

Procedure for Bone Marrow Collections

Purpose

Examination of the bone marrow is a widely used method in diagnosing many hematologic diseases such as anemia, leukemia, multiple myeloma, and lymphoma. In addition to determining the presence of specific cells, the bone marrow procedure offers the opportunity for assessing the iron store and cellularity of the bone marrow.

Definitions

- ICD code: A code to classify diseases and a wide variety of signs, symptoms, abnormal findings, complaints, social circumstances and external causes of injury or disease.
- Spicules: Small particles of bone within the marrow.
- NPO: Nothing by mouth; patient is to have no food or drink (generally after midnight.)
- Pull-prep: Place a small drop of specimen approximately 1 cm from the edge of a slide, place glass cover-slip on top of the specimen (gently). Allow specimen to spread, and pull the cover slip in the opposite direction.
- Push-prep: Place a small drop of specimen approximately 1 cm from the edge of a slide. Using another glass slide at a 30° angle, place the second slide near the specimen and pull it toward the specimen until it touches. Quickly push the second slide forward using rapid, even motion.
- BMT: Bone Marrow Technician
- MSDS: Material Safety Data Sheets
- EDTA: Ethylenediamine Tetraacetic acid is a common anticoagulant used in collection tubes to maintain blood in the fluid state for hematological studies.
- ACD: Acid Citrate Dextrose is an anticoagulant solution used to preserve blood specimens.
- CT: Computed tomography (generally designating a hospital department)

Reagents and Supplies

Bone marrow cart supplies:

- Bone marrow pre-packed kits (two (2) are needed for bilateral procedures)
- 1.5 % EDTA bottle (located in the hospital pharmacy)
- 100u/ml Heparin bottle (located in the hospital pharmacy)
- Lidocaine (located in hospital central supply)
- EDTA blood Vacutainer tubes (for routine bone marrow aspirate)
- Sodium heparin blood Vacutainer tubes (for routine bone marrow aspirate and viral/bacterial cultures)
- ACD blood collection tubes (yellow) for fungal cultures only if requested
- Viral media only if viral cultures are requested (obtained in clinical laboratory)
- Alcohol prep pads

- Davidson's Fixative
 - Hazardous chemicals include: formaldehyde, methanol, isopropyl alcohol, and acetic acid.
 - **SAFETY NOTE:** First aid for exposure to these chemicals:
 - Eyes – Flush immediately with lukewarm water for at least 15 minutes.
 - Skin – Remove contaminated clothing and wash skin with soap and water.
 - Ingested – Do not induce vomiting.
 - Inhalation – Relocate to a well-ventilated area. If unable to breathe, proceed with artificial respiration. If breathing is difficult, give oxygen. In all above cases, seek a physician.
 - **See MSDS for more information.**
- Sterile gauze (4x4)
- Capillary tubes
- Petri dishes
- Syringes (in sizes 20cc, 10cc, 5cc, 3cc, and 1cc)
- Jamshidi biopsy needles in 11 gauge (10cm and 15cm lengths), 13 gauge (5cm and 9cm lengths) and 15 gauge (7.6cm in length).
- Spinal needles (in sizes 18 inch 3.5 pink, 22 inch 3.5 black)
- Progress sheets (kept available for physician use)
- Bone marrow worksheets
- NeoGenomics Laboratory requisition
- Safety needles (in sizes 20 gauge 1 1/2 inch yellow, 25 gauge 5/8 inch orange, 25 gauge 1 1/2 inch orange and pink)
- Slide holder with glass slides
- Disposable gloves (all sizes)
- Protected disposable scalpel

Specimen Collection and Handling

- CBC: Collected by phlebotomy in EDTA tube.
- Bone marrow aspirate: Collected by physician in 1-2 (3) mL EDTA blood Vacutainer tube and 1-2 (3) mL sodium heparin blood Vacutainer tube.
- Bone marrow core biopsy: Core biopsy collected by physician and placed in Davidson's Fixative
- Blood specimens for routine hematology tests must be collected in potassium EDTA to minimize changes in cell characteristics. Oxalate can cause unsuitable morphologic changes such as cytoplasmic vacuoles, cytoplasmic crystals, and irregular nuclear lobulation. Heparin can cause cellular clumping (especially of platelets), pseudo-leukocytosis with pseudothrombocytopenia in some particle counters, and troublesome blue background in Wright-stained blood films. Citrate may be useful in some cases of platelet agglutination due to EDTA, but those CBC results will require adjustment for the effects of dilution.
- Peripheral blood specimens will be rejected if they are unlabeled, hemolyzed, or clotted. If the bone marrow specimen exhibits any of these characteristics, the pathologist must be notified for additional instructions before processing.

