Impact of Aging and Knee Osteoarthritis on Lower Limb Alignment and CPAK Classification: Gender Differences in a Japanese Cohort

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COI DISCLOSURE

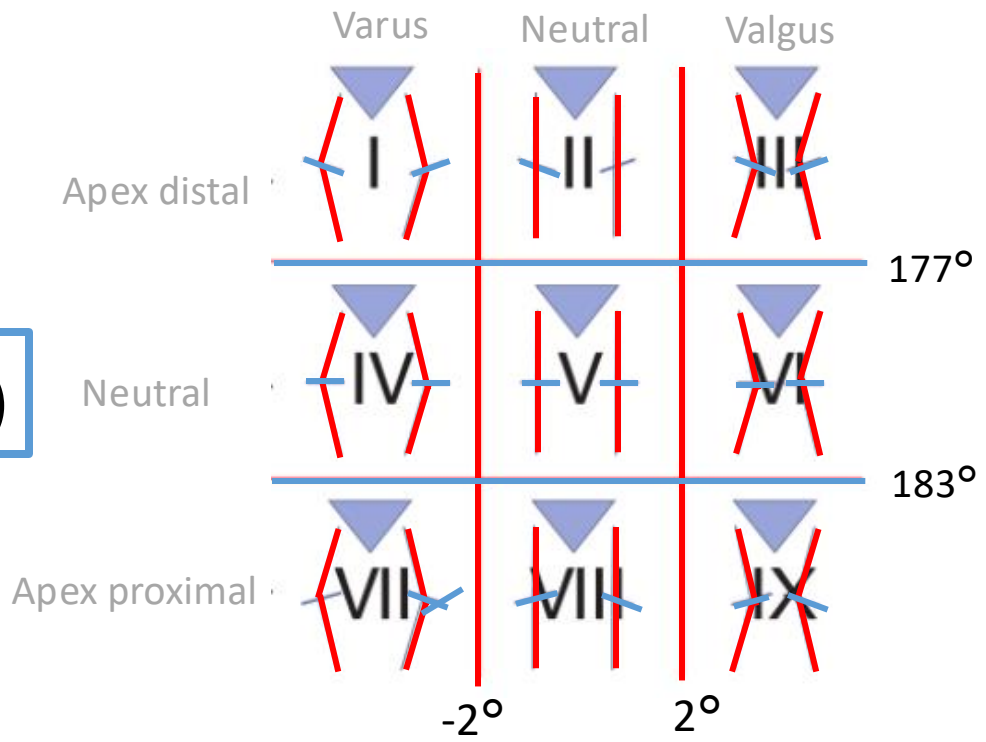
Name of the presenter: Kento Harada

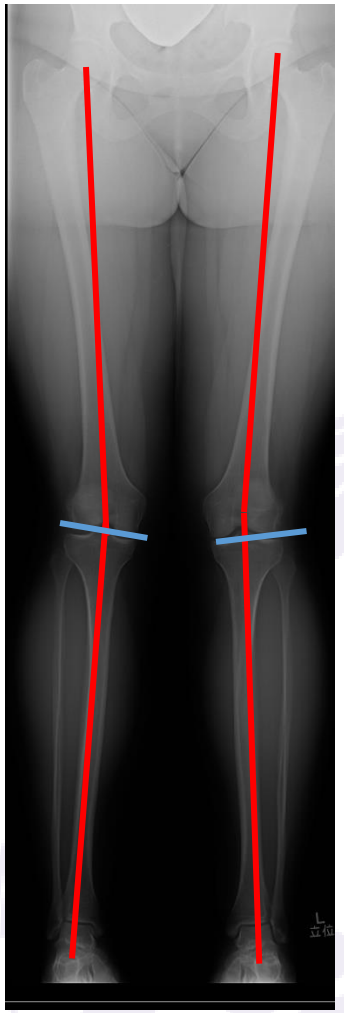
I have no conflict of interests related to this presentation.

CPAK classification (CPAK: Coronal Plane Alignment of the Knee)

aHKA (arithmetic HKA)

JLO(Joint Line Obliquity)





Type Ⅲ

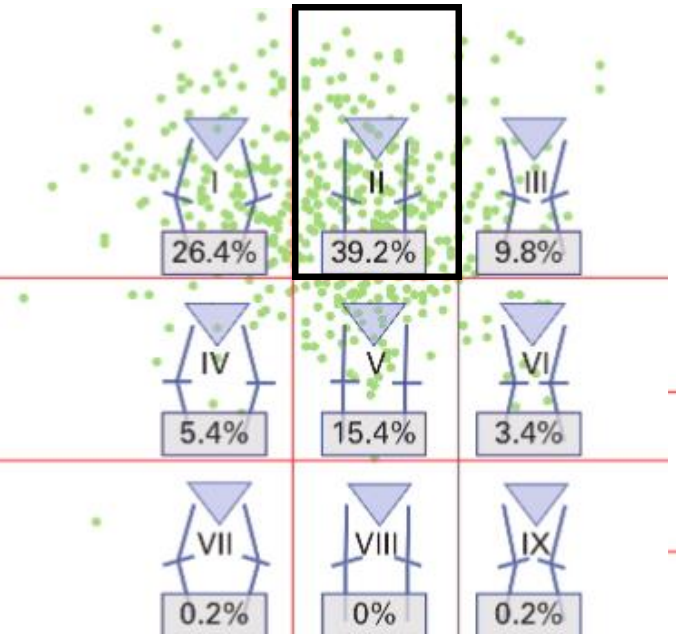
- ✓ Divides lower limb alignment and joint plane inclination into **9** types based on **aHKA** and **JLO**

(MacDessi, 2021)

Radial differences of CPAK distributions

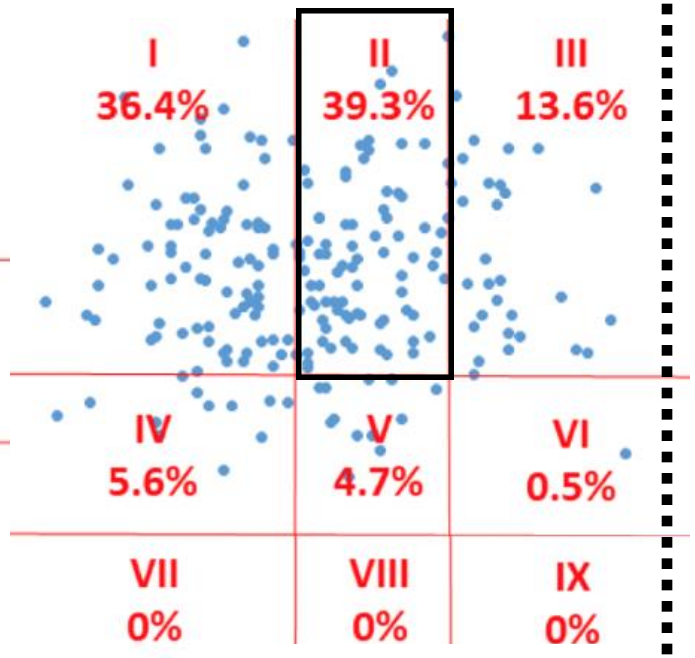
➢ Young age without knee OA

Belgium



(MacDessi, 2021)

Taiwan

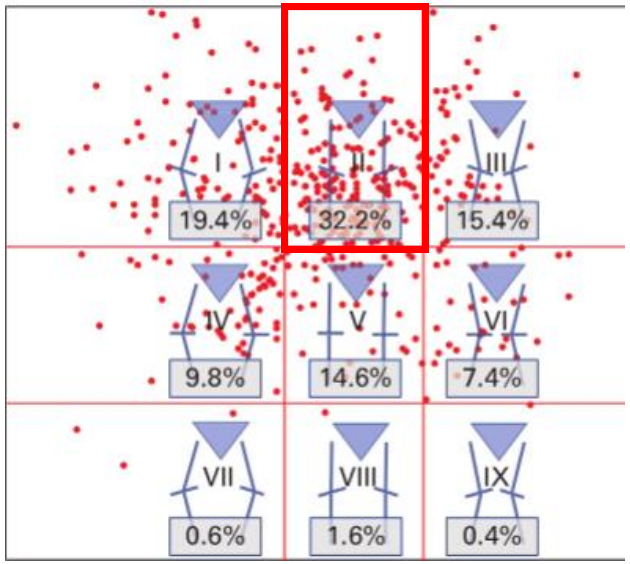


(Hsu, 2022)

✓ Similar distribution

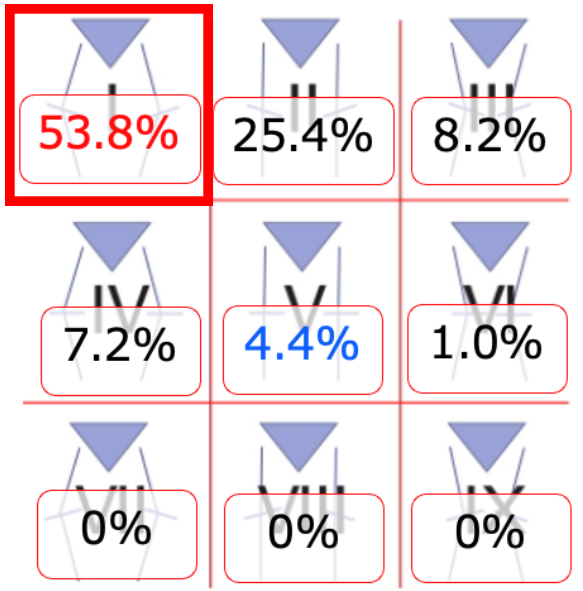
➢ TKA cases

Australia



(MacDessi, 2021)

Japan



(Toyooka, 2022)

✓ Different distribution

*OA: Osteoarthritis

Objective

➢Belgium vs Taiwan　　Young ages without OA → **similar**

Same distribution in Japanese young ages?

＋OA

＋Aging

How do aging, OA, and gender affect Japanese CPAK classification?

➢Australia vs Japan　　TKA cases → **different**

Aim of study

To compare **the effects of age and knee OA** on coronal lower limb alignment and CPAK classification in **Japanese male and female**

Method: Patients

✓Nov. 2020 – Dec. 2022

✓Patients who visited our hospital with knee complaints

Classified into 3 groups according to age and progressive OA

Group A	Group B	Group C
20-49y/o Without knee OA (KL* grade 0-2)	50-y/o Without knee OA (KL grade 0-2)	50-y/o With knee OA KL grade **3,4**

50 patients in each group by gender

↓

Total **300** patients were included

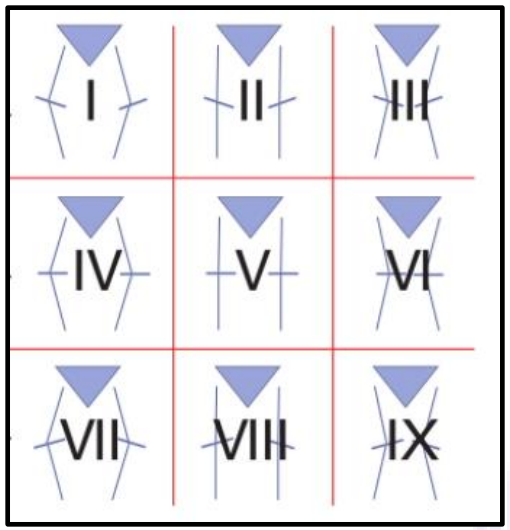
*KL: Kellgren-Laurence classification

Method: Measurement

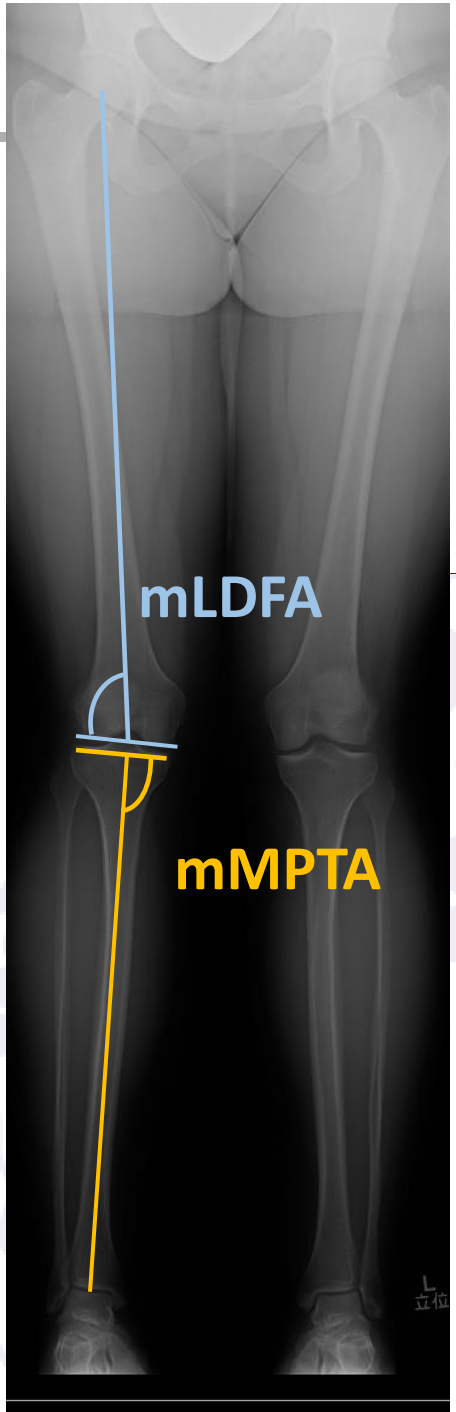
① Measured **mLDFA** and **mMPTA** in the standing whole-leg plain radiographs

② Calculated **aHKA** (mMPTA−mLDFA) and **JLO** (mMPTA＋mLDFA)

③ Classified according to CPAK classification



④ Compared the groups by t-test and clarified the gender difference



Results: Radiographic Measurement

		Group A 20-49 y/o without OA	Group B 50- y/o without OA	Group C 50- y/o with OA	p-Value A vs. B	p-Value B vs. C
Male	mLDFA	86.0 ± 1.7	87.1 ± 1.6	88 ± 2.2	0.003	0.001
	mMPTA	85.3 ± 2.4	85.8 ± 2.3	84.5 ± 2.7	0.359	0.124
	aHKA	−0.7 ± 2.8	−1.3 ± 2.4	−3.5 ± 3.7	0.263	0.001
	JLO	171.3 ± 3.1	172.8 ± 3.2	172.5 ± 3.2	0.292	0.584
Female	mLDFA	86.5 ± 2.1	86.9 ± 2.2	88.1 ± 2.2	0.439	0.008
	mMPTA	86.5 ± 1.9	85.7 ± 2.3	85.0 ± 2.3	0.049	0.004
	aHKA	0.0 ± 2.5	−1.2 ± 3.2	−3.6 ± 2.9	0.018	0.001
	JLO	173.1 ± 3.1	172.5 ± 3.0	173.1 ± 3.3	0.408	0.389

Results: CPAK type distribution –male–

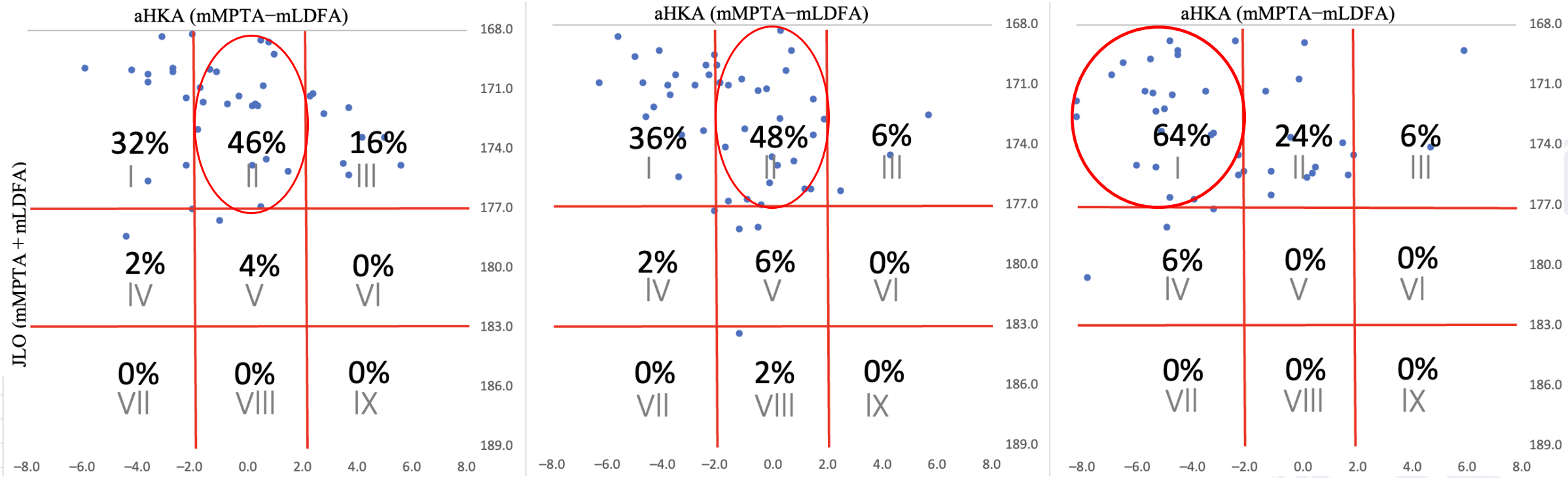
GroupA
20-49 y/o without OA

+Age

Group B
50- y/o without OA

+OA

Group C
50- y/o with OA



- Group A and B: similar distribution
- Most common category changed from **type II to type I** with **OA progression**

Results: CPAK type distribution –female–

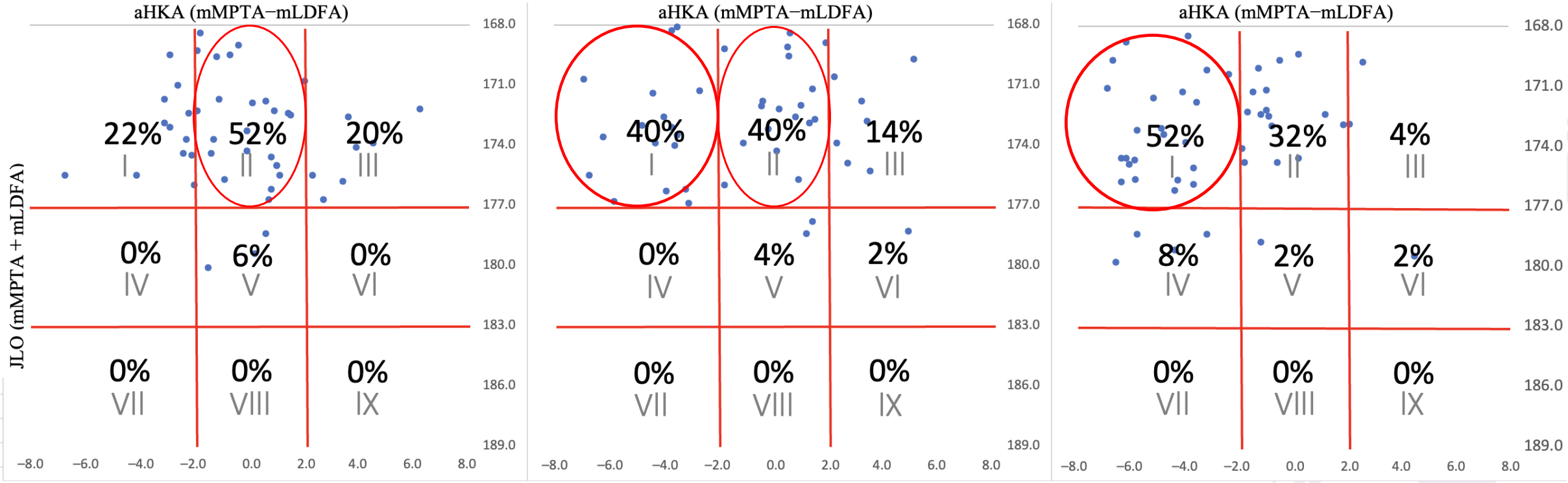
GroupA
20-49 y/o without OA

+Age

Group B
50- y/o without OA

+OA

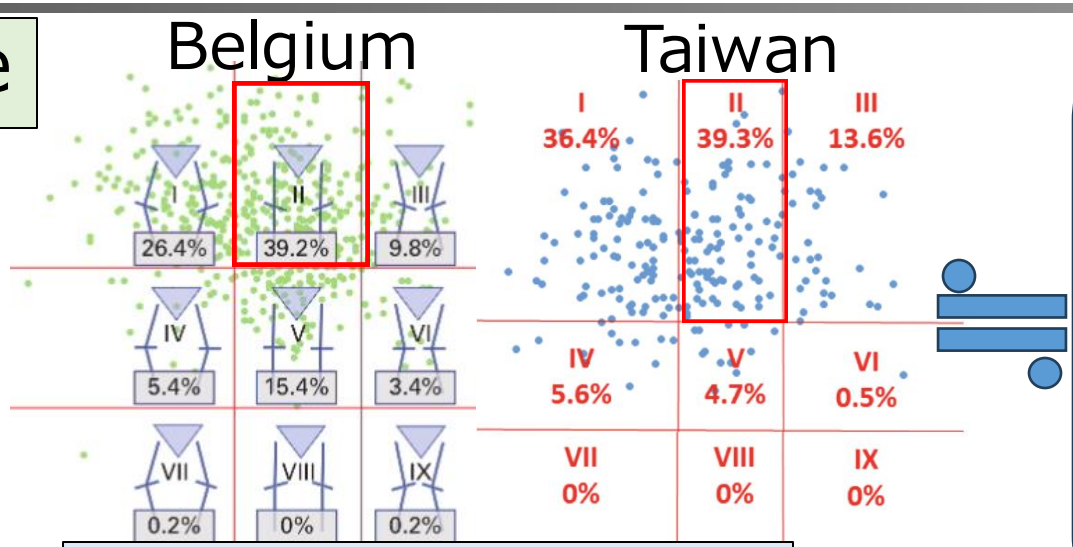
Group C
50- y/o with OA



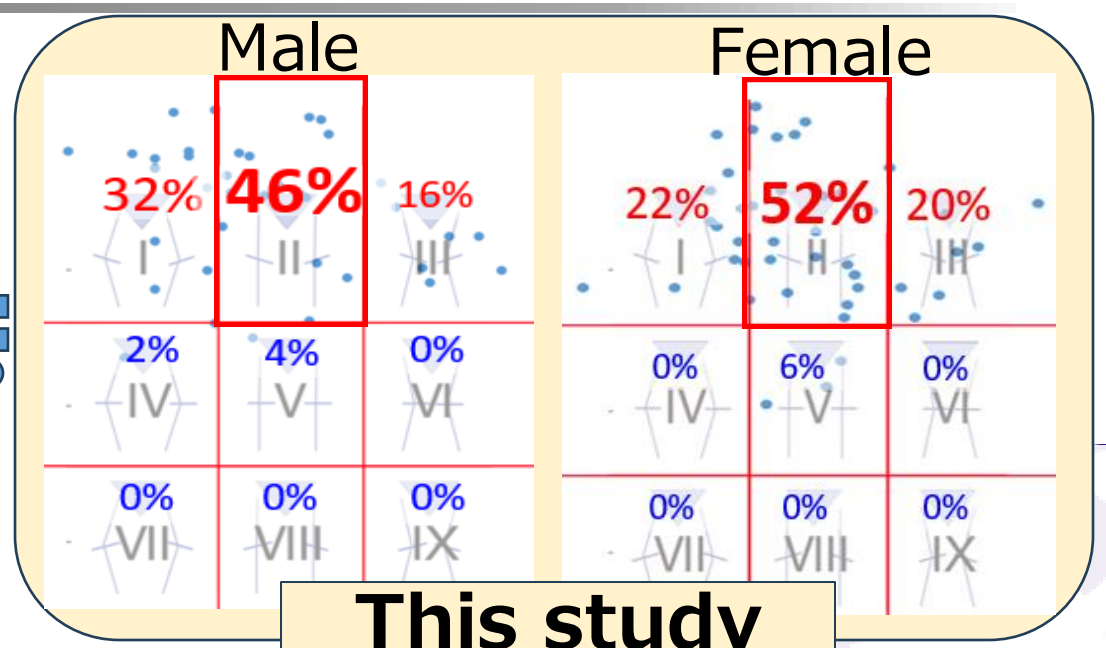
- Most common category changed from **type II to type I** with **aging** and **OA progression**

