

Epochs in Endourology

Evolution of Hand-Assisted Laparoscopic Surgery

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The fall 1989 meeting of the American College of Surgeons in Atlanta was momentous. Overnight, American general surgery was rejuvenated by the magic of laparoscopic cholecystectomy and the open door to minimally invasive surgery. Many surgeons, sung and unsung, made this advance come to pass.

A group of us at the Charleston Area Medical Center (CAMC) were swept up in the “first wave.” After Kusminsky attended a Reddick and Olsen training session in January 1990, we (Drs. E. H. Tiley and James P. Boland, and R.E. Kusminsky) set about putting laparoscopic cholecystectomy in place and then conducting training sessions for other surgeons in our area. By the summer of 1990, “lap chole” was a mature procedure, and, we, like many other groups, were looking for new worlds to conquer. Our efforts were delayed somewhat by the temporary departure of the senior member of the group, when Dr. Boland was recalled to active duty in the United States Navy for the duration of Gulf War I.

On his return to Charleston in April 1991, the group developed evolutionary plans to expand our minimally invasive horizon. We were attracted to Mr. Wickham’s Minimally Invasive Therapy (MIT) Society and his basic concepts of quantifying “minimally invasive” and used this outline as the intellectual and scientific underpinning of our future efforts.¹

At that time, the surgical community was in a quasi-feverish state of excitement after catching a glimpse of a new portal of opportunities. Discussions and trials of increasingly complex laparoscopic procedures burst forth on the surgical stage and were rapidly adopted, not always with complete scientific rigor. Splenectomy, adrenalectomy, nephrectomy, and others became familiar themes.

We brainstormed, and grumbled about the fact that we lacked some of the resources needed to embark on advanced procedures. We did not like the idea of morcellation of solid organs. And, in the midst of our discussions, it became clear to us that a technique using traditional surgical skills could well serve as a transitional step that would allow practically any experienced surgeon to perform advanced laparoscopic procedures. Or so we thought.

“All surgeons are comfortable with this instrument,” said Boland, raising and rotating his hand.

We scanned the literature *ad infinitum*.

Nothing.

We theorized that using a sleeve-like device around the incision, similar to the system used in incubators, would keep the pneumoperitoneum from escaping; but after our initial steps, we did not pursue the issue. We were pleased with the swift evolution of new instruments. For our purposes, high-volume insufflators and endoscopic linear staplers were most significant. We used the period from April 1991 to April 1992 to verify (using standard open techniques) that the vascular linear staplers were safe and effective.

Our first case, a hand-assisted splenectomy in May 1992, was planned carefully. We checked the equipment the way a pilot checks his aircraft prior to departure. Just in case, we asked for a second insufflator. We started the case laparoscopically, and eventually we were forced to make a small incision because the patient bled from a short gastric vessel. The spleen, almost completely detached, was delivered easily by a hand introduced through the small incision. The patient had a smooth and uneventful postoperative course. We returned to the idea of hand assistance as we had theorized and planned earlier.

We evolved, logically, to use of a lower-abdomen transverse incision. Kusminsky, a general and colorectal surgeon, had experience with the Pfannestiel incision. Toward the second half of 1992, we switched our approach, and theoretically and practically, that became our incision of choice (Fig. 1).

Using a Pfannestiel incision generated further excitement in the operating room. After the patient’s abdomen was prepared, we estimated the distance between the pubis and the left upper quadrant. We debated the exact placement of the incision: the “little higher” and the “little lower” camps finally came to an agreement. Unanimously, Boland was chosen as the “hand” surgeon: he is 5’7” and 140 pounds and wears a size 6½ glove. In those days, gloves that size in our institution were pink.

Boland was teased gently.

During the procedure, the incision had to be extended to allow Boland’s forearm to reach the upper pole of the spleen.



FIG. 1. Suprapubic incision and obstetrical glove.

Once again, discussion ensued about how much the incision was to be lengthened. As we gained experience, it became obvious that that the incision's length in centimeters correlated fairly well with the glove size of the "hand" surgeon.

Once the splenic hilum was transected, we observed, fascinated, the trek of the spleen down to the pelvis and smiled as the pink hand made it disappear from the screen and reemerged in the three-dimensional world, out of the abdomen.

We wrestled with a name for the technique. We tried "one-handed video-assisted," "intra-abdominal manipulation," and "minilaparotomy with manipulation" as well as others, less inspired, until we settled comfortably on "hand-assisted laparoscopic surgery." Our description of the conceptual basis of the technique appeared in the *Journal of Minimally Invasive Therapy* early in 1993.²

As our plans were developing, Dr. Ralph V. Clayman was doing his pioneering work in renal/urological minimally invasive surgery, and about this time Dr. J. P. Tierney (a urologist) joined our group. By engaging the whole group in the developmental efforts (all attending the standard cases, using the new instruments, and then discussing "ideal" cases and the "next step"), we felt ethically secure that our approach was conservative and well conceived. Operative permission was obtained from the patients by explaining that the procedure was our standard except that it was to be performed through a "more comfortable" incision (or incisions) and that, in the event of any untoward event, the standard incision might be necessary. This was similar to our approach to informed consent for laparoscopic cholecystectomy, where the risk of conversion to open surgery was part of the discussion with each patient.

Our initial efforts did not get an enthusiastic reaction. What sounded safe and logical for a regional medical center with a relatively low volume of solid-organ surgery did not resonate in the world of devoted "pure" laparoscopic surgeons practicing in referral centers in major metropolitan areas and making up many of the editorial boards and journal referees. Our salvation was the MIT Society, where we could both present papers and have them accepted for publication.

