

SPORTS HIP 16

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SPEAKER NOTES

Rintje Agricola

WARWICK orthopaedics

WARWICK orthopaedics

SPORTS INJURY CONFERENCES

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27TH & 28TH JUNE 2016

THE NATIONAL FOOTBALL CENTRE, ST GEORGE'S PARK

www.sports-surgery.org

COURSE CONVENOR



PROFESSOR DAMIAN GRIFFIN

PROFESSOR OF TRAUMA & ORTHOPAEDIC SURGERY

UNIVERSITY OF WARWICK

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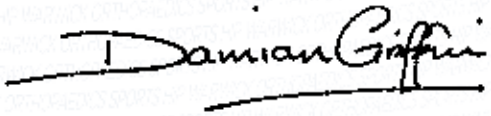
Dear Colleague,

The Sports Hip Conference will run again in 2018 as part of our portfolio of Sports Injury conferences. Some of you may have already attended the Sports Foot & Ankle, Sports Shoulder and and Sports Knee conferences. The dates for the next events will shortly be published on our website
www.sports-surgery.org

The key feature of these Sports Injury conferences is that we explore the latest ideas and most difficult problems in a relatively small group, guided by an expert international faculty.

Please do let us know if you have any thoughts about the meeting or any suggestions as to how we might develop it in the future.

With very best wishes.



PROFESSOR DAMIAN GRIFFIN
PROFESSOR OF TRAUMA & ORTHOPAEDIC SURGERY
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Rintje Agricola



Rintje Agricola studied Medicine at the Erasmus University Rotterdam. At the same University, he received his PhD (cum laude/with honor). His PhD at the department of orhopaedic surgery concerned the role of morphological risk factors in the development of hip osteoarthritis.

Rintje's primary focus was on the relationship between femoroacetabular impingement (FAI) and osteoarthritis but he also studied how FAI hip morphology develops in adolescent boys. Finally, he was involved in studies on the definition of FAI.

During his Phd, he did a fellowship the Nuffield department of orthopaedics, rheumatology and musculoskeletal sciences at the University of Oxford.

After his Phd he went to Doha, Qatar, for a fellowship at the Aspetar orthopaedics and sports medicine hospital on the development of FAI morphology in youth football players. From June 2015 he has been working as a resident orthopaedic surgeon.

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Session 3

TRAINING AND REHABILITATION

Is FAI caused by sport?

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Is FAI caused by sport?

Rintje Agricola

Erasmus MC

ATHLETIC ACTIVITY IN ADOLESCENCE AS AN ETIOLOGICAL FACTOR IN DEGENERATIVE HIP DISEASE

R. O. Murray and Catherine Duncan, London, England

Erasmus MC

Factors associated with cam deformity

- **Gender**
  - females 0-15%, males 15-25%
- **Genetics**
  - Asian vs Caucasian[1], siblings of patients with cam FAI 2.8 more likely to have a cam deformity than the patients' spouses[2]
- **Growth plate orientation**
  - Growth plate orientation towards the femoral neck[3]
- **Athletic activity**
  - High impact sporting activities 89%, non-athletic controls 9%[4,5]

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Growth plate extension associated with cam deformity





Figure adapted from Siebenrock et al. CORR 2004

Athletic activity and cam deformity

- **Prevalence 60-90% in the adult athletic population**
  - Soccer[1,4,5,9], Basketball[3], Track and field[10], Ice hockey[7,11,12], Kapoera[8], American Football[2,6]
  - Higher prevalence in athletes compared with non athletes[3,4]
- **Opportunity for prevention?!**
  - When does the cam deformity develop?
  - How does it develop (loading patterns)?

1. Johnson et al. 2012
2. Kapron et al. 2011.
3. Siebenrock et al. 2011
4. Agricola et al. 2012
5. Gerhardt 2012
6. Nepple et al. 2012
7. Siebenrock et al. 2013
8. Mariconda et al. 2014
9. Lahner et al. 2014
10. Lahner et al. 2014
11. Ayeni et al. 2014
12. Philippon et al. 2013

When do cam deformities develop?



