Protamine

In aneurysmal rupture during coiling give 50 mg of protamine (protamine should always be availlable during the procedure)

Heparin Reversal

IV protamine sulfate 1 mg protamine reverses ≈ 100 U heparin (give slowly, not to exceed 50 mg in any 10 min period).

A preloaded syringe of 50 mg should be available at all times. Normally protamine is administered as an IV infusion over 10–30 minutes, to prevent idiosyncratic hypotension and anaphylactoid symptoms. In an emergency, e.g. vessel or intracranial aneurysm perforation, anticoagulation must be immediately reversed by rapid IV bolus of 10 mg protamine over 1–3 minutes.

Therapy should be guided by coagulation studies.

Low molecular weight heparin reversal

Reversal of low molecular weight heparins (LMWH): slow IV injection of a 1% solution of protamine can also be used to reverse LMWHs as follows:

Enoxaparin (Lovenox®): ≈ 60% of Lovenox can be reversed with 1 mg of protamine for every mg of Lovenox given (maximum dose = 50 mg) within the last 8 hrs, and 0.5 mg of protamine for every mg of Lovenox given from 8–12 hrs prior. Protamine is probably not needed for Lovenox given > 12 hrs earlier.

Dalteparin (Fragmin®) or ardeparin (Normiflo®): 1 mg of protamine for every 100 anti-Xa IU of the LMWH (maximum dose = 50 mg) with a second infusion of 0.5 mg protamine for every 100 anti- Xa IU of LMWH if the APTT remains elevated 2–4 hours after the first dose is completed.

Danaparoid and Hirudin: no known reversing agent.

For emergencies: if it would be deleterious to wait 4–6 hours after discontinuing heparin and then repeating the PTT to verify that anticoagulation has been corrected, then heparin can be reversed with protamine.

For emergencies, low-molecular-weight heparin can be reversed with protamine.

For post-op management (carotid endarterectomy) optional: reverse half of the heparin with

protamine 10 minutes after closing the arteriotomy.

Hemostasis & coagulopathy in patients with ICH patients on heparin: consider reversal with protamine sulfate (Level II [1])

Low-molecular-weight heparin neutralization using protamine alone can be unreliable, especially in cases of immediate reversal for emergency surgery. Here, we describe a unique case of a 17-month-old girl with a history of glioneuronal tumor and corresponding hydrocephalus status post debulking and ventriculoperitoneal shunt placement, who was placed on enoxaparin after the development of superior sagittal sinus thrombosis. The patient presented for emergency craniectomy and evacuation of subdural bleed after a fall while on a therapeutic dose of enoxaparin. Protamine and fresh frozen plasma were used in the patient's perioperative course providing a reliable reversal of enoxaparin [2]

While protamine, owing to its isolation from salmon milt and homology with human sperm protamine, can trigger anaphylactic and anaphylactoid reactions in a small proportion of patients previously exposed to the peptide (e.g. diabetic patients), who are allergic to fish or have undergone a vasectomy, such reactions are unlikely to be triggered in individuals exposed to non-protamine cationic arginine-rich peptides [3].

1)
Hemphill JC,3rd, Greenberg SM, Anderson CS, et al. Guidelines for the Management of Spontaneous Intracerebral Hemorrhage: A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association. Stroke. 2015; 46:2032–2060
2)
Botros MM, Mahmoud MA, Costandi AJ. Reliable low-molecular-weight heparin reversal in a child undergoing emergency surgery: a case report. J Clin Anesth. 2016 Sep;33:317-9. doi: 10.1016/j.jclinane.2016.04.036. Epub 2016 May 18. PMID: 27555185.
3)
Edwards AB, Mastaglia FL, Knuckey NW, Meloni BP. Neuroprotective Cationic Arginine-Rich Peptides (CARPs): An Assessment of Their Clinical Safety. Drug Saf. 2020 Oct;43(10):957-969. doi: 10.1007/s40264-020-00962-z. PMID: 32613595.