Advances in Laparoscopic Surgery

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KEYWORDS

• Veterinary • Laparoscopy • Canine • Feline • Single port • SILS • SPA
• Minimally invasive surgery

KEY POINTS

- In an attempt to make minimally invasive techniques even more minimal, surgeons are exploring new approaches to abdominal entry that reduce the overall number of points of entry.
- The single-port platform has shown promise as a potentially less-invasive alternative to multiport laparoscopic surgery.
- The single-port platform enables all the individual laparoscopic instruments, including the telescope, to pass through the same abdominal incision.
- There have been several published reports documenting the efficacy and safety of single-port procedures in veterinary patients in recent years.

INTRODUCTION

Over the past decade, minimally invasive surgery has gained widespread acceptance in the veterinary community, with benefits including but not limited to improved cosmesis, reduced surgical trauma and postoperative pain, and expedited patient recovery times.[1–6] With the constantly evolving stream of technological advances and instrumentation, minimally invasive surgical techniques have been continually improving, providing a higher standard of care to veterinary patients than was possible before.

SINGLE-PORT ACCESS SURGERY

In an attempt to make minimally invasive techniques even more minimal, human and veterinary surgeons have begun to explore novel approaches to abdominal entry that

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either reduce the overall number of trocar-cannula assemblies placed through the abdominal wall or eliminate them completely by using a natural orifice.[7] This has led to the development of several new minimally invasive access platforms; the most notable are single-port access surgery and natural orifice transluminal endoscopic surgery (NOTES).[7–9] To date, single-port access surgery has emerged as the most technically feasible reduced access platform for the majority of surgeons and, therefore, is the topic of discussion. NOTES is still in its infancy and has not yet been broadly implemented; therefore, it is not discussed further. NOTES, however, will likely gain more widespread acceptance in years to come as the surgical field moves toward the paradigm of truly scarless procedures.

Principles of Single-port Access Surgery

The single-port platform has shown promise as a potentially less-invasive alternative to multiport laparoscopic techniques.[10–14] The principles of single-port surgery are similar to conventional multiport laparoscopy, although inherent differences exist. These differences must be recognized and carefully considered by the surgeon prior to attempting any single-port procedure to minimize potential surgical complications and patient morbidity.

The single-port platform enables all the individual laparoscopic instruments, including the telescope, to pass through the same single abdominal incision without compromising the safety and efficacy of the procedure.[15] Having only 1 point of abdominal entry and the resulting close proximity of instruments and optics increases, however, the technical complexity of surgery due to reduced working space, inadequate triangulation, compromised field of view, decreased exposure, and frequent instrument collisions.[16] Fortunately, several concurrent technological advances in instrumentation and optics have allowed surgeons to overcome many of these technical difficulties, notably the development of angled telescopes and angled or articulating instruments.[15] These innovations have dramatically improved the ease and efficacy by which surgeons can perform single-port procedures by minimizing instrument crowding, maximizing surgeon working space, and allowing a sufficient degree of triangulation.[15,16]

Human Applications

There has been a pronounced emergence of single-port procedures for children and adults in recent years, a majority of which have been successfully adapted from common multiport laparoscopic abdominal procedures, including cholecystectomy,[17–19] adrenalectomy,[20–22] nephrectomy,[22,23] appendectomy,[24] hemicolectomy,[25] hysterectomy,[26–29] prostatectomy,[30,31] and orchidopexy.[32,33] In human patients, it has been suggested that potential advantages of single-port surgery over conventional multiport laparoscopy include superior cosmesis through a relatively hidden umbilical scar, decreased morbidity from visceral and vascular injury during trocar placement, and reduced rate of postoperative wound infection and hernia formation.[12] Comparative trials in humans, however, have yet to demonstrate significant differences between single-port and multiport laparoscopy with regard to postoperative complications, postoperative pain, duration of hospital stay, and cosmetic results.[13,14] Importantly, clinical case series and laboratory-based skill acquisition studies have identified unique surgeon requirements of single-port surgery, with skill sets and ergonomic demands that cannot be directly adapted from existing multiport laparoscopic experience.[34] Thus, additional training should be undertaken prior to attempting single-port procedures to minimize the likelihood of complications and prolonged surgical times.