Association of Femoroacetabular Impingement with Femoral Head Cartilage Volume : *A pathway to Hip Osteoarthritis*



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SPHPM – Summer Research Project 2013/14

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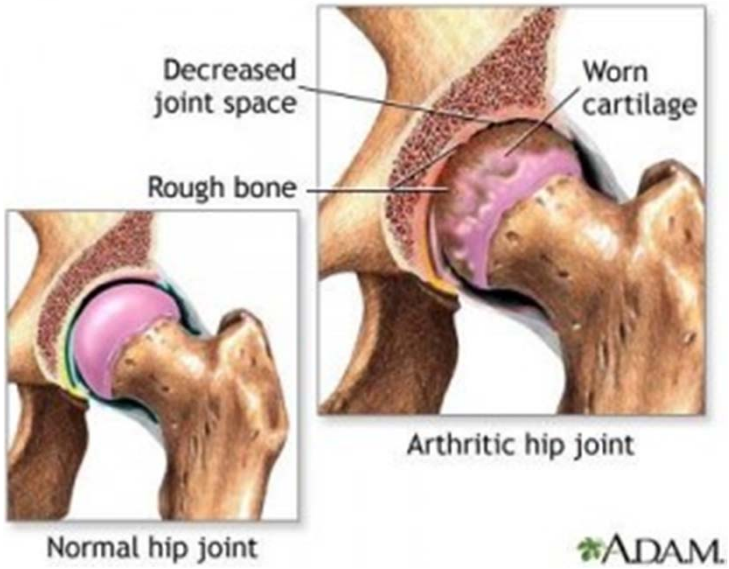
Outline

- Short Video
- What is Hip OA?
- What is FAI?
- Research (Findings!)
- Thanks!

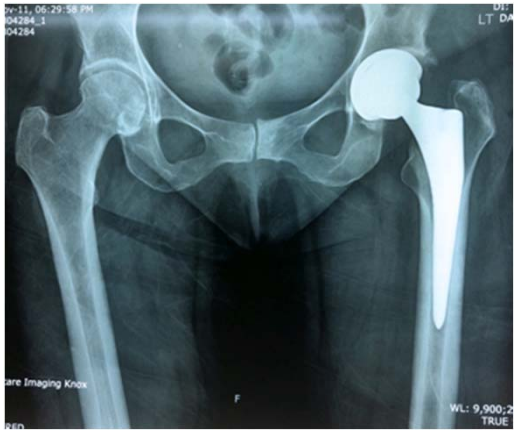


What is Hip Osteoarthritis?

- **Loss of cartilage**
  - Leading to pain and disability
- **No treatment can <u>reverse</u> cartilage loss**
  - Surgery: Total Joint Replacement

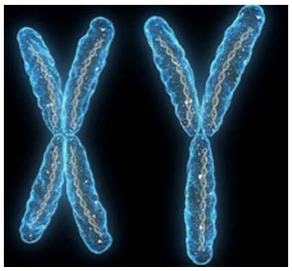


- Affects **1 in 4** people in lifetime *(*Koch GG, et al. 2010)
- Cost **> $1.6 billion** per year *(AIHW, 2012)*



Risk factors for Hip OA

- Multifactorial risk factors:
  - Genetics
  - Aging
  - Females
  - Metabolic factors (Obesity, smoking)
  - **Biomechanical Factors**
    - **(Hip bone geometry, FAI)**







