

AVITUS[®] BONE HARVESTER

TECHNIQUE GUIDE

Indications covered:

1. To harvest cancellous bone and marrow
2. To debride and capture infected, necrotic, or diseased cancellous bone e.g. osteomyelitis and cancellous bone tumors



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AVITUS® BONE HARVESTER

System Overview

INDICATIONS FOR USE

The Avitus® Bone Harvester is intended:

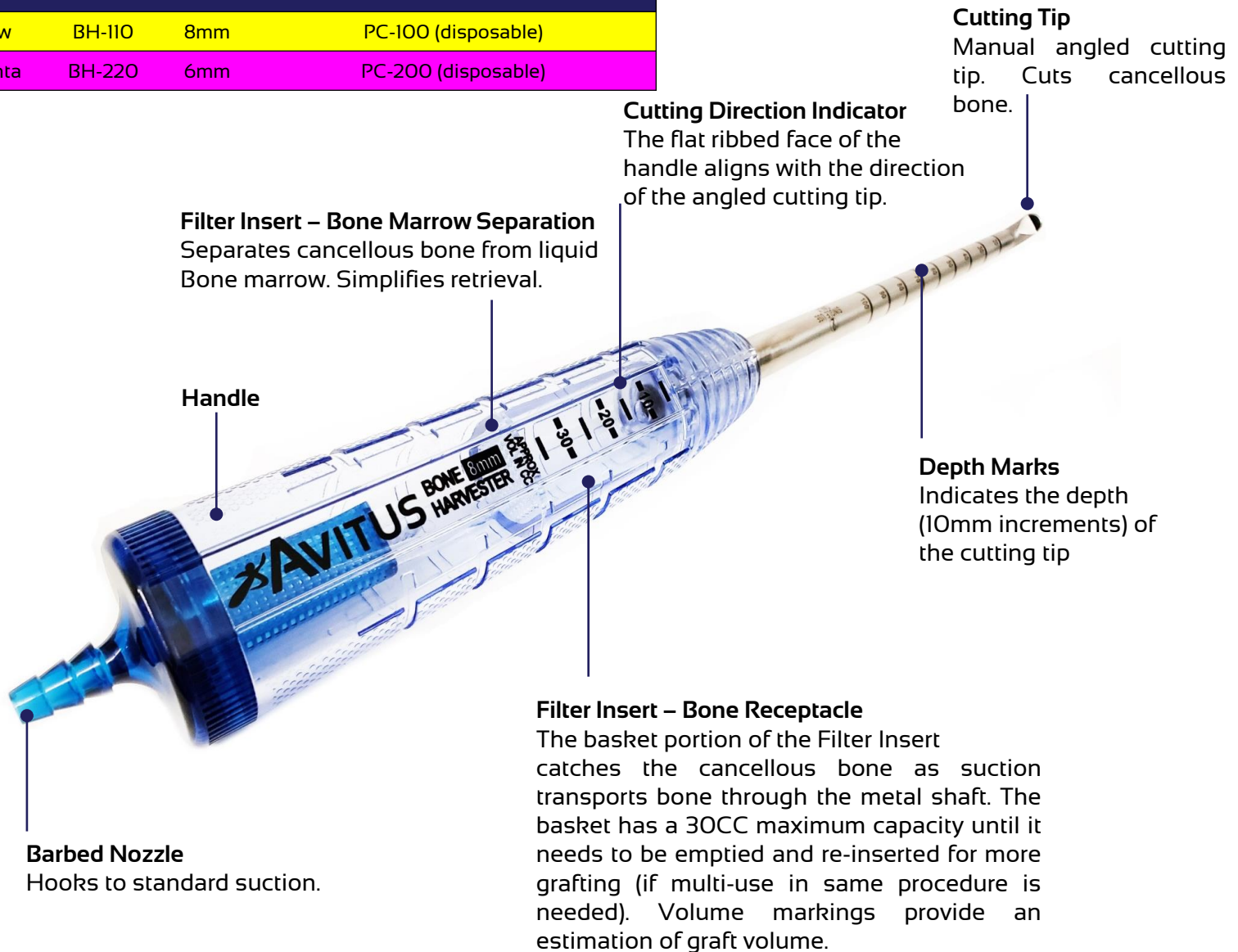
- 1) To harvest cancellous bone and marrow;
- 2) To debride and capture infected, necrotic or diseased cancellous bone (e.g. osteomyelitis, cancellous bone tumors).

SUMMARY

The Avitus® Bone Harvester can be used in primary and revision orthopaedic, foot&ankle, trauma, and upper extremity procedures requiring bone graft as well as for debridement and capture of infected, necrotic, or diseased cancellous bone. Most common harvest sites include Proximal Tibia, Distal Tibia, Calcaneus, and Distal Femur. In the case of debriding and capture of infected, necrotic, or diseased cancellous bone that are minimally invasive, the use of fluoroscopy is recommended to take care not to perforate diseased state cortical bone. The Avitus® Bone Harvester is available in two diameters (6 mm and 8 mm) to allow the surgeon versatility in harvest needs.

Features

Color Code	Product Code	Size	Avitus® Pilot Hole Creator Pairing
Yellow	BH-110	8mm	PC-100 (disposable)
Magenta	BH-220	6mm	PC-200 (disposable)



AVITUS® PILOT HOLE CREATOR

System Overview

INDICATIONS FOR USE

The Avitus® Pilot Hole Creator is an orthopaedic manual surgical instrument intended for use in surgical procedures with other devices in orthopedic surgery.

SUMMARY

The Avitus® Pilot Hole Creator is a manual surgical instrument that easily and safely breaches a hole in the cortex to expose the inner cancellous bone. The Avitus® Pilot Hole Creator (single use disposable) comes in two sizes (11mm and 8mm). PC-100 is used in conjunction with the BH-110. The PC-200 is used in conjunction with the BH-220.

CAUTION:

To avoid abrasion between pilot hole creator and metal retractors, take care to keep a clearance between pilot hole creator shaft and metal retractors -**or**- create pilot hole prior to the use of retractors.

Features

Product Code	Description
PC-100	Avitus® Pilot Hole Creator – Ø11mm x 20mm Single use, sterile Used in conjunction with BH-110
PC-200	Avitus® Pilot Hole Creator – Ø8mm x 20mm Single use, sterile Used in conjunction with BH-220

Anchor Tip

Pierces cortex. Centers and guides the cutting blade to cut a hole without slipping on the bone.

Stop Feature

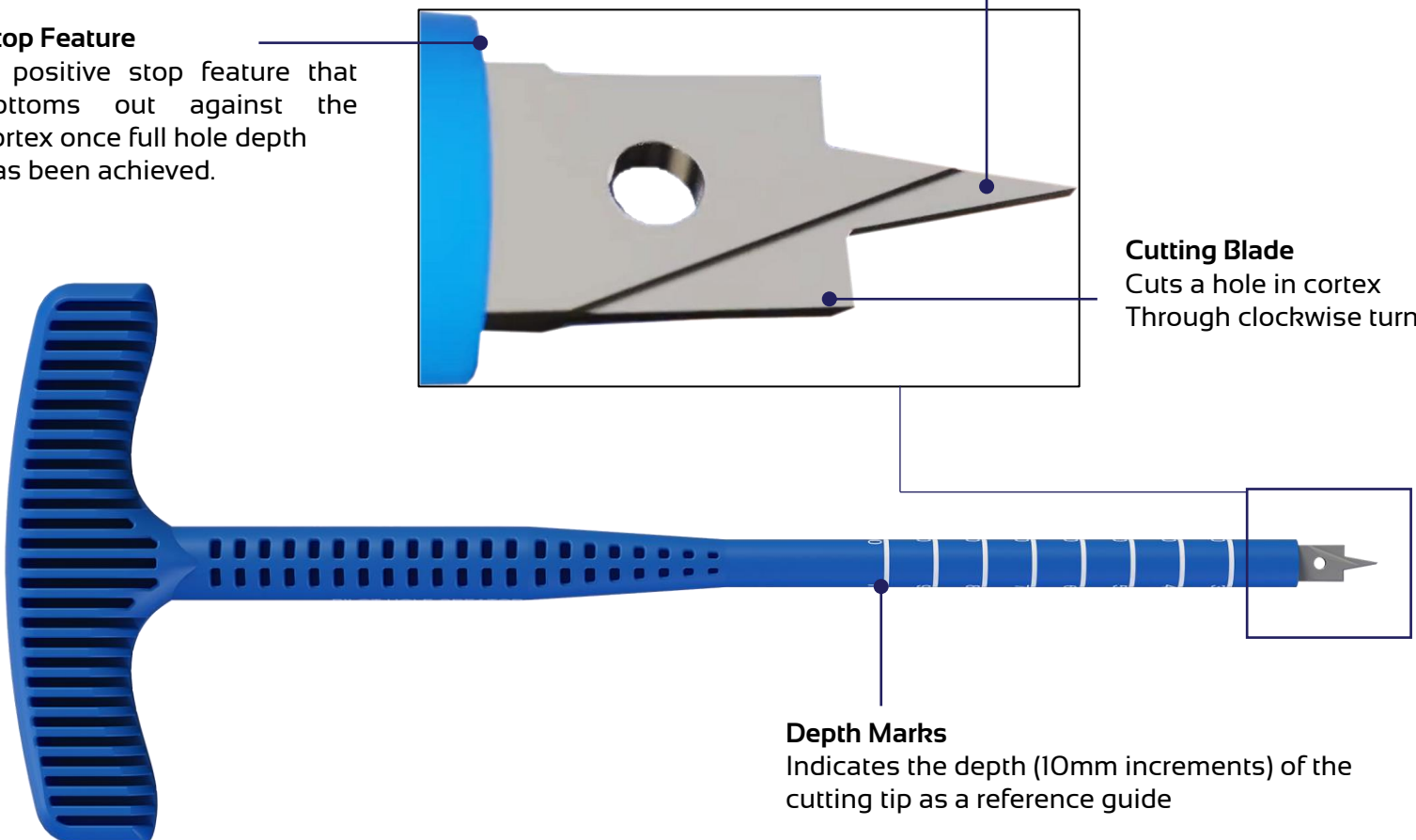
A positive stop feature that bottoms out against the cortex once full hole depth has been achieved.