Approximately 1 year after our initial efforts, we presented our work on laparoscopic hand-assisted staging laparotomy in

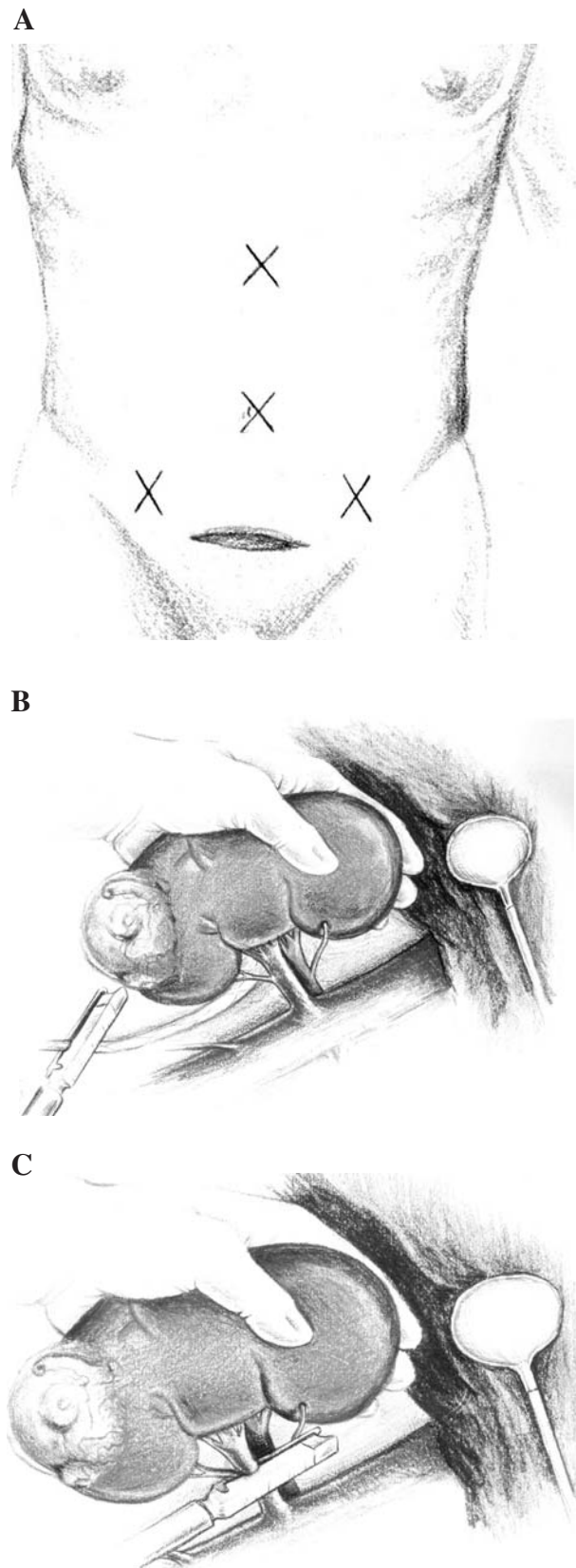


FIG. 2. Original hand-assisted nephrectomy. (A) Incision and port placement. (B) Stapled transection of ureter. (C) Stapled transection of renal vessels.

Orlando, Florida, during the meeting of the MIT Society. The audience included surgeons from the US, Germany, and England. We continued to carry the message to numerous places: San Francisco, Berlin, Mexico. Reactions ranged from polite questions to frank rejection. Adverse comments abounded. In Mexico, in 1993, Boland was criticized rather aggressively by a well-known surgeon, who claimed that he had tried the technique already and abandoned it. In Berlin in 1994, Tierney presented the first-ever series of hand-assisted laparoscopic nephrectomies in seven patients. Simultaneously, Tiley introduced our work on hand-assisted gastric fundoplication, and we again updated our results with hand-assisted splenectomy. Tiley won an award for his presentation.

And the main award?

It went to a group presenting hand-assisted nephrectomy done in a porcine model and using a Pneumo-sleeve. Almost a year earlier, Tierney had submitted our paper describing the first-hand assisted laparoscopic nephrectomy (Fig. 2) to a prestigious American journal, and the manuscript was rejected: it was felt that "using an endoscopic stapler to transect the renal hilum was unsafe." That paper finally appeared in *Minimally Invasive Therapy* in 1994.³

We extended our experience to adrenalectomy, colon resections, and any suitable procedures, because it became clear to us shortly after the development of the technique that this was not really a transitional approach but could supplant the open strategies and perhaps even the purely laparoscopic ones with similar advantages.

Respectability for the hand assist came with the development of commercial hand-assist laparoscopic products and the publicity associated with them (journal advertisements, brochures, product display at conventions, etc.). At present, Tierney, the urologist of our group, who has a larger forearm circumference, uses the "ports"/pneumoperitoneum sleeves almost all the time. The general surgeons at our institution continue to use the tech-

nique originally described; in other words, they do not utilize sleeves. However, at our institution, there has been a declining number of splenectomies.

A brief technical point about our routine: the cuffs on reusable gowns are so tight they cannot be pulled to just below the antecubital fossa. Using an obstetrical glove requires a more expandable cuff, so whenever possible, we switch to cloth gowns.

To conclude, the hand assist appears to be an appropriate minimally invasive solution to many surgical problems, and we consider it an important addition to our laparoscopic surgical armamentarium. What started as an emergency maneuver to control intraoperative bleeding during a splenectomy has evolved into an accepted technique for various extirpative and reconstructive laparoscopic operations.

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