



Practice/Clinical Guidelines published on: 10/2006
by the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES)

GUIDELINES FOR DEEP VENOUS THROMBOSIS PROPHYLAXIS DURING LAPAROSCOPIC SURGERY

Preamble:

There is still some controversy over the best practice for prevention of deep vein thrombosis (DVT) during laparoscopic surgery. This guideline is intended to assist surgeons in making decisions regarding DVT prophylaxis when performing laparoscopic procedures. Although there are examples of specific procedures, the basic philosophy is that the prophylactic therapy be tailored to the individual patient needs based on estimated risk of venous thromboembolic (VTE) disease. In this regard, there may be a specific procedure that has a variety of treatment strategies for varying clinical scenarios. Recommendations are based on the current medical evidence and have been graded according to the available evidence. Where data exist for only open surgical procedures, we will adapt these data, and note a lower evidence and/or recommendation rating.

Disclaimer:

Clinical practice guidelines are intended to indicate the best available approach to medical conditions as established by a systematic review of available data and expert opinion. The approach suggested may not necessarily be the only acceptable approach given the complexity of the healthcare environment. These guidelines are intended to be flexible, as the surgeon must always choose the approach best suited to the patient and to the variables at the moment of decision. These guidelines are applicable to all physicians who are appropriately credentialed regardless of specialty and address the clinical situation in question.

These guidelines are developed under the auspices of SAGES, the guidelines committee and approved by the Board of Governors. The recommendations of each guideline undergo multidisciplinary review and are considered valid at the time of production based on the data available. New developments in medical research and practice pertinent to each guideline are reviewed, and guidelines will be periodically updated.

RISK STRATIFICATION (Table 1)

Operative factors – Laparoscopic surgery of all types causes serum hypercoagulability of varying degrees

(level I, II evidence)^{1,2}. Shorter (less than one hour) and less complex laparoscopic procedures such as simple laparoscopic cholecystectomy probably have low risk of VTE disease (level III evidence)². Longer/complex laparoscopic procedures such as laparoscopic roux-en-y gastric bypass are higher risk, (level II evidence)³. Although patient positioning may alter DVT risk, there is not enough significant evidence to suggest that DVT prophylaxis should be changed based on body position alone.

Patient factors – Age, immobility, history of venous thromboembolism (VTE), varicose veins, malignant disease, severe infection, chronic renal failure, > three pregnancies, peri-pregnancy, CHF, history of MI, inflammatory bowel disease, hormone replacement therapy, oral contraceptive use, and obesity all increase risk (level II evidence)^{4,5}. Inherited or acquired thrombophilias (e.g. protein C or S deficiency, factor V Leiden, antithrombin deficiency) greatly increase risk (level II evidence)⁶. A strong family history of clotting complications should be inquired about, and may also influence prophylactic treatment strategy.

PROPHYLACTIC METHODS

Unfractionated heparin (low dose UH) – The dose is 5000 U given subcutaneously. This should be started within two hours of operation (evidence level II) and then every 8 or 12 hours. Every 8 hours is probably more effective at preventing VTE with similar risk of major bleeding (level II evidence)^{7,8}. Continuous infusion of unfractionated heparin is as effective as the subcutaneous route but has an increased risk of major bleeding and also requires hematologic monitoring (level III evidence)⁹.

Low molecular weight heparin (LMWH) – the dose and frequency for LMWH depends on the manufacturer, and should be used according to their recommendations, although patient weight may also be a factor. One trial showed a need for increased LMWH in the morbidly obese (level III evidence)²⁰. LMWH is at least as effective as low dose UH with a similar risk of major bleeding (level I evidence)^{7,8}. There is decreased dosing schedule and decreased risk of heparin induced thrombocytopenia with LMWH compared to UH. Most studies start dosing the night before surgery with no other preoperative dosing to decrease the risk of operative bleeding. One trial showed no increase of operative bleeding when given two hours preoperatively versus the night before (level I evidence)¹⁰. Special consideration needs to be given when using LMWH with epidural or spinal anesthesia because of the risk of causing hematoma during placement or removal of the catheter (level II evidence)¹⁶.

Pneumatic compression devices (PCD) – calf length pneumatic compression devices seem to offer the same protection for VTE as LMWH or low dose heparin (level II evidence)^{11,12,13}. Foot pneumatic compression devices increase lower extremity venous blood flow and cause fibrinolysis to the same extent as calf length devices and seem to have similar benefit to calf length (level III evidence)¹⁶. Foot compression devices are often used with obese patients because calf length may not fit properly. With pneumatic compression devices there is no increased risk of bleeding and therefore little risk of use. There are no data to support the use of PCDs on only one extremity or the upper extremities during laparoscopic surgery.

Combination therapy – LMWH or low dose UH with PCDs may decrease the risk of VTE even more the single line therapy (level II evidence)^{12,13}.

