Scientific Session 10: Neonatal Surgery (continued)

78

A NOVEL NEEDLE DRIVER TO FACILITATE LAPAROSCOPIC INTRACORPOREAL KNOT TYING

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Purpose: Intracorporeal knot tying is one of the most challenging techniques in laparoscopic surgery. Proficiency requires a series of technical movements in a restricted space. We developed a novel needle driver to increase ease and efficiency of intracorporeal knot tying.

Methods: Initial designs for the device were developed using Solidworks® computer-aided 3D design (Dassault Systemes, Velizy-Villacoublay, France). A laparoscopic bipolar vessel sealing device was used as the framework for our prototype. This instrument was modified using components 3D printed by an Eden 260VS Polyjet 3D printer (Stratasys, Eden Prairie, MN) to construct a functional device.

Results: Using rapid-prototyping, a novel laparoscopic needle driver was created in which a segment of the device proximal to the needle holder is magnetized and rotates around the axis of the shaft. The surgeon forms a knot using the following steps: (1) after a stitch is thrown, the suture tail is grasped with the needle driver, (2) the needle is placed on and secured by the magnetized shaft segment, (3) a trigger on the device handle is depressed, rotating the magnetized segment and needle one revolution, creating a loop in the suture, (4) the suture tail is pulled through the loop, producing one throw of a knot. This process can be repeated for further throws.

Conclusion: Our novel laparoscopic suturing device facilitates efficient intracorporeal knot tying that is not hindered by suboptimal triangulation conditions. It does so while allowing continuous control of the suture tail, automated loop formation, and surgeon preference of needle and suture. Our device simplifies a complex laparoscopic skill while maintaining the familiarity and versatility of a conventional needle driver and suture.