



Chapter 10: Capillary Puncture Equipment and Procedures



Objectives

1. Define the key terms and abbreviations listed at the beginning of this chapter.
2. List and describe the various types of equipment needed for capillary specimen collection.
3. Describe the composition of capillary specimens, identify which tests have different reference values when collected by capillary puncture methods, and name tests that cannot be performed on capillary specimens.
4. Identify indications for performing capillary puncture on adults, children, and infants.



Objectives (cont' d)

5. List the order of draw for collecting capillary specimens.
6. Describe the proper procedure for selecting the puncture site and collecting capillary specimens from adults, infants, and children.
7. Describe how both routine and thick blood smears are made and the reasons for making them at the collection site.
8. Explain the clinical significance of capillary blood gas, neonatal bilirubin, and newborn screening tests and describe how specimens for these tests are collected.



Capillary Puncture Equipment

- Lancet/Incision Devices: **Video** (Blood extraction via capillary puncture)
 - Sterile, disposable, sharp-pointed or bladed instrument
 - Punctures or cuts skin to obtain capillary blood specimen
 - Designed for either finger or heel puncture
- Laser Lancet
 - Vaporizes water in skin to produce a small hole w/o. cauterizing capillaries
 - No risk of accidental sharps injury, no need for sharps disposal

Capillary Puncture Equipment (cont' d)

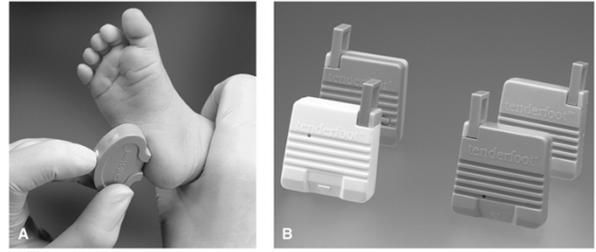
- Finger puncture lancets



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Capillary Puncture Equipment (cont' d)

- Heel puncture lancets



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Capillary Puncture Equipment (cont' d)

- Microcollection Containers (different order of draw)
 - Small plastic tubes used to collect tiny amounts of blood from capillary punctures
 - Some come with narrow capillary tubes attached
 - Have color-coded bodies or stoppers & markings for min/max fill levels
- Microhematocrit Tubes and Sealants
 - Disposable, narrow-bore plastic or plastic-clad glass tubes
 - Fill by capillary action
 - Used primarily for hematocrit determinations
 - One end of tube is sealed with plastic or clay sealants

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Capillary Puncture Equipment (cont' d)

- Microcollection containers



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Capillary Puncture Equipment (cont' d)

- Capillary Blood Gas Equipment (CBG)
 - **CBG collection tubes:** narrow-bore plastic capillary tubes
 - **Stirrers: (fleas)** metal filings or bars inserted into tube to mix
 - **Magnet:** used for mixing, in conjunction with stirrer
 - **Plastic caps:** used to seal tubes
- Microscope Slides
 - Used for blood films for hematology determinations
- Warming devices
 - Warming the site increases blood flow as much as 7 times

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Capillary Puncture Equipment (cont' d)

- Capillary blood gas collection equipment



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Capillary Puncture Principles

- Composition of Capillary Specimens
 - Mixture of arterial, venous, & capillary blood
 - Interstitial & intracellular fluid
 - More closely resembles arterial blood than venous
- Reference Values
 - Capillary reference values may differ from venous values
 - Glucose concentrations are higher in capillary blood
 - Total protein (TP), calcium (Ca²⁺), and potassium (K⁺) concentrations are lower in capillary blood

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Capillary Puncture Principles (cont' d)

- Indications for Capillary Puncture in Adults & Older Children
 - Available veins are fragile or must be saved for other procedures
 - Several unsuccessful venipunctures have been performed
 - Patient has clot-forming tendencies
 - Patient is apprehensive or has an intense fear of needles
 - There are no accessible veins (IVs in both arms, scars, burns)
 - For POCT procedures such as glucose and protime monitoring
 - If pt can't afford to have a waste drawn from line.

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Capillary Puncture Principles (cont' d)

- Reasons for Capillary Puncture in Infants & Very Young Children
 - Small blood volume & risk of anemia
 - Risk of cardiac arrest when large quantities of blood are removed
 - Venipuncture is difficult & may damage veins & surrounding tissues
 - Puncturing deep veins can cause hemorrhage, venous thrombosis, infection, & gangrene
 - Risk of injury due to restraint needed for venipuncture
 - Capillary blood is preferred specimen for some tests

Capillary Puncture Principles (cont' d)

- Tests That Cannot Be Collected by Capillary Puncture
 - Most erythrocyte sedimentation rate methods
 - Coagulation studies that require plasma specimens
 - Blood cultures
 - Tests that require large volumes of serum or plasma

Capillary Puncture Principles (cont' d)

- Order of Draw
 - Blood gas specimens (CBGs)
 - EDTA specimens
 - Other additive specimens
 - Serum specimens
 - Over filling tube can cause microclot formation

Capillary Puncture Steps

- First 4 Steps Are Same as for Venipuncture (see Ch. 8)
 - Step 1: Review & accession test request
 - Step 2: Approach, identify, & prepare patient
 - Step 3: Verify diet restrictions & latex sensitivity
 - Step 4: Sanitize hands & put on gloves

Capillary Puncture Steps (cont' d)

