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Review Article

Skin biopsy- some key concepts and guidelines

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Abstract Skin biopsy is an easy, fundamental and outpatient method aiding timely and correct diagnosis in various confusing skin disorders. In addition to diagnosis, it is valuable regarding monitoring purpose, evaluation of therapy and can be curative for certain small skin lesions. Before embarking on the procedure, one must be very specific and clear in mind regarding anticipated benefits, avoiding unnecessary burden on diagnostic centers with limited resources. There are various types of skin biopsies and the choice lies in site involved, suspected disease, specific anatomy and of course size of the lesion.

This article explains pre-biopsy evaluation of patients, site selection, and types of skin biopsies with their respective indications, area preparation, and choice of anesthesia and possible complications that can bother an internist.

Key words
Biopsy, punch biopsy, shave biopsy, excision biopsy.

Introduction

Skin biopsy plays a pivotal role in diagnostic armamentarium of a dermatologist and is a common procedure to be practised. Living in an era of continuous improvement towards practicing evidence-based medicine, patient awareness and legislation, it provides us sound basis for diagnosis of serious, chronic diseases and starting definite management.

Diagnostic yield of the biopsy depends on many factors e.g. clinical insight into the disease in question, selection of proper site for biopsy, activity of disease, accuracy of biopsy technique, processing and interpretation by a qualified dermatohistopathologist.

Before embarking on any surgical procedure we need to take a proper history of presenting dermatosis including its evolution in time, symptoms, primary site and other areas involved and examination like site, size, colour, shape, nature of lesion etc.

In addition certain important systemic evaluations also need to be carried out as shown in **Table 1**.[1]

Site-selection for skin biopsy

Site of biopsy is selected keeping in mind some patient-specific and lesion-specific factors. Patient-specific factors are age, sex, skin type and prior treatments. Whenever possible the operator must take multiple specimens from several representative sites as some of the results might be inconclusive or incomplete; secondly healing is slow at acral areas.

Lesion specific factors are morphology and anticipated depth of lesion. Regarding ulcers, biopsy has to be taken from the edge covering normal skin and the bottom edge, as well; however, biopsy of annular lesions e.g. annular

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Table 1 Systemic evaluation required in a patient undergoing skin biopsy [1].

Cardiovascular system	Ischemic heart disease, pacemakers & implantable defibrillators – bipolar coagulation safe; monopolar (e.g. Hyfrecator) probably should be avoided in old pacemakers and all implantable defibrillators. Valvular disease Raynaud's disease
Drugs	Warfarin, aspirin and clopidogrel
Pregnancy	Skin surgery is best avoided in pregnancy unless benefits outweigh the risks Where possible local anesthetic should be avoided in the first trimester.
Allergies	Elastoplast, antibiotics, latex – gloves and surgical couch, antiseptic preparations, local anesthetic.
General examination	Patients with pre-malignant lesions or skin cancer must have a thorough examination of the skin.
Patient expectations	Is the surgery necessary? What outcome is the patient expecting? Risks vs. benefits.

erythemas, lupus erythematosus and porokeratosis is preferably taken from the active edge. Infiltrative lesions are to be sampled at their deepest part and vesicles are to be taken intact on a cushion of subcutaneous tissue.[2]

Another crucial factor is anatomical location of the lesion in skin or subcutaneous tissue. For example lesions which are located in epidermis and papillary dermis e.g. melanocytic nevi, warts, seborrheic keratosis, Paget's disease, superficial basal cell carcinoma, mycosis fungoides, actinic keratosis, psoriasis, lichen planus, lupus erythematosus etc., biopsy has to be taken at the active edge taking piece of epidermis till reticular dermis at least. However, a lump, which is felt more than seen, is sampled up till subcutaneous tissue.

