Biopsy, Freehand, ultrasound guided

Preparation

Radiologist – hands washed and wearing sterile gloves (do not need to be fully
gowned up as biopsy is not a very invasive procedure)

Determine optimum patient position for biopsy from the imaging findings, e.g.
on front / back. Positioning dependent on identification of planned needle path
and depth to biopsy site. Ensure planned biopsy site is as close to the surface as
possible whilst minimising the number of other internal structures between it
and the outside. Also make sure no vessels lie in the intended path of the needle.

Using ultrasound - Planning biopsy site- aim to get the biopsy through the wall of
the thing you are biopsying. Pathologists like to see normal tissue and then a
zone of transitional into abnormality and then definitely abnormal tissue. So
they know what normal and abnormal is in the same sample. Also, aim for the
edge of a tumour because often tumours outgrow the blood supplies so the centre
breaks down and goes all necrotic and won’t give a good sample.

Once planned incision site is identified mark the planned incision site, e.g. by
pressing needle cap in skin to leave an indentation – this should still be visible
when you return to start procedure. Once mark is made on skin check that the
planned biopsy site is visible when the ultrasound probe is placed directly over
this point.

Also important that the patient is advised to take note of their breathing and
informed that they will be asked to control their breathing. Scans and procedure
are done at same point in breathing cycle (internal organs move during
breathing). Whenever asking the patient to hold their breath hold your breath as
well to remind you to ask the patient to breath normally afterwards.

Trolley prepared

Equipment Required

Biopsy Needle (test fired to ensure in working order and primed and ready for use) –
either coaxial (with trocar) or uniaxial

Test firing the biopsy needle so the patient can hear it will reassure the patient
that the noise is normal when the actual biopsy is done and will reduce the risk
of them moving when the biopsy sample is taken

5ml syringe (local, 1% lidocaine)
Orange needle (short, 23g needle)
Green needle (longer and larger calibre than orange needle)
Ultrasound probe cover
Sterile ultrasound jelly
2 silver fluid containers (1 antiseptic and then waste, 1 for saline)
Sterile green sheets (two small, one large, one split sheet).
Paper bag (for used surgical tools which are returned for sterilisation)
Dressing (an adherent, transparent film) or towel clip
Swabs
Sharps pad (for sharps safety; blade placed into pad)
Blade
Local anaesthetic (1% lidocaine), approx 10ml required
Non-absorbent paper (to hold sterile jelly)
Sponge holder forceps (to hold swab while cleaning the skin)
Required transport medium to hold biopsy sample
Saline (500ml normal saline) – see saline prep. algorithm
White needle (used to draw up saline)
20ml saline syringe (see saline prep algorithm)

Steps Included in the Biopsy US Guided Procedure Task Analysis

1. Select Syringe
2. Preparation of syringe
3. Draw up local
4. Ensure there are no bubbles in the syringe
5. Cleaning incision site
6. Sterile Sheets
7. Injecting local anaesthetic
8. Incising Skin
9. Preparing Ultrasound
10. Preparing for Procedure
11. Checking probe is the right way around
12. Biopsy Procedure
13. Uniaxial Biopsy Needle
14. Coaxial Biopsy Needle
1. Select Syringe
   
   1.1. Select 5ml syringe

2. Preparation of syringe

   2.1. Push in plunger of the syringe.
   
   2.2. Pull plunger to maximum travel.
   
   2.3. Push plunger back in
3. **Draw up Local Anaesthetic**

3.1. Attach green needle to local syringe (a green needle is used to draw up local as it is a larger calibre than the orange needles and fluid flow is more rapid)

3.2. Request local anaesthetic from assistant

3.3. With an assistant both read out the contents of the vial and the use by date (to check correct vial selected)

3.4. Request assistant take the top off the vial

3.5. Request assistant hold the vial almost horizontal with the top of the vial pointing towards you

3.6. Place needle in vial

3.7. Move the neck of the vial downwards with the needle so the neck of the vial is pointing down to the floor

3.8. Draw up local (pull back on syringe). Is there enough local in the syringe?

   **Yes** (go to step 4.1)

   **No** (repeat steps 3.2 to 3.8)
4. Ensure there are no bubbles in the syringe

NOTE - Air can be dangerous if injected into a vessel, and air along the needle track will interfere with ultrasound making imaging difficult

4.1. Tap and oscillate the syringe to allow bubbles to float to the surface of the liquid

4.2. Hold syringe with needle pointing up

4.3. Press plunger on syringe until all air is evacuated (surface of the liquid reaches top of syringe or liquid comes out of syringe.)