Discussion: CPAK distribution compared to other reports

Young age

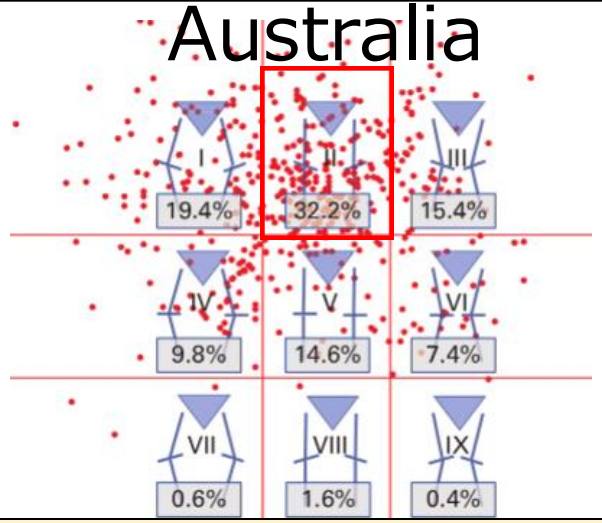


Similar distribution

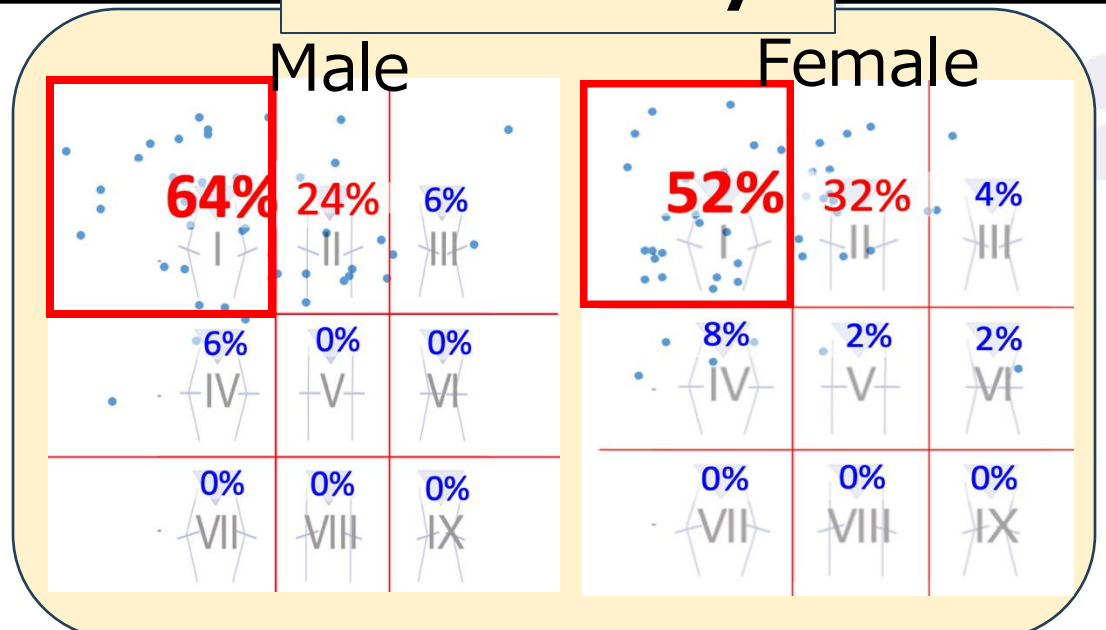


This study

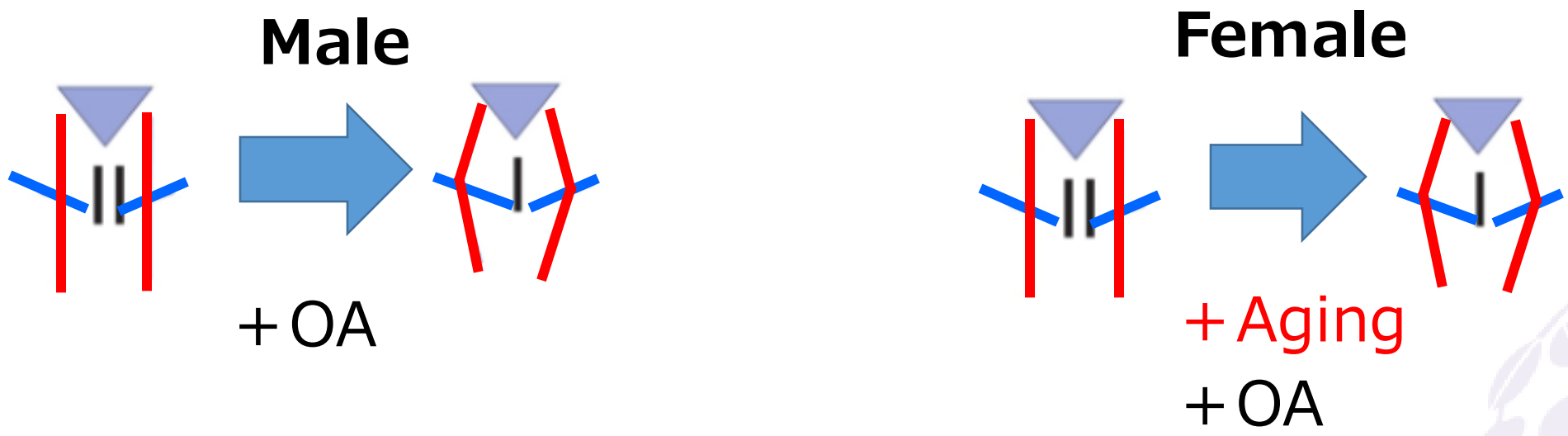
OA cases



Different distribution



Discussion: Factors affecting the most common category



- The effects of aging on CPAK distribution differed by gender
- With OA progression, aHKA changed more varus while maintaining JLO

Conclusion

- OA progression correlates with an inherent varus alignment among both male and female.
- Aging was notably associated with varus alignment only in female.
- There are racial differences in CPAK classifications.

Reference

- MacDessi et al. Coronal Plane Alignment of the Knee (CPAK) classification. Bone Jt. J. 2021, 103-B, 329–337.
- Hsu et al. Validation and modification of the Coronal Plane Alignment of the Knee classification in the Asian population. Bone Jt. Open 2022, 3, 211–217.
- Toyooka et al. Distribution of Coronal Plane Alignment of the Knee Classification in Patients with Knee Osteoarthritis in Japan. J. Knee Surg. 2023, 36, 738–743.