

Performing Skin Biopsies: Maximizing Accuracy; Minimizing Risk

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The skin biopsy is one of the most commonly performed procedures in dermatology. Samples of skin are usually taken for routine microscopy, and immunofluorescence microscopy is generally required when the possibility of an immunologic disorder exists. Rarely, electron microscopy may be performed when unusual diseases of connective tissue or unusual neoplasms are evaluated. This article will cover the four biopsy techniques that are most commonly employed: shave, punch, incision, and excision. Other specimens lend themselves to enucleation, such as cysts and benign neoplasms situated in the subcutis.

Although the actual technique of skin biopsy is relatively straightforward, there are a number of important principles that must be adhered to in order to avoid potential problems, some of which may be serious. Although the vast majority of dermatologic disorders are not life-threatening, there are many pitfalls that may bedevil the unsuspecting clinician who is not aware of them.

Standards & Principles

- Provide complete, accurate information to the dermatopathologist. A biopsy specimen submitted without appropriate clinical information may yield equivocal, confusing and often, useless results. Dermatology is a specialty that requires clinicopathologic correlation to be practiced well. Inability to correlate clinical findings with histologic ones very commonly leads to misdiagnosis and inappropriate treatment, often with harm to the patient. It is essential that those performing skin biopsies know the fundamental lesions of cutaneous pathology and how to describe them accurately and skillfully. Furthermore, the clinician must have an understanding of the disease process in question. Skin disorders are not static but are dynamic processes, and a knowledge of the disease progression and chronology is essential. For example, a biopsy taken from a lesion just in its inception or, conversely, at its end, is likely to appear completely different than those that are fully developed. The most characteristic, typical skin lesion of a given process should be sampled in a fashion that provides an intact and representative specimen to the dermatopathologist.
- Submit specimens only to those competent in the interpretation of cutaneous pathology. Dermatopathology is a complex specialty with morphology and terminology as fundamental elements. Those fully trained in dermatopathology have spent one or more years in specialty training focusing on the subtleties of dermatology and cutaneous pathology. Those who practice this on a daily basis are highly qualified and usually better able to make accurate diagnoses of skin disorders from skin biopsies. It cannot be emphasized too strongly that clinicopathologic correlation forms the cornerstone of the practice of dermatology even when dealing with seemingly banal processes such as basal cell carcinoma and nevi. It obviously assumes even more importance when the patient presents with an unusual inflammatory skin

disorder or a pigmented lesion such as a possible melanoma.

- If no description can be made or a differential diagnosis cannot be rendered, it may be best to refer the patient for a second opinion. Incorrectly performed biopsies such as those performed using faulty technique or sampling a non-representative lesion may lead to an erroneous histologic diagnosis. For example, a superficial shave biopsy of discoid lupus erythematosus may be misinterpreted as squamous cell carcinoma with disastrous results. Conversely, a punch biopsy of malignant melanoma may fail to sample a diagnostic area resulting in failure to diagnose a serious, potentially lethal malignancy.
- Inflammatory skin disorders should not be biopsied using the shave technique but by punch or incision. Inflammatory dermatoses are evaluated on the basis of the pattern of the inflammation in the specimen so that evaluation of the superficial, as well as the depth of the skin, needs assessment. Superficial specimens do not permit such evaluation and are therefore prone to misinterpretation. Punch and incision specimens should extend into the subcutaneous fat. Panniculitides and alopecias, which are generally more complicated disorders, should be referred to experts in virtually all cases and must be sampled by either broad, deep punch technique or deep incision.
- Pigmented lesions suspicious of being melanoma should be sampled by excision whenever possible. Superficial shave and punch specimens of pigmented lesions are fraught with difficulty and are prone to medicolegal liability. Therefore, when dealing with lesions such as this, it is essential that appropriate specimens be taken. Punches are not recommended unless all of the lesions can be excised with the punch, or the lesion is of such a size that complete primary excision is not feasible. In the latter case, either an incisional biopsy including the area of greatest concern or a broad punch biopsy can be performed. In any biopsy of a pigmented lesion, it is essential that the specimen that is taken be representative of the entire neoplasm in question.
- Ulcers should be biopsied in a way that samples the ulcerated area as well as an edge. Ulcers may develop due to many different pathologic processes in the skin ranging from neoplasms to vascular diseases. The border of the ulcer usually represents the most active portion of the process and thus, may have histologic features that differ significantly from what may be seen in the center, which may be only granulation tissue. Accurate diagnosis of ulcers is often difficult, so that ancillary procedures such as cultures and immunoperoxidase stains may be required. Either broad, deep punch or incisional biopsy is required.
- A bulla should be biopsied so as to include a portion of the blister as well as the skin just adjacent to its edge. Vesicles, which are tiny blisters in the skin, can often be completely punched out, which is the preferable method, although bullae cannot be sampled as such

because of their larger size. Punches taken through the center of a larger blister will cause the epidermis to shear away and possibly be lost. As the epidermis is often an important element in the accurate diagnosis of blistering diseases, it is essential that the specimen be taken to preserve it. Immunofluorescence studies are to be performed; it is important that the differential diagnosis is known and that the specimen be taken in an appropriate manner as certain blistering diseases should be sampled away from the blister, while others, such as pemphigus, are best sampled from the blister edge.

