Diagnosing hip dysplasia using a convolutional neural network.

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Hip dysplasia affects 3-4% of the Swedish population and predisposes the hip joint to osteoarthritis (OA). Unfortunately, hip dysplasia is often missed on regular radiograms. Previous studies using Machine learning (ML) have shown promising results, but a ceiling effect has been observed. The study aims to investigate whether an alternate approach using artificial intelligence (AI) algorithm in the form of a convolutional neural network (CNN) can identify hip dysplasia.

The research group, through a collaboration with a private information technology (IT) service, used a cloud based AI-service to train a CNN. Priming of the model was done using a data-set consisting of 354 radiograms (120 dysplasia, 234 normal). An additional convenience sample consisting of 150 standing anteroposterior pelvic radiogram were measured for dysplasia. Subsequent data augmentation yielded a dataset of 530 hips (114 dysplastic, 416 normal). The age and gender distribution between dysplastic and normal hips were comparable. Training of the model was performed using an iterative process using 470 images (88%), 64 images (12%) were saved for model validation. The model was instructed to present binary output as to whether hip dysplasia was present or not. The algorithm achieved a 93% success rate in identifying dysplasia.

The algorithm successfully identified dysplasia with a success rate superior to human evaluation. The authors conclude that a binary approach using CNN is feasible and may reduce the workload for radiologists.