Abdominal Wound Closure Forceps

Abstract. The device is a modification of a standard tissue forceps for use during closure of abdominal wounds made for a surgical procedure. The modification consists of a scoop on the handle end of the forceps; the scoop functions as a needle catch during suturing, thereby protecting the underlying viscera.

Background. Despite the advent of laparoscopic surgery, open surgical procedures on the abdomen still are performed with a widely variable frequency. There has been no indication that open surgery will be phased out in the foreseeable future. Wound closure after an open surgical procedure involves repetitive passage of a large suture needle through the abdominal wall (Figure 1). In a long, linear incision, this closure typically is done by suturing from both ends of the incision with two separate threads until they meet in the middle (Figure 2). At this point the two threads may be tied together to complete the closure. Not infrequently, the final portion of the incision that is closed between the two threads (Figure 2d) is difficult to access with the suture needle. This part of the incisional closure often is done with suboptimal visualization of the underlying bowel, which puts the bowel at risk for perforative injury by the needle (Figure 3). In order to minimize this risk, the surgeon uses a variety of surfaces (such as a abdominal wall retractor, or even the surgeon's own fingers) to serve as a needle catch (or guide) to protect the viscera from the closure needle. There is no specific device which combines the function of a heavy tissue forceps with that of a needle catch/guide.

Purpose. The purpose of the proposed device is to provide the surgeon with a forceps that can be used to grab the abdominal wall fascia during wound closure, but also to provide the surgeon with a scoop that functions as a needle catch, thus protecting the underlying intestines when the suture needle is passed through the fascia.

Description. The proposed device is a modification of a conventional heavy tissue forceps (also known as a "Ferris-Smith" forceps; see Figure 4). The conventional forceps consists of a relatively large handle so that the surgeon can apply force to the thick, strong tissue which typically is manipulated during abdominal incision closure. The gripping end of the forceps is equipped with teeth to facilitate holding of the tissue. The proposed device (i.e., the Abdominal Wound Closure Forceps) has a scoop or catch coming off the handle end of a conventional heavy tissue forceps (see Figure 5). This scoop has a built-in curve which accommodates the curving path of a suture needle. In addition, the scoop has a longitudinally-oriented groove which prevents the needle from slipping away as it is passed into the scoop. During the initial phases of closure of a long, linear incision, the surgeon would employ the Abdominal Wound Closure Forceps in the same manner as a conventional Ferris-Smith forceps. During the final phases of wound closure (when exposure of the underlying viscera is poor), the surgeon would flip the Abdominal Wound Closure Forceps around in his/her nondominant hand, such that the scoop could be placed underneath the fascia, between the perforating tip of the needle and the underlying bowel. The scoop then could catch the needle as it is passed through the tissue (Figure 6). Employment of the scoop of the Abdominal Wound Closure Forceps in this manner would allow safe passage of the needle during the final throws of the suture.

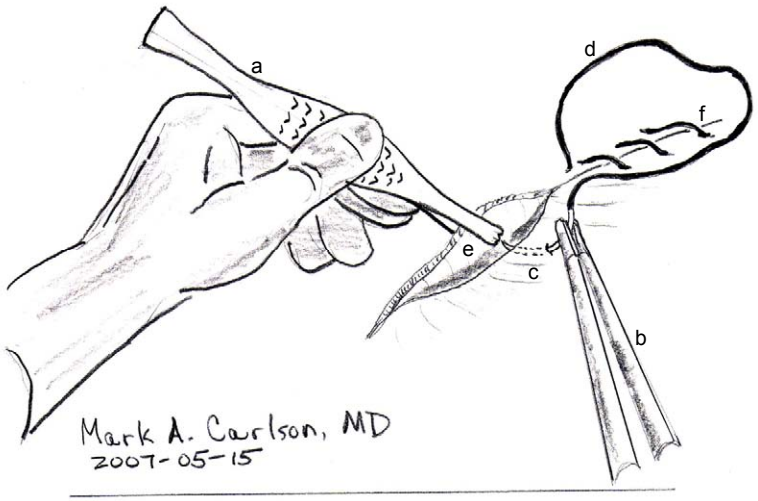

Figure 1: Suturing of an abdominal incision. The left hand of the surgeon is shown holding a conventional heavy tissue forceps (a). The right hand of the surgeon (not shown) is holding a needle driver (b), which holds a suture needle (c, in partial phantom view) that is attached to the suture thread (d). The open area of incision which remains to be closed (e) is held open with the forceps in anticipation of needle passage. The portion of the incision which already has been closed (f) is shown with “over-an-over” loops of suture.

