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An improved needleholder for endoscopic knot tying

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The indications of endoscopic surgery have widened rapidly over the last decade from adhesiolysis, salpingostomy, and cystectomy to myomectomy, cholecystectomy, pelvic lymph node sampling, and even hysterectomy (1). This rapid expansion was started by the enthusiasm of pioneers such as Semm, Bruhat, and others and supported by technological improvements such as lasers for safe endoscopic cutting and coagulation, light sensitive video cameras providing a sharp image, better designed instrumentarium, and recently, insufflation devices with a high flow rate (2).

Endoscopic surgery remains hampered by the fact that endoscopic suturing and knot tying still is a relative slow and tedious procedure. As an alternative method besides the existing extracorporeal and intracorporeal knot-tying techniques (3-5), a new needle holder was developed. Its most prominent feature is a small lateral and rotating hook that greatly facilitates and increases speed of knot tying and suturing.

MATERIALS AND METHODS

The principle was tested by modifying a standard Storz 3 mm needle holder (Storz AG, Tuttlingen, Germany). A rotating shaft (outer diameter: 5 mm) was fitted around the needle holder. The distal end of the shaft contained a small hook (Fig. 1Aa). To make a knot, the thread is easily grasped with this hook (Fig. 1Ab) and fixed to the shaft of the needle holder by advancing the latter (Fig. 1Ac). A loop is

automatically formed by rotating the shaft 360° (Fig. 1A,d and e). After the loose end of the thread is grasped, the hook is released, and the knot is formed.

RESULTS

The usefulness of the needle holder was evaluated with a pelvic trainer and in vivo. In vitro, the case of learning by registrars in training, and the numbers of knots tied/min (range 4 to 15) was not obviously different between the hook needle holder and a conventional needle holder. The speed of knot tying with the hook needle holder was, however, more constant, whereas with a conventional needle holder knot tying varied from very slow to the most rapid. This reflects the authors experience in vivo that knot tying with a conventional needle holder varied from relatively easy and rapid to irritatingly difficult and slow, especially deep in the pelvis when the thread is moistened with saline and/or blood and when little space is available to move the instruments. Especially in difficult situations, the hook needle holder proved to be superior because it enabled us to form reliably 4 to 8 knots/min. The hook needle holder has the additional advantage that the needle can be withdrawn in the shaft, which makes the introduction of the needle easy and safe through a 5-mm trocar.

Our clinical experience with the hook needle holder involves suturing of an accidentally opened bladder (n = 1) or rectum (n = 2), of the uterus following a myomectomy (n = 3), and of a chole-
dochus (n = 1). No complications were encountered.

DISCUSSION

Endoscopic suturing and knot tying remains a relatively difficult procedure that requires special

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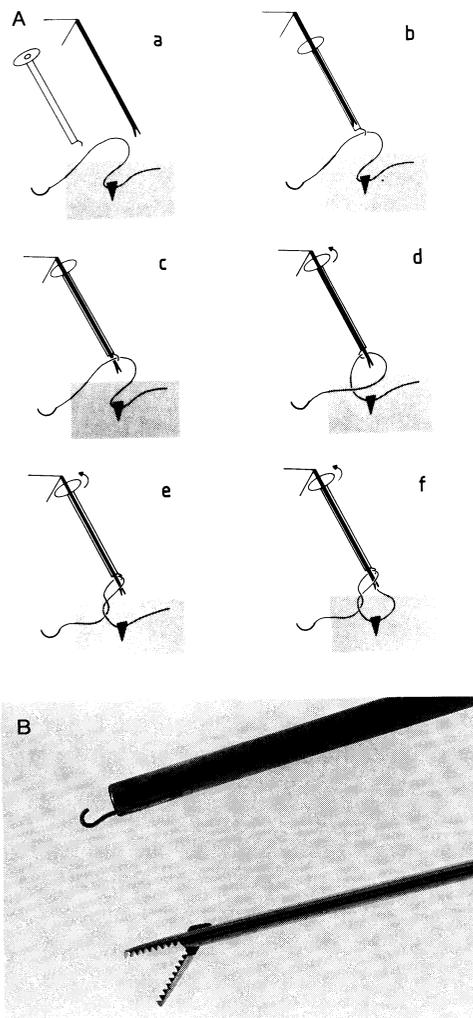


Figure 1 (A), Needle holder and rotating shaft with hook (a). To make a knot, the thread is grasped with the hook (b) and fixed to the needle holder by advancing the latter (c). By turning the shaft 360° (d + e), a loop is automatically formed. The distal end of the thread is grasped by the forceps (f), the hook released and the knot tied. (B), Needle holder with a rotating shaft and hook.

skills and extensive training. Initially, loops with preformed knots were used mainly to ligate vascular pedicles, such as the infundibulo pelvic ligament during ovariectomy, and more recently the cystic duct during cholecystectomy. Preformed loops, although very useful for specific indications, remained hampered by a relative high cost because for each knot/suture a new loop had to be used. Moreover, these loops could not be used to approximate tissue under tension, e.g., to close the uterine wall after a myomectomy.

Over the last years, alternative instruments for hemostasis such as metal clips and stapling devices were developed. Simultaneously, endoscopic suturing and knot tying techniques have been developed. Suture material, specific for endoscopic use, with small straight needles or ski needles, was introduced. Improved extracorporeal knot-tying techniques were recently described (4), which only emphasizes the technical difficulty of intracorporeal endoscopic knot tying. The feasibility of intracorporeal endoscopic knot tying has been described and mastered over several years by great endoscopic surgeons with exceptional skills. We found that although intracorporeal endoscopic knot tying can sometimes be relatively easy, it often is very difficult, especially deep in the pelvis when little space is available to move the instruments. In these cases, the new needle holder with the lateral hook proved extremely useful because loops around the needle holder were automatically and reliably formed while being kept firmly in place when the other end of the thread was grasped. Knot tying with a conventional needle holder is essentially a two-hand procedure, whereas knot tying with the hook needle holder is a one-hand procedure, the position of the grasper holding the longer end of the thread being relatively unimportant.

The major advantage of the hook needle holder is use in difficult situations and when the surgeon is less experienced. This is especially important in gynecology in which the indications for endoscopic suturing are relatively limited and for many surgeons restricted to the accidental opening of a bladder or a bowel. The awareness of the surgeon, however, is that he is able to deal endoscopically with these situations is extremely important to excise completely, e.g., deeply infiltrating endometriosis.

In conclusion, an improved needle holder for endoscopic surgery is described. A rotating lateral hook forms semiautomatically a loop that is stabilized when the end of the suture is grasped. This facilitates endoscopic suturing by speeding up knot tying, especially in difficult situations.

SUMMARY

A needle holder fitted with a distal and rotating hook is described. During endoscopic suturing, this hook grasps the thread and forms automatically a loop, through which the distal end of the thread is pulled to secure the knot. Endoscopic intracorporeal

knot tying thus becomes easier and faster, especially in difficult situations.

Key Words: Endoscopic surgery, needle holder.

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