If the lesion involves deep reticular dermis and subcutaneous tissue, biopsy has to be deeper e.g. blue nevus, dermatofibroma, melanoma, panniculitis, sarcoidosis, rheumatoid nodule, polyarteritis nodosa.[3]

Pigmented lesions must be evaluated by clinical examination followed by dermoscopy and then biopsied. For multiple pigmentary lesions, most suspicious lesion is preferred. Common biopsy techniques used are shave, incisional and excisional biopsies. Current guidelines by National Institute of Health are in favour of taking an excisional biopsy for a suspected lesion of melanoma. This method not only provides proper diagnosis but also aids in staging, future treatments and prognosis.[4]

The American Academy of Dermatology has recently issued a position statement for the management of melanoma. It says that a narrow excisional biopsy with 1mm to 3mm margins is required to clear the subclinical component of most atypical melanocytic lesions. It is, therefore, preferable in almost all clinical scenarios.[5]

Regarding pigmented lesion on the lip, shave biopsy is acceptable for a lesion that has not crossed the vermilion border. If the pigmented lesion has crossed vermilion border, a punch biopsy is preferred aligned vertically and the margins must be painted with gentian violet to avoid misalignment while closing the defect.[6]

Table 2 describes the type, optimum timing and site of biopsy for a particular dermatological disorder. International recommendations favour punch biopsy for most of the disorders, however, keeping in mind the limited resources, it can always be tailored to small incisional biopsies.

Table 2 Type, optimum timing and site of biopsy for a particular dermatological disorder [2,6,14].

Disease	*Time*	*Site selection*	*Type of biopsy*
Alopecia areata	Active	border	Two 4mm punches for vertical and horizontal sections
Scarring alopecia	Active	Erythematous follicular plug, inflamed follicle	Punch
Atopic/ contact dermatitis	Acute/ chronic	Erythematous vesicle/ lichenoid area	Punch
Exanthema	Active	Lesion	Punch
Erythema annulare centrifugum	Well-developed lesion	Active border	punch
Erythema nodosum	Active lesion, 1st week	Center of lesion	Deep incision till sub cutis, send culture
Erythema multiforme	Targetoid lesion	One from dusky center, other from erythematous border	Punch
Granuloma annulare	Active	Raised border	Punch
Larva migrans	Migrating erythema	Normal skin 2mm above the erythematous line	Punch
Lichen planus	Anytime	Violaceous papule	Punch
Discoid lupus erythematosus	Active lesion	Scaly plaque with plugged follicles	punch
Lupus tumidus	Active lesion	anywhere	punch
Sub acute cutaneous LE	Active lesion	Anywhere	punch
Systemic lupus erythematosus	Active	Anywhere	punch
LE profundus	Depressed center and adjacent area	center	Deep incision or excision
Mycosis fungoides	Patch- non-treated	Center	Two or more punches
	Plaque-non-ulcerated	Most infiltrated area	One or more punches
	Nodule-non-ulcerated	Indurated area	Punch
Morphea	Early	Lilac ring	Punch
	late	center	
Necrobiosis lipoidica	Anytime	Atrophic center	Punch
Nephrogenic fibrosing dermopathy	Sclerotic plaque	Indurated area of plaque	punch
Pityriasis lichenoides chronica	2-3 weeks old	Papulosquamous area	punch
Pityriasis lichenoides et varioliformis acuta	2-3 week old	Necrotic papule	Punch
Guttate psoriasis	Late stage	Lesional	4mm punch
Plaque psoriasis	Scaly	anywhere	punch
Pyoderma gangrenosum and ulcerative colitis	Small early, non-ulcerated lesion	Entire lesion	Excision with tissue culture
Scleromyxedema	Sclerotic skin	Beaded papules	Punch
Urticaria and urticarial vasculitis	Active 3 days	lesional	punch

Table 3 Types and respective indications of skin biopsy [7,8].

Type of biopsy	*Indications*
Punch biopsy	Most superficial inflammatory diseases (erythema multiforme major), papulosquamous disorders (psoriasis), connective-tissue disorders (systemic lupus erythematosus), superficial blistering disorders (pemphigus vulgaris), benign tumors, granulomatous disorders (sarcoidosis), non-melanotic malignant tumors (infiltrating squamous cell carcinoma)
Shave biopsy	Raised lesions (skin tags), lesions that separate out easily from underlying tissues (seborrheic keratosis), dