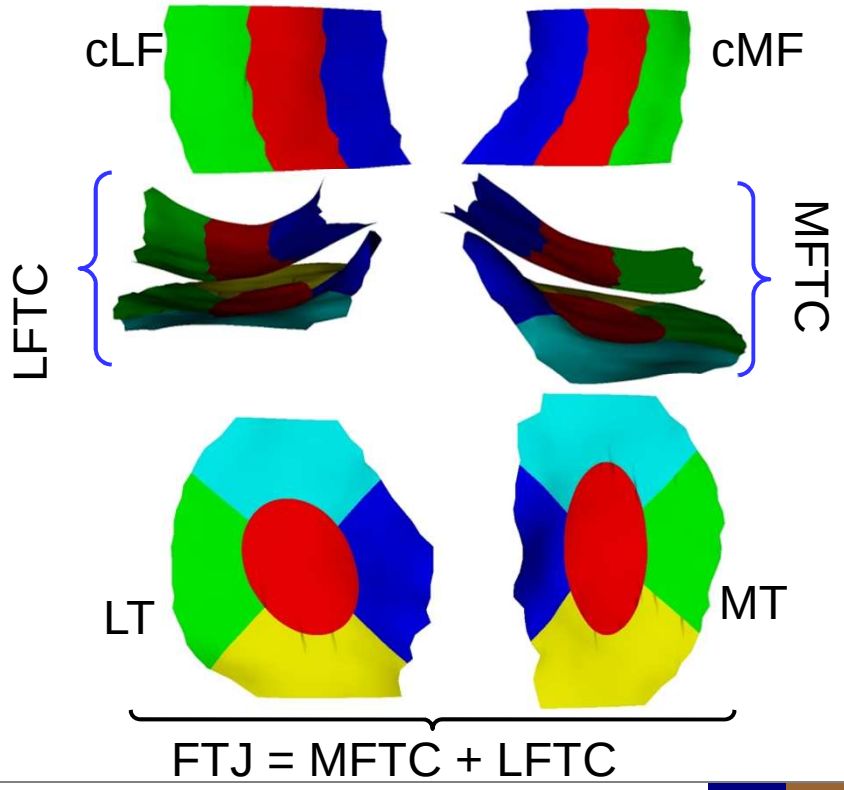


SEGMENTATION & COMPUTATION

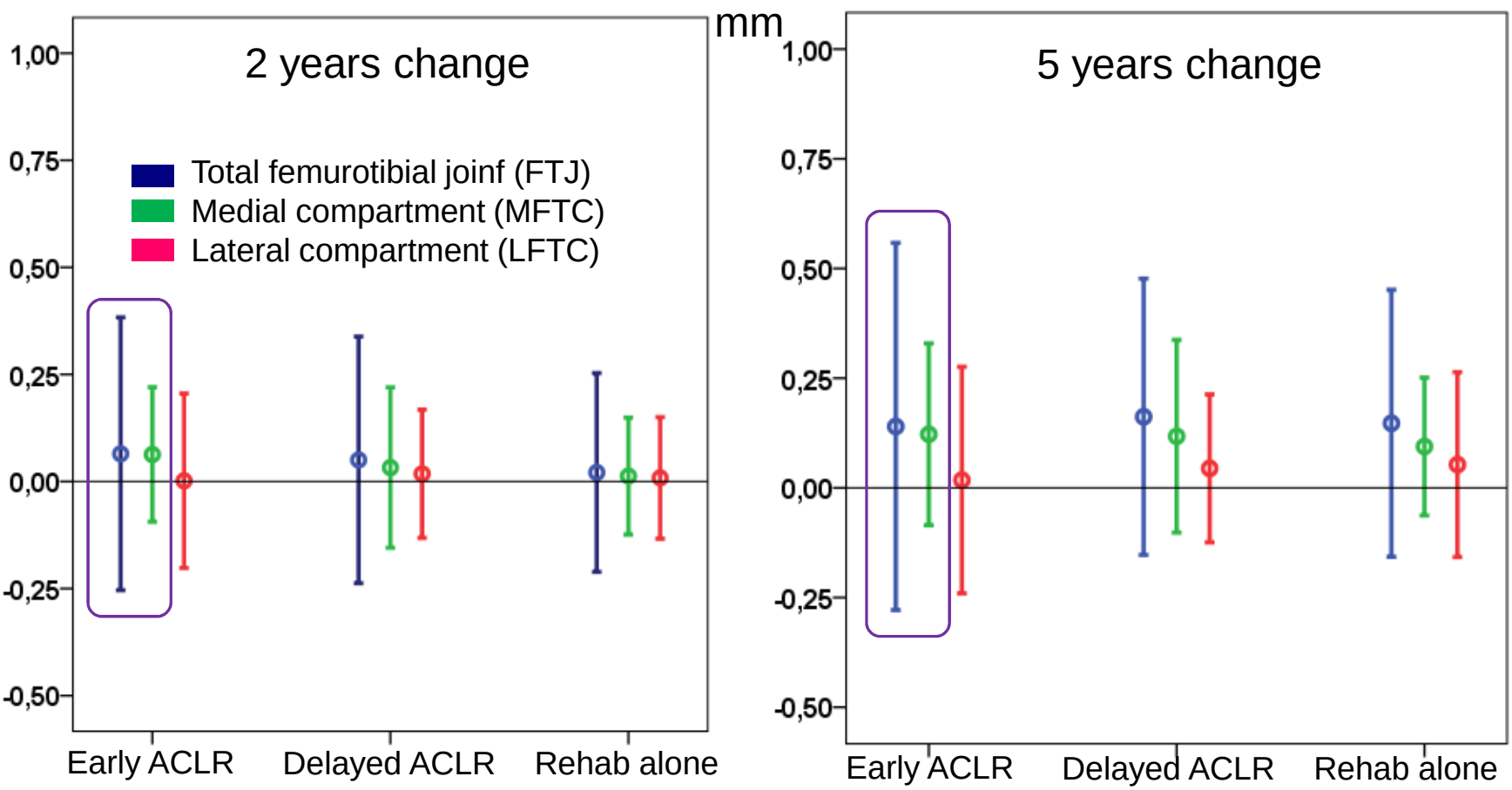
Segmentation of cartilages in femorotibial joint (FTJ):

- Medial and lateral tibia (MT/LT)
- Central 75% of the medial and lateral femoral condyle (cMF/cLF)