Scheduling Bone Marrows

Inpatients

- Inpatient bone marrows are scheduled by the staff at Watauga Pathology Associates.
- Inpatient procedures are performed in the main operating room, endoscopy, CT, or the patient's room.
- Watauga Pathology Associates is responsible for coordinating collection time for phlebotomy and processing areas.
- The following information is needed from the nursing staff and is recorded in Outlook: patient name, room number, diagnosis, and name of physician ordering the procedure (must be a hematology/oncology physician).
- Send the notice of the bone marrow to the phlebotomy supervisor (verify receipt) and all personnel responsible for processing bone marrows at Watauga Pathology Associates.

Outpatients

- Outpatient bone marrow procedures are performed at the Regional Cancer Center or in CT.

Bone Marrow Collection

Preparation

- Prior to leaving the laboratory, the bone marrow technician checks the bone marrow cart to make sure it is clean and stocked with all necessary supplies.
 - **NOTE:** The bone marrow cart must be cleaned each day used, with hospital approved disinfectant cleaner.
 - The bone marrow technician needs to order additional supplies as needed.
- If the bone marrow collection is performed in the main operating room the technician needs to change into surgical green scrubs before entering into those areas. **NOTE:** (Surgical greens can be obtained from personnel in operating room, or issued by linen distribution on the lower level of the hospital).
- Upon arrival to the operating room or same day surgery, the technician must utilize proper surgical Personal Protective Equipment (PPE) (i.e. cap, face mask, gloves, and shoe covers). All items are located outside the surgical areas.

Collection site preparation

- Remove plastic outer covering from bone marrow kit. **NOTE:** The physician is the only person who removes the sterile inner cover (hospital wrap) from the bone marrow kit.
- Place bone marrow kit on a clean work surface within close proximity of the patient's bed.
- The technician gives the pathologist/physician size appropriate disposable gloves.
- Spread the hospital wrap out over the working surface and then the bone marrow kit is opened by the physician.
- From the bone marrow cart, remove the following items and place them on the hospital wrap: (Be careful not to touch the sterile hospital wrap with your gloves!!)

- (2) 20cc syringes (slip tip)
- (3) 20 gauge 1 1/2 inch yellow safety needles
- (1) 25 gauge 5/8 inch orange safety needle
- (1) Protected disposable scalpel
- (1) Package sterile gauze.
- The physician may also request a spinal needle.
- **NOTE:** Once supplies are removed from sterile cover, no one other than the physician may touch the supplies placed on hospital wrap.
- The following items are removed by the bone marrow technician from the bone marrow cart storage drawers and placed on top of the cart:
 - (1) vial of EDTA
 - (1) vial of heparin
 - (1) vial of 2% lidocaine
 - (1) Davidson's Fixative bottle
 - (1) Petri dish, alcohol wipes, extra set of sterile gloves for the physician
- Using the alcohol wipes, the technician cleans the tops of the EDTA, heparin, and lidocaine vials.
- From the patient's chart, the technician obtains at least seven (7) patient labels, making sure to have enough labels to place on the aspirate tubes, core biopsy tubes and two extra for paperwork.
- Using the patient labels, the technician labels two (2) EDTA blood Vacutainer tubes, two (2) heparin blood Vacutainer tubes, the Davidson's Fixative bottle, and the time out sheet. (Label culture tubes if this testing is requested.) This must be done at the patient's bedside after verifying the patient's identity and the labels **must have two patient identifiers present** (patient's name and either medical record number or date of birth.)
- A "Surgical Pause" is performed by a RN, (registered nurse), before the procedure begins. During the "Surgical Pause," the technician and physician listen to the RN and verify that the patient, physician, surgical site and procedure are all correct. If all information is complete, accurate, and correct it is noted on the **Bone Marrow Worksheet** by the technician.

Physician collection

- The technician presents lidocaine to the physician at which time he/she draws a syringe of lidocaine into one 20 ml, or smaller syringe, (slip tip) and places it on the hospital wrap.
- Next, prepare the EDTA syringe as follows:
 - The technician presents the EDTA to the physician.
 - Aspirate 1 ml of EDTA into a syringe.
 - Move the plunger up and down in the syringe so as to coat the syringe with EDTA.
 - Leave the 1 ml of EDTA within the syringe.
 - Hand the syringe to the physician.
 - **NOTE:** The bone marrow technician should pay special attention to where the physician places the syringe of EDTA in order to distinguish it from the other syringes on the tray.