4.4. Remove green needle from syringe and place on sharps pad

4.5. Select orange needle and place on syringe (this needle is thinner and therefore less painful for patient)

4.6. Place local syringe on trolley
5. **Cleaning incision site**

5.1. Pick up swab from trolley

5.2. Fold swab over so it is small enough to be placed in forceps

5.3. Pick up forceps from trolley

5.4. Place swab in forceps

5.5. Using forceps soak swab in antiseptic by placing it in pot holding antiseptic

5.6. Pick up pot and take pot, forceps (with swab) over to the patient

5.7. Clean the planned incision site with antiseptic soaked swab

5.8. If necessary, place a clean swab in the patient’s groin area (this prevents the antiseptic running into this area which is very painful)

5.9. Pour small amount of antiseptic from pot onto patient and dab / wipe with swab to remove excess alcohol

5.10. Discard used swab
6. **Sterile Sheets**

6.1. Position sterile sheets and sterile split sheet over patient so incision site is exposed

6.2. Is the split sheet in a secure position for the procedure?

   **Yes** – go to next step

   **No** – Secure sheets using a towel clip or adherent dressing from trolley: remove backing and use to fasten green split sheet in position
7. Injecting local anaesthetic

7.1. Pick up local syringe (with orange, i.e. short 23g needle)

7.2. Position needle over planned incision site

7.3. Insert needle of syringe very superficially (intra-epidermal injection)

7.4. Aspirate with needle (if you get blood this indicates the needle is in a vessel, do not inject local into vessel). Is there blood?

   Yes (pull back and adjust needle slightly and repeat step 7.4)

   No (go to step 7.5)

7.5. Inject local (this produces a bleb on skin which looks like a nettle sting and gives instantaneous anaesthesia)

7.6. Insert needle at a shallow angle a little further into skin

7.7. Aspirate with needle (if you get blood this indicates the needle is in a vessel, do not inject local into vessel). Is there blood?

   Yes (pull back and adjust needle slightly and repeat step 7.7)

   No (go to step 7.8)

7.8. Inject local (forms a larger weal on the skin)

7.9. Increase angle of needle to the skin

7.10. Slowly advance needle into subcutaneous tissue

7.11. Aspirate with needle (if you get blood this indicates the needle is in a vessel, do not inject local into vessel). Is there blood?

   Yes (pull back and adjust needle slightly and repeat step 7.11)

   No (go to step 7.12)

7.12. Inject local
7.13. Repeat steps 7.9 to 7.12 until required amount of local has been injected or you reach the extreme of the needle

7.14. Remove syringe (needle remains in skin, as a marker for site of local injection) and place on trolley

7.15. Is more local required?

   **Yes** - select longer needle (green) from trolley and place on syringe

   **No** – go to next section

7.16. Insert green needle next to orange needle (which is marking position)

7.17. Repeat steps 7.9 to 7.12 until required amount of anaesthetic has been injected

7.18. Remove syringe (with green needle attached)

7.19. Place green needle with syringe attached into sharps pad.
8. Incising Skin

NOTE - approx 1cm deep nick in skin at planned incision site (the blade can be pushed directly down as planned biopsy site has been identified so that there is no danger of damaging anything underneath the skin, a deeper cut reduces any resistance when needle is inserted.

8.1. Wait for the local to work (approx 2 minutes)

8.2. Select blade and sharps pad from trolley

8.3. Remove orange needle from skin and place on sharps pad

8.4. Press gently on skin with blade at planned incision site to check no feeling. Is there feeling?

   Yes (inject more local, subjective decision, Section 7)

   No (go to step 8.5)

8.5. Place blade at planned incision site

8.6. Is there a risk of damaging a vein or artery whilst making incision?

   Yes - keeping blade resting on site of planned entry site retract skin laterally by 1 to 2cms (moves skin away from vein or artery while nicking to reduce the risk of cutting into the vein or artery)

   No – go to next step

8.7. Make nick in skin

8.8. If skin was retracted allow it to fall back

8.9. Place blade on sharps pad

8.10. Place sharps pad on trolley

8.11. Pick up swab from the trolley and wipe the incision site to clean away any blood
9. Preparing Ultrasound

9.1. Check positioning of ultrasound screen. Can you view it OK?

   Yes (go to step 9.2)

   No (ask assistant to move screen into view and go to step 9.2)

9.2. Request assistant open ultrasound probe cover package

9.3. Remove the probe cover from the packaging

9.4. Concertina ultrasound probe cover up (this makes it easier to place over ultrasound probe), place your fingers inside the cover, holding the channel open