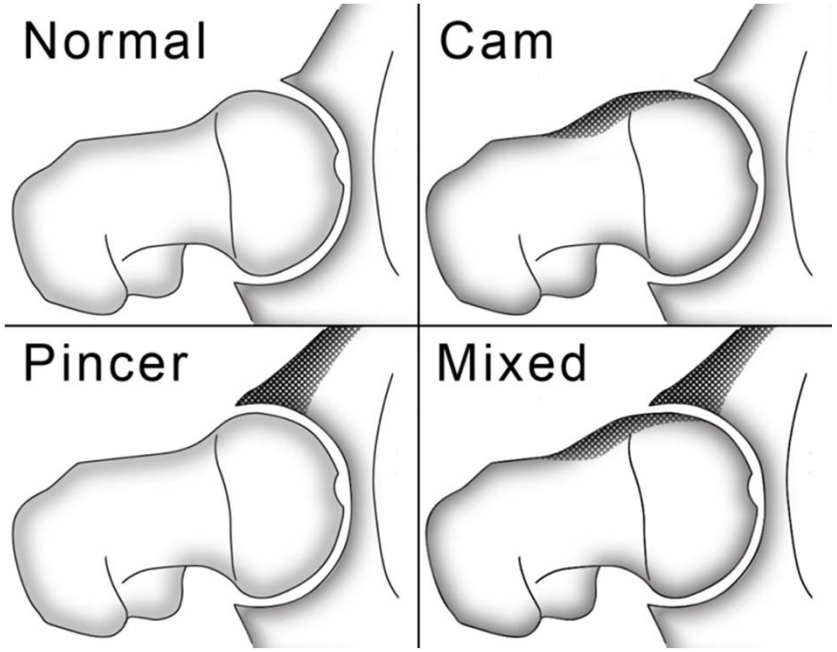


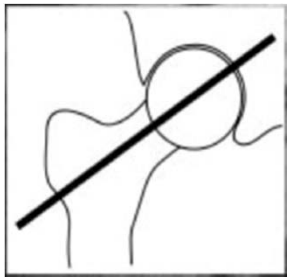
Risk factors for Hip OA

- *"Tomic will have surgery during the week in Melbourne to repair the tear, related to a **femoroacetabular impingement (FAI)** that has restricted his athleticism." – Sydney Morning Herald, Jan 2014*



What is Femoroacetabular Impingement (FAI)?



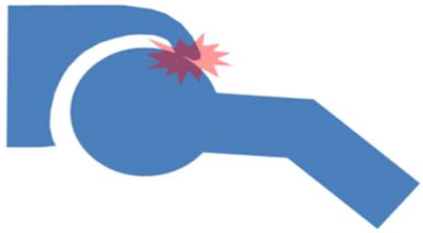


Oblique axial plane

Hip: ball & socket joint

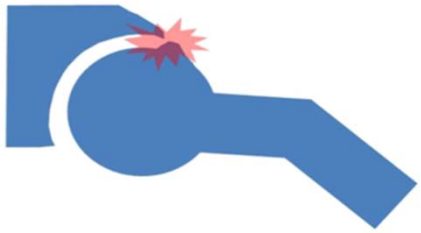
Pincer
Acetabulum too deep

Bone spur on labrum



CAM
Femoral head aspherical

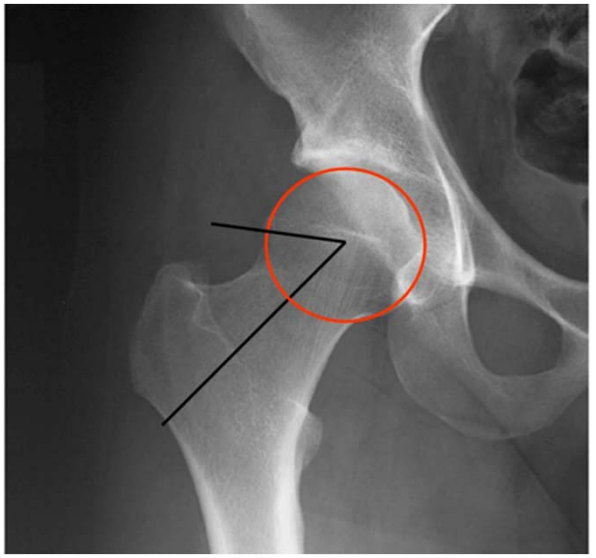
Misshapen femoral head



Study Aims

- To examine the association of FAI with femoral head cartilage volume in adults
- To find if factors such as age, gender, BMI is associated with FAI