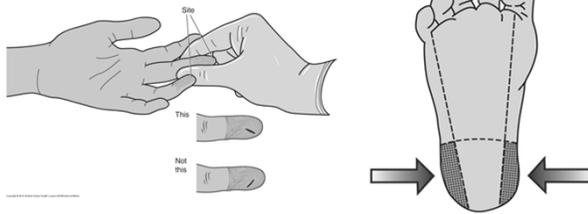
- Step 5: Position Patient
 - **Finger puncture:** arm supported on firm surface, hand extended & palm down...**gravity is your friend**
 - **Whorls: spiral patterns in finger tips**
 - **Young child:** held in lap of parent or guardian
 - **Infant heel puncture:** supine

Capillary Puncture Steps (cont' d)

- Step 6: Select the Puncture/Incision Site
 - **General criteria**
 - Skin is warm, pink, normal color
 - No scars, cuts, bruises, rashes, cyanosis, edema, or infection
 - **Adults & older children**
 - Palmar surface of distal or end segment of middle or ring finger of nondominant hand
 - Central, fleshy portion of the finger
 - **Infants**
 - Medial or Lateral plantar surface of the heel. **No more than 2.0 mm deep**
 - **PUNCTURE OF THE BONE CAN CAUSE**
 - **Osteomyelitis** : inflammation of the bone marrow and adjacent bone.
 - **Osteochondritis** : inflammation of bone and cartilage, as the result of infection
 - **Calcaneus:** heel bone

Capillary Puncture Steps (cont' d)

- Recommended site & direction of finger puncture & infant heel puncture (shaded area)



Capillary Puncture Steps (cont' d)

- Step 7: Warm the Site if Applicable
 - Warming increases blood flow up to sevenfold
 - Wrap site for 3 to 5 min. with a warm, moist washcloth, towel, or diaper or warming device. Temp not to exceed 42 degrees C (108 F)
- Step 8: Clean and Air-Dry Site
 - Cleanse site with an antiseptic (70% isopropyl alcohol)
 - Allow to air-dry

Capillary Puncture Steps (cont' d)

- Clean and air-dry the site



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Capillary Puncture Steps (cont' d)

- Step 9: Prepare Equipment
 - Don gloves if not already on
 - Select collection devices & place in easy reach
 - Select new, sterile lancet/incision device
 - Open packages in view of patient

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Capillary Puncture Steps (cont' d)

- Step 10: Puncture the Site and Discard Lancet
 - **Finger puncture**
 - Grasp patient's finger between non dominant thumb & index finger
 - Place lancet device flat against skin in central, fleshy pad
 - **Heel puncture**
 - Grasp foot gently but firmly with nondominant hand
 - Encircle heel by wrapping your index finger around arch, thumb around bottom, & other fingers around top of foot
 - Place lancet flat against skin on medial or lateral plantar surface of heel

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Capillary Puncture Steps (cont' d)

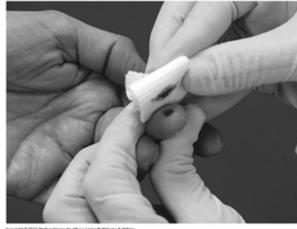
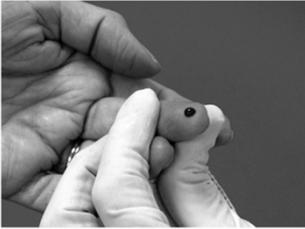
- Puncture the site and discard lancet



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Capillary Puncture Steps (cont' d)

- Step 11: Wipe Away the First Blood Drop
 - First drop is typically contaminated w. excess tissue fluid



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Capillary Puncture Steps (cont' d)

- Step 12: Fill and Mix Tubes/Containers in Order of Draw
 - Collect slides, platelet counts, & other hematology specimens first to avoid clumping & clotting
 - Collect other anticoagulant containers next & serum specimens last
 - Touch collection tube or device to drop of blood

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Capillary Puncture Steps (cont' d)

- Fill and mix tubes/containers in order of draw



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Capillary Puncture Steps (cont' d)

- Step 13: Place Gauze and Apply Pressure
 - Keep site elevated
- Step 14: Label Specimen and Observe Special Handling Instructions
- Step 15: Check the Site and Apply Bandage
- Step 16: Dispose of Used and Contaminated Materials
- Step 17: Thank Patient, Remove Gloves, and Sanitize Hands
- Step 18: Transport Specimen to the Lab

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Special Capillary Puncture Procedures

- Capillary blood gas specimen by heel puncture
- Neonatal bilirubin collection
- Newborn/neonatal screening: **Video (Phlebotomy newborn Screening and PKU)**
 - **Phenylketonuria (PKU)**- done every newborn, state required
 - Galactosemia
 - Hypothyroidism
 - Cystic fibrosis

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Special Capillary Puncture Procedures (cont' d)

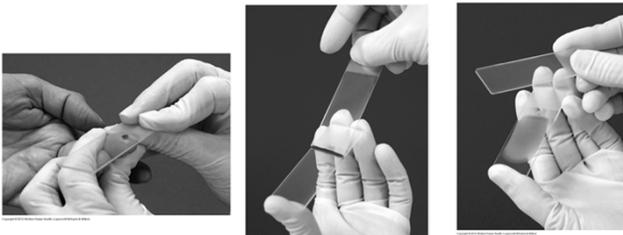
- Newborn screening blood spot collection



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Special Capillary Puncture Procedures (cont' d)

- Routine blood film/smear preparation



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Special Capillary Puncture Procedures (cont' d)

- Blood smear preparation:
 - Diagnosed by presence of organism in peripheral blood smear
 - A very large drop of blood is placed in center of glass slide
 - Drop is spread with corner of another slide or cover slip until it is the size of a dime
 - Allow to dry for a minimum of 2 hours before staining
 - Must be taken from tube within 1 hour of drawing
 - **"Feather"** : the thinnest area of a blood film

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Chapter 10/11 test info at the end of chapter 11 slides