Supplemental material

Quantification of motion during microvascular anastomosis simulation using machine learning hand detection
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Supplemental Figure 1. Correlation between the horizontal plane time series of both hands and the video recording. Twenty-one landmarks on each hand are presented in different colors. The direction of the spike points to inward or outward movements. Instruments are located outward to the side of the dominant hand (right). Top row (from left to right, with microscope photographs inset): instrument change; movement of the nondominant hand to grasp the suture; instrument change; instrument change. Bottom row (from left to right, with microscope photos inset): inward movement of the dominant hand to perform a bite; instrument change; reaching for the microscope handle; instrument change.
Supplemental Figure 2. Correlation between the vertical plane time series of the dominant hand and the video recording. Twenty-one landmarks on each hand are presented in different colors. Suture patterns are outlined. The largest spike corresponds to the movement of the hand to reach the microscope handle, followed by a loss of tracking because the hand is off the video frame. Photographs show (from left to right, with microscope photographs inset) suture pull, suture pull, suture pull, reaching superiorly for the microscope handle, and instrument change.
Supplemental Figure 3. Identification of the microsuturing sequence on the dominant hand vertical plane time series, side-to-side anastomosis. Pull spikes are indicated with the letter P. Tracking data for landmark 4 (tip of the first finger; orange), landmark 8 (tip of the second finger; pink) and landmark 20 (tip of the fifth finger; blue) are shown. The microsurgical sequence video frames show (1) beginning a bite, (2) completed bite, (3) grab, (4) countersweep, (5) reload, and (6) suture pull.
Supplemental Figure 4. Identification of the microsuturing sequence on the dominant hand vertical plane time series, end-to-side anastomosis with interrupted technique. Double pull spikes are indicated with the letter P. Hand tracking data are shown for landmark 4 (tip of the first finger; orange), landmark 8 (tip of the second finger; pink), and landmark 20 (tip of the fifth finger; blue). Microscope photographs of the microsurgical sequence show (from left to right) bite, grab, counter-sweep, and knot tying. Video stills of the operator show (from left to right) hand motion, instrument change, suture pull, instrument change, and instrument change (microscissors).
Supplemental Figure 5. Dominant hand, horizontal plane time series. Implementation of an outlier detection algorithm for calculation of the excess of motion. Measurements classified as outliers are indicated in red. (A) Expert operator time series. (B) Novice operator time series. (C) Intermediate operator time series.