Cutting Blade

Cuts a hole in cortex
Through clockwise turns.

Depth Marks

Indicates the depth (10mm increments) of the cutting tip as a reference guide

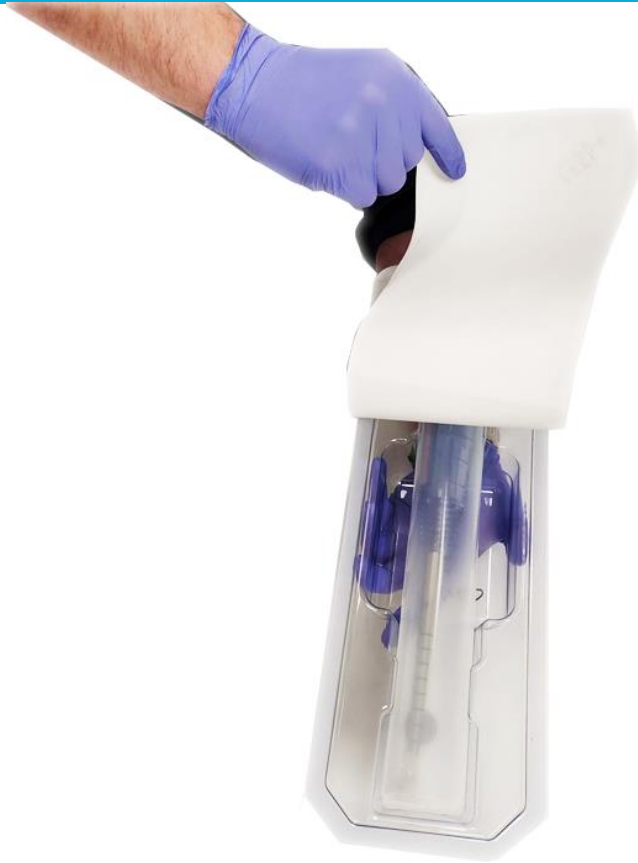


Device Assembly

Remove from Packaging

STERILE PRESENTATION

Open the Tyvek tray by separating the Tyvek lid from the blister tray. Expose the inner-packaging tube. The entire packaging tube gets grabbed and placed into the sterile field.



COMPONENT BREAKDOWN



Device Assembly

Insert the Filter Insert

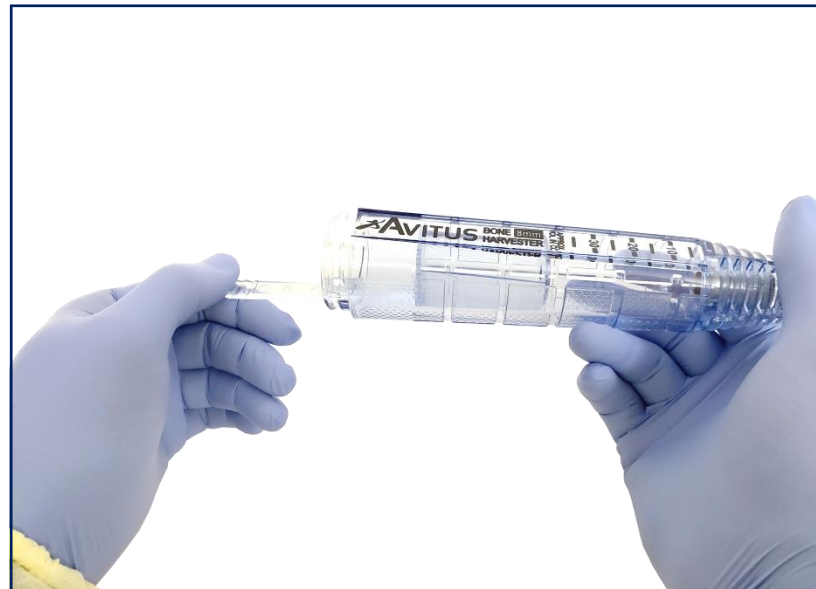
ORIENTATION

Hold the Filter Insert with the rectangular opening of the receptacle facing upward. Similarly, hold the Harvester with the Avitus® logo facing upwards.

INSERTION

Insert the Filter Insert into the handle of the Harvester until the Filter Insert sits flush at the bottom of the handle.

* NOTE: The Filter Insert will not sit flush against the bottom of the Harvester handle if the orientation shown below is not followed.



Screw on the Cap & Attach Suction

SCREW ON CAP

Screw on the Cap and tighten until the flat sides of the Cap and Handle align.

CONNECT SUCTION TUBE

Attach a standard suction tube (5-8mm) to the barbed nozzle of the Cap. Ensure that the suction tube is connected to a waste canister and suction source (min 150mmHg, max setting is recommended). Check the cutting tip of the metal shaft to confirm that suction is active.



Device Assembly

Prepare two specimen cups for collection

Cup for cancellous graft collection



Cup for marrow collection



For straining extra bloody harvests



STRAINER CUP (OPTIONAL)

If there is an excess amount of blood in the harvest the Strainer Cup can be utilized to further strain out excess liquid from the bone graft. The top of the packaging tube contains holes at the bottom and serves as a Strainer Cup.

Obtain a sterile specimen cup (not included), and place the Strainer Cup atop the specimen cup. See Graft Retrieval Section for use instructions.

General Harvesting Technique

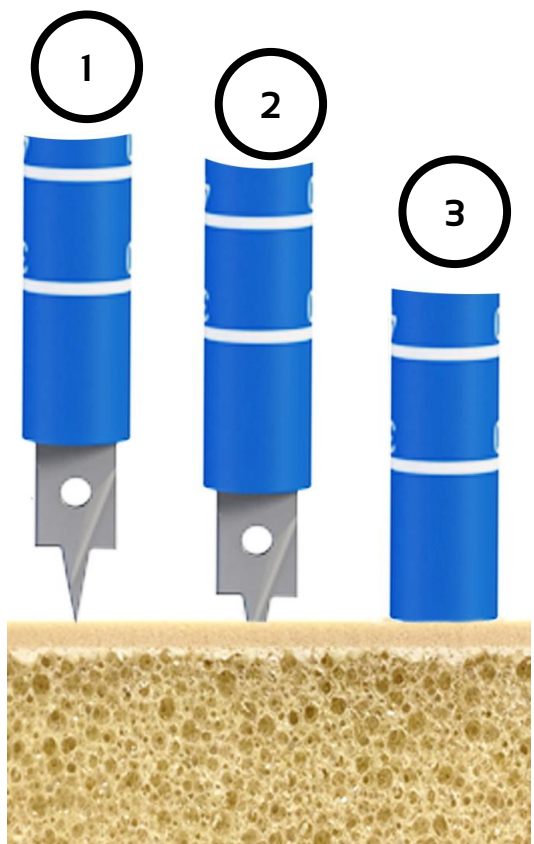
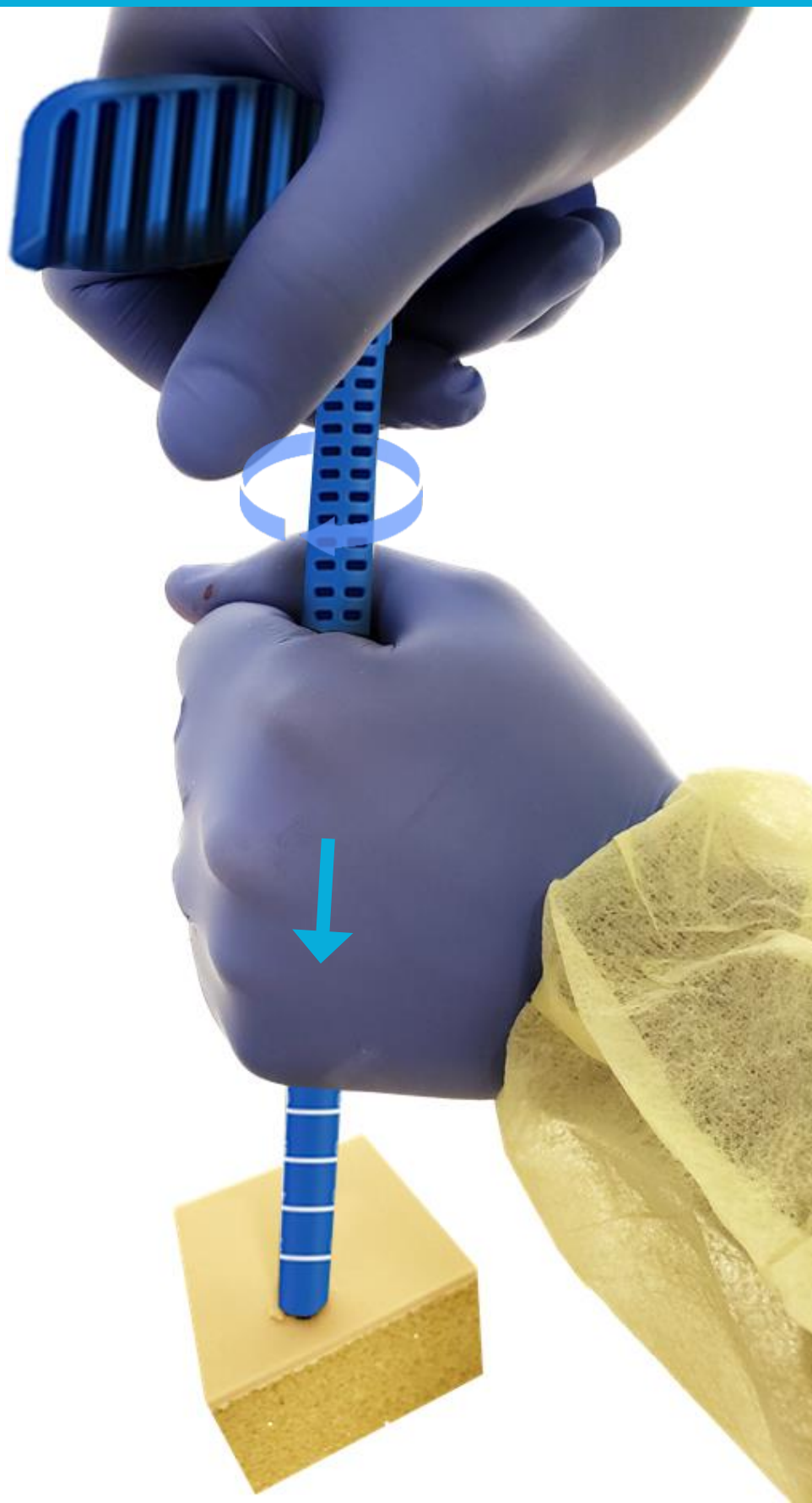
Pilot Hole Creation

