

THE MAGELLAN™ – FIRST ROBOTIC ULTRASOUND-GUIDED NERVE BLOCK IN HUMANS

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Background: Ultrasound(US)-guided nerve blocks are very popular in modern anesthesia. The aim of the present study was to develop a robotic US-guided system (The Magellan™) to perform nerve blocks in humans using a remote control centre and to determine its feasibility defined as success rate.

Methods: In this pilot study, 13 patients were enrolled after approval of the local Ethics board and written informed consent. The Magellan™ (Fig. 1) consists of three main components: a ThrustMaster T.Flight Hotas X joystick (Guillemot Inc., New York, NY, USA), a JACO robotic arm (Kinova Rehab, Montreal, QC, Canada), and a software control system. The Magellan™ consists of a remote control centre (joystick and nerve block cockpit) linked to both a webcam and a US machine for image transmission (Fig. 2). The joystick allows simulation of wrist or arm movements of a human operator. After manual localization of the sciatic nerve, 35 ml of bupivacaine 0.25% were injected. Success rate of popliteal nerve blocks and block performance times (performance time = interval of time from the start of the ultrasound search for the nerve to the end of the injection of the drug; robotic time = interval of time from the detection of the nerve to the end of the injection of the drug) were measured. Data are shown as median (interquartiles; min, max) and categorical data. Trend was analyzed using linear regression.

Results: Seven men and 8 women aged 37 yrs were included in this study. Three out of 16 patients received a bilateral block. Nerve blocks were successful in all patients. Nerve performance time was 189 s (150, 233; 90, 305), robotic time was 164 s (121, 210; 73, 271). The linear regression of the mean nerve performance time showed a negative slope, denoting that each successive trial required less time (Fig. 3). The negative regression coefficient of the slope was more distant from 0 when the patients receiving bilateral blocks were excluded (Fig. 4).

Conclusions: We present the first human testing of a robotic US-guided nerve block system. The success rate was 100%. The total robotic block performance time ranged from 3 to 4 min.