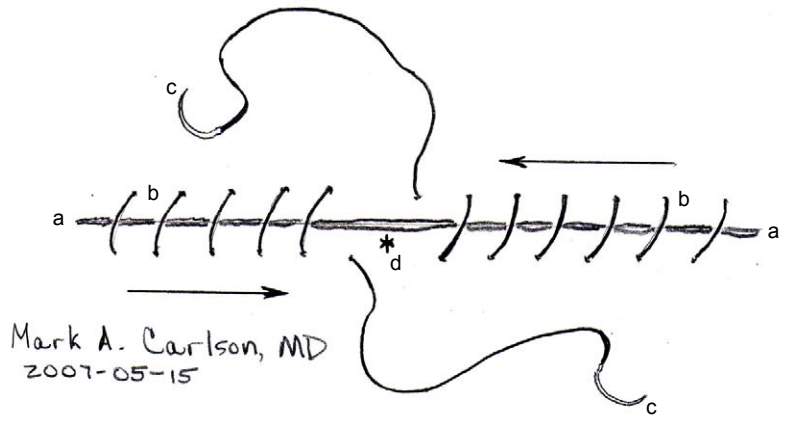

Figure 2: Typical method of wound closure for a long, linear incision. The incision (a) is closed by suturing from both ends of the incision, thereby having the two suture threads “meet” in the middle of the incision. The arrows indicate the direction of sewing for each respective thread. The suture is placed with a continuous “over-and-over” technique, which results in loops of suture (b) holding the incision together as shown. The suture needles (c) are shown attached to their respective threads. The area marked with an asterisks (d) is the final portion of the incision that needs to be sutured; because of the confined space, this portion of the incision often is difficult to access with a suture needle.

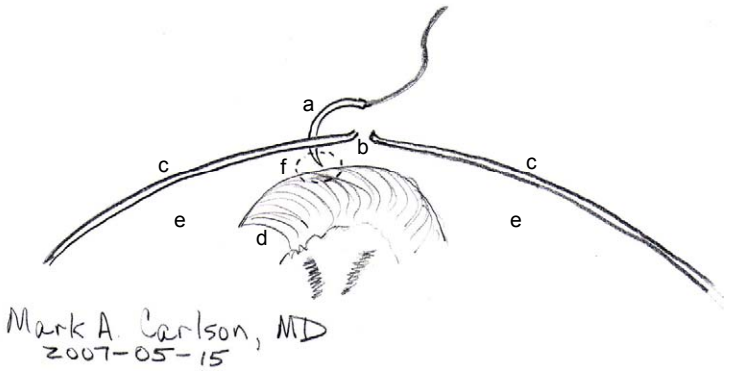

Figure 3: Mechanism of visceral injury during abdominal incision closure. During closure of the final portion of a long, linear incision, the placement of the last few suture loops often is done with suboptimal visualization of the underlying viscera (e.g., intestine). The suture needle (a) is passed across the gap (b) between the two layers of fascia (c); but this possibly may be done blindly because at this point in the wound closure, there is little space left in which to work. It is common to have loops of intestine (d) present in the peritoneal cavity (e) directly beneath the suture needle. If the surgeon is not extremely careful, then the suture needle may be passed inadvertently into the lumen of the intestine (f) during these final closure steps.