IVC filters – These have been used for high risk patients. Patients with venous stasis disease, BMI>59, truncal obesity, and hypoventilation syndrome or sleep apnea undergoing Roux-en-Y gastric bypass with good results (level III evidence)¹⁴. There are retrievable filters that can be placed peri-operatively and removed up to a year later or left in place. If filters are left in place, low dose coumadin or equivalent anticoagulation is recommended to prevent IVC thrombosis and pulmonary embolism caused by the filter (level III)¹⁹.

Compression stockings, Coumadin – these are inferior methods for the prevention of VTE (level III evidence)^{12,15}. Presumably, compression stockings do not create enough pressure to prevent stasis in the deep leg veins or alter lower extremity blood flow and fibrinolysis. The anticoagulative effect of coumadin alone starts too late to prevent DVT if given immediately prior to the surgical procedure.

Length of treatment remains controversial. We recommend treatment until patients are fully mobile or until discharge from the hospital, unless the patient has an acquired hypercoagulable state, then treatment for two weeks or more may be prudent (level III). Consultation with a hematologist may be helpful in determining an appropriate treatment strategy in these instances.

CONTRAINDICATIONS

Contraindications to anticoagulation therapy for VTE prophylaxis will vary depending on the clinician's assessment of the risk-benefit ratio. The clinician should refer to individual manufacturer recommendations for specific therapy, and utilize sound clinical judgment regarding the decision to withhold prophylactic therapy.

APPENDIX A: Levels of Evidence

Level I Evidence from properly conducted randomized, controlled trials

Level II Evidence from controlled trials without randomization

Or

Cohort or case-control studies

Or

Multiple time series, dramatic uncontrolled experiments

Level III Descriptive case series, opinions of expert panels

APPENDIX B: Scale used for Recommendation Grading

Grade A Based on high-level (level I or II), well-performed studies with uniform interpretation and conclusions by the expert panel

Grade B Based on high-level, well-performed studies with varying interpretation and conclusions by the expert panel

Grade C Based on lower level evidence (level II or less) with inconsistent findings and/or varying interpretations

or conclusions by the expert panel

TABLE 1		
RISK FACTORS FOR VTE (One Point Each)		
PROCEDURE SPECIFIC	PATIENT SPECIFIC	
Duration >1 Hour	History of VTE	Congestive heart failure
Pelvic Procedures	Age >40	Myocardial infarction
	Immobility	Hormone replacement therapy
	Varicose Veins	Oral Contraceptive Use
	Cancer	Multiparity (3)
	Chronic Renal Failure	Inflammatory bowel disease
	Obesity	Severe infection
	Peri-partum	
For inherited or acquired thrombophilias hematology consult is recommended where available		

TABLE 2			
SUGGESTED VTE PROPHYLAXIS			
PROCEDURE	RISK FACTORS	RECOMMENDATION	LEVEL OF RECOMMENDATION/ LEVEL OF EVIDENCE
Lap Chole	0 or 1	None, PCD's, UH or LMWH	C; II,III
Lap Chole	2 or more	PCD's, UH or LMWH	C; II,III
Lap Appy	0 or 1	None, PCD's, UH or LMWH	C; II,III
Lap Appy	2 or more	PCD's, UH or LMWH	C; II,III
Diagnostic Lap	2 or more	PCD's, UH or LMWH	C; II,III
Lap Inguinal H	2 or more	PCD's, UH or LMWH	C; II,III
Lap Nissen	0 or 1	PCD's, UH or LMWH	B/II
Lap Nissen	2 or more	PCD's AND UH or LMWH	B/I, II
Splenectomy	0 or 1	PCD's, UH or LMWH	B/II

TABLE 2			
Splenectomy	2 or more	PCD's AND UH or LMWH	B/II
Other Major Lap			
Procedures: Roux-Y, etc	0 or more	PCD's AND UH or LMWH	B/III

References:

