AP X-rays are as accurate as CT for assessing acetabular component orientation using 3D/2D matching

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Introduction
Routine post-operative X-rays are often used to determine cup orientation. However, measurements can be unreliable due to lack of control of pelvic position in relation to the X-ray plane. By contrast, CT scans offer increased accuracy with the drawback of additional cost to the healthcare system.

With the growing prevalence of pre-operative CT scans for more precise surgical planning, we investigated the accuracy of a 3D/2D registration technique for measuring post-operative cup orientation.

Methods
• 48 patients with pre- and post-operative CT scans, as well as a routine post-operative AP radiograph were identified from a previous study.
• The pre-operative 3D pelvis was matched to the post-operative AP X-ray (Mimics X-ray Module, Materialise, Belgium), Fig 1a.
• Next, the 3D cup geometry was matched to the post-operative AP X-ray (Mimics X-ray Module, Materialise, Belgium), Fig 1b.
• Knowing the 3D position of the cup relative to the pelvis allowed the cup orientation to be measured, Fig 1c.
• As a control, cup orientation was also measured directly from the post-operative CT.

Results
The Pearson correlation coefficients between 3D/2D registration and CT for cup inclination and anteversion were 0.98 and 0.97 respectively, Fig 2. The maximum inclination error was 3.5° and maximum anteversion error was 5.4°.

Conclusion
3D/2D registration is a reliable and accurate method for determining acetabular cup orientation from a routine post-operative X-ray, providing a pre-operative CT is available.

Disclosure
One or more of the authors are paid consultants to Corin Group. One of the authors is a shareholder of Corin Group.