

Comparison of Laparoscopic Suturing and Knot-tying Time of Different Acute Angles between Straight Instruments Used during Laparoendoscopic Single Site Surgeries

Introduction and Objective: Laparoscopic suturing and knot-tying with needle drivers and graspers is difficult even in multi-port laparoscopy with optimum angles between straight instruments. This is more challenging in Laparoendoscopic Single Site surgeries due to more acute angles, especially between straight non-articulating instruments. Our objective is to compare duration of laparoscopic suturing and knot-tying when performed at angles of 15-degrees, 25-degrees and 45-degrees between straight non-articulating instruments.

Materials and Methods: Six urologists performed timed-exercises consisting of making five sutures and tying three knots using 3-O Polyglycolic acid with HR-26 needle in 2 cm incision model inside a Do-It-Yourself Angle Trainer. Straight non-articulating laparoscopic needle drivers and graspers were placed alternately at instrument angles between them of 15-degrees, 25-degrees and 45-degrees. A 0-degree laparoscopic telescope was placed between the instruments and respectively at 135-degrees and 90-degrees suture position relative to telescope axis.

Results: At 45-degrees instrument angle and 135-degrees sutured-object position, suturing and knot-tying time was 744 seconds (range: 480-1128). At 25-degrees instrument angle and 135-degrees sutured-object position, suturing and knot-tying time was 785 seconds (range: 487-1313). At 15-degrees instrument-angle and 135-degrees sutured-object position, suturing and knot-tying time was 1046 seconds (range: 698-1454). At 45-degrees instrument angle and 90-degrees sutured-object position, suturing and knot-tying time was 695 seconds (range: 408-1157). At 25-degrees instrument angle and 90-degrees sutured-object position, suturing and knot-tying time was 736 seconds (range: 345-1325). At 15-degrees instrument angle and 90-degrees sutured-object position, suturing and knot-tying time was 929 seconds (range: 360-1576). Using Wilcoxon Signed Rank Test, suturing and knot-tying times were significantly longer ($p=0.0061$) at 15-degrees instrument angle compared with 45-degrees instrument angle. It was also significantly longer ($p=0.0061$) at 15-degrees instrument angle compared with 25-degrees instrument angle. These were observed in both 135-degrees and 90-degrees sutured-object positions relative to telescope axis. No significant difference ($p=0.1167$) in suturing and knot-tying time was noted at 45-degrees instrument angle compared with 25-degrees instrument angle.

Conclusions: Compared to 45-degrees angle between instruments and 25-degrees angle between instruments, laparoscopic suturing and knot-tying time is significantly longer in the more acute 15-degrees angle between straight non-articulating instruments used during Laparoendoscopic Single Site surgeries.