Periprocedural Management of Coagulation Status and Hemostasis Risk in Percutaneous Imaging Guided Interventions: Body Imaging Division

Category 0: Procedures with easily detected and controllable bleeding:

Procedures:

- Superficial fluid aspiration
- Thyroid FNA and core biopsy
- Superficial lymph node or mass FNA and core biopsy

Pre-procedure Lab Testing

- None

Management

- Manual compression.
- Ice pack x 5 min

Category I: Procedures with low risk of bleeding:

Procedures

- Thoracentesis
- Paracentesis

Pre-procedure Lab Testing

- INR: if on Warfarin or with liver disease
- Platelet count: if with liver disease

Management

- INR > 2.0: Without liver disease: Stop Warfarin and wait 1-2 days or treat with vitamin K until at or below 2.0. Resume Warfarin in the evening.
- INR > 2.0: With liver disease, MELD score > 30: Hepatology consult
- Platelets: Transfuse if < 20,000
- IV heparin stop x 3 hours. Resume 2-4 hours post procedure.
- Lovenox: Therapeutic dose: withhold one dose. Resume in the evening.
  Prophylactic dose: no need to withhold
- All other anticoagulants: Do not withhold

Category II: Procedures with moderate risk of bleeding

Procedures

- Intraabdominal, intrathoracic, or retroperitoneal biopsy or abscess aspiration.
- Percutaneous liver biopsy

Pre-procedure Lab Testing

- INR: Required
- Platelet count: Required

Management

- INR: Correct if above 1.5.
- Platelets: Transfuse if < 50,000
- Warfarin: Withhold for 2 days before procedure then check INR. Resume in the evening.
- IV heparin: Stop x 3 hrs. Resume in the evening.
- Lovenox (prophylactic and therapeutic): Withhold one dose before procedure. Resume in the evening.
- Plavix: Withhold for 5 days before procedure; bridge as needed. Resume the next day.
- Aspirin and non-steroidal anti-inflammatory drugs: Do not withhold
- Newer anticoagulants: Withhold or bridge with Lovenox as needed. Resume next day.

Category III: Procedures with significant bleeding risk, difficult to detect or control

Procedures

- Renal biopsy
- Spleen biopsy

Pre-procedure Lab Testing

- INR: Required
- Platelet count: Required
- Activated PTT: if on IV heparin

Management

- INR: Correct if above 1.5
- Activated PTT: Correct if > 1.5 times control
- Platelets: Transfuse if < 50,000
- Warfarin: Withhold x 2 days; check INR; bridge with Lovenox as needed. Resume in the evening.
- Lovenox (therapeutic): Withhold x 24 h or two doses. Resume in the evening.
- IV heparin: Stop x 3 hrs. Resume in the evening.
- Plavix and aspirin: Withhold x 5 days; bridge as needed. Resume next day.
- Other anticoagulants: Withhold or bridge as needed. Resume next day.

Notes:

-Guidelines may be exceeded at the discretion of radiologist after consulting with the clinician

-Always use color Doppler to avoid intervening vessels

-Resume IV heparin, Warfarin, and Lovenox the evening of and all other anticoagulants the day after the procedure if no signs of bleeding.

Appendix 1:

Aspirin: ASA
- Anti-platelet agent
- Blocks formation of thromboxane A2, inhibiting platelet aggregation
- Irreversible, platelets regenerate at 10% per day

Coumadin: Warfarin
- Anticoagulant
- Inhibits vitamin K recycling, depleting active vitamin K
  - Vitamin K activates factors II (PT), VII, IX, X, and proteins C, S, and Z
- Half-life 40 hours, liver metabolism, renal excretion

Heparin: unfractionated heparin
- Anticoagulant
- Binds antithrombin III, inactivating thrombin and factor Xa
- Half-life 1.5 hours, metabolized by endothelial cells and macrophages

Lovenox: Enoxaparin sodium, low molecular weight heparin
- Anticoagulant
- Binds to antithrombin to irreversibly inactivate factor Xa
- Less activity against IIa (thrombin) than Heparin
- Elimination half-life 4.5 hours, renal excretion
- Similar drugs:
  - Innohep: tinzaparin sodium
  - Fragmin: dalteparin sodium, metabolized by liver

