Multispecialty Single Port Robotic Technology Applied in the Live Animal Model: Proof of Concept

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Background

Robotic surgery is a field that continues to evolve since its inception approximately 20 years ago. As the field of robotic surgery advances and technology improves, delivering a less invasive surgical option that continues to decrease the morbidity associated with multi-port laparoscopic and open surgery is at the forefront of most companies' design efforts. In this light Titan Medical Inc. (Toronto, Ontario) is developing a single port robotic platform (SPORT Surgical System) that can be utilized across multiple surgical specialties.

Description

The SPORT Surgical System is a single port robotic platform that is comprised of 2 main components: a surgeon workstation and a patient cart. The surgeon workstation is where a surgeon operates the multi-articulated instruments and 3D high-definition camera using a natural handle interface and a 3D high-definition flat-screen display, while sitting in an ergonomically comfortable chair with elbow supports. The patient cart is a single boom system which suspends a central unit that connects to the 3D high definition camera and two 8mm multi-articulating exchangeable instruments. The SPORT Surgical System offers a comprehensive set of instruments including monopolar and bipolar instruments along with needle drivers and graspers.

Methods

The SPORT Surgical System was installed at the Florida Hospital Nicholson Center training facility in September 2017 to conduct feasibility studies. To date, there have been five surgeons across three specialties who have used the single port technology to perform a variety of specialty-specific procedures on live animals.

Results

The five surgeons performed a total of eleven procedures on nine live animals. The three specialties involved were urology, colorectal surgery, and gynecology. All three of the urological surgeries performed were renal procedures. The first two procedures were attempted by a combination of two surgeons (attending and fellow). These procedures were

attempted to assess feasibility and ease of port placement, as well as, assessment of the docking process for the robotic system. Once access was achieved, hilar dissection with identification and isolation of the renal artery, vein, and ureter were completed. The third urologic procedure was a partial nephrectomy which was completed with a cross clamp time of 12 minutes. After initial evaluation and usage of the SPORT Surgical System by the urology team other specialties became involved. Four separate procedures were performed by the colorectal surgeons. Two colectomies were completed without incident, one by a single surgeon and a combination of two surgeons for the second. The other procedures performed were a low anterior resection and a cholecystectomy. The gynecologist completed four hysterectomies in total. The first two were simple hysterectomies with bilateral salpingo-oophorectomies and pelvic lymphadenectomies. The second two were radical hysterectomies with radically wide margins and pelvic/para-aortic lymphadenectomies. There were no conversions to open procedures or major complications in any of the procedures.

Conclusion

The SPORT Surgical System is a robotic single port platform that has been shown to be successful in the live animal model across several specialties. In our experience, multiple surgeries have been completed by multiple surgeons of varying experience with this developing technology. Further study and evaluation of more data points with eventual transition to the human model needs to be undertaken, but as of now the SPORT Surgical System by Titan Medical is proving to be a feasible and reliable advancement in the field of single incision robotic surgery.