FEYENOORD ACADEMY

- Cam deformities develop around the age of 13 years[1]
- They gradually increase in size during adolescence[2]
- Do not seem to occur after closure of the growth plates[2]
- Bone adaptation in response to athletic activities during skeletal growth?[3]

1. Agricola et al. AJSM 2012
2. Agricola et al. AJSM 2014
3. Agricola et al. Nature rev rheum 2014





Development cam deformity over time



Agricola et al. AJSM 2012
Agricola et al. AJSM 2014
Agricola et al. Nature Rev Rheum 2014
Glyn-Jones et al. Lancet 2015

Bones adapt to mechanical load

Hip rotationplasty



Bones adapt to mechanical load

Hip rotationplasty





Why around the age of 12 years?

Period in which bone is most responsive to exercise

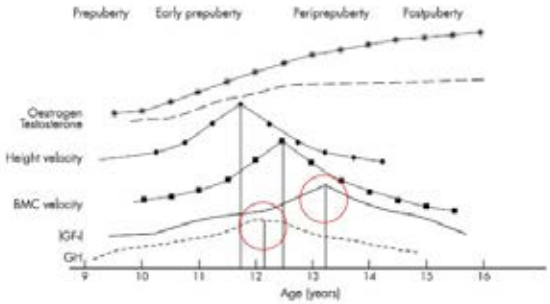
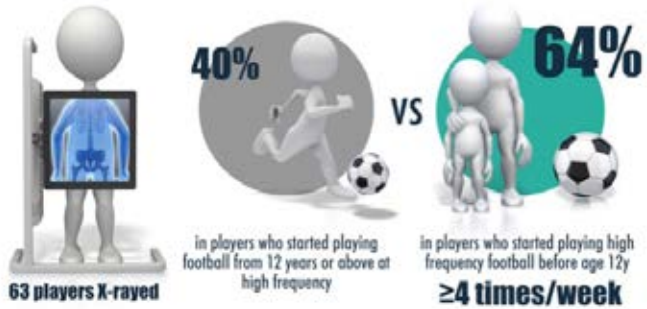


Figure adapted from:
MacKelvie et al.
BJSM 2004

Dose response relationship

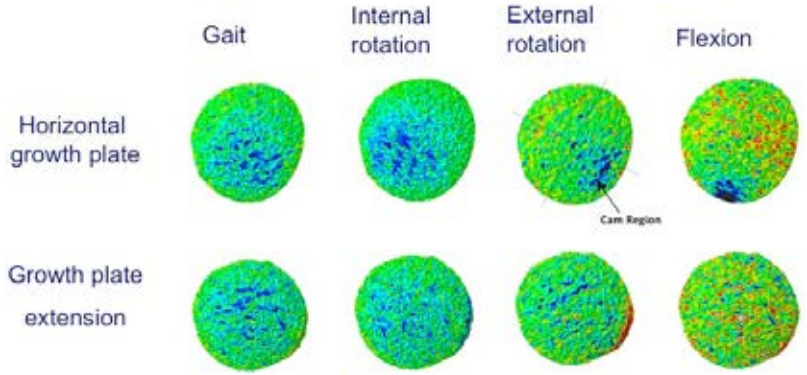


This was also true for a pathological cam deformity (12 vs 30%)

Tak et al. BJSM 2015

Yann Le Meur @YLMSportsScience

Type of loading pattern: FE model



FE model



FE Model = many assumptions

Only one clinical study looking at loading patterns

Dickenson et al. BJSM 2016:
Trail hips more cam morphology than lead hips in elite golfers

Summary development cam deformity

- Cam deformity is highly prevalent in the athletic population
- Age between 12 and 13 years seems critical in boys
- It probably only develops during skeletal maturation
- There might be a dose response relationships between athletic activity during adolescence and development of a cam deformity
- Movements patterns of flexion and external rotation might trigger the formation of cam deformity

Summary development cam deformity

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Erasmus MC

Thank you

Orthopaedics

M.P. Heijboer (MD)

J.A.N. Verhaar (Prof, MD, PhD)

H. Weinans (Prof, MD, PhD)

J.H. Waarsing (PhD)

General practice

S.M.A. Bierma-Zeinstra (Prof,PhD)

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Session 5

FEMOROACETABULAR IMPINGEMENT 1: DIAGNOSIS

What is the natural history of FAI syndrome? Does it cause OA?