Plavix: Clopidogrel
- Anti-platelet agent
- Irreversibly inhibits an ADP receptor ($P2Y_{12}$) on platelet membranes
- Half-life 7-8 hours, metabolized by the liver, hepatic and renal elimination

MELD score:
- Model for End-Stage Liver Disease
- Utilizes serum bilirubin, serum creatinine, and INR to predict survival

Appendix 2:
Management of Antiplatelet Therapy

The probability of a thromboembolic complication following reversal or discontinuation of anticoagulation or antiplatelet agents depends upon the preexisting condition for which the medication was prescribed

Up-To-Date 2016-Management of antiplatelet agents in patients undergoing endoscopic procedures

Condition-related risk of thromboembolic complications

High-risk conditions
Atrial fibrillation associated with valvular heart disease (including the presence of a mechanical valve)
Atrial fibrillation associated with congestive heart failure or a left ventricular ejection fraction of <35 percent
Atrial fibrillation associated with a history of a thromboembolic event
Atrial fibrillation associated with hypertension, diabetes, or age >75 years
Mechanical valves in the mitral position
Mechanical valves in patients who have had a prior thromboembolic event
Coronary stents placed within one year
Acute coronary syndrome
Nonstented percutaneous coronary intervention after myocardial infarction
Low-risk conditions
Deep vein thrombosis
Chronic or paroxysmal atrial fibrillation that is not associated with valvular disease
Bioprosthetic valves
Mechanical valves in the aortic position

Appendix 3:
Management of Anticoagulant Therapy

Perioperative thrombotic risk for Anticoagulants- UpToDate 2016

Risk stratum	Indication for anticoagulant therapy
	Atrial fibrillation
Very high thrombotic risk*	CHA_2DS_2-VASc score of ≥6 (or $CHADS_2$ score of 5-6) Recent (within three months) stroke or transient ischemic attack Rheumatic valvular heart disease
High thrombotic risk	CHA_2DS_2-VASc score of 4-5 or $CHADS_2$ score of 3-4
Moderate thrombotic risk	CHA_2DS_2-VASc score of 2-3 or $CHADS_2$ score of 0-2 (assuming no prior stroke or transient ischemic attack)

Risk stratum	
	Mechanical heart valve
Very high thrombotic risk*	Any mitral valve prosthesis Any caged-ball or tilting disc aortic valve prosthesis Recent (within six months) stroke or transient ischemic attack
High thrombotic risk	Bileaflet aortic valve prosthesis and one or more of the of following risk factors: atrial fibrillation, prior stroke or transient ischemic attack, hypertension, diabetes, congestive heart failure, age >75 years
Moderate thrombotic risk	Bileaflet aortic valve prosthesis without atrial fibrillation and no other risk factors for stroke

Risk stratum	VTE
Very high thrombotic risk*	Recent (within three months) VTE Severe thrombophilia (eg, deficiency of protein C, protein S, or antithrombin; antiphospholipid antibodies; multiple abnormalities)
High thrombotic risk	VTE within the past 3 to 12 months Nonsevere thrombophilia (eg, heterozygous factor V Leiden or prothrombin gene mutation) Recurrent VTE Active cancer (treated within six months or palliative)
Moderate thrombotic risk	VTE >12 months previous and no other risk factors

VTE: venous thromboembolism
CHADS2: congestive heart failure, hypertension, age ≥75 years, diabetes mellitus, and stroke or transient ischemic attack
CHA2DS2-VASc: congestive heart failure, hypertension, age ≥75 years (2 points), diabetes mellitus, prior stroke or transient ischemic attack or thromboembolism (2 points), vascular disease (peripheral artery disease, myocardial infarction, or aortic plaque), age 65-74 years, sex category female.

* Very high risk patients may also include those with a prior stroke or transient ischemic attack occurring >3 months before the planned surgery and a CHA2DS2-VASc score <6 (or CHADS2 score <5), those with prior thromboembolism during temporary interruption of anticoagulation, or those undergoing certain types of surgery associated with an increased risk for stroke or other thromboembolism (eg: cardiac valve replacement, carotid endarterectomy, major vascular surgery).

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