Image guidance in open spinal surgery is compromised by changes in spinal alignment between preoperative images and surgical positioning. Fan et al. evaluated the registration of stereo-views of the surgical field to compensate for vertebral alignment changes.

To assess the accuracy and efficiency of an optically tracked hand-held stereovision (HHS) system to acquire images of the exposed spine during surgery.

The standard midline posterior approach exposed L1 to L6 in 6 cadaver porcine spines. Fiducial markers were placed on each vertebra as “ground truth” locations. Spines were positioned supine with accentuated lordosis, and preoperative computed tomography (pCT) was acquired. Spines were re-positioned in a neutral prone posture, and locations of fiducials were acquired with a tracked stylus. Intraoperative stereovision (iSV) images were acquired and 3-dimensional (3D) surfaces of the exposed spine were reconstructed. HHS accuracy was assessed in terms of distances between reconstructed fiducial marker locations and their tracked counterparts. Level-wise registrations aligned pCT with iSV to account for changes in spine posture. Accuracy of updated computed tomography (uCT) was assessed using fiducial markers and other landmarks.

The acquisition time for each image pair was <1 s. Mean reconstruction time was <1 s for each image pair using batch processing, and mean accuracy was 1.2 ± 0.6 mm across 6 cases. Mean errors of uCT were 3.1 ± 0.7 and 2.0 ± 0.5 mm on the dorsal and ventral sides, respectively.

Results suggest that a portable HHS system offers the potential to acquire accurate image data from the surgical field to facilitate surgical navigation during open spine surgery [1)].

1)
Fan X, Durtschi MS, Li C, Evans LT, Ji S, Mirza SK, Paulsen KD. Hand-Held Stereovision System for Image Updating in Open Spine Surgery. Oper Neurosurg (Hagerstown). 2020 May 4. pii: opaa057. doi: 10.1093/ons/opaa057. [Epub ahead of print] PubMed PMID: 32365204.