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What is the natural history of FAI syndrome? Does it cause OA?

R. Agricola

Erasmus MC

Natural history of FAI

FORCE trial:
FAI and OsteoaRthritis Cohort Study

0 10 20 30 40 50 60 70 >80 **AGE**

Development Cam

First onset of symptoms?

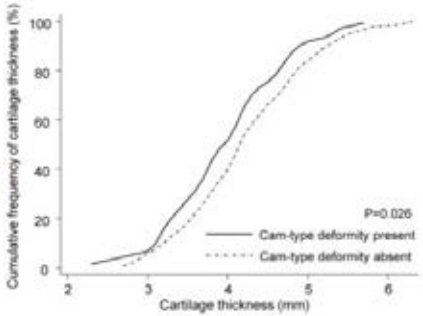
First onset of Intra-articular pathology?

First onset of OA

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Cartilage damage can develop at young age[1]

- 244 Swiss army recruits
- Mean age 19.9 years
- 67 with cam deformity
  - Cartilage layer significantly thinner (0.2 mm)

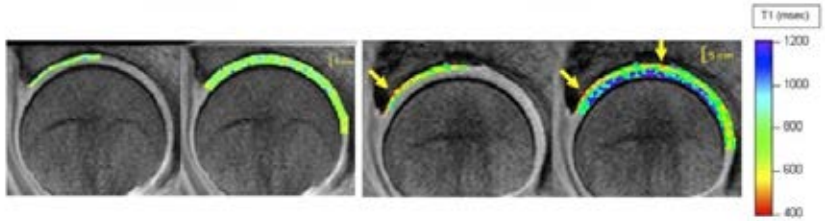


1. Reichenbach et al. A&R 2011

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Correlation size cam deformity and cartilage quality[1]

Normal **Cam**



1. Pollard et al. JBJS Am 2010

Osteoarthritis

Cross sectional and retrospective studies:

Cam deformity: association with OA

Pincer deformity: conflicting

CHECK cohort



Baseline

5 year follow-up





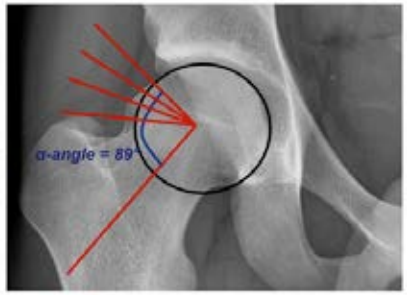
1000 individuals
45-65 years

FAI deformity?

Osteoarthritis?

α-angle >60° = Cam deformity[1,2]

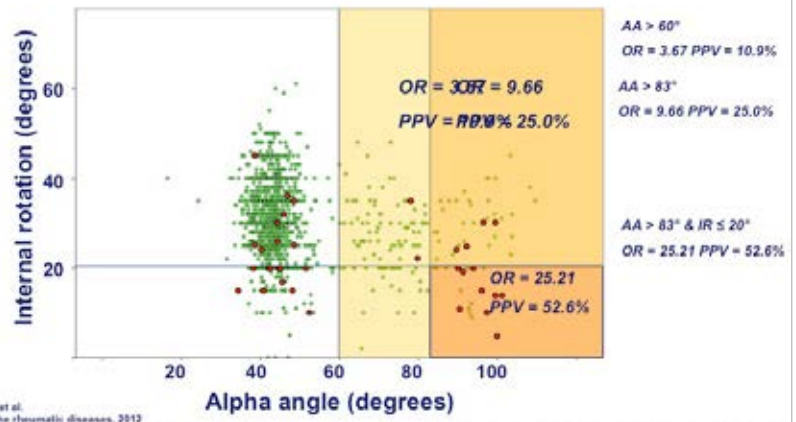




1. H.P. Notzli et al. Journal of Bone and joint Surgery 2012

2. K. Agricola et al. Osteoarthritis & Cartilage 2013

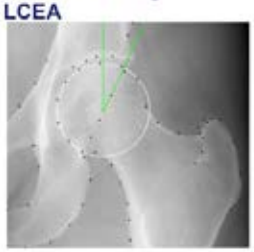
Cam deformity: important risk factor hip OA[1]



