Abstract

Objectives. The aim of the present study is to evaluate mental workload and fatigue in fingers, hand, arm, shoulder in single-incision laparoscopic surgery (SILS) and multiport laparoscopy. Methods. Volunteers performed chosen tasks by standard laparoscopy and SILS. Time to complete tasks and finger and hand strength were evaluated. Lateral, tripod, and pulp pinch strengths were measured. Hand dexterity was determined by pegboard. Electromyography recordings were taken from biceps and deltoid muscles of both extremities. The main outcome measurement was median frequency (MF) slope. NASA-TLX was used for mental workload. Results. Time to complete laparoscopic tasks were longer in the SILS group (P < .05). Decrease of strength in fingers and hand were similar in SILS and standard laparoscopy. Pegboard time was increased in both hands after SILS (P < .05). MF slope of biceps muscle and deltoid muscle in SILS was far away from the reference slope. MF slope of biceps muscle and deltoid muscle in standard laparoscopy was close to reference slope, indicating there was more fatigue in biceps and deltoid muscles of both upper extremities in SILS group. NASA-TLX score was 73 ± 13.3 and 42 ± 19.5 in SILS and multiport laparoscopy, respectively (P < .01). Mental demand, physical demand, temporal demand, performance, effort, and frustration were, respectively, scored 10.7 ± 3.8, 11.7 ± 3.5, 12.2 ± 2.7, 11 ± 3, 13.6 ± 2.7, and 13.5 ± 2.8 in SILS and 6.3 ± 3.1, 6.6 ± 3.3, 7.3 ± 3.3, 7.1 ± 4.1, 7.9 ± 3.9, and 6.6 ± 3.8 in standard laparoscopy (P < .01). Conclusions. SILS is mentally and physically demanding, particularly on arms and shoulders. Fatigue of big muscles, effort, and frustration were major challenges of SILS. Ergonomic intervention of instruments are needed to decrease mental and physical workload.