**Application of a new wearable video see-through augmented reality system based on head mounted displays to aid percutaneous procedure in spine surgery.**

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Introduction. In mini-invasive surgery the surgeon performs the procedure under medical imaging guidance without a direct visualization of the patient’s anatomy. This fact has lately inspired several research activities among these, Augmented Reality (AR) systems represent the most promising ones. The aim of the study was the evaluation of the efficacy of the use of a new wearable AR system to guide the position of a working cannula into the vertebral body through a transpedicular approach without the use X-Ray image guidance.

**Methods**. We describe a video see-throught system based on Head Mounted Displays (HMDs) that allows the augmentation of video frames acquired by two cameras with the rendering of patient specific 3D models obtained elaborating pre-operative radiological volumetric images. Our system has been tested on an experimental setup that simulate the reaching of lumbar pedicle as in vertebroplasty procedure. Experienced and young surgeons were asked to perform the percutaneous task wearing the HMDs with the AR guide running and the system accuracy was evaluated by a post-operative CT scan.

**Results.** The post-operative CT scan was registered to the preoperative one and the trajectories obtained were compared to the planned one. The maximum distance between the planned and obtained trajectories in the pedicle was considered to assess the quality of the guide system. The results obtained show a medium error of 1.48+/-0.81 mm.

**Conclusions** The results of the in vitro tests were encouraging in terms of system usability and ergonomics proving our system to be worthy of more extensive tests.