1. Haas S, Flosbach CW. Prevention of postoperative thromboembolism with Enoxaparin in general surgery: a German multicenter trial. *Semin Thromb Hemost*. 1993;19 suppl 1:164-73
2. Nguyen NT, Owings JT, Gosselin R, Pevec WC, Lee SJ, Goldman E, Wolfe BM. Systemic coagulation and fibrinolysis after laparoscopic and open gastric bypass. *Arch Surg*. 2001 Aug;136(8):909-16
3. Gonzalez QH, Ishler DS, Plata-Munoz JJ, Bondora A, Vickers SM, Leath T, Clements RH. Incidence of clinically evident deep venous thrombosis after laparoscopic roux-en-Y gastric bypass. *Surg Endosc*. 2004 Jul;18(7):1082-4
4. Samama MM. An epidemiologic study of risk factors for deep vein thrombosis in medical outpatients: the Sirius study. *Arch Intern Med*. 2000 Dec 11-25;160(22):3415-20
5. Heit JA, O'Fallon WM, Petterson TM, Lohse CM, Silverstein MD, Mohr DN, Melton LJ 3rd. Relative impact of risk factors for deep vein thrombosis and pulmonary embolism: a population-based study. *Arch Intern Med*. 2002 Jun 10;162(11):1245-8
6. Blaszyk H, Bjornsson J. Factor V Leiden and morbid obesity in fatal postoperative pulmonary embolism. *Arch Surg*. 2000 Dec;135(12):1410-3
7. Haas S, Flosbach CW. Prevention of postoperative thromboembolism with Enoxaparin in general surgery: a German multicenter trial. *Seminars Thrombosis hemostasis* 1993;19 suppl 1:164-173
8. Nurmohamed MT, Verhaeghe R, Haas S, Iriarte JA, Vogel G, van Rij AM, Prentice CR, ten Cate JW. A comparative trial of a low molecular weight heparin (enoxaparin) versus standard heparin for the prophylaxis of postoperative deep vein thrombosis in general surgery. *Am J Surg*. 1995 Jun;169(6):567-71
9. Anderson DR, O'Brien BJ. Cost effectiveness of the prevention and treatment of deep vein thrombosis and pulmonary embolism. *Pharmacoeconomics* 1997 Jul;12(1):17-29
10. Avikainen V, von Bonsdorff H, Partio E, Kaira P, Hakkinen S, Usenius JP, Kaaja R. Low molecular weight heparin (Enoxaparin) compared with unfractionated heparin in prophylaxis of deep venous thrombosis and pulmonary embolism in patients undergoing hip replacement. *Annales chirurgiae et gynaecologiae* 1995 84:85-90
11. Clagett GP, Reisch JS. Prevention of venous thromboembolism in general surgical patients. Results of meta-analysis. *Ann Surg* 1988 Aug;208(2):227-40
12. Colditz GA, Tuden RL, Oster G. Rates of venous thrombosis after general surgery: combined results of randomized clinical trials. *Lancet* July 19, 1986:143-146
13. Miller MT, Rovito PF. An approach to venous thromboembolism prophylaxis in laparoscopic roux-en-Y gastric bypass surgery. *Obes Surg*. 2004 Jun-Jul;14(6):731-7
14. Sapala JA, Wood MH, Schuhknecht MP, Sapala MA. Fatal pulmonary embolism after bariatric operations for morbid obesity. *Obes Surg*. 2003 Dec;13(6):819-25
15. Dunn CJ, Goa K. Enoxaparin a pharmacoeconomic appraisal of its use in thromboembolic prophylaxis after total hip arthroplasty. *Pharmacoeconomics* 1996 Aug;10(2):179-90
16. Leali A, Fetto J, Moroz A. Prevention of thromboembolic disease after non-cemented hip arthroplasty. A multimodal approach. *Acta Orthop Belg*. 2002 Apr;68(2):128-34
17. Douketis JD, Kinnon K, Crowther MA. Anticoagulant effect at the time of epidural catheter removal in

patients receiving twice-daily low molecular-weight heparin and continuous epidural analgesia after orthopedic surgery. *Thromb Haemost.* 2002;Jul;88(1):37-40

18. Geerts WH, Pineo GF, Heit JA, Bergquist D, Lassen MR, Colwell CW, Ray JG. Prevention of venous thromboembolism: the seventh ACCP conference on antithrombotic and thrombolytic therapy. *Chest* 2004;Sep;126(3 suppl):338s-400s.
19. Kalve SP, Athanasoulis CA, Fan CM, Curvelo M, Geller SC, Greenfield AJ, Waltman AC, Wicky S. "Recoverytrade mark" vena cava filter: experience in 96 patients. *Cardiovasc Intervent Radiol.* 2006;mar 24;(epub ahead of print)
20. Scholten DJ, Hoedema RM, Scholten SE. A comparison of two different prophylactic dose regimens of low molecular weight heparin in bariatric surgery/ *Obes Surg* 2002;12:19-24.

This statement was reviewed and approved by the Board of Governors of the Society of American Gastrointestinal Endoscopic Surgeons (SAGES), October 2006. It was revised by the SAGES Guidelines Committee.

Brought to you by:

Society of American Gastrointestinal Endoscopic Surgeons
11300 West Olympic Boulevard, Suite 600
Los Angeles, CA 90064
(310) 437-0554
FAX: (310) 437-0585
Website: www.sages.org

This is a revision of SAGES publication #0016 printed 10/92, revised 10/06.

This document is Copyright © 1995 - 2012 [Society of American Gastrointestinal and Endoscopic Surgeons](http://www.sages.org) | All Rights Reserved