9.5. Request assistant place ultrasound jelly inside the probe cover

9.6. Request assistant place (non sterile) probe inside sterile ultrasound probe cover (avoiding contact with your fingers as the probe is not sterile)

9.7. Open out the probe cover and extend it along the length of the probe cable, secure with rubber bands as needed.

9.8. Ensure the ultrasound jelly completely covers the end of the probe (avoid air between the patient and the probe as this will reflect sound and impair the imaging)

9.9. Place probe securely on the sheet covering the patient

9.10. Place sheet of non-absorbent paper (e.g. can use paper from the ultrasound probe cover package) on sheet covering patient

9.11. Request assistant place ultrasound jelly on the paper
10. Preparing for Procedure

10.1. Pick up the biopsy needle (already primed) from the trolley

10.2. Place biopsy needle on the sheet

10.3. Pick up ultrasound probe from sheet

10.4. Place end of probe in the sterile jelly on the waxy paper

10.5. Smooth jelly out using finger so there is a thin layer covering the head of the probe
11. Checking probe is the right way around

11.1. If there is no jelly already on probe, place end of probe in the sterile jelly on the non-absorbent paper

11.2. Smooth jelly out using finger so there is a thin layer covering the head of the probe

11.3. Place finger at one end of the probe face.

11.4. Check the image on the screen

11.5. Identify which way round the probe is by identifying finger on image (to ease interpretation of the ultrasound image your left and right needs to be the same as the left and right on the ultrasound image of the patient)
12. Biopsy Procedure

12.1. Is it a coaxial or uniaxial biopsy needle?

Uniaxial (go to section 13)  Coaxial (go to section 14)
13. Uniaxial Biopsy Needle

13.1. Place probe on patient at incision site

13.2. Looking at the ultrasound screen roll the probe back and forth on the incision site until the planned biopsy site is identified

13.3. Note the depth of the planned biopsy site using the markers on the ultrasound screen

13.4. Pick up the biopsy needle from the green sheet - make note of the measurement markers on the needle to identify how deep this needle is going to be inserted

13.5. Holding the needle shaft position the biopsy needle at the incision site

13.6. Holding the needle shaft begin to insert the needle perpendicular to the skin into incision

13.7. Position the needle, probe and planned biopsy site in the same plane (to ensure all necessary information can be viewed on the ultrasound screen)

13.8. Looking at the ultrasound screen jiggle the needle gently and identify the needle on the image (a moving needle is easier to identify than a static needle) and the planned biopsy site (the aim is to be able to see both the needle and the planned biopsy site in the same image)

13.9. Slowly advance the biopsy needle towards the planned biopsy site, constantly viewing the ultrasound image to guide orientation and progress

13.10. Continue advancing the needle in this way until the planned biopsy site is reached (the needle should be positioned just short of the planned sample site, if a tumour is being biopsied the needle needs to be at the edge of the tumour), be guided both by the image and by your knowledge of the depth of the planned biopsy site
13.11. Request patient to hold their breath (when ever asking the patient to hold their breath hold your breath as well to remind you to ask the patient to breath normally afterwards)

13.12. Whilst patient holding their breath check (on the ultrasound screen) positioning of biopsy needle is correct. Is the needle in the correct position for biopsy?

   Yes – go to next step (allow the patient to breath shallowly)

   No – repeat from step 13.8 (if necessary withdraw the needle slightly before proceeding) allow the patient to breath.

13.13. If necessary adjust positioning of hand on needle to enable firing mechanism to be activated

13.14. Request patient to hold their breath

13.15. Whilst patient is holding their breath fire the biopsy needle and take the biopsy sample

13.16. Remove the biopsy needle

13.17. Allow the patient to breath.

13.18. Place ultrasound probe securely on green sheet

13.19. Move over to the trolley

13.20. Holding the biopsy needle over the trolley cock the needle and push the needle out to expose the sample

13.21. Examine the biopsy sample in the needle (looking for a number of factors indicating quality of sample, for example, size, texture, consistency, the degree of fragmentation of the sample and colour of the sample)

13.22. Select orange needle or blade off the trolley
13.23. Using the orange needle or blade gently lift the biopsy sample from the biopsy needle

13.24. Place biopsy sample in the required transport medium (this depends on where the sample is going for testing – e.g. test for cancer = preservative)

13.25. Determine whether another sample is required. This will depend on the number of samples needed to send for testing and the quality of the sample (s) already taken (the aim is to take the least number of samples as possible given these constraints as each time you pass a needle in the risk of complication is increased). Is another sample required?

