

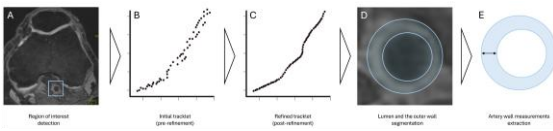
BACKGROUND & OBJECTIVE

- Hip OA is a distinct clinical entity, but vascular-health links are underexplored.
- Popliteal artery wall metrics can be quantified opportunistically on knee MRI and may reflect **systemic** atherosclerotic burden.
- Objective: test whether MRI-derived popliteal artery wall metrics are associated with baseline and 4-year hip OA/pain outcomes in OAI.

METHODS

- Design: OAI multicenter prospective cohort; hip-level analyses with cluster-robust SEs.
- Imaging biomarker: FRAPPE deep-learning pipeline on 3-T knee DESS MRI; lumen and outer wall segmentation.
- Exposures: eccentricity ratio, mean/max normalized wall index (NWI), max wall thickness.
- Outcomes: radiographic hip OA (rHOA), symptomatic hip OA (sHOA), and frequent hip pain at baseline and 4 years.
- Models: logistic regression per 1-SD exposure increase; adjusted for age, sex, BMI, height, comorbidity, smoking, PASE, MI/stroke, BP, diabetes, lipid-lowering medications.

DEEP-LEARNING WORKFLOW



Automatic region detection -> vessel centerline refinement -> lumen/outer-wall segmentation -> wall biomarker extraction.

KEY COHORT NUMBERS

8,506

hips in cross-sectional rHOA/sHOA analyses

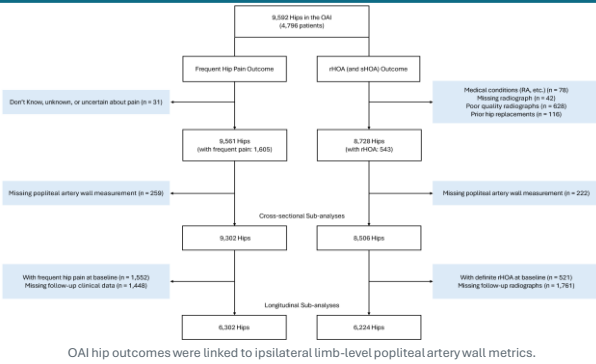
6,224

hips in longitudinal rHOA/sHOA analyses

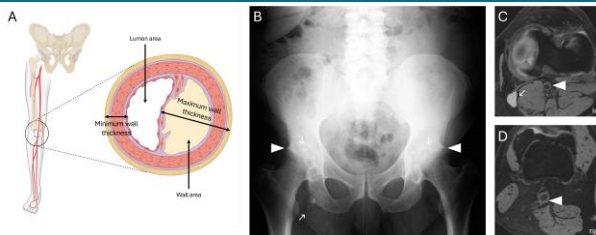
6.1%

baseline rHOA prevalence

STUDY FLOW



WHAT WAS MEASURED?



Morphology metrics captured wall burden and eccentric remodeling; max/min wall thickness, wall area, total vessel area, NWI, and eccentricity ratio.

MAIN TAKEAWAY

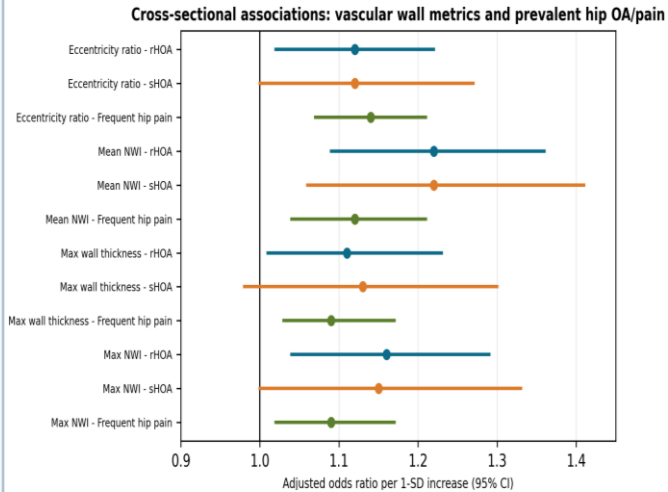
Prevalent hip OA and pain signal

Higher popliteal artery wall burden was consistently associated with baseline rHOA, sHOA, and frequent hip pain after adjustment.

Longitudinal signal mainly pain

Over 4 years, baseline mean NWI predicted incident frequent hip pain, but not incident rHOA or sHOA.

RESULTS: CROSS-SECTIONAL ASSOCIATIONS



Adjusted ORs per 1-SD increase. Mean NWI showed strongest and most consistent associations with baseline rHOA, sHOA, and frequent hip pain.

LIMITATIONS & NEXT STEPS

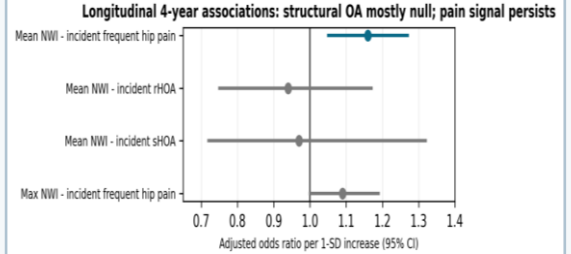
- Limitations: observational design; popliteal artery is a systemic/limb-level proxy, not direct hip arterial supply; baseline-only vascular measurement; low 4-year incidence of structural hip OA.
- Next: repeated vascular measures, hip-specific arterial imaging, and longer follow-up to test whether vascular-health trajectories predict hip OA phenotypes.

REFERENCES

1. Steinmetz et al. Lancet Rheumatol 2023. 2. Hussain et al. J Rheumatol 2020. 3. Canton et al. J Am Heart Assoc 2021. 4. Chen et al. Magn Reson Med 2020. 5. Wang et al. Rheumatology 2023. 6. Altman & Gold. Osteoarthritis Cartilage 2007. 7. Findlay. Rheumatology 2007.

• Abbreviations: OAI = Osteoarthritis Initiative; OA = osteoarthritis; rHOA = radiographic hip OA; sHOA = symptomatic hip OA; DESS = double-echo steady-state; NWI = normalized wall index; PASE = Physical Activity Scale for the Elderly; OR = odds ratio; CI = confidence interval.

RESULTS: LONGITUDINAL 4-YEAR OUTCOMES



96 incident rHOA, 46 incident sHOA, and 809 incident frequent-pain hips. Mean NWI remained associated with incident frequent pain (OR 1.16, 95% CI 1.05-1.27).

CLINICAL INTERPRETATION

- Opportunistic vessel-wall quantification may identify a vascular-metabolic phenotype among patients undergoing knee MRI.
- Findings support a vascular-musculoskeletal interface linking systemic vascular burden to established hip OA and pain.
- The effect sizes are modest and observational; results should inform risk stratification and hypothesis generation, not management thresholds.

CONCLUSIONS

• MRI-derived popliteal artery wall metrics were independently associated with prevalent rHOA, sHOA, and frequent hip pain. Mean NWI also predicted incident frequent hip pain over 4 years. These opportunistic deep-learning vascular biomarkers from knee MRI may help characterize systemic vascular contributions to hip OA pain phenotypes.

One-line message

Vascular wall burden was linked more strongly to established hip OA and pain than to short-term structural incidence.