Al-Qadisiyah Journal of Veterinary Medicine Sciences
(P-ISSN 1818-5746/ E-ISSN 2313-4429)
www.qu.edu.iq/journalvm

Review

Techniques and suturing used In laparoscopic surgery in animals: Review

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(Received 03/08/2018, Accepted 03/10/2018)

Abstract

This review aimed to highlight on laparoscopic suturing techniques and difficulties of these techniques to the surgeon either the instruments used to release these difficulties. The researches confirm that the laparoscopic surgery were more appropriate when compared with conventional open surgery in veterinary medicine, because early recovery due to smaller surgical sites, earlier healing, lower post-operative illness, reduce postoperative pain, lesser infection rate, and the early return to activity. But need more practice and training to increase this skill. One of the most laparoscopic surgeon challenges are suturing and knot tying, so the solution of this problem was more practice and training either, special suture techniques and devices that have discovered by Surgeons and researches to release these difficulties like Side winding technique, barbed sutures, Mechanical Suturing Devices (Endostitch) device, and Mechanical stapling device. The conclusions of this review, the laparoscopic surgery had more advantage than open surgery with low morbidity to the patient. Same suture material and pattern were used in traditional and laparoscopic surgery.

Keywords: Animals, Laparoscopy, Suturing, Surgery, Techniques

Laparoscopic surgery

Laparoscopic surgery is a surgical procedure making by several thin instruments, small incisions are made to produce ports through these incision to insert telescope and the instruments (1). This technique is useful for viewing internal organs, biopsy, diagnosis of different intra-peritoneal disorders and surgical correction (2). It causes minimal damage in tissue, early recovery and diagnostic accuracy these make laparoscopic technique over the traditional laparotomy (3). Laparoscopic surgery needs specific instruments with a camera and recording material, insufflator to produce gas inside the abdomen cavity to produce a space which makes the movement of the instruments easily without damaging intra-cavity organs Figure (1). This space is obtained by insufflating carbon dioxide into the abdominal cavity with pressure degree depending on the size of animal to creating a pneumoperitoneum, an electrosurgical unit with unipolar and bipolar cautery for endoscopic instruments, as well as irrigation and vacuum systems, are necessary. Other instruments must also be available: automatic biopsy needles, scissors, palpation probes, laparoscopic trocar, veress needle, trocar, and needle-holders, endograspers, endodissectors and endoretractors. Although feedback controlled electro-cautery devices are now widely used, endoligatures and endosuture, as well as endoclips and surgical staples, are necessary for some procedures Figure (2, 4). One of the most laparoscopic surgeon challenges are suturing and knot tying, so many training has need to increasing this skills. The Quick-Stitch and mechanically

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assist suture device provide significant time-saving to surgeons nevertheless of experience and thus reduces operating room costs (5). (6), believe that surgeons with high skill of laparoscopic technique will have an important tool to reduce some challenges of the laparoscopic surgery in large intestine which is supported by a long learning curve. The use of sutures in laparoscopic surgery needs patience and more practice. The development of progresses in instrumentation has made suturing more accessible to surgeons (7).

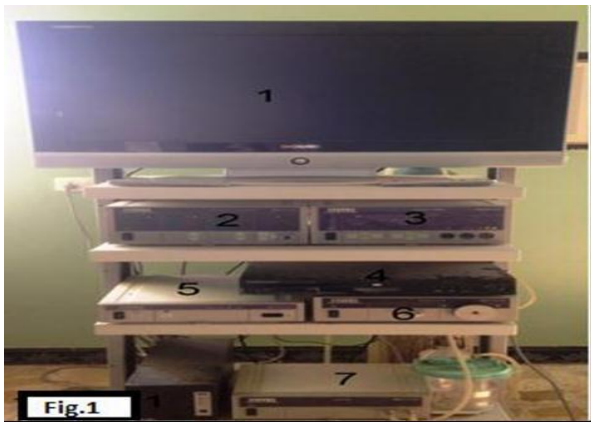

Figure (1): Laparoscopic apparatus, LCD monitor (1), Insufflator unit (2), Electro-cautery (3), DVD recorder (4) Video-camera system (5), Xenon light sources (6), and suction-irrigation machine (7). (23).

Figure (2): Laparoscopic instruments used in the experiments. Insufflator tube(1), Cable of camera (2), Head of camera (3), Light cable (4), Needle holder (5), Titanium clips (6), Clip applier (7), Grasper forceps (8,9), Scissor (10), Telescope (11), Suction and irrigation cannula (12), Cannula (13), Trocar (14).(23).

