Evaluation of the iQ™ intelligent System for Rapid Screw Insertion

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Introduction

Neurosurgical procedures requiring craniotomies can often be multi-faceted and complex cases. The fixation of plating systems to the patient's host bone is often one component of these procedures, and is intended to provide protection to anatomical structures, support bone healing, and allow for reconstruction. Fixation of plates to bony structures using manual means can add additional surgical time to the case. Powered instruments have the potential to reduce this time and allow for a more rapid closure.

A new high speed device (iQ Intelligent System, Biomet Microfixation) has recently been developed. The iQ Intelligent System continuously monitors torque output to allow for consistent, accurate and rapid screw insertion. This system can offer enhanced surgical efficiency by increasing the speed of screw insertion during flap closure. This may lead to potential time savings and reduced hospital costs.

The objective of this study was to compare insertion times of titanium screws using the iQ Intelligent System to alternative methods.

Methods

An in vitro lab was conducted in a controlled environment to reduce variability that may occur in the operating room, and allow for true differences in the insertion times to be determined. Six participants, including 3 board certified neurosurgeons from 2 centers, participated in this lab. Participants were asked to insert 1.5 x 4mm self drilling titanium screws (n=10) into a 10 hole straight plate. The plate was fastened to a rigid polyurethane foam block (d=0.64g/cc), designed per ASTM F-1839-08 as a test medium for human bone.

Three methods of screw insertion were compared:

- iQ Intelligent System
- Standard battery powered driver
- Manual screw driver

A minimum of 90 screws were inserted for each of the above scenarios. Insertion times for each scenario were recorded, and the mean values were computed to allow for comparisons between groups. Statistical analysis was performed using a one way ANOVA.

a. iQ Intelligent System

b. Battery Powered Driver

c. Manual Driver

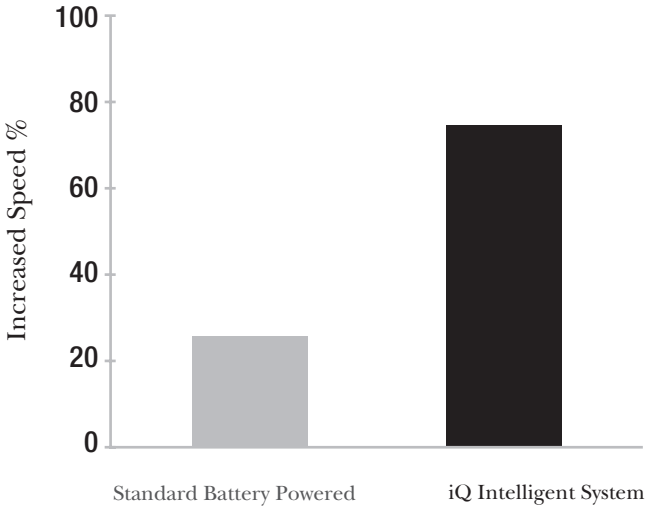
Screw insertion drivers evaluated: iQ Intelligent System (a), battery powered driver (b), and a manual driver (c).

Results

Of the 3 methods tested, the iQ Intelligent System was the most rapid method for screw insertion. The iQ Intelligent System was found to result in:

- 75% faster screw insertion compared to manual methods ($p<0.0005$)
- 40% faster screw insertion compared to standard battery powered drivers ($p<0.0005$)
- No excessive torque application resulting in screw stripping
- Complete seating of all screws

Increased Speed of iQ™ and Battery Powered Drivers Over Manual Drivers



Increased screw insertion with the iQ Intelligent System and standard battery powered drivers relative to manual methods. When compared to manual screw insertion, the iQ provided time savings triple that of battery powered drivers.

Discussion

OR costs are often highly variable, and can depend on factors such as the length and complexity of the case, type of facility, use of equipment, and the amount of staff. A recent study of 100 U.S hospitals found that OR charges averaged $66 per minute[1].

Medical devices that have the potential to reduce OR costs offer significant value to hospitals. One manner in which costs can be reduced is through increased speed and efficiency.

Conclusions

The iQ Intelligent System resulted in a significantly faster method for screw insertion compared to other methods. Based on published data of OR charges[1], a surgeon who performs 250 cases annually with the iQ Intelligent System may save $16,500 for every minute OR time is reduced*.

*Data based on 250 surgeries x $66 per minute

References

1. Shippert, RD. A study of time-dependent operating room fees and how to save $100,000 by using time saving products. Am J Cosmetic Surg, 22(1), pg. 25-34, 2005.

This white paper is authored by Brian Hatcher, Ph.D. who is the Director of Research for Biomet Microfixation.

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