Hold the Avitus® Pilot Hole Creator perpendicular to the surface of the bone. See Image 1.

Apply downward pressure in order to seat the Anchor Tip 3-5mm into the cortical bone. See Image 2.

Continue to apply downward pressure while rotating the handle in complete 360° **clockwise** rotations until the Stop Feature is seated flush against the surface of the bone. See Image 3.

NOTE: Impaction of the handle is **NOT RECOMMENDED**.



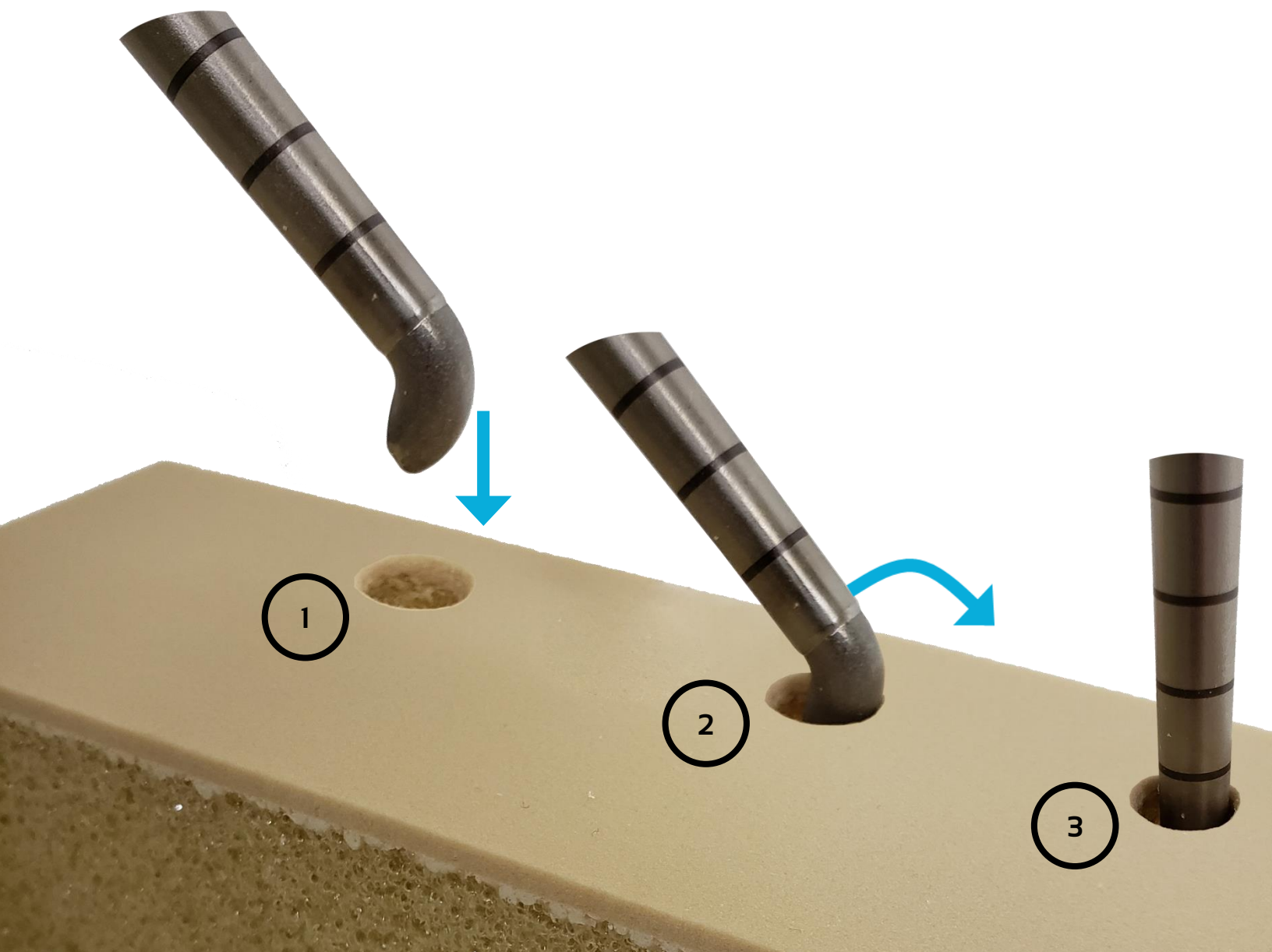
General Harvesting Technique

Harvester Insertion

Hold the Harvester with the cutting tip facing downward towards the pilot hole. See Image 1.

Thread the cutting tip of the Avitus® Bone Harvester into the pilot hole. See Image 2.

Once the cutting tip is seated in the cancellous bone, straighten the Harvester (see Image 3) and proceed to begin harvesting (See Harvesting Techniques).



General Harvesting Technique

Rotation Stroke

Tilt the handle.

Apply downward pressure.

Rotate the handle while maintaining the tilt.

Rotate 360° alternating between clockwise and counter-clockwise.



General Harvesting Technique

Sweep Stroke



Drop the flat side of the handle down to pull the cutting tip back.

While applying downward pressure, sweep the handle across until the flat side of the handle is tilted upwards.

Repeat the Sweep Stroke 2-3 times.

Rotate 180° so the cutting tip faces the opposite direction. Repeat the Sweep Stroke 2-3 times.

General Harvesting Technique

Up Stroke

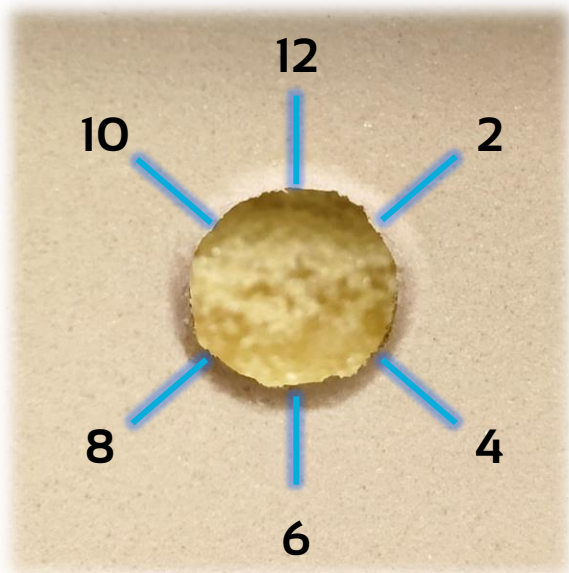
Press the cutting tip into a wall of cancellous bone.

Apply an upward force away from the pilot hole to drag the cutting tip upward across the cancellous wall.



