

# Digital Dynamic Radiography as a Useful Clinical Tool for Assessing Mechanical Complications of Hip and Knee Implants: A Case Series

Benjamin W. King, BS<sup>1</sup>, Marisa Brito, BS<sup>1</sup>, Emilio Arellano, BS<sup>1</sup>, Bailey Ross, MD<sup>1</sup>, Max McCall, MD<sup>1</sup>, Jacob M. Wilson, MD<sup>1</sup>, Ajay Premkumar, MD<sup>1</sup>  
<sup>1</sup>Emory University Department of Orthopedics

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**INTRODUCTION:** Digital dynamic radiography (DDR, Konica Minolta) is an emerging imaging modality with promising potential for clinical utilization given that it is simple-to-operate, can be incorporated into the clinical workflow, produces similar radiation exposure compared to traditional fluoroscopy, and allows for dynamic measurements of joint motion. Dynamic mechanical complications following total hip arthroplasty (THA) and total knee arthroplasty (TKA) present a diagnostic challenge. This case series describes five cases where DDR proved instrumental in reaching a final diagnosis in complex THA and TKA patients.

**METHODS:** Two complex THA patients and three complex TKA patients who underwent DDR imaging between November 2024 and July 2025 were retrospectively identified. All patients had persistent joint-related symptoms with non-confirmatory findings on conventional static imaging, and DDR was obtained as part of routine clinical evaluation. Informed consent was obtained for inclusion in this case series.

## RESULTS:

*Case 1:* A 41-year-old male presented with a five-year history of left hip pain. The patient had undergone bilateral THA at the age of 16 due to multi-joint avascular necrosis secondary to chemotherapy. Static radiographs demonstrated mild eccentric polyethylene liner wear of the left THA, while computed tomography (CT) revealed osteolytic lesions and iliopsoas bursitis, which were previously believed to be the source of the patient's symptoms. An anterior view DDR of the left hip revealed dynamic inferior subluxation of the hip with flexion and reduction with extension (**Figure 1**). The patient was recommended and elected to proceed with revision THA as a result of the DDR findings.

*Case 2:* A 65-year-old female presented with a six-month history of right hip pain. The patient had a complex surgical history including six lumbar spine surgeries and three revision right THA procedures. The patient was without pain for three years following her last THA revision but had since developed severe pain and a "popping" sensation in the right hip. Static radiographs of the right hip revealed well-fixed, well-positioned implants without overt evidence of loosening, instability, or other complications. Lateral DDR images of the right hip revealed dynamic anterior subluxation of the femoral head when rising from a seated position (**Figure 2**). The patient was recommended and elected to proceed with revision THA as a result of the DDR findings.

*Case 3:* A 61-year-old female underwent right lateral unicompartmental knee arthroplasty after a five-year history of right knee pain. Despite an uncomplicated postoperative course, the patient continued to experience significant right anterior knee pain for eight months postoperatively. All postoperative static radiographs displayed well-fixed, properly positioned implants without evidence of loosening or mechanical failure. Lateral and sunrise DDR imaging revealed an overhang of the femoral component catching against the posterior aspect of the patella as the patient flexed their knee, with severe progression of degenerative changes to the patella (**Figure 3**). The patient was recommended and elected to proceed with conversion to TKA.

*Case 4:* A 77-year-old man presented to clinic with a four-year history of left knee pain. The patient had previously undergone resection of the left proximal tibia, tibial osteoplasty with prosthetic reconstruction, and total knee arthroplasty due to a giant cell tumor of the proximal tibia at the age of 62. Static radiographs of the left knee displayed frank failure of the modular junction of the femoral component with valgus collapse of the femoral component and varus migration of the femoral stem. DDR imaging of the patient's left knee revealed pistoning of the femoral implant with gross instability. Based on the radiographic findings, revision left TKA was recommended, and the patient elected to proceed with surgery.

*Case 5:* A 71-year-old female presented with a one-year history of left knee pain and stiffness following left knee TKA at an outside institution. Static radiographs revealed a well-sized, well-fixed tibial component but the femoral component was notable for having an anterior radiolucent line beneath the flange concerning for loosening. DDR imaging of the left knee revealed subtle movement of the femur independent of the component suggestive of component debonding. Based on the radiographic findings, revision left TKA was recommended, and the patient elected to proceed with surgery.

**DISCUSSION:** DDR represents a novel imaging modality with unique advantages over traditional static radiographs, CT, MRI, and fluoroscopy. Unlike conventional imaging, which captures a single moment in time, DDR provides a dynamic sequence of low-dose radiographs that visualize joint movement in real-time. This dynamic assessment can help detect motion or position-dependent mechanical failures that may be missed with static imaging. In this case series, DDR demonstrated substantial diagnostic utility in five complex arthroplasty cases, each of which had diagnostic uncertainty despite prior static imaging. In all five cases, DDR findings directly guided the recommendation for revision arthroplasty.

**SIGNIFICANCE/CLINICAL RELEVANCE:** DDR is a promising low-radiation, real-time imaging tool that can complement existing imaging modalities and enhance the evaluation of patients with suspected arthroplasty implant instability. Given its ease of integration into clinical workflows and significant diagnostic value, DDR can be considered for incorporation into routine assessment of total joint arthroplasty patients with possible complications not demonstrated on static imaging.

## IMAGES:

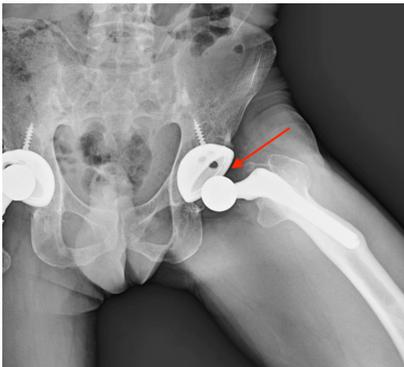


Figure 1: L Hip Dynamic Inferior Subluxation



Figure 2: R Hip Dynamic Anterior Subluxation



Figure 3: R Knee Conflict of Femoral Component Overhang with Patella