- If an infectious process is suspected, send part of the biopsy for culture and inform the dermatopathologist so that appropriate special stains will be performed.
- All annular and expanding lesions should be sampled from the leading edge. As the central portion of annular lesions often shows no pathologic changes, it is essential that all such lesions be sampled from the active margin.
- Reserve shave biopsies for pedunculated or sessile lesions. The shave is generally a technique used to sample a specimen either for confirmation such as clinically obvious nevi or keratoses or for cosmeses such as removal of acrochordons or warts. It generally does not sample the dermis so that inflammatory processes and deeply seated neoplastic disorders may be missed when sampled in this fashion. Furthermore, many serious neoplastic disorders may have seemingly innocuous appearances, so that over-reliance on this technique puts the clinician at increased risk of failure to diagnose a serious process.
- Punch biopsies smaller than 3 mm often do not provide enough material to make a diagnosis. Inflammatory skin disorders are almost always widespread so that the punch biopsy, even when broad, represents only a small portion of the entire process. Punches smaller than 3mm in diameter often do not contain diagnostic findings. It is often helpful if several biopsies taken from lesions at different stages of evolution and from different body sites are submitted.
- Suppose the dermatopathologist reports that no pathologic changes were found, and you are certain that pathologic changes were present in the biopsy specimen, ask that deeper sections be cut. In some cases, the lesion may have been small so that the initial sections into the block may not have sampled diagnostic areas.
- Most malpractice claims in dermatology are due to failure to diagnose. Poorly performed biopsies, specimens submitted with insufficient or misleading clinical information, and histologic interpretation by those without expertise in dermatopathology are the prime sources of medicolegal liability. It is essential that those performing dermatology be familiar with the

standards of care in their communities and practice appropriately.

- Maintain a low threshold for the performance of skin biopsies in immunosuppressed patients when appropriate. Skin disorders may serve as signs of underlying serious infectious and neoplastic conditions and may have unusual and innocuous appearances. Skin biopsies may be the only way to establish a definitive diagnosis.
- Do not put specimens from multiple sites in one bottle. In some cases, malignant neoplasms may simulate benign conditions so that if multiple specimens are placed in one bottle, and one is found to be malignant, the results may be disastrous. Ideally, there should be one specimen per bottle, each properly labeled with regard to the site from which the biopsy specimen was taken.
- Handle the tissue specimen with care. Make sure that once the biopsy specimen has been removed that it actually enters the formalin bottle. Shave specimens have a tendency to adhere to the scalpel or razor blade, while punch specimens can sometimes remain in the punch barrel. The formalin should be inspected to see that the specimen is floating in the formalin itself as if specimens adhere to the bottle, they may be crushed in the lid. The specimen should be placed in the formalin promptly to avoid dehydration and autolysis. Avoid spearing or crushing the specimen as crush artifact often renders histologic findings uninterpretable.

Biopsy Techniques

Shave Biopsy

Equipment:

- Personal protective equipment (PPE)
- Alcohol swabs
- 3 cc syringe with 30 g needle containing 1% xylocaine with epinephrine 1:10,000 (do not use epinephrine on the finger, toe, or penis)
- Gauze pads
- No. 15 scalpel blade or surgical razor blade
- Cotton tipped swabs
- Cautery
- Specimen transport medium (formalin)
- Antibiotic ointment
- Bandage

Technique:

- Obtain consent
- Don PPE
- Clean lesion and field with alcohol
- Infiltrate anesthesia intradermally

- Cut lesion at the base using a sawing motion
- Place specimen in formalin bottle to be submitted for pathologic examination
- Stop bleeding using Monsel's solution or 20% aluminum chloride solution
- Apply antibiotic ointment and bandage

Punch Biopsy

Equipment:

- Personal protective equipment (PPE)
- Alcohol swabs
- Anesthesia
- Gauze pads
- Biopsy punch (3, 4, or 6 mm)
- Sharp pointed scissors
- Small toothed forceps
- Needle holder
- Monofilament nylon suture with a reverse cutting needle
- Specimen transport medium (formalin)
- Antibiotic ointment
- Bandage

Technique:

- Obtain consent
- Don PPE
- Clean lesion and field with alcohol
- Infiltrate anesthesia as above
- Choose punch that encompasses the desired lesion
- With one hand, stretch skin perpendicular to natural skin tension (skin fold) lines. With the other hand, twist the punch to and fro between the fingers while slowly pushing it into the skin.
- Push to the hub, except in areas with little subcutaneous fat, such as the dorsa of the hands, eyelids, and external ears.
- Pull the punch straight out.
- Press the skin circumferentially around the wound site. The punch specimen should be expressed from the defect. If necessary, use a blunt instrument to remove it from the wound site. Avoid using toothed forceps as they can crush the specimen.
- Snip the specimen free with scissors at the base, taking care to include some fat in the lower portion of the specimen.
- Suture closed using a simple interrupted, horizontal mattress, or figure-of-eight stitches, in such a way as to align the incision line parallel to the skin tension lines.
- Apply pressure to obtain hemostasis
- Dress with antibiotic ointment and a bandage
- The patient is instructed to keep the area covered but clean it gently daily with water and apply antibiotic ointment before bandaging.
- Remove sutures at the next scheduled appointment

Excisional and Incisional Biopsy

Equipment:

It- Similar to that for punch biopsy plus a No. 15 scalpel blade on a handle.