Laparoscopy in veterinary medicine

Laparoscopy has been used in animals to evaluate reproduction and for artificial insemination. A technique that uses a Para lumbar fossa approach and a rigid laparoscope to view the uterus and ovaries of cattle (8)**.** **(**9) Preform that laparoscopic techniques are profits to see of deep structures and it is much better than open surgical techniques.With demand for modified treatments, laparoscopic techniques to prevent strangulated inguinal herniation, colopexy and cystotomy in stallions laparoscopic adhesiolysis, (10, 11), gastrotomy in donkey (12) bilateral ovariectomy, granulosa cell tumor removal, evaluation of infertility, uterine biopsy, tubal ligation, surgical embryo transfer, oviductal insemination and ovariohysterectomy (13, 14), ovariectomy in rabbits (15), laparoscopic-assisted cystotomy (16). Also splenectomy in goats (17), ovariectomy in goats (18), follicular aspiration in goats (19), cholecystectomy in goats (20), liver resection in goat through using parenchymal suturing (21), to provide normal anatomy of the goat abdomen and liver biopsy (22), colotomy in goat (23).

Suture materials use in laparoscopic surgery

Generally Suture is any material use to approximate the tissue ends and give artificial support while the tissue heals naturally. Usually suture materials are dividing into natural or synthetic, absorbable or non-absorbable. Each has a typical role when used properly for wound closure techniques. Absorbable suture materials like chromic gut, polygalactin 910 (Vicryl) and polyglycolic acid (Dexon) are usually used laparoscopically in the gastrointestinal tract, heals very rapidly and suture tensile strength is only needed for 2-3weeks. There is a growing concern over the most suitable material for the closure of surgical wounds that will enhance rapid healing with minimal

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postoperative complications. (24, 25).One of laparoscopic difficulty is that surgeon need more practice to increase his skill specially suturing technique and knot tying (26, 27). For that reason Quick-Stitch, Side winding technique and mechanically assist suture device discover by researches and technical to provide significant time-saving to surgeons and to reduce operating room costs (28, 29). The side winding technique is a simple intra corporeal technique use for knot tying when the surgeon has partial view of the scope and instruments Figure (3). Even an Unskilled laparoscopic surgeon will be able to perform this suture safely and quickly (30).

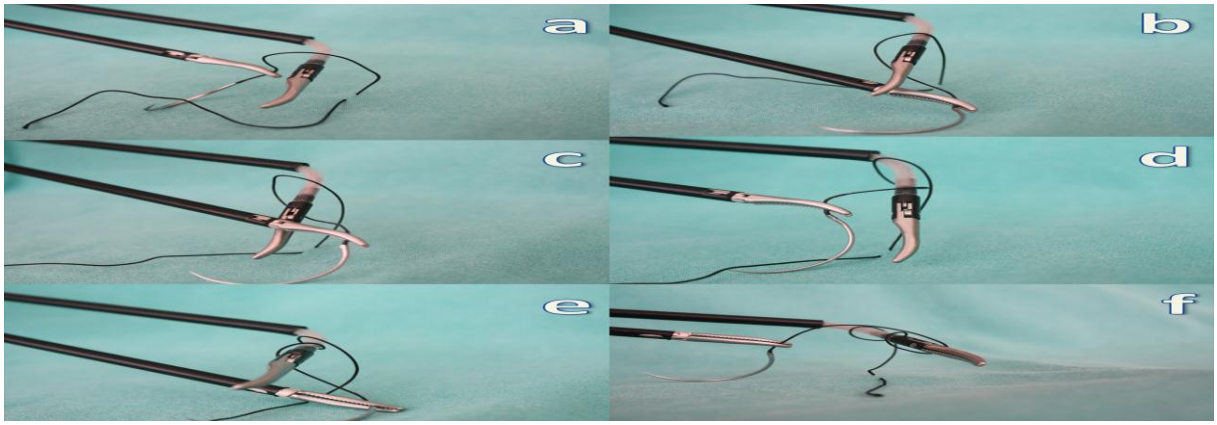

Figure (3): Step of side winding intracorporeal knot tying technique(5).

Another material that make suturing more suitable is barbed sutures has recently been proposed to facilitate laparoscopic suturing. One of these novel sutures, the V-Loc consists of a barbed absorbable suture with a surgical needle at one end and a loop at the other end (Figure, 4). The barb and loop end make it possible to approximate the tissues without the need to tie surgical knots. The ability and suitability of barbed sutures have been report in urologic and gynecologic surgery, bowel anastomosis after gastrectomy. The uses of the V-Loc will reduce intra-operative stress on the endoscopic surgeon (31).

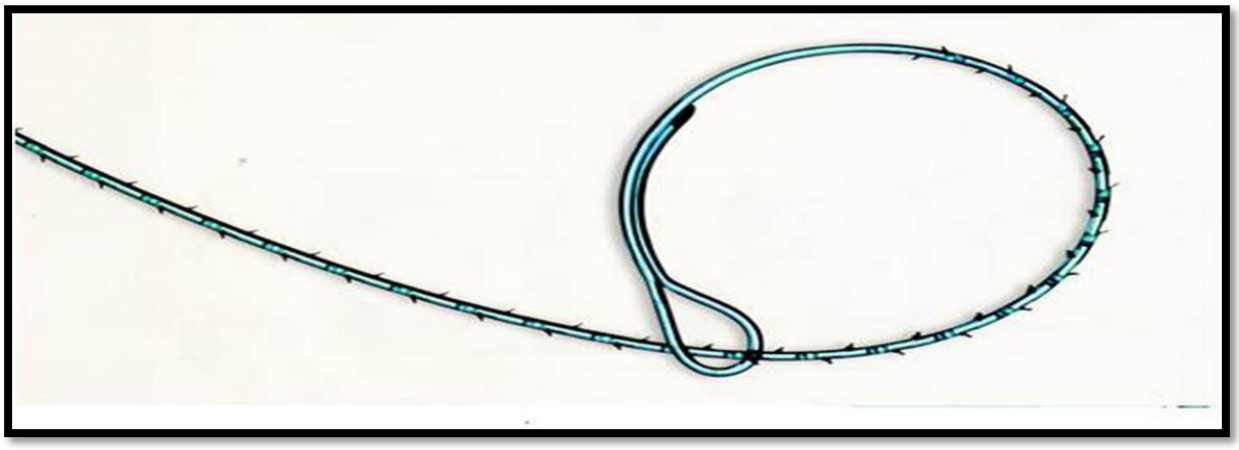
Figure (4): Barbed sutures (31).

Mechanical Suturing Devices (Endostitch) device.

This device is design for abdominal laparoscopic surgery. It is easy and quick device but need more training (Figure, 5).

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Laparoscopic closure with the endostitch device present excellent repair with minimal morbidity in patient. The unique technology of placing sutures distal from the surgeon's immediate access is applicable to many procedures (32). The use of the endosuture technique has been establish as a safe assistant to endoscopic staple assisted esophago-diverticulostomy, that it may have a particular benefit in difficult, unfavorable, or contraindicated cases and may employed of this technique as an alternative method to facilitate endoscopic repair and potentially obviate the need for open approach(23, 38).

Figure (5): Endostitch device(31).

Mechanical stapling.

Stapling technology is use in surgical procedures early, the twentieth century. Several methods of restoring interrupt continuity of the large and small bowel are available to the surgeon(34). The healing wound that suture by stapling technique happening by primary intention with a minimal inflammatory response resulting in superior wound strength during the first week after surgery and manifest by an abbreviate or absent Lag Period(35).Stainless steel and titanium staples are used in most procedures, but absorbable staples are also available. Absorbable staples and specially design equipment is used primarily in laparoscopic surgery (Figure, 6,7). One application of this instrument results in an inverting side-to-side anastomosis with a 5-cm long stoma. The stapler has been used successfully in the horse to perform jejunocecostomies, ileocolostomies, anastomoses, gastrojejunostomies, small-intestinal resections with side to-side jejunojejunostomy, and functional end-to-end anastomoses (36).

Figure (6): Clips applicator (31)

Figure (7): Head of Clips applicator (31)

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There are no significant differences in find operative indications, age, sex, bleeding, recovery period, and recurrence between the stapling and hand-sewn techniques, the differences objective in the operation times in the stapled group that is shorter than in the hand-sewn group (37). Either stapled anastomosis is associated with fewer leaks than hand sewn anastomosis in the treatment of conditions such as Crohn's disease (38). While (39) found that the suturing technique in small colon anastomosis is better than the stapling technique because of significantly larger lumen diameters, better anastomotic healing, and minimal intra-abdominal adhesion formation. Either tight stapling in ileocolostomy has reduce suture line blood flow than the two-layer manual anastomosis (40). Experimental study report that colonic perforations which are at least 10mm treat by endoscopic suturing with hemoclips, while another study preform that endoluminal closure of a 4cm colon perforation with clips is successful in the majority of cases. Sutures are useful in the closure of gaping colon perforations that cannot be closed with clips (41, 42). The conclusions of this review discovered that Laparoscopic surgery has more advantage than open surgery with low morbidity to the patient, the suture material and patterns that use in open and laparoscopic surgery are same and there are special devices use in laparoscopic surgery to easiest the difficulties of laparoscopic surgery.

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