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SAGES GUIDELINE FOR LAPAROSCOPIC APPENDECTOMY

I. Preamble

The laparoscopic approach to appendectomy has gained wide acceptance over the last 15 years as a means of improved diagnostic accuracy and wound complication rate over the open procedure. Despite a breadth of data and widespread adoption of the technique, there continues to be controversy regarding the advantages of this approach in hastening postoperative recovery, as well as its use in the management of complicated appendicitis. The following guidelines provide recommendations to surgeons for the laparoscopic management of patients with both simple and complicated appendicitis.

II. Disclaimer

Guidelines for clinical practice are intended to indicate preferable approaches to medical problems as established by experts in the field. These recommendations will be based on existing data or a consensus of expert opinion when little or no data are available. Guidelines are applicable to all physicians who address the clinical problem(s) without regard to specialty training or interests, and are intended to indicate the preferable, but not necessarily the only acceptable approaches. Guidelines are intended to be flexible. Given the wide range of specifics in any health care problem, the surgeon must always choose the course best suited to the individual patient and the variables in existence at the moment of decision.

Guidelines are developed under the auspices of the Society of American Gastrointestinal Endoscopic Surgeons and its various committees, and approved by the Board of Governors. Each clinical practice guideline has been systematically researched, reviewed and revised by the guidelines committee, and reviewed by an appropriate multidisciplinary team. The recommendations are therefore considered valid at the time of its production based on the data available. Each guideline is scheduled for periodic review to allow incorporation of pertinent new developments in medical research knowledge, and practice.

III. Definitions

See SAGES The Definitions Document: A Reference for Use of SAGES Guidelines (01/2009)

IV. Utilization of Laparoscopy for Appendicitis

Guideline: The indications for appendectomy are identical whether performed laparoscopically or open. (level III, Grade A)

For the purpose of this guideline, it is recognized that the clinician has determined operative intervention for presumed appendicitis is indicated. When the clinician is evaluating a patient with possible appendicitis, the risk and benefit of each diagnostic test and evaluation should be taken into account during the workup. The use of laparoscopy to establish the diagnosis of appendicitis is addressed in the SAGES Guideline for Diagnostic Laparoscopy (SAGES PUBLICATION #0012).

General considerations when deciding to proceed laparoscopically include availability of trained staff and equipment, ability and training of surgeon, and the patient's ability to tolerate general anesthesia and pneumoperitoneum. Previous laparotomy is not an absolute contraindication to a laparoscopic approach.

V. Patient Selection

A. Uncomplicated Appendicitis

GUIDELINE: Laparoscopic appendectomy is a safe and effective method for treatment uncomplicated appendicitis and may be used as an alternative to standard open appendectomy. (level I, grade A)

1. Length of operation, post-operative pain, return to work.

Multiple randomized controlled studies have demonstrated the safety and efficiency of laparoscopic appendectomy compared with open appendectomy for the treatment of acute appendicitis. Generally, these studies involve 200 patients or less 1 but some larger experiences have also been reported 2,3. Although the differences between the two approaches have been small, most studies show that the laparoscopic operation is longer, but associated with a shorter hospital stay and possibly with a more rapid return to work. A meta-analysis of 28 trials available by 1998 4 found that the laparoscopic approach took about 16 minutes longer but resulted in less post-operative pain on day one, shorter hospital stays (15 hours) and quicker return to full activities (5-9 days sooner). Complication rates were comparable, except that wound infections were slightly lower after laparoscopic appendectomy. More recent updates by these authors 5,6 analyzing 45 and 54 studies confirm that the open procedure is shorter (12 minutes) but results in more pain and longer stays. Wound infections occurred about half as often with the laparoscopic approach but deep pelvic abscesses were twice as frequent.

Because of the lack of clarity of results from clinical trials, population based studies of up to 150,000 cases looking at the results by 1CD-9 codes for laparoscopic and open appendectomy have been analyzed to sample a broader range of patients 7,8. These studies have again shown shorter stays, higher rates of routine discharge and lower morbidity and mortality rates for the laparoscopic group. In particular, mortality rates for laparoscopic appendectomy were only 1/5 the rates of open appendectomy for patients older than 65.

2. Complications and conversions.

In earlier population studies, complication rates were comparable between the two approaches, except for a higher wound infection rate for the open approach and a higher intraabdominal abscess rate for the laparoscopic procedure. Recent studies 3,9 show little difference in complications suggesting that with added experience surgeons can reduce the rate of abscess formation.

Recurrent appendicitis has been seen in patients whose appendix was incompletely removed at the original operation 10, 11. This is a problem seen with open appendectomies as well 12, but stresses the need for careful laparoscopic dissection and identification of landmarks prior to appendiceal division. Fortunately, the tip of the appendix usually lies free in the peritoneal cavity 13 rather than being behind the cecum, minimizing this risk.

Conversion rates vary from 0-27% 1. Conversion to open appendectomy should be done according to surgeon judgement, experience, and ability to treat the operative findings safely.

3. Cost.

Initial studies of laparoscopic appendectomy suggested higher costs because of the expense for equipment and the longer operative times 14. As surgeons and centers have gained experience, it is no longer clear that there is a higher cost with laparoscopy. The small differences in operative costs are offset by gains attributable to shorter hospital stays and quicker returns to work 15,16. These factors are not entirely addressed by current studies. See the technical section for further discussion.