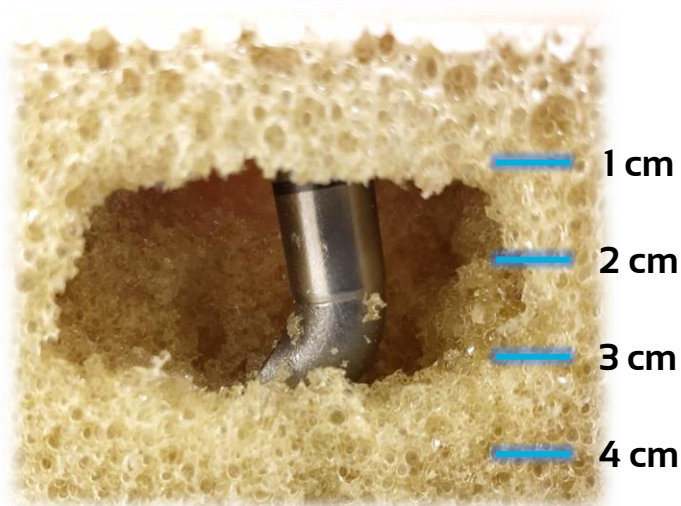
General Harvesting Technique

Other Harvesting Pearls



Work the Clock

Maximize your harvest volume by working the pilot hole like a clock, using the various strokes described in this section to reach pockets of graft at the 12 o'clock, 2 o'clock, etc. positions.



Work the Levels

Maximize your harvest volume by using the various strokes described in this section at various depths into the cancellous region. Use the gradation marks on the metal shaft of the Harvester to gauge the depth of the cutting tip in the cancellous region.

Estimating Graft Volume



To measure cancellous graft volume during harvest:

Shine the OR light onto the Harvester and an estimate of solid graft volume can be obtained from reading the volumetric lines.

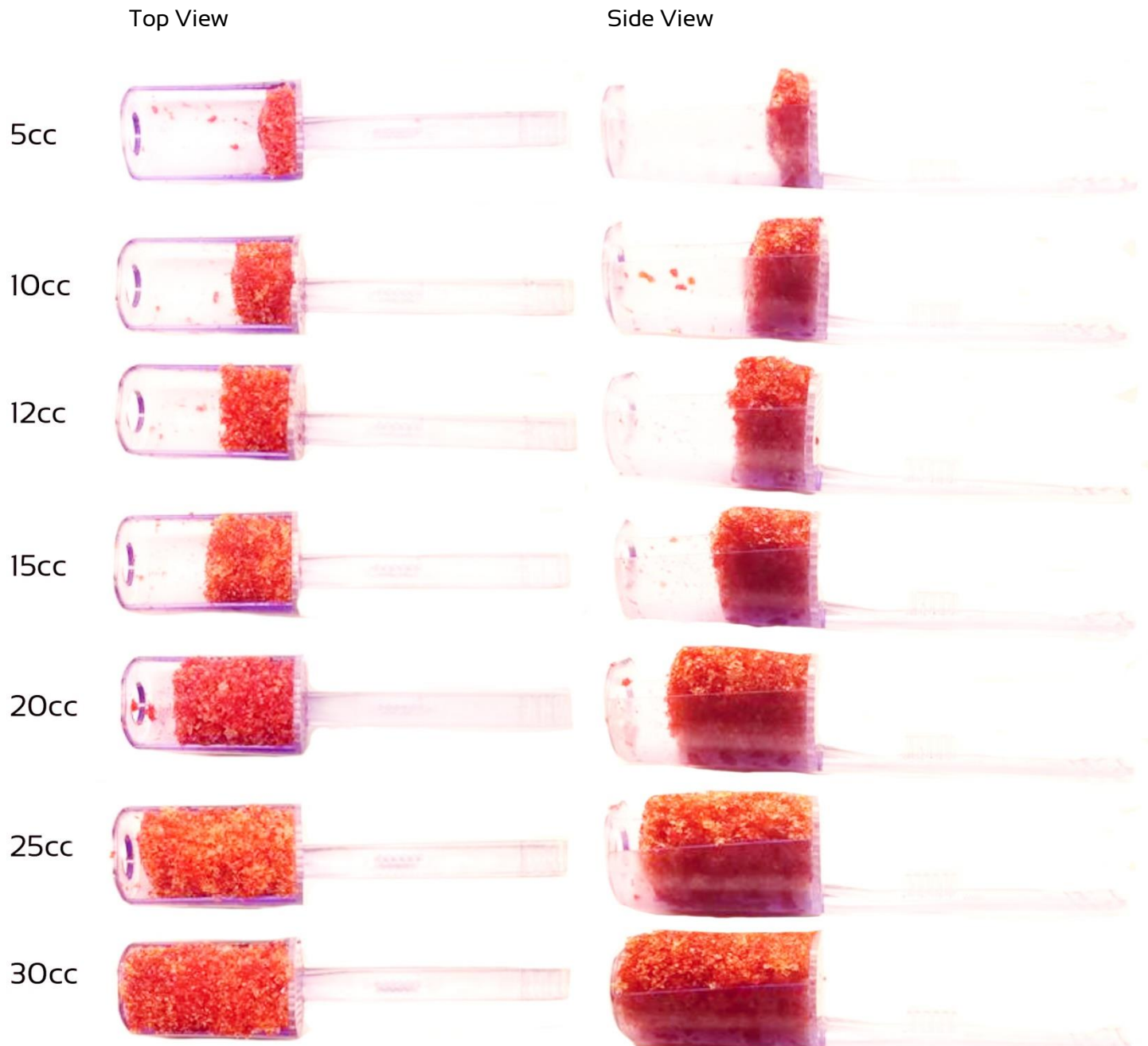
When to Harvest and Perioperative Storage

It is recommended to harvest as close to time of implantation as possible to optimize graft viability. If perioperative storage of the graft is necessary, store the graft combined with the marrow or with saline solution. Avoid drying of the graft.

- Laursen, M., Christensen, F., Bünger, C., & Lind, M. (2003). Optimal handling of fresh cancellous bone graft different peroperative storing techniques evaluated by in vitro osteoblast-like cell metabolism. *Acta Orthopaedica Scandinavica*, 74(4), 490–496. <https://doi.org/10.1080/00016470310017848>
- Maus, U., Andereya, S., Gravius, S., Siebert, C. H., Schippmann, T., Ohnsorge, J. A., & Niedhart, C. (2008). How to store autologous bone graft perioperatively: An in vitro study. *Archives of Orthopaedic and Trauma Surgery*, 128(9), 1007–1011. <https://doi.org/10.1007/s00402-008-0616-8>
- Jang, E. C., Lee, E. W., Kang, S. Y., & Kang, K. S. (1997). Bone cell viability after exposure to air. *Journal of the Korean Orthopaedic Association*, 32(6), 1464. <https://doi.org/10.4055/jkoa.1997.32.6.1464>
- Hassanein, A. H., Greene, A. K., Arany, P. R., & Padwa, B. L. (2012). Intraoperative cooling of iliac bone graft: An experimental evaluation of cell viability. *Journal of Oral and Maxillofacial Surgery*, 70(7), 1633–1635. <https://doi.org/10.1016/j.joms.2011.07.005>
- Rocha, F. S., Batista, J. D., Zanetta-Barbosa, D., & Dechichi, P. (2013). Effect of different storage media on the regenerative potential of autogenous bone grafts: A histomorphometrical analysis in Rabbits. *Journal of Oral Implantology*, 39(6), 635–642. <https://doi.org/10.1563/aid-joi-d-11-00020>

Estimating Graft Volume

When the Filter Insert is removed from the Handle of the Harvester, cancellous bone volume can be estimated in the Bone Receptacle as follows:



Proximal Tibia Harvest Technique

Harvest Site Preparation

A **tourniquet is recommended** to minimize bleeding and to reduce bone marrow contamination and dilution. Fluoroscopy can be used to facilitate incision placement

LOCATION

Make a 1-2cm vertical incision over the proximal tibia metaphyseal flare.

Lateral Approach: Incision is made lateral to the tibial tuberosity, in the metaphyseal flare. Care is taken to elevate muscle tissue.

Medial Approach: Incision is made at the medial aspect of the tibial tuberosity, in the metaphyseal flare.

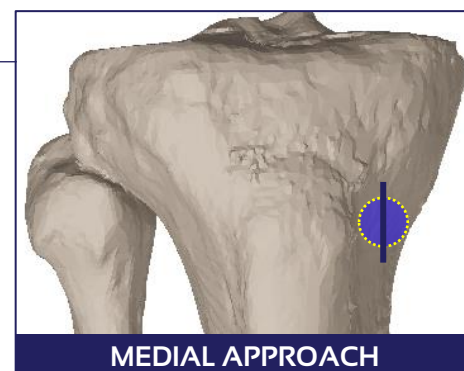
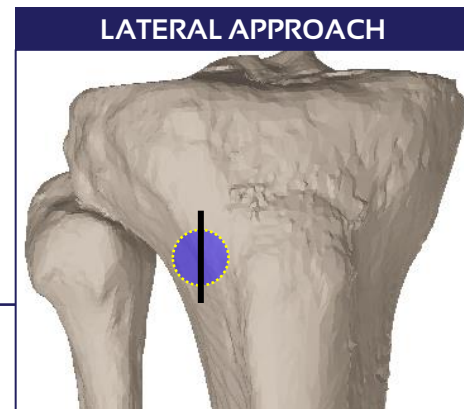
Incision should be slightly wider than Avitus® Pilot Hole Creator.

DISSECTION

Bluntly dissect down. **Elevate the periosteal tissue over the cortical layer of bone.** A small army navy retractor is recommended to protect surrounding tissue. **For Knee Scooters: consider lateral approach with incision placement more posteriorly to avoid pressure or discomfort during scooting.** A small retractor is recommended to protect surrounding tissue and create clearance for suction. **TIP:** Suction should be audible during harvesting.

ENTRY HOLE

Use the Avitus® Pilot Hole Creator to cut an entry hole into the metaphyseal flare.



Proximal Tibia Harvest Summary

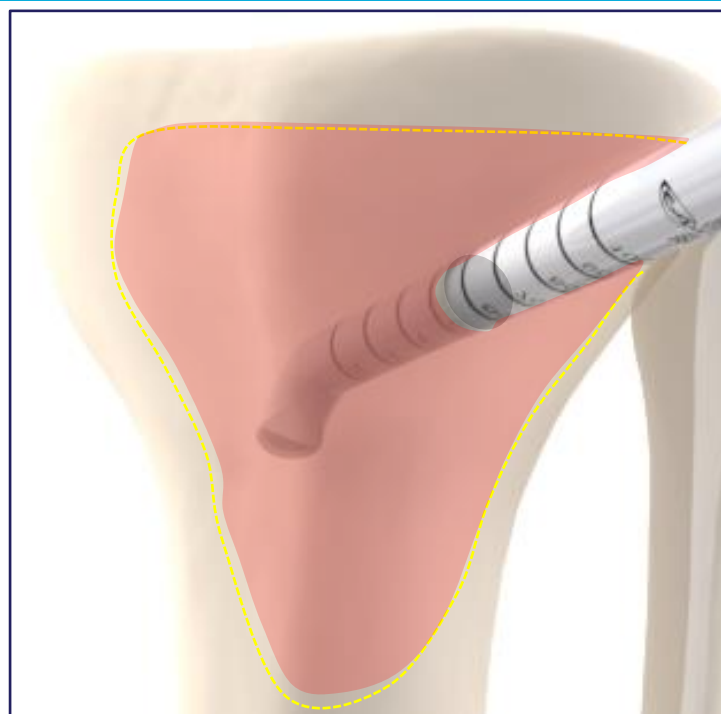
Radiograph example of lateral proximal tibia harvest (35cc)



AVERAGE VOLUMES:

cancellous Bone Range: 5-55CC's
 BMA Range: 5-40CC's

[Volumes depends on surgeon needs and patient anatomy]



NOTE: Either medial or lateral approach can be used. There is no difference in obtainable volume between these approaches. Medial approach provides less tissue to dissect while lateral approach provides additional tissue cushion over the entry hole post harvest.

Distal Femur Harvest Technique

Harvest Site Preparation

A **tourniquet is recommended** to minimize bleeding and to reduce bone marrow contamination and dilution. Fluoroscopy can be used to facilitate incision placement.

LOCATION

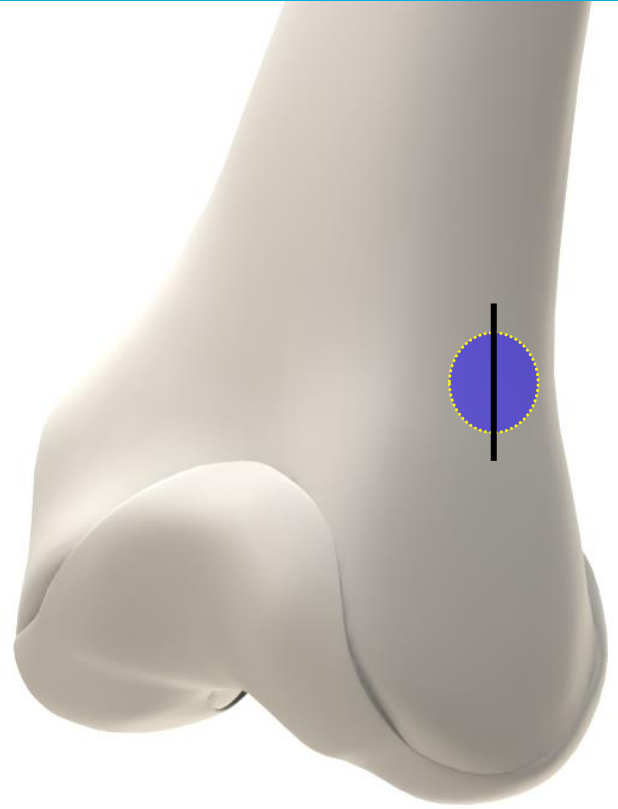
Incision and pilot hole are made into the flare of the distal femur lateral epicondyle. Incision should be slightly wider than Avitus® Pilot Hole Creator (1-2cm). Be aware of the tibiofemoral and patellofemoral joints.

DISSECTION

Bluntly dissect down. **Elevate the periosteal tissue over the cortical layer of bone.** A small retractor is recommended to protect surrounding tissue and create clearance for suction. **TIP:** Suction should be audible during harvesting.

ENTRY HOLE

Use the Avitus® Pilot Hole Creator to cut an entry hole. Either size of Avitus® Pilot Hole Creator can be used per surgeon preference (PC-100, or PC-200).



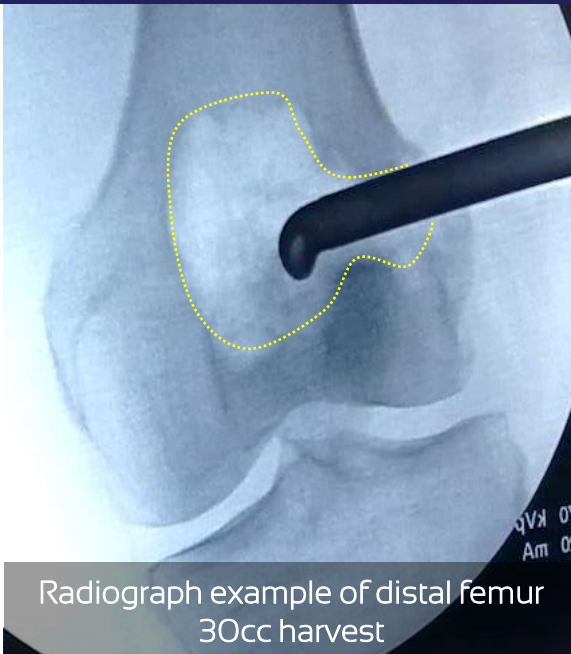
Distal Femur Harvest Summary

AVERAGE VOLUMES:

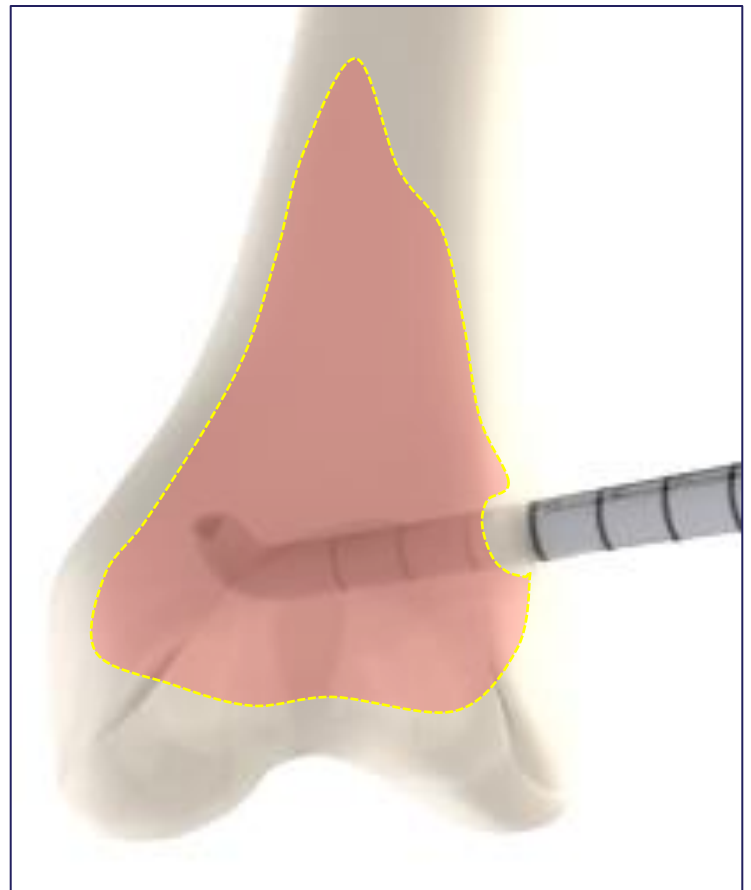
Cancellous Bone Range: 5-50CC's

BMA Range: 5-20CC's

[Volumes depends on surgeon needs and patient anatomy]



Radiograph example of distal femur
30cc harvest



Distal Tibia Harvest Technique

Harvest Site Preparation

A **tourniquet is recommended** to minimize bleeding and to reduce bone marrow contamination and dilution. Fluoroscopy can be used to facilitate incision placement

LOCATION

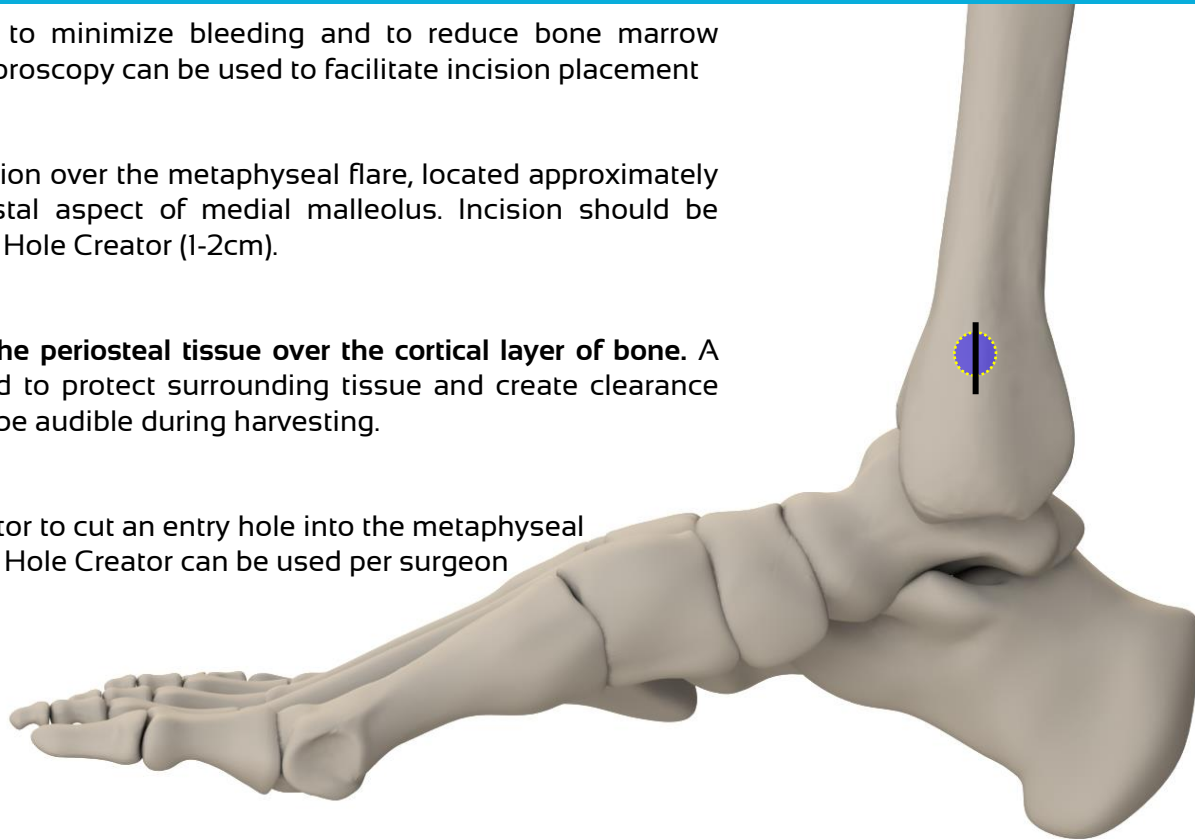
Medial distal tibia, midline incision over the metaphyseal flare, located approximately 2-4cm proximally from the distal aspect of medial malleolus. Incision should be slightly wider than Avitus® Pilot Hole Creator (1-2cm).

DISSECTION

Bluntly dissect down. **Elevate the periosteal tissue over the cortical layer of bone.** A small retractor is recommended to protect surrounding tissue and create clearance for suction. **TIP:** Suction should be audible during harvesting.

ENTRY HOLE

Use the Avitus® Pilot Hole Creator to cut an entry hole into the metaphyseal flare. Either size of Avitus® Pilot Hole Creator can be used per surgeon preference (PC-100, or PC-200).



Distal Tibia Harvest Summary



VOLUME RANGE:

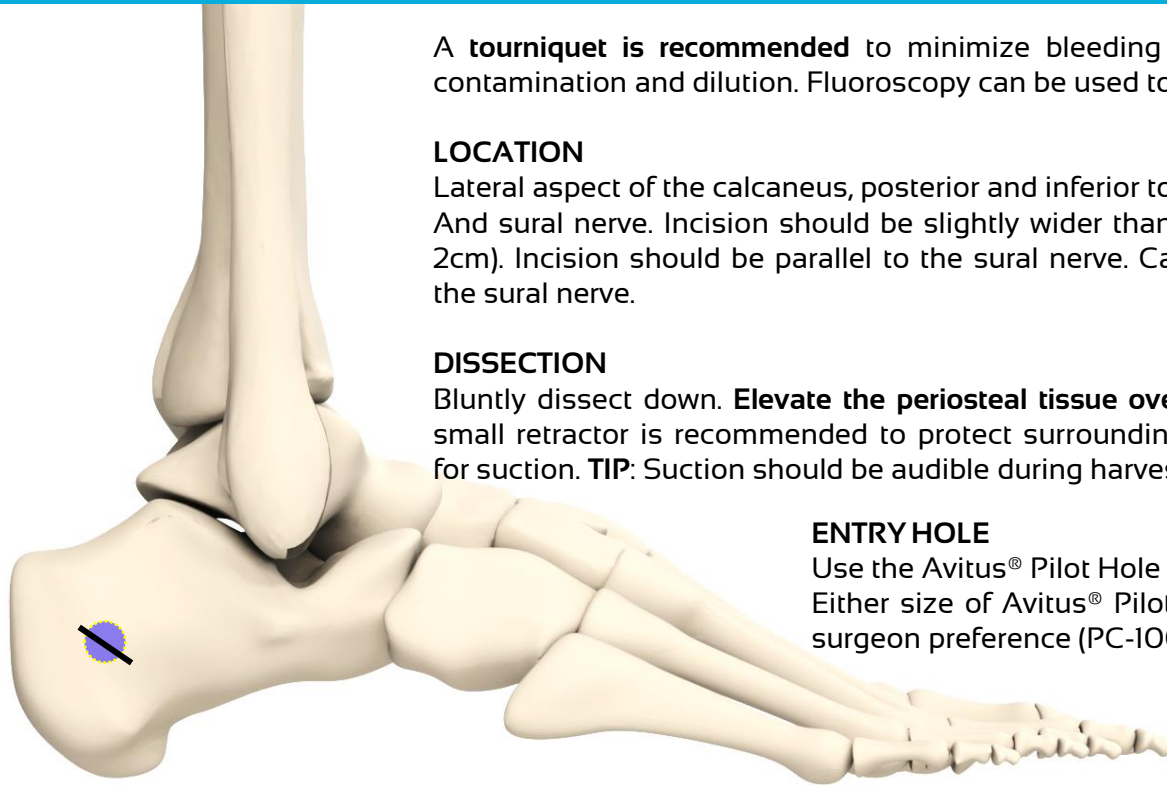
Cancellous Bone Range: 5-25CC's

BMA Range: 3-20CC's

[Volumes depends on procedural needs and patient anatomy]

Calcaneus Harvest Technique

Harvest Site Preparation



A **tourniquet is recommended** to minimize bleeding and to reduce bone marrow contamination and dilution. Fluoroscopy can be used to facilitate incision placement.

LOCATION

Lateral aspect of the calcaneus, posterior and inferior to the peroneal tendons and sural nerve. Incision should be slightly wider than Avitus® Pilot Hole Creator (1-2cm). Incision should be parallel to the sural nerve. Care should be taken to protect the sural nerve.

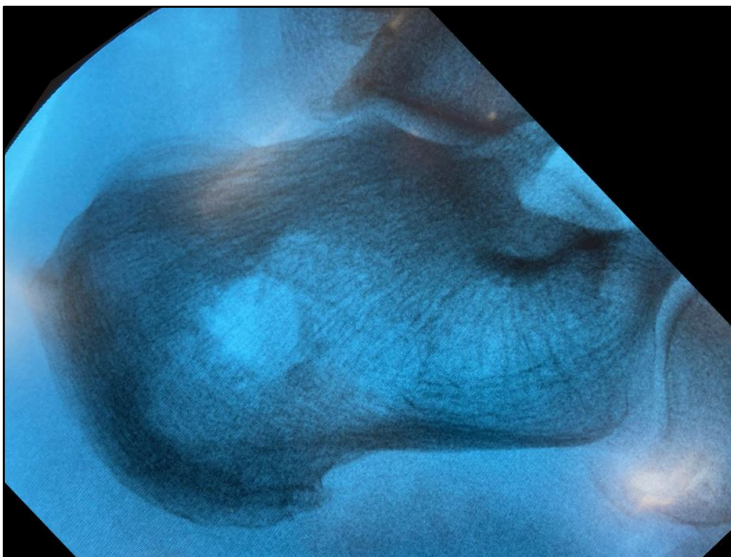
DISSECTION

Bluntly dissect down. **Elevate the periosteal tissue over the cortical layer of bone.** A small retractor is recommended to protect surrounding tissue and create clearance for suction. **TIP:** Suction should be audible during harvesting.

ENTRY HOLE

Use the Avitus® Pilot Hole Creator to cut an entry hole. Either size of Avitus® Pilot Hole Creator can be used per surgeon preference (PC-100, or PC-200).

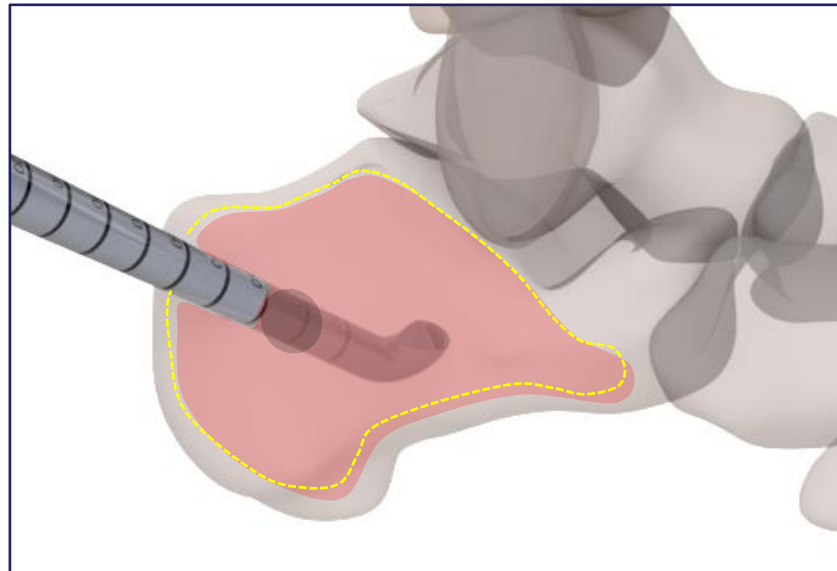
Calcaneus Harvest Summary



AVERAGE VOLUMES:

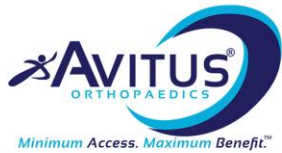
Cancellous Bone Range: 3-25CC's
BMA Range: 0-20CC's

[Volumes depends on procedural needs and patient anatomy]



Upper Extremity Harvest Sites

Olecranon & Radius Harvesting Techniques



TECHNIQUE GUIDE

Bone & marrow harvesting techniques for upper extremity surgery using the **AVITUS® BONE HARVESTER**

By Steven Regal MD
Upper extremity Orthopaedic surgeon

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[CH I\) Distal Radius, Dorsal Approach](#)
[CH II\) Distal Radius, Radial Approach](#)
[CH III\) Olecranon, Posterior Approach](#)



[Link to Upper Extremity Technique Guide](#)

Harvest Site Closure

Closure Preparation and Considerations

- Saline flush the harvest site prior to closure.
- Backfill may be used per surgeon preference. Gel foam may be used to pack the harvest site for hemostasis. See below section for backfilling considerations.
- Close periosteum over pilot entry hole. Proceed to close in layers.
- Standard bulk compressive dressing. Consider extra padding at the proximal tibia harvest site if patient will be using a scooter.
- Literature suggests 6-weeks non-weight bearing status at the harvest site.

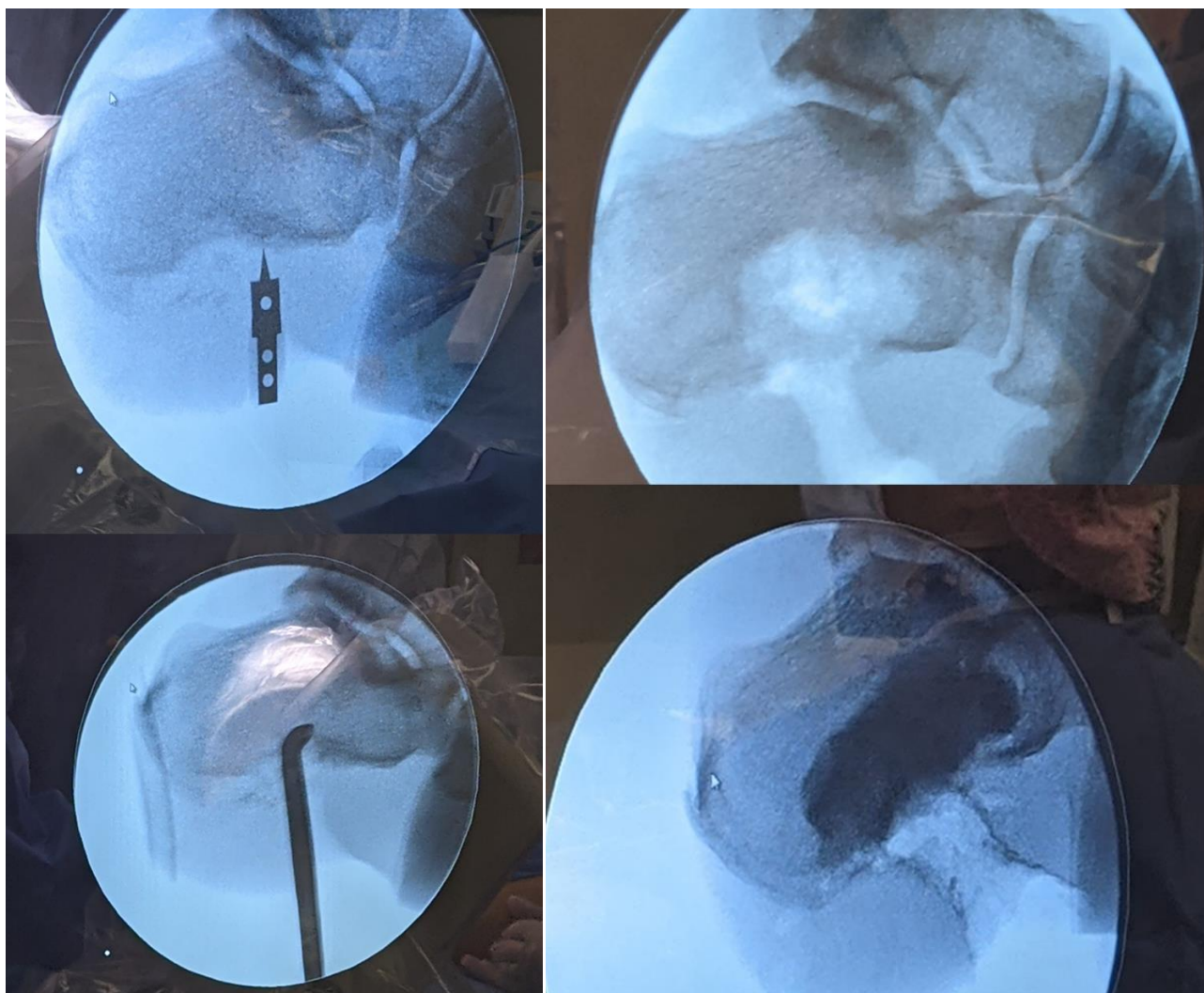


Backfilling Considerations

Clinical Scenario:	Backfilling
Patient is otherwise healthy	No backfill coupled with layered closure is most common. Gel foam with or without thrombin can be used for additional hemostasis.
Patient has many comorbidities, osteopenic or a compliance concern	Structural backfill products such as allograft chips or bone void fillers can be considered coupled with layered closure.
Patient needs to be immediately weightbearing	Structural backfill products such as allograft chips or bone void fillers can be considered. Generally, bone harvests of 5cc or less do not receive backfilling.

Bone Infection / Bone Tumor Debridement

1. Set suction to high
2. Irrigation can be used in conjunction with Avitus® Debridement if desired
3. The use of fluoroscopy is recommended to visualize diseased bone area for debridement
4. Note: during infected bone debridement, possible excess capture of coagulated blood or soft tissue can fill up the canister. If canister fills, simply empty the contents. Make sure to clean off the filter cap of all excess soft tissue prior to re-assembly.



Example: Calcaneus osteomyelitis debridement with Avitus®

Graft & Marrow Retrieval

Drain Marrow and Clear Metal Shaft

HOLD HARVESTER UPRIGHT PRIOR TO REMOVING SUCTION

Take effort to keep the Barbed Nozzle of the Cap upright while active suction tubing is connected.

NOTE: Tipping the Harvester upside down (i.e., barbed nozzle facing down) while connected to active suction tubing will lose liquid marrow from the Handle and not allow user to collect liquid marrow contents.



REMOVE SUCTION TUBE

Disconnect the suction tube and **immediately flip the device** to have the barbed nozzle pointing into the Strainer Cup.

NOTE: Prior to disconnecting the suction tube, keep the Cutting Tip over the Strainer Cup to catch any contents that may escape the cutting tip prior to flipping the device.

FLIP HARVESTER



DRAIN LIQUID MARROW

Allow 10-15 seconds for the liquid marrow to drain out the Barbed Nozzle of the Cap.



CLEAR METAL SHAFT

While the liquid marrow drains, tap the side of the metal shaft of the Harvester with a heavy metal object (e.g., osteotome handle) to dislodge any cancellous graft from the metal shaft into the Filter Insert Bone Receptacle.

Graft & Marrow Retrieval

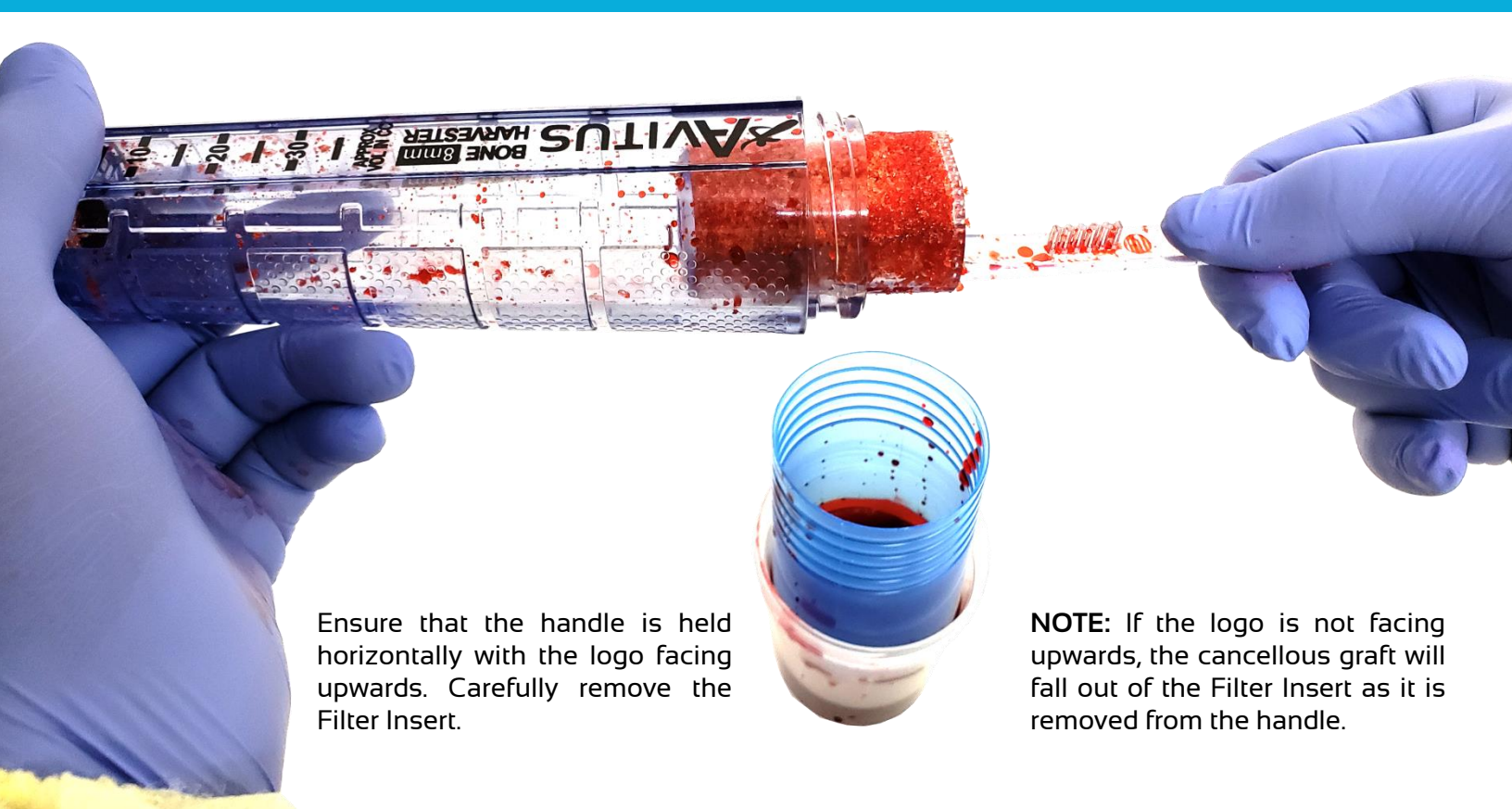
Remove the Cap



Hold the Harvester horizontally over the Strainer Cup and unscrew the Cap. Slightly tilt the handle to allow any remaining liquid marrow to pour out.

NOTE: Take care to stop the Filter Insert from sliding out of the handle at this point.

Remove the Filter Insert



Ensure that the handle is held horizontally with the logo facing upwards. Carefully remove the Filter Insert.

NOTE: If the logo is not facing upwards, the cancellous graft will fall out of the Filter Insert as it is removed from the handle.

Graft & Marrow Retrieval

Retrieve Cancellous Bone from the Filter Insert Receptacle



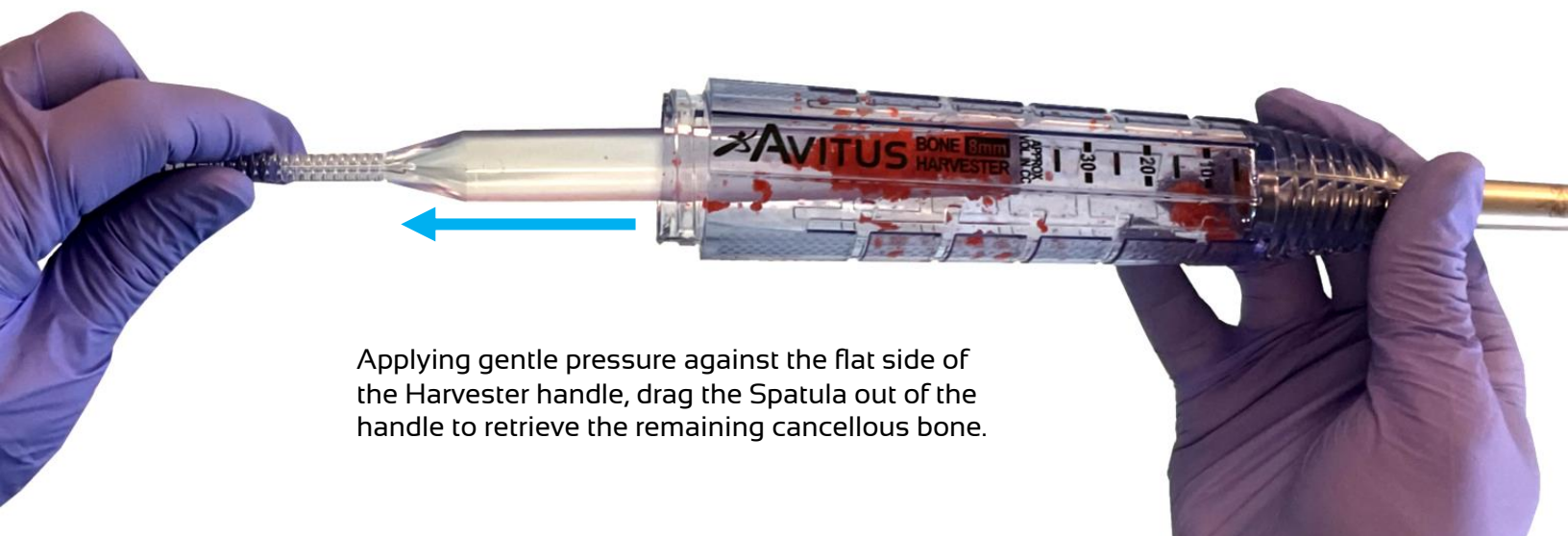
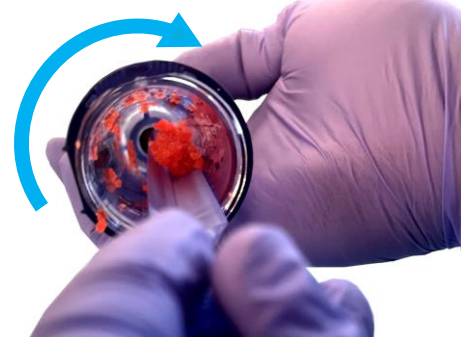
Use the rounded end of the Plunger accessory (included) to remove the cancellous graft from the Filter Insert receptacle into the Straining Cup. Take care to retrieve every chunk.

Retrieve Remaining Cancellous Bone from the Harvester Handle

Use the Spatula accessory (included) to remove any remaining cancellous graft from the Harvester handle.



Insert the Spatula into the Harvester handle and press gently against the wall while rotating the Harvester handle to scrape any remaining cancellous graft into the Spatula.



Applying gentle pressure against the flat side of the Harvester handle, drag the Spatula out of the handle to retrieve the remaining cancellous bone.

Troubleshooting

De-clogging



If the cutting tip of the Harvester gets clogged with cancellous bone, follow these steps:

1. Confirm that the suction tube forms an airtight connection with the barbed nozzle and that the suction source is powered on high.
2. Perform several additional cutting strokes to allow the Harvester to de-clog itself.

If the cutting tip is still clogged, use the Plunger accessory as shown above. Holding the Plunger by the thumb holder, hook the L of the Plunger into the Harvester opening and follow the curve of the Harvester to de-clog and resume harvesting.



Ordering Information

Product Description		CAT No.	Size
HARVESTING	 <p>Avitus® Bone Harvester Sterile, disposable surgical instrument for large volume cancellous bone and marrow harvesting with marrow separation insert. Collect 5-50 CCs of cancellous bone + bone marrow aspirate.</p>	BH-110	8mm
		BH-220	6mm
CORTICAL ENTRY	 <p>Avitus® Pilot Hole Creator Sterile, disposable surgical instrument for creating a pilot hole</p>	PC-100	Ø11mm x 20mm Used with: BH-110
		PC-200	Ø8mm x 20mm Used with: BH-220

Color Code	Product Code Pairing	
Yellow	BH-110	PC-100
Magenta	BH-220	PC-200

Product questions? Avitusproduct.support@zimmerbiomet.com / 860-404-6476

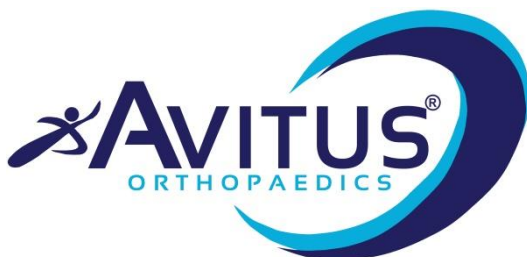
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