

The Windshield Wiper Sign: A Radiographic Finding of Hip Instability

The pathogenesis of hip instability is multifactorial and often results in significant functional debilitation. Hip instability is characterized by excessive femoral head movement in relation to the socket, which elevates the risk for intraarticular injury and early onset osteoarthritis. Multiple variables can contribute to hip instability including deficient acetabular coverage of the femoral head, femoral antetorsion, disruption of the labral suction seal, and/or soft tissue laxity. Markers of hip instability can aid surgeons in the decision-making process for patients whose primary hip pathology is unclear. However, there are few independently reliable diagnostic measures available. The purpose of this study was to introduce a new radiographic sign of hip instability that often results in acetabular suction seal disruption in the native hip, coined the “windshield wiper” (WSW) sign. We theorize the patho-mechanism of the WSW sign begins with superolateral subluxation of the femoral head due to instability, resulting in chronic friction stress between the hip joint capsule and femoral head. We coined this the WSW sign, because with chronic instability, the capsule wipes back and forth over the femoral head/neck, as the head moves internally and externally in the subluxated position, like a windshield wiper, resulting in chronic attrition of the osteochondral surface. We performed a retrospective review of patients who underwent or had scheduled a periacetabular osteotomy (PAO) with the senior author between March 2021 and September 2023. All patients with the characteristic radiographic WSW sign in a native hip were identified and included in the analysis. A WSW sign was identified on plain radiographs (seen best on AP and 45° Dunn view) as a concave or flat osteochondral defect on anterolateral femoral head extending medial to the head-neck-junction with a resultant loss of femoral head sphericity. All patients underwent arthroscopy prior to PAO to address intra-articular pathology. We found 22 hips (17 patients) with a WSW sign on plain radiographs, with a prevalence of 8.5% of PAO patients reviewed. Each patient with a WSW sign had severe symptomatic hip instability. The mean age of a patient with a WSW sign was 31.2 years (± 9.14 years). Fourteen hips (63.6%) had frank dysplasia, 6 (27.3%) had borderline dysplasia, and 2 (9.1%) had a normal lateral center edge angle (LCEA). Of the hips identified, 17 had undergone surgical management. Of this cohort, 3 (17.6%) required labral reconstruction and the rest underwent labral repair during arthroscopy. Femoroplasty and capsular plication were performed in all 17 hips. Every patient with a WSW sign had arthroscopic confirmation of a dysfunctional labral suction seal. Importantly, the WSW sign was present in patients without frank acetabular dysplasia. Thus, the WSW sign can provide evidence of severe hip instability when measures such as LCEA do not indicate severe hip disease. To recapitulate, a WSW sign is an uncommon radiographic finding in patients with severe hip instability. When identified, it is highly predictive of significant hip instability, which may be of value for patient prognosis and counseling as well as preoperative evaluation, diagnosis, and surgical planning, especially in cases which are otherwise considered borderline dysplasia or normal based on LCEA.