Reduction in Radiation Exposure for TLIF with the KICK System

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Introduction

Transforaminal Lumbar Interbody Fusion (TLIF) is a surgical procedure that stabilizes adjoining vertebrae to facilitate union. It can be performed using minimally invasive techniques that reduce tissue disruption and improve healing times. However, recent systematic reviews highlight the health hazard of radiation exposure using current visualization devices [1]. The goal of the study was to compare the KICK System and standard fluoroscopic guidance.

Methods

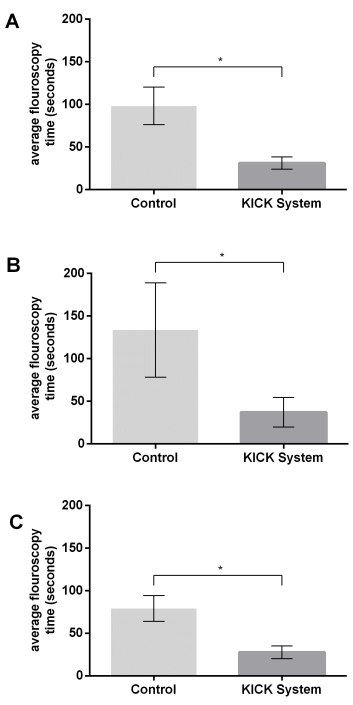
A case study was conducted between October 2016 and February 2017. 43 TLIF cases were conducted at Holland Hospital in Michigan. Cases comprised 20 (+ 2 pilot) cases with fluoroscopic guidance only (i.e., control), followed by 20 (+1 pilot) KICK System image-guided cases with fluoroscopic guidance (i.e., experimental). This study was limited to 1-level (2 vertebrae) and 2-level (3 vertebrae) cases and subgroup analysis was performed for each level.

Mean procedure fluoroscopy time (seconds) and individual screw placement (minutes and seconds per procedure) were analyzed using a student's t-test between control and KICK System cases.

Results:

The patients were between 30 -70 years old and comparable between 1-level (control n:13 and KICK System n:13) and 2

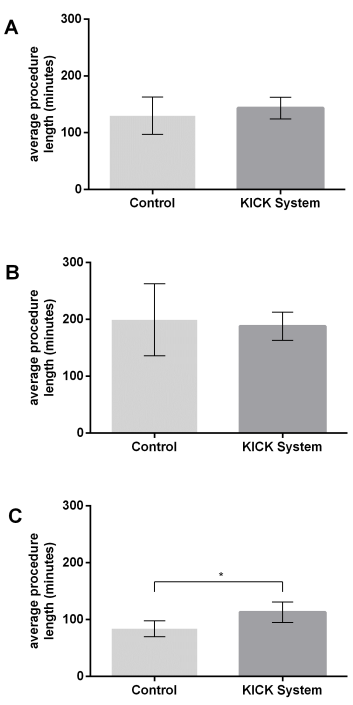
Figure 1.



Average fluoroscopy time (seconds) between control and KICK System cases overall (A), for 2-level (B) and 1-level (C) procedures. Error bars display 95% confidence intervals. *significant differences.

There was a 68% reduction in the total fluoroscopy time (seconds) between control (mean: 98.1; SD: 46.1) and KICK cases (31.1; 14.8) (p <0.001; Figure 1A). For 1-level cases and 2-level cases, there was a 65% decrease (79.1; 25.0 vs. 27.7; 12.5) (p <0.001; Figure 1B.) and a 72% decrease (133; 59.8 vs. 37.2; 18.8) (p= 0.00157;Figure 1C).

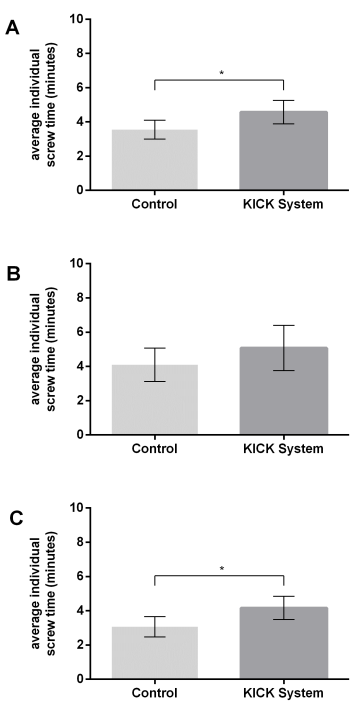
Figure 2.



Average procedure duration (minutes) between control and KICK System cases overall (A), 2 -level (B) procedures and for 1-level (C). Error bars display 95% confidence intervals. *significant differences.

There was no significant difference in overall mean procedure duration (minutes) between control (130.0; 66.4) and KICK System cases (143.6; 40.0) (p=0.454; Figure 2A) or for 2-level cases (199.3; 68.3 vs. 188.1; 26.8) (p=0.693; Figure 2B). There was an increase in overall mean procedure duration (89.5; 15.0 vs 119.6; 22.8) (p<0.001;Figure 2C) for 1-level cases.

Figure 3.



Average individual screw time (minutes) between control and KICK System cases overall (A), for 2-level (B) and 1-level (C) procedures. Error bars display 95% confidence intervals. *significant differences.

There was an increase in average screw placement time (minutes and seconds) between control (3m33s; SD: 2m34s) and KICK System cases (4m35s; 3m22s) (p=0.02; Figure 3A). There was no significant difference in 2-level cases (4m6s; 3m3s vs. 5m5s; 4m14s) (p=0.23; Figure 3B). There was a significant increase (3m4s; 1m57s vs. 4m10s; 2m27s) (p=0.02; Figure 3C) for 1-level cases.

Conclusions

Compared to fluoroscopic guidance alone, the KICK System is associated with a significant decrease in mean radiation exposure time.

Learning Objectives

By the conclusion of the session, participants should be able to:

1) Understand the issue of radiation exposure during surgical imaging

2) Identify techniques that mitigate radiation exposure.

References

[1] R. K. Duffy, S. Goldhahn, A. Matityahu, A. Joeris, P. Richter and F. Gebhard, "The Great Unknown—A systematic literature review about risk associated with intraoperative imaging during orthopaedic surgeries," Injury, p. 1727–1734, 2017.