B. Perforated Appendicitis

GUIDELINE: Laparoscopic appendectomy may be performed safely in patients with perforated appendicitis. (Level II, grade B) 8, 17 and is possibly the preferred approach (level III, grade C)

There have been no randomized controlled trials comparing open and laparoscopic treatment of perforated appendicitis but multiple studies have established the feasibility and safety of LA. There is significant variability in complication rates, specifically infection rates, reported in the literature. Level I evidence indicates that LA has a lower wound infection rate and a large population based study also identified LA to be associated with a lower infection rate 8. The population studies showed shorter stays, and lower morbidity and mortality rates for the laparoscopic group. These findings were the same for all age groups and regardless of whether perforations had occurred or abscesses developed. Earlier studies showed a possible increased risk of intra-abdominal abscess (IAA) formation after LA for perforated appendicitis however more recent studies show no difference 17. Others have shown that with specialized laparoscopic teams, the IAA rate can be diminished. 18

C. Women of Childbearing Age

GUIDELINE: Laparoscopic approach for fertile women with presumed appendicitis should be the preferred method of treatment. (Level 1, grade A)

With improved visualization of the entire abdomen, laparoscopy for the treatment of appendicitis improves the diagnostic accuracy and can identify the definitive pathology more often than the open approach.19, 20, 21, 22.

D. Elderly Patients

GUIDELINE: Laparoscopic approach may be the preferred method of treatment. (Level II, Grade B) 8, 23

Population based studies have shown a lower rate of complications and death, especially in the elderly (2.4 vs 0.5%)8 for open vs. laparoscopic appendectomy in patients over age 65 years. This supports the primary use of laparoscopic appendectomy for uncomplicated appendicitis in those centers possessing the requisite skills and equipment.

E. Pediatric Patients

GUIDELINE: Laparoscopic appendectomy may be safely performed in pediatric patients. For specific recommendations, reference may be made to IPEG guidelines.

F. Pregnancy

GUIDEINE: Laparoscopic appendectomy may be performed safely in pregnant patients with suspicion of appendicitis (Level II, Grade B).

Laparoscopic appendectomy can be performed safely in any trimester and is considered by many to be the standard of care for gravid patients with suspected appendicitis.24, 25, 26, 27 See SAGES Guidelines for Diagnosis, Treatment, and Use of Laparoscopy for Surgical Problems during Pregnancy for more complete discussion.

G. Obesity

GUIDELINE: Laparoscopic appendectomy is safe and effective in obese patients.(level II, Grade B) and may be the preferred approach (level III, grade C)

The laparoscopic approach may convey some advantages over the open approach in access to the appendix, visualization, and decrease in wound complications. In the morbidly obese, longer trocars and instruments may be needed.28

VI. Special Considerations

A. Treatment of normal appendix on laparoscopy for appendicitis

GUIDELINE: If no other pathology is identified, the decision to remove the appendix should be considered but based on the individual clinical scenario.(level III, Grade A)

Macroscopically normal appendixes may have abnormal histopathology. Several studies have shown a 19% to 40% rate of pathologically abnormal appendix in the setting of no visual abnormalities.29Therefore the risk of

leaving a potentially abnormal appendix must be weighed against the risk of appendectomy in each individual scenario. Cases of postoperative symptoms requiring reoperation for appendectomy have been described in patients whose normal appendix was left in place at the time of the original procedure.

VII. Technical Aspects

GUIDELINE: Developing a consistent operative method decreases costs, OR time, and complications. (level II, Grade B)

A. Historical context

Laparoscopic appendectomy has been simplified by the development of electrocoagulating bipolar instruments, ultrasonic dissectors, and endoscopic staplers as well as improved camera optics. Experience has brought about a reduction in the size and number of ports. Mastery of the learning curve and proficiency in advanced laparoscopic techniques has decreased OR times.

There is very little Level I evidence comparing particular techniques however some Level II and III evidence suggests that developing a consistent method decreases costs and OR time and decreases complications 18, 30 . This applies to laparoscopic appendectomy performed in a training program. One study involved the creation of a minimally invasive service.

The use of standardized techniques, including peritoneal lavage following removal of the appendix has been shown to reduce the intraabdominal abscess rate 18 after a learning curve of 20 cases.

B. Technical approaches

Positioning: Supine position with Trendelenburg, left arm tucked with both surgeon and camera operator on patient's left side. Foley placement, or voiding preoperatively in uncomplicated appendicitis, provides decompression of bladder which may help with exposure and avoid injury.

Trocar placement: Basic principles of triangulation in trocar placement apply. All studies describe placement of the initial (usually a 10mm camera) port at the umbilicus. One study 31 found that using all 5 mm ports was feasible although 35% needed conversion to a 10mm trocar due to a fatty mesoappendix. While port placement is at the discretion of the operating surgeon, the secondary port placements reported in the literature were:

i. LLQ and RLQ directly above appendix for retraction. This location provides a means for "fingeroscopy" 18 to break up adhesions. One study found that fingerscopy may allow more efficient and full lysis of inflammatory adhesions and prevent incomplete appendectomy.
ii. RLQ and suprapubic.
iii. LLQ and suprapubic.
iv. Considerations: Having two working ports in adjacent quadrants (i.e. LLQ and suprapubic positions) allows the surgeon to work two-handed, rather than relying on an assistant to provide retraction while the surgeon dissects. Surgeons should consider the experience level of their assistant as well as the goals of a training program if they work in one.

Appendiceal retraction: Methods reported include simple retraction with a grasper via a 5mm port, a 5mm port placed directly above the appendix, an endotie around the end of the appendix to retract up, or a straight needle placed through the abdominal wall.

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