   Yes (clean biopsy needle with wet swab, then repeat steps 13.1 to 13.25)

   No (go to next step)

13.26. Do final ultrasound scan on patient to ensure there are no complications (most common complication is bleeding) and to identify artefact on scan where tissue has been traumatised and the track of the needle can be identified – this will confirm that biopsy was taken from correct place.

   Was biopsy taken from correct place

   Yes (go to next step)

   No (repeat biopsy, go to step 13.1)

13.27. Wipe incision site with swab

13.28. Hold swab down on incision site to stop any bleeding
14. Coaxial Biopsy Needle

14.1. Place probe on patient at incision site

14.2. Looking at the ultrasound screen roll the probe back and forth on the incision site until the planned biopsy site is identified

14.3. Note the depth of the planned biopsy site using the markers on the ultrasound screen

14.4. Pick up the biopsy trocar (with needle) from the green sheet - make note of the measurement markers on the trocar to identify how deep this needle is going to be inserted

14.5. Holding the needle shaft position the biopsy trocar at the incision site

14.6. Holding the shaft begin to insert the trocar perpendicular to the skin into incision

14.7. Position the trocar, probe and planned biopsy site in the same plane (to ensure all necessary information can be viewed on the ultrasound screen)

14.8. Looking at the ultrasound screen jiggle the trocar gently and identify the trocar on the image (a moving needle is easier to identify than a static needle) and the planned biopsy site (the aim is to be able to see both the trocar and the planned biopsy site in the same image)

14.9. Slowly advance the trocar towards the planned biopsy site, constantly viewing the ultrasound image to guide orientation and progress

14.10. Continue advancing the trocar in this way until the planned biopsy site is reached (the needle should be positioned just short of the planned sample site, if a tumour is being biopsied the needle needs to be at the edge of the tumour), be guided both by the image and by your knowledge of the depth of the planned biopsy site
14.11. Request patient to hold their breath
14.12. Whilst patient holding their breath check (on the ultrasound screen) positioning of trocar is correct. Is the trocar in the correct position for biopsy?
   Yes – go to next step (allow patient to breath, shallowly)
   No – repeat from step 14.7 (if necessary withdraw the trocar slightly before proceeding) (allow patient to breath)
14.13. Place the probe securely on the green sheet
14.14. Request patient hold their breath
14.15. Hold the trocar and remove the needle from the trocar (ensuring trocar is not moved from its position)
14.16. Place thumb over end of trocar (to prevent the risk of air entering)
14.17. Patient can breath shallowly
14.18. Place needle on sharps pad on trolley
14.19. Pick up biopsy needle (already primed) from the trolley
14.20. Request patient hold their breath and keep very still
14.21. Insert biopsy needle into the trocar
14.22. Continue inserting the biopsy needle into the trocar until it is at its extreme
14.23. If necessary adjust positioning of hand on needle to enable firing mechanism to be activated
14.24. Whilst patient is holding their breath fire the biopsy needle and take the biopsy sample
14.25. Remove the biopsy needle leaving the trocar in place
14.26. Put thumb over end of trocar until you are ready to put the trocar needle back in place in the trocar
14.27. Put trocar needle back into trocar
14.28. Allow patient to breath
14.29. Move over to the trolley
14.30. Holding the biopsy needle over the trolley cock the needle and push the needle out to expose the sample
14.31. Examine the biopsy sample in the needle (looking for a number of factors indicating quality of sample, for example size, texture, consistency, the degree of fragmentation of the sample and colour of the sample)
14.32. Select orange needle or blade off the trolley
14.33. Using the orange needle or blade gently lift the biopsy sample from the biopsy needle
14.34. Place biopsy sample in the required transport medium (this depends on where the sample is going for testing – e.g. test for cancer = preservative)
14.35. Determine whether another sample is required. This will depend on the number of samples needed to send for testing and the quality of the sample (s) already taken (the aim is to take the least number of samples as possible given these constraints as each time you pass a needle in the risk of complication is increased). Is another sample required?

**Yes** (clean biopsy needle with wet swab, then repeat steps 14.1 to 14.35)

**No** (go to next step)

14.36. Remove biopsy trocar from patient
14.37. Wipe incision site with swab
14.38. Hold swab down on incision site to stop any bleeding
14.39. Do final ultrasound scan on patient to ensure there are no complications (most common complication is bleeding) and to identify artefact on scan where tissue has been traumatised and the track of the needle can be identified – this will confirm that biopsy was taken from correct place.

Was biopsy taken from correct place

**Yes** (end of procedure)  **No** (repeat biopsy, go to step 14.1)