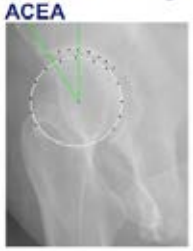
1. Agricola et al. Annals of the rheumatic diseases, 2012

Pincer deformity not associated with OA

Lateral coverage:
LCEA



Anterior coverage:
ACEA



Pincer deformity not associated with development of OA
ORs 0.34 – 0.77[1]

Agricola et al. OA&C 2013

Chingford cohort

1003 women mean age of 55 years at baseline. Follow-up 19 years

2011 Nested case control[1]

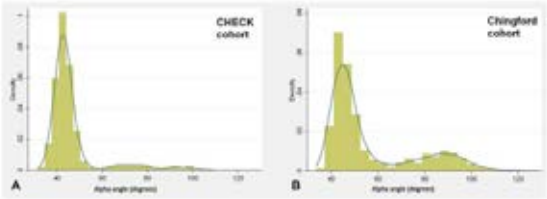
- 25 THR cases vs 243 controls
- Alpha angle higher in THA cases (62°) than in controls (46°)
- OR of 1.05 (p=0.001) for every degree increase in alpha angle.
- LCEA significantly lower in THA cases 29 vs 34, p=0.001

2014: Prospective study[2]

- OR 1.05 for each degree in alpha angle above 65 degrees radiographic hips OA (K&L≥2)

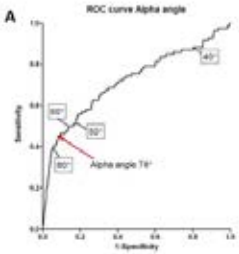
Nicholls et al. A&R 2011 2. Thomas et al. OA&C 2014

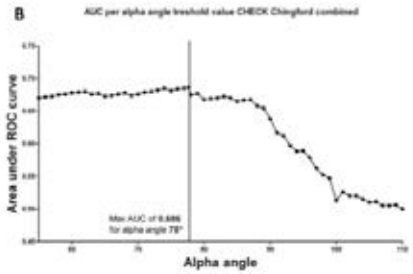
Defining the presence of cam deformity by the alpha angle[1]



Alpha angle >60° = cam

Defining the presence of cam deformity by the alpha angle[1]





Alpha angle >78° = pathological cam

Rotterdam study

- 11000 participants → 4438 without definite radiographic OA included at baseline
- Male and female aged 55 years or older
- Follow-up 9.2 years
- Baseline: cam deformity (alpha angle >60) and pincer deformity (LCEA>40)
- Outcome: Incident OA (K&L ≥2 or THR)

Hosnijeh et al. A&R accepted for publication

Rotterdam study

All participants:

Cam **OR 2.11** (95% CI 1.6 – 2.9), Pincer 1.24 (95% CI 0.9 – 1.7)

Stratified by:

Age:

≤65 years: Cam **OR 3.07** (95% CI 2.0 – 4.6), Pincer 1.37 (95% CI 0.9 – 2.0)

>65 years: Cam OR 1.36 (95% CI 0.9 – 3.4), Pincer 1.10 (95% CI 0.7 – 1.7)

Sex

Male: Cam **OR 2.40** (95% CI 1.6 – 3.6), Pincer 1.33 (95% CI 0.8 – 2.3)

Female: Cam **OR 1.71** (95% CI 1.0 – 2.9), Pincer 1.21 (95% CI 0.9 – 1.7)

Hosnijeh et al. A&R accepted for publication

Conclusion

- Natural history of FAI is unknown
- A cam deformity is present from 12-13 years of age
- Cartilage damage can occur even <20 years
- Cam deformity is related with rapid development of hip OA
  - Individuals >45 years and AP radiographs only
- Pincer deformity (LCEA >40°) is not associated with hip OA

Thank you

Orthopaedics

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