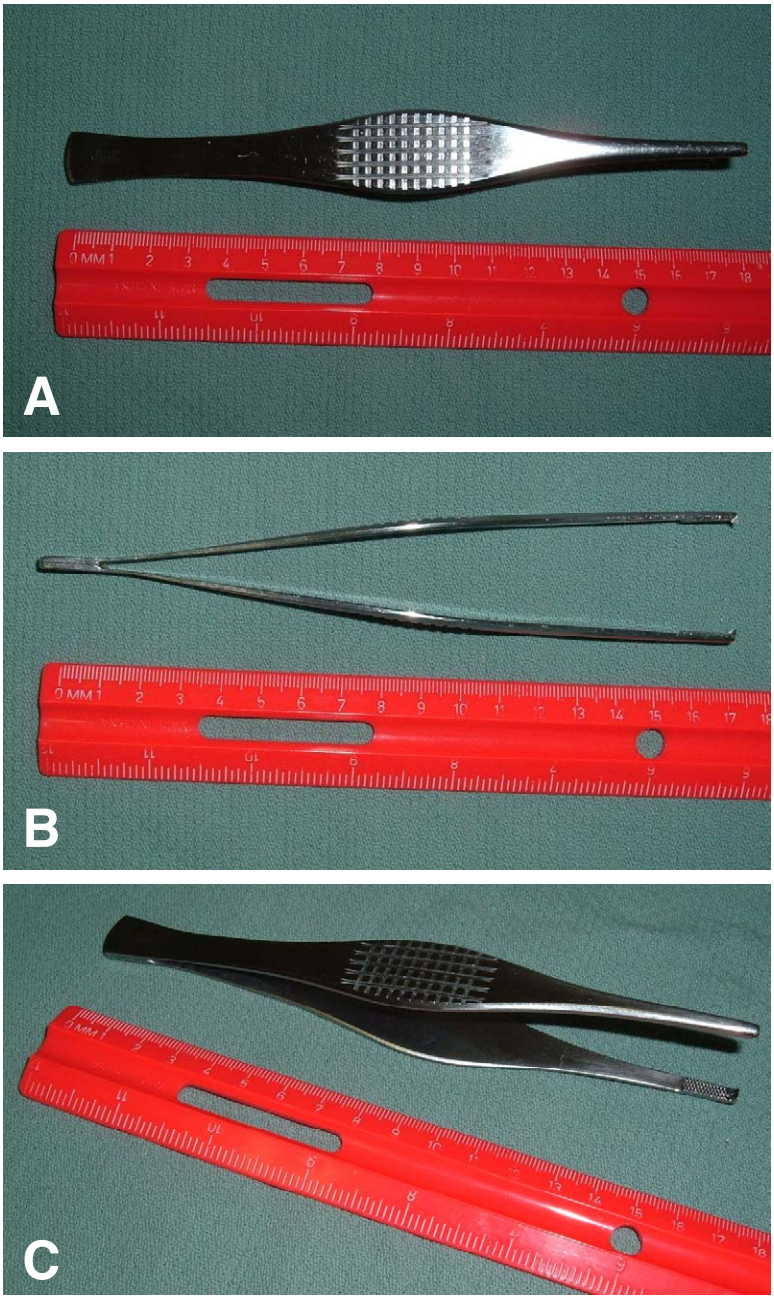

Figure 4: conventional heavy tissue ("Ferris-Smith") forceps. A = lengthwise view, flat side; B = lengthwise view, on edge; C = oblique view. Scale closest to the instrument is in cm.

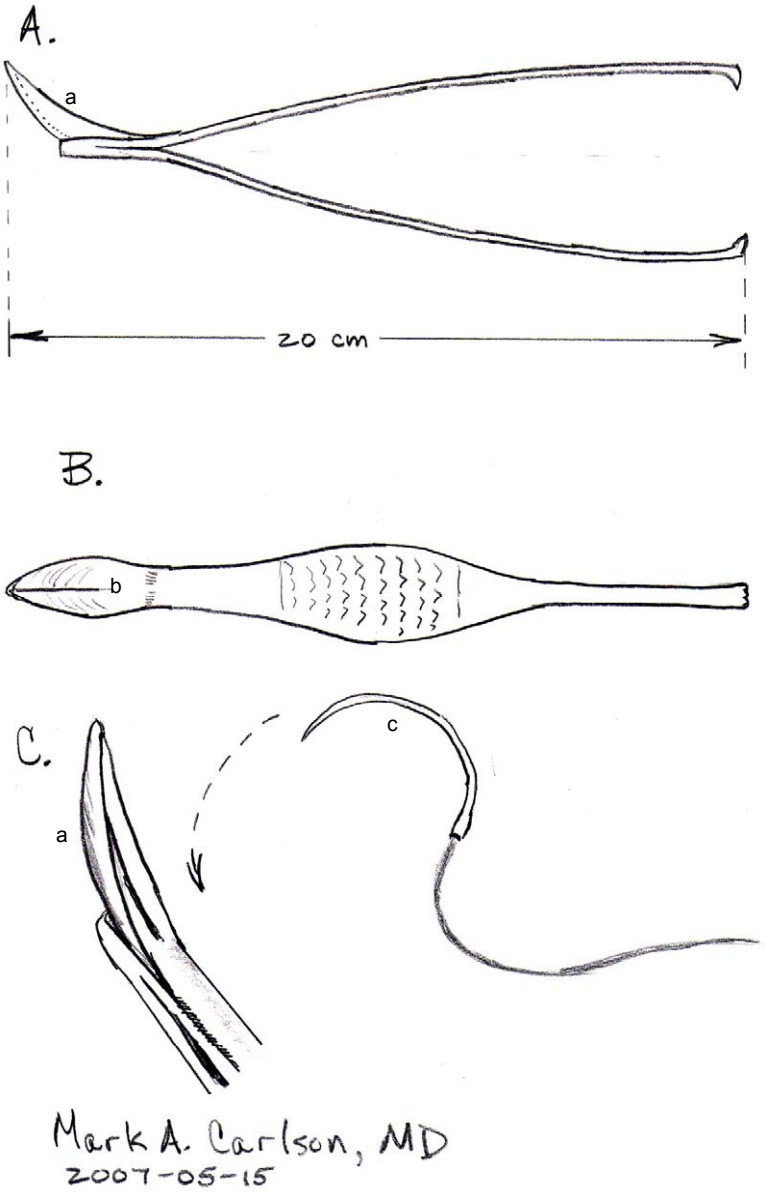

Figure 5: the Abdominal Wound Closure Forceps. The device consists essentially of a Ferris-Smith forceps modified on the handle end with a scoop or catch for the suture needle. A = lengthwise view, on edge. The scoop (a) is shown coming off the handle end (to the left). B = lengthwise view, flat side. Inside the scoop is a groove (b) which prevents needle slippage. C = oblique view of handle end, showing the scoop (a) and a suture needle aimed into the scoop (c).

Figure 6: Technique with the Abdominal Wound Closure Forceps. In this mock-up, the surgeon's right hand is driving an (imaginary) needle into the receiving scoop of the Abdominal Wound Closure Forceps (here represented by a conventional Ferris-Smith forceps, held in the surgeons' left hand). The direction of needle passage is indicated by the arrow.