Patient Cohort

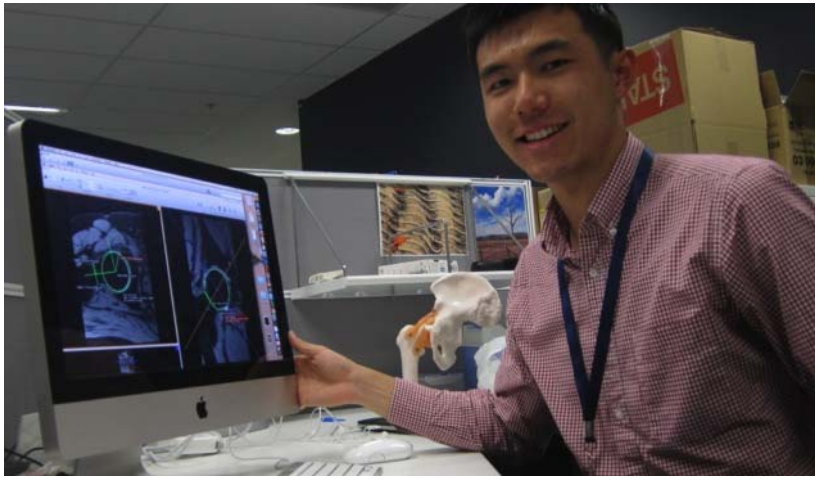
- Melbourne Collaborative Cohort Study
  - 142 asymptomatic subjects recruited from 2008-2009
    - Age 50-79 years old.
    - Exclusion criteria:
      - Hip OA, recent hip pain, malignancy, arthritis, contraindication to MRI
- 19 subjects with hip osteoarthritis also recruited

Epworth HealthCare

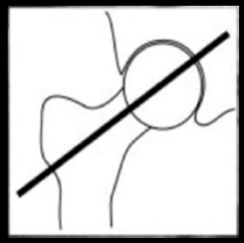
easternhealth
GREAT HEALTH AND WELLBEING

Methods

- Measures of FAI from hip MRI
  - CAM = non-spherical hip head
  - Pincer = hip too deep in socket (acetabulum over-coverage)
- All measurements taken at least twice
  - Intraclass correlation co-efficient (0.97-0.99)
- Previously measured
  - Cartilage volume (mm3)
- Statistical analysis

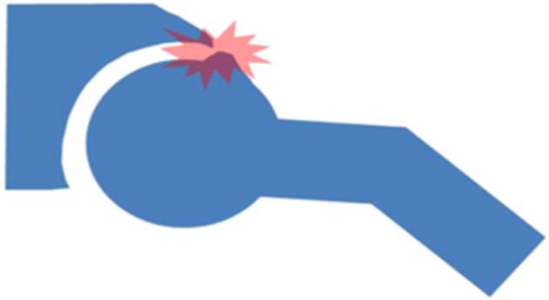


CAM & Pincer Impingement



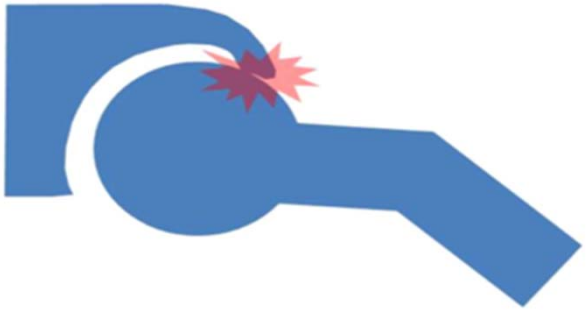
CAM
Femoral head aspherical

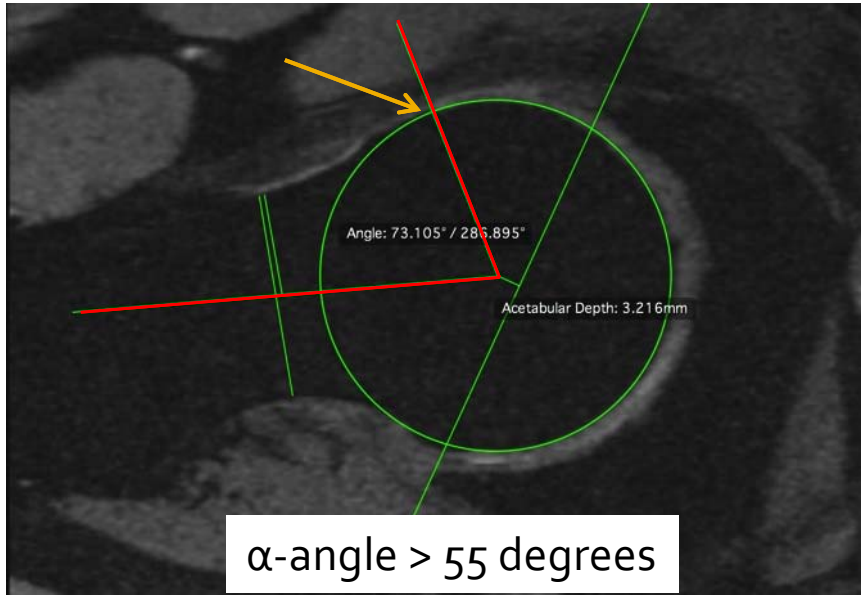
Misshapen femoral head



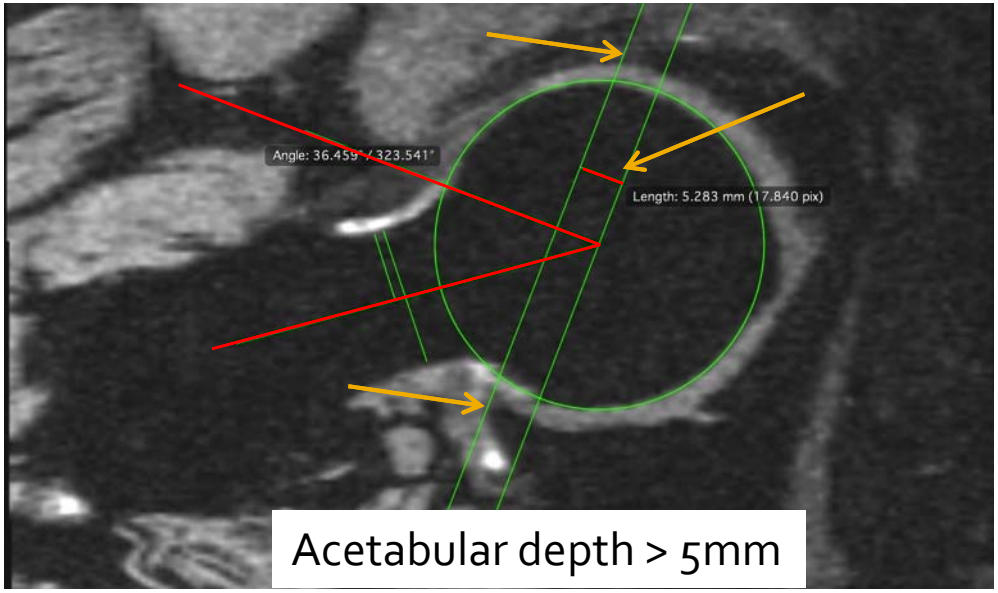
Pincer
Acetabulum too deep

Bone spur on labrum





α-angle > 55 degrees



Acetabular depth > 5mm

Results: Subject Characteristics

Characteristic	Non-OA (n=142)	Hip OA (n=19)	p-value
Age (years)	66.8 ± 7.4 years	59.5 ± 7.6 years	< 0.001
Females n,(%)	79 (56%)	11 (58%)	0.85
BMI (kg/m^2)	27.67 ± 4.80	27.2 ± 4.8	0.73
Hip cartilage volume (mm^3)	**3343 ± 808**	**1763 ± 321**	**< 0.001**
Cam Impingement	**Alpha angle: 52.3 ± 9.8 degrees**	**Alpha angle: 74.8 ± 20.6 degrees**	**< 0.001**
Pincer Impingement *(smaller A.D = deeper)*	Acetabular depth: 3.8 ± 2.5 mm	Acetabular depth: 3.0 ± 2.8 mm	0.21

Data are presented in mean (SD) except for sex which is presented in number of subject (%within sex)
Independent Samples T test was performed to compare means between male and female

Results: Association of CAM and Pincer measures with hip cartilage volume

Study factors	Non – OA Regression Coefficient* (95% CI)	P value
Cam Measurements (Aspherical hip head)		
Alpha angle	-17.5 (-26.4, -8.5)	**<0.001**
Pincer Measurements (Overhanging acetabulum)		
Acetabular depth	102.9 (56.9, 149.0)	**<0.001**

↑α-angle (Cam)
aspherical hip head

= CARTILAGE LOSS

↑A.D (Pincer)
Hip too deep

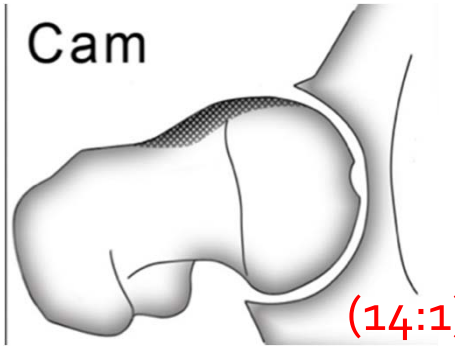
* Multivariate analysis, adjusted for age, gender, BMI and MRI centre

Results: Is it possible to predict FAI?

(Age, gender, BMI)

Cam Factors

(Aspherical hip head)

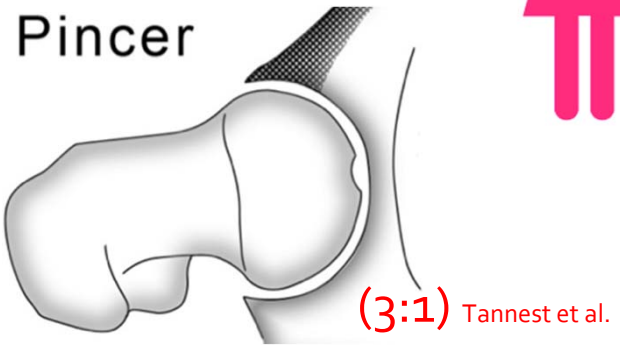


(14:1) Tannest et al.

- Male gender significantly associated with aspherical hip head (p<0.001)
  - ↑ *Alpha angle*
  - ↑*Anterior offset*
  - ↑ *offset ratio*

Pincer Factors

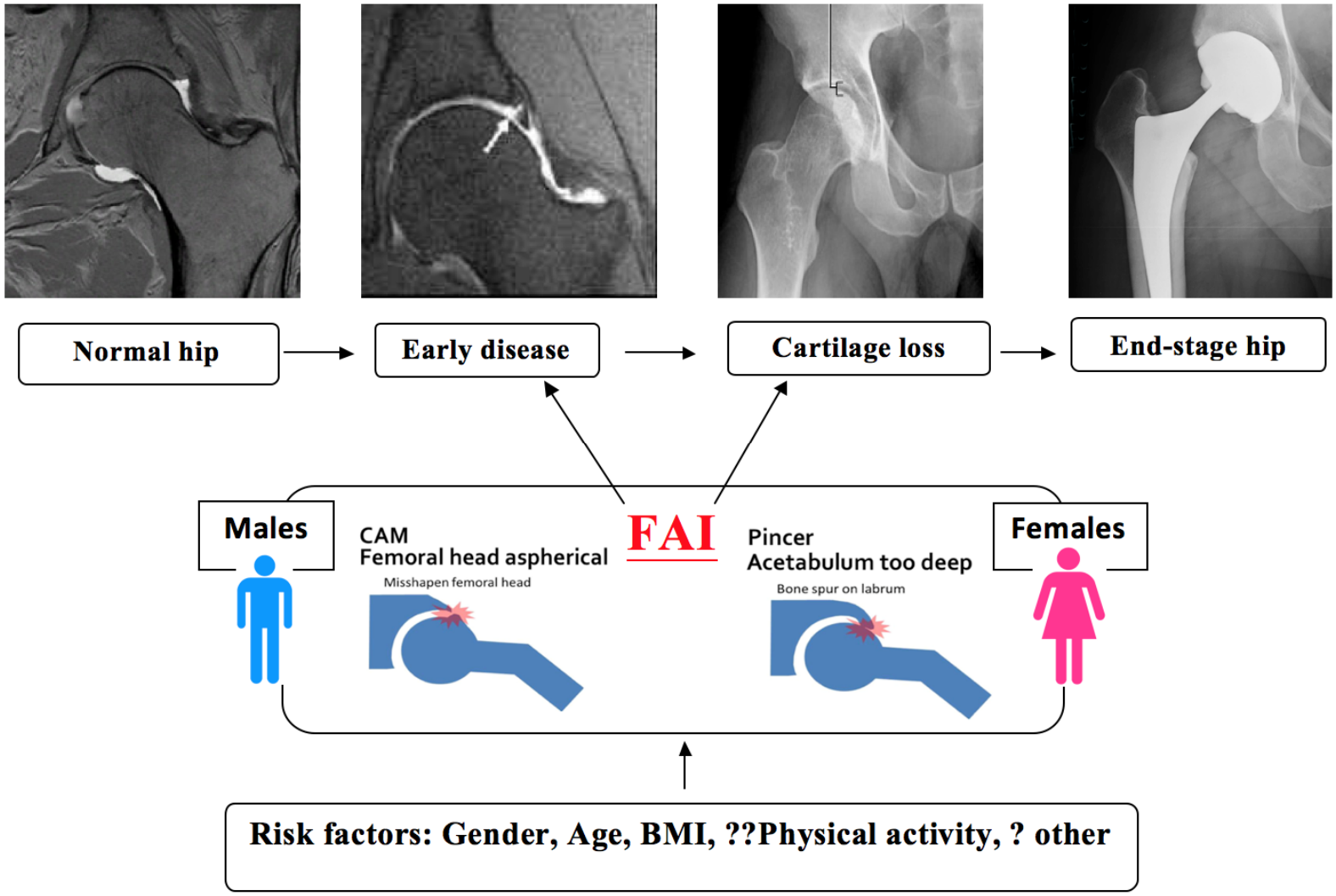
(Overhanging acetabulum)



(3:1) Tannest et al.

- Female gender associated with overhanging acetabulum (P<0.01)
  - ↑ *Acetabular depth*

Explanation of the findings: *Pathway to disease*



Limitations



- Cross-sectional study
  - Longitudinal data required to confirm
- Only n=19 for hip OA
- STRENTHS
  - Sensitive imaging modality (MRI)
  - Larger non-OA cohort
    - Previous studies have been with Xray
    - … and with smaller sample size



Conclusions

- Hip joint impingement associated with ↓hip cartilage volume
- FAI has strong gender dispositions
- Need longitudinal studies to confirm understanding factors associated with early FAI
- May lead to novel approaches to prevention and treatment of hip OA!



Thank you!



- Musculoskeletal Research Team
  - Prof. Flavia Cicuttini, Dr. Yuanyuan Wang, A/Prof. Anita Wluka, Dr. Andrew Teichtahl
- Summer Project Coordinators
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- SPHPM