- The technician presents heparin to the physician at which time he/she collects approximately 1 ml of heparin solution into one 20 ml syringe (slip tip).
 - Move the plunger up and down in the syringe so as to coat the syringe with heparin.
 - Leave the 1 ml of heparin within the syringe and place it on the hospital wrap.
- At this time, the physician/pathologist prepares the patient for the bone marrow collection.
- Once prepped, the physician proceeds with aspirating bone marrow into the EDTA and heparin syringes.
 - The EDTA specimen is collected first and handed to the technician.
 - Obtain 5-10 ml of marrow (if possible).
 - The technician transfers a small amount of the aspirate into a Petri dish for spicule inspection and informs the physician of the presence or absence of spicules.
 - The remaining aspirate from the EDTA syringe is transferred into 1-2 EDTA blood Vacutainer tube(s) (lavender) depending on the volume obtained, capped, and gently inverted ten (10) times to prevent clot formation.
- The heparin aspirate is then collected by the physician and handed to the technician.
 - Obtain 5-10 ml of marrow if possible.
 - Express the heparin aspirate into heparin blood Vacutainer tube (green) tube(s) (1-2).
 - Gently invert ten (10) times to prevent clot formation.
 - Place some of this specimen in the fungal tubes if fungal cultures are requested.
- Next, the bone marrow core biopsy is collected by the physician.
 - The technician has a frosted glass slide ready so the physician can place the core biopsy on it.
 - The technician transfers the core biopsy to the Davidson's Fixative bottle.
 - **NOTE:** If requested, touch preps can be made by touching the core biopsy gently with a clean frosted slide before it is placed into the Davidson's Fixative.
- When the procedure is complete, make sure all lids are tightly secured and that all specimens are labeled with a patient label with two identifiers prior to leaving the bedside.

Collection closing (wrap up)

- From the bone marrow cart, the technician removes the following items: (1) bottle of alcohol, (1) roll of tape, (1) package sterile 4x4 gauze and (1) Band-aid (if requested).
- The technician saturates gauze with alcohol to give the physician for cleaning the patient's collection site.
- Physician bandages the collection site.
- The technician disposes of all items that were used prior to, during, or after the procedure that, may be biohazardous or contaminated.

- **NOTE:** Any items or supplies classified as “sharps” must be disposed of in a hospital approved sharps container. These items are disposed by the physician.
- Prior to leaving the collection area, the technician verifies with the physician, all testing that needs to be performed on the patient samples.

Procedure Notes

- Bone marrow samples over two (2) weeks old are to be discarded from the refrigerated storage into an approved biohazard waste receptacle.

References

- Davidson, I. and Henry J., “Clinical Diagnosis by Laboratory Methods”, pp. 135-137, W.B. Saunders Co., Philadelphia, 1974.
- Wintrobe, M.W., et al., “Clinical Hematology”, p. 26, Lea & Febiger, Philadelphia, 1974.
- “*Universal Protocol for Prevention of Wrong Site, Wrong Procedure, Wrong Person Surgery*”, MSHA Standard Operating Procedure.
- “*Accessioning A Bone Marrow*”, JCMC Laboratory Standard Operation Procedure.
- “*Manual Differential Cell Count and Review Procedure*”, JCMC Laboratory Standard Operation Procedure, Section 5.1.

BONE MARROW WORKSHEET

Name: _____ DOB: _____ Sex _____ Client/MRN: (_____)_____	Time out observed including proper site, proper procedure, and patient identification performed. _____ (initials of observing bone marrow tech)
PLACE PATIENT STICKER HERE IF AVAILABLE	
Physician: _____ Client Location: _____ Collected by: _____ (Adjust billing if collected by pathologist)	Additional tests requested: ___ Fungal ___ AFB cultures (ACD-yellow tube, isolator) ___ Bacterial cultures (heparin-green tube) ___ Other (complete)_____
CLINICAL DIAGNOSIS: _____	
NOTE: If diagnosis is multiple myeloma order CD138 on core biopsy.	

Case # **BM19**-_____ Pathologist: _____ Date Collected: _____

SPECIMENS SUBMITTED

(A) ___ **PERIPHERAL BLOOD SMEAR**
 (___ purple top, ___ slides) (**E – G for bilateral only)

(B) ___ **BONE MARROW ASPIRATE** (___ purple top, ___ green top, ___ slides)
 (green top, ___ slides)

(E) ___ **BONE MARROW ASPIRATE** (___ purple top, ___ slides)

Spicules EDTA?			Spicules EDTA?
Spicules Heparin?			Spicules Heparin?
Touch Preps (order TPNC)			Touch Preps (order TPNC)

(C) ___ **BONE MARROW CLOT** (WRAP) (F) ___ **BONE MARROW CLOT** (WRAP)

(D) ___ **BONE MARROW CORE** (G) ___ **BONE MARROW CORE**

Core (length)			Core (length)
Touch Preps (order TPNC)			Touch Preps (order TPNC)

Comments:

 Tracking # _____ Tech: _____
 _____ Date: _____

Approval and Review

The signatures below indicate approval of *Procedure for Bone Marrow Collections*. Review is documented by the Laboratory Medical Director or designee in the designated sections listed below.

Document Author:

Written by/title

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Approved by:

Laboratory Medical Director

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