- Once anesthesia is obtained, the procedure is performed under sterile conditions.
- Blunt-tipped undermining scissors are used instead of sharp-tipped scissors to loosen the tissue before closure.

Technique:

- Obtain consent
- Don PPE
- Clean field with alcohol
- Infiltrate with anesthesia as above
- Apply betadine or similar preoperative scrub and don sterile gloves.
- Make an elliptical incision around the lesion into the superficial dermis. The ratio of length to width should be about 3: 1. If an incisional biopsy is to be performed, make an elliptical incision into the lesion itself, making certain that the most abnormal areas of the lesion are included in the specimen.
- Repeat incising perpendicular to the skin surface until the subcutaneous fat is seen at the base, and the ellipse sits like an island in the center of the wound.
- Lift one point of the ellipse with the forceps and carefully dissect the base of the specimen free with scissors, taking care to include some subcutaneous fat with the specimen.
- Venous oozing is usually controlled by applying gentle pressure.
- Small arterial bleeders may be ligated with an absorbable suture.
- Close the wound with simple interrupted nylon sutures or with horizontal or vertical mattress sutures. Gaping wounds will have a better cosmetic result if buried sutures are used to approximate the deeper layers with absorbable suture material such as Vicryl. This is followed by superficial interrupted or running sutures using Nylon.
- Apply antibiotic ointment and bandage.
- Dressing changes and suture removal as above.

PAS Stain for Onychomycosis

The performance of the potassium hydroxide preparation is considered fundamental in the diagnosis of dermatophyte infection. When dealing with onychomycosis, this is a somewhat more onerous procedure as the nail must be clipped to the proximal-most portion of involvement, and scrapings must be taken off the subungual debris. The material may need to be left on the slide for up to 20 minutes before examination, which may not be possible or practical. To expedite the diagnosis of fungal infections of the nail, a simple procedure can be done using the dermatopathology laboratory to confirm the presence of hyphae in the nail plate. This technique can be used because there are stains that allow the fungus to be identified in tissue.

Equipment:

- Heavy-duty nail clippers
- Transport medium (formalin or clean Ziploc bag)
- Gauze pads

Technique:

- Clean the area with an antiseptic solution or alcohol swab.
- Identify a dystrophic nail plate.
- Gently slide the edge of the nail clipper under a dystrophic nail plate.
- Place gauze on the surface of the affected nail (prevents nail plate from flying across the room).
- Apply steady firm pressure with nail clippers until the nail plate is cut.

- Place a nail in a laboratory transport medium.
- Inform laboratory to perform PAS stain for fungus on the nail plate.

About Clay J Cockerell, MD

Dr. Clay Cockerell is a board-certified dermatologist and a Fellow of the American Academy of Dermatology. He currently sits on multiple boards and committees. Dr. Cockerell is internationally recognized for his contributions to both dermatology and dermatopathology. He is the past president of the American Academy of Dermatology. For many years, Dr. Cockerell has overseen an educational program designed to train the next generation of dermatopathologists. He has served as Associate Editor of the *Journal of the American Academy of Dermatology*, and he is on the editorial boards of several medical journals, including the *American Journal of Dermatopathology*.

Dr. Clay Cockerell serves as Founder & Medical Director Cockerell Dermatopathology in Dallas, TX. Since joining the group in 1988, Cockerell Dermatopathology has grown into one of the nation's most respected dermatopathology practices by always focusing on the needs of referring clinicians and their patients.

He has two children, Charles and Lillian, and he and his wife have been married for forty years. Besides being very active within the dermatology and dermatopathology specialties, Dr. Cockerell and Brenda enjoy traveling, golf, and winter sports.

About Cockerell Dermatopathology

Cockerell Dermatopathology (CDP), located in the heart of Dallas' medical district, was founded by Dr. Clay J. Cockerell, former president of the American Academy of Dermatology and internationally recognized dermatologist and dermatopathologist. CDP offers diagnostic excellence and unparalleled service in evaluating dermatologic disorders ranging from the routine to the most difficult.

Cockerell Dermatopathology continues to invest in the future by implementing advanced technologies within the laboratory to best serve referring clinicians and their patients. These new technologies produce higher quality slides to diagnose, improves turnaround time on routine cases, and allows for quicker deployment of EMR interfaces.

From an academic standpoint, CDP hosts numerous Internet-based continuing education events and has a 14-headed microscope for in-person training sessions. Cockerell Dermatopathology serves hundreds of clinicians from across Texas, the United States, and abroad. With an accessible team of board-certified dermatopathologists and a highly trained support staff, Cockerell Dermatopathology's vision is to treat every specimen as if it came from one of our own family members.

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