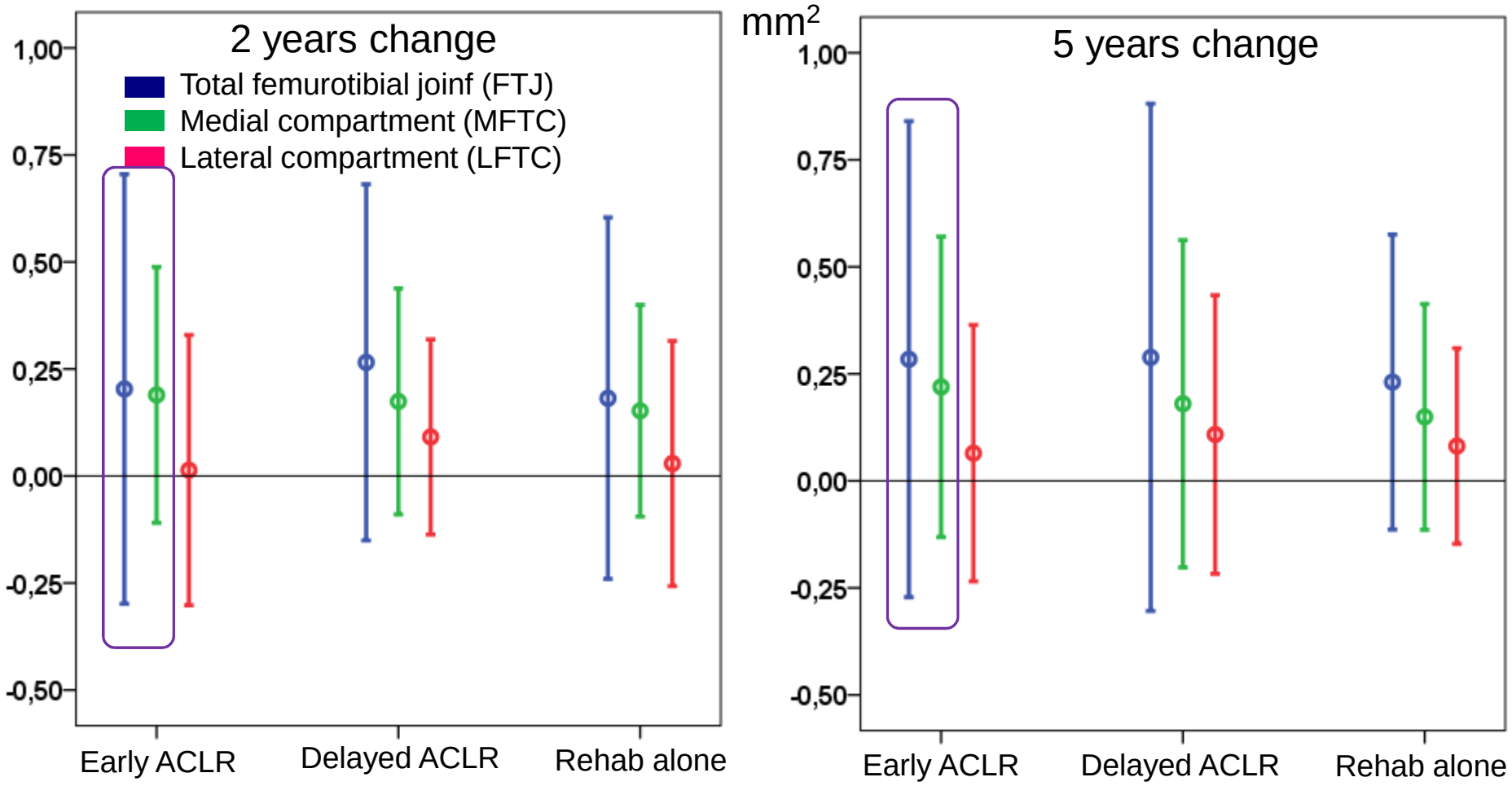


RESULTS – ThCtab

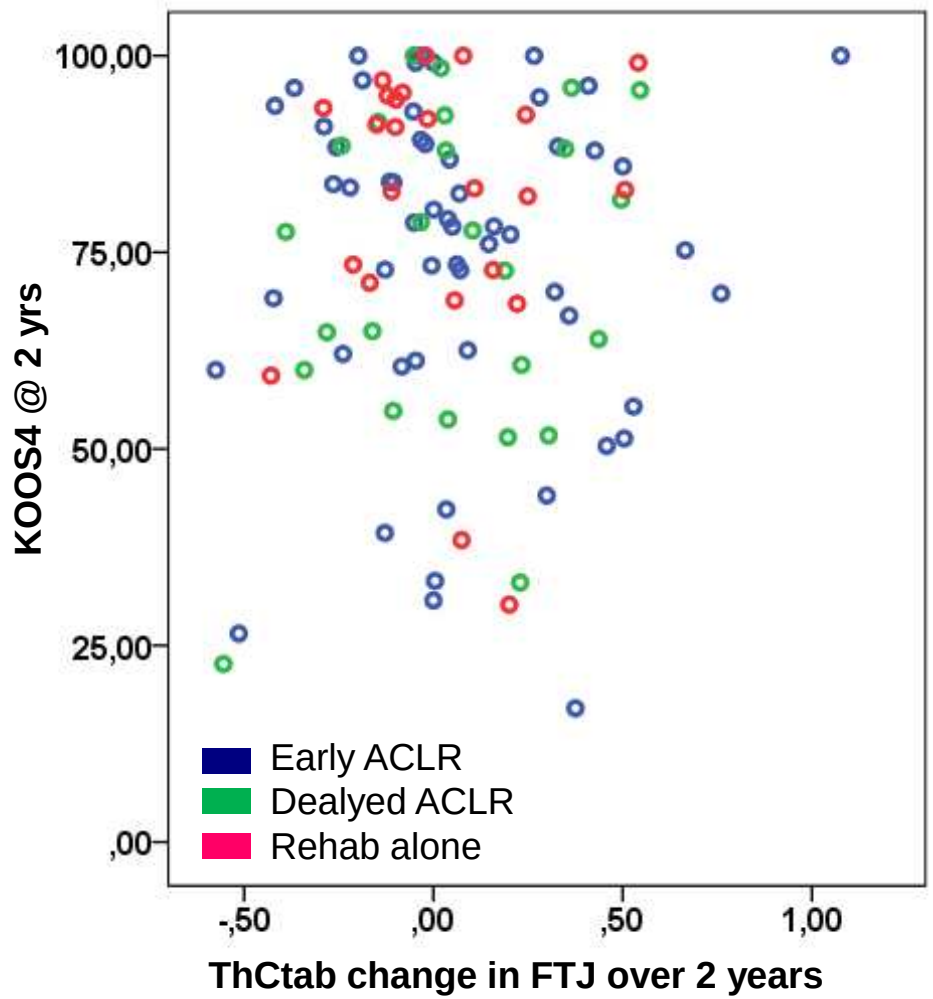


Abstract #10, W Wirth, Friday 11:15 AM

RESULTS – tAB


2 years change
Total femurotibial joinf (FTJ)
Medial compartment (MFTC)
Lateral compartment (LFTC)
1,00
0,75
0,50
0,25
0,00
-0,25
-0,50
Early ACLR
Delayed ACLR
Rehab alone
mm2
5 years change
1,00
0,75
0,50
0,25
0,00
-0,25
-0,50
Early ACLR
Delayed ACLR
Rehab alone

CARTILAGE THICKNESS - CLINICAL OUTCOME



Cartilage thickness @ 2 & 5 years

No significant correlations between
KOOS4 @ 2 & 5 years

and

ThCtab change over 2 & 5 years for
FTJ
MFTC
LFTC

for entire sample
or for any treatment group

SUBCHONDRAL BONE AREA – CLINICAL OUTCOME

Full analysis set

2 years

↑ tAB medial compartment (MFTC) - ↓ $KOOS_4$ at 2 years

(r= -0.21, p=0.03)

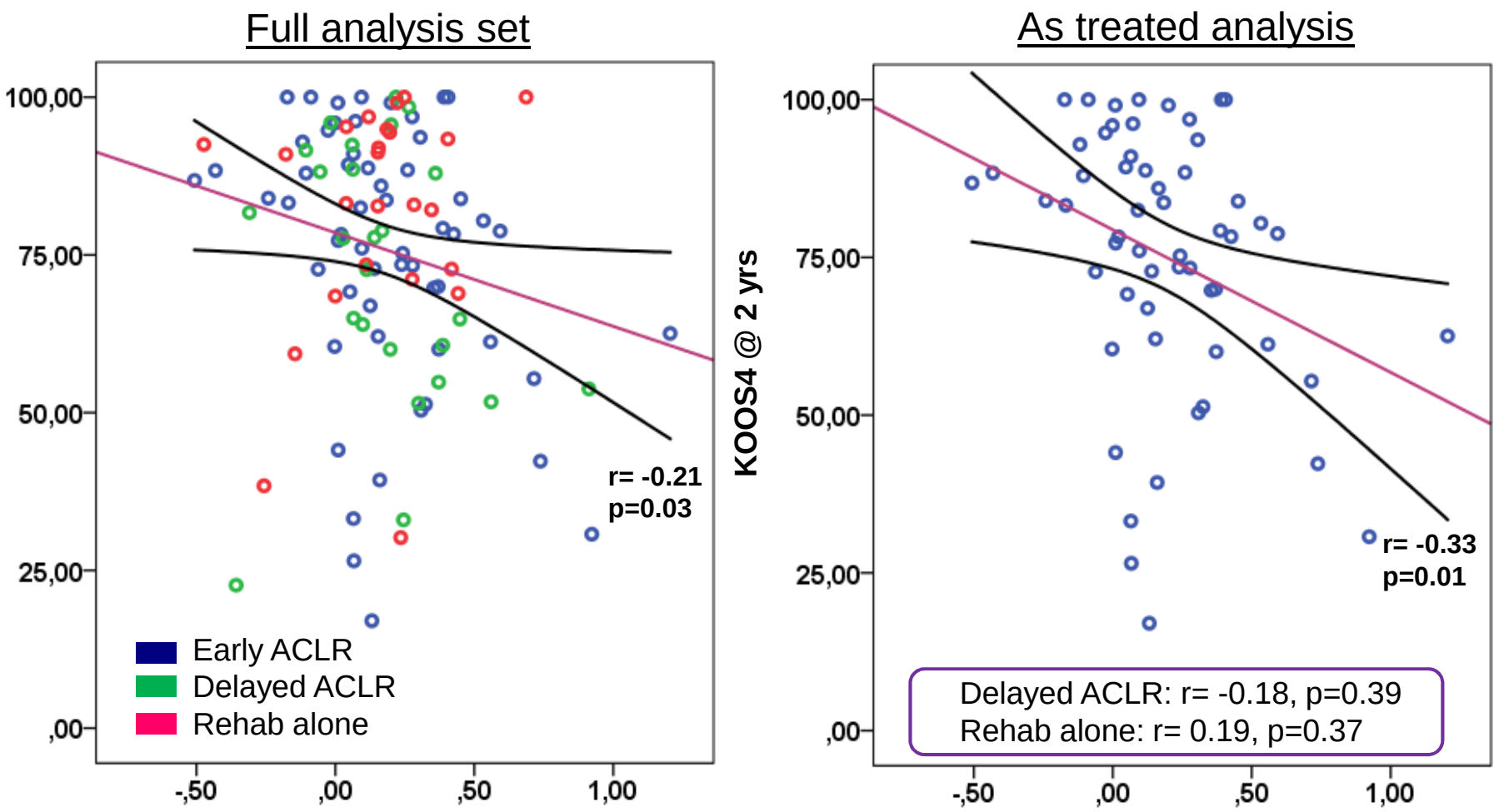
5 years

↑ tAB in total joint (FTJ) - ↓ $KOOS_4$ at 2 years

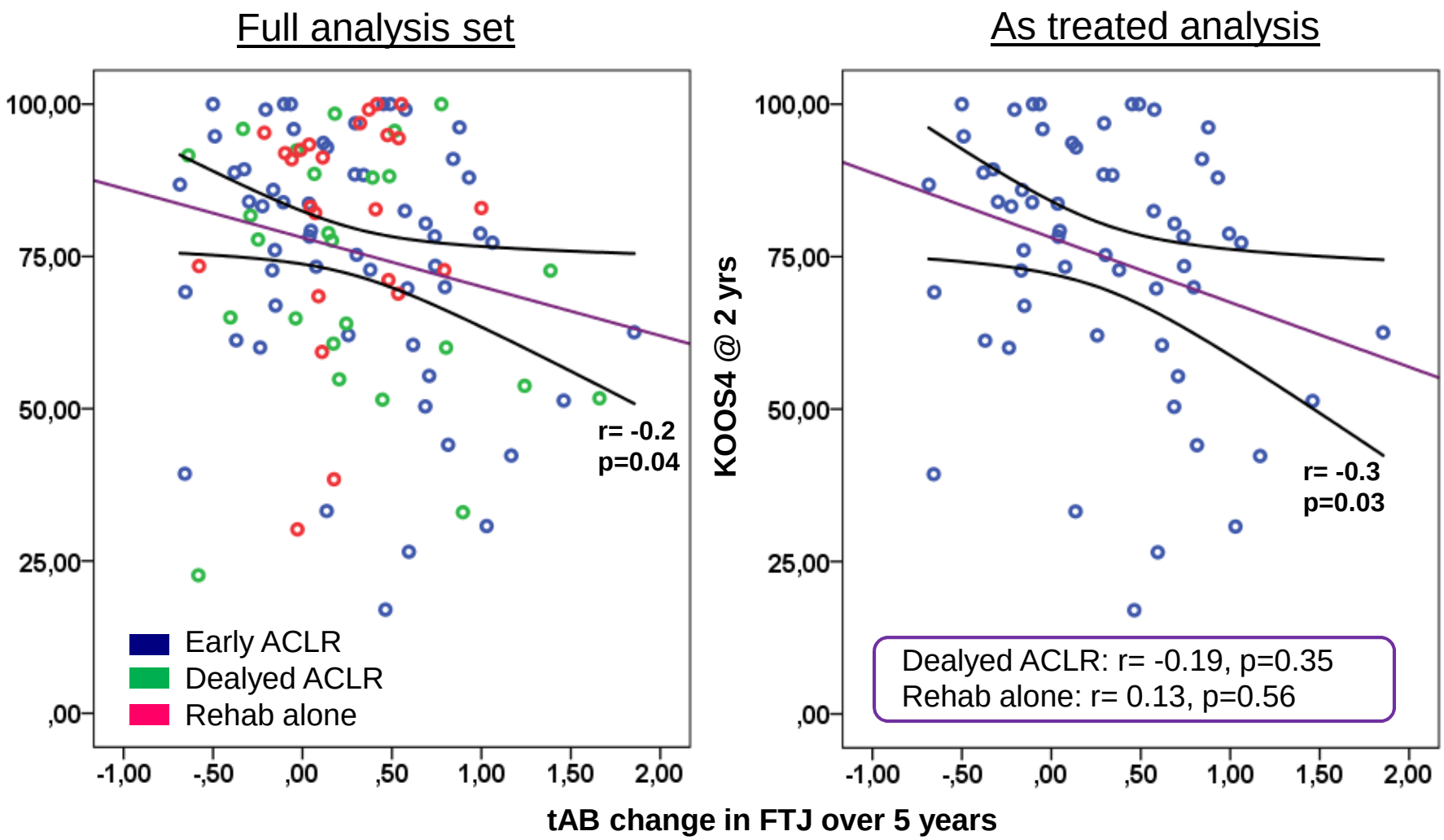
(r= -0.20, p=0.04)

No correlations to $KOOS_4$ at 5 years

MFTC tAB 2 YR CHANGE – KOOS4 @ 2 YRS



FTJ tAB 5 YR CHANGE – KOOS4 @ 2 YRS



SUBCHONDRAL BONE AREA – CLINICAL OUTCOME

As treated analysis (but not in full analysis set)

2 years

Early ACLR

↑ tAB in total joint (FTJ) - ↓ KOOS4 at 2 & 5 years

(r= -0.33, p=0.01 & r= -0.27, p=0.04)

Delayed ACLR & Rehab alone

No relations found

LIMITATIONS

KANON-trial is a treatment RCT – not powered to find predictors

Early ACLR group is twice as big as the other two groups

Symptoms @ 2 & 5 years may not be related to OA

We do not know who will develop ROA or SxOA

CONCLUSION

Increased tAB, but not change in ThC, may be related to worse clinical outcome 2 years after ACL injury

May be especially true for those treated with early ACLR

- where increased tAB of the total femurotibial joint was related to worse clinical outcome at both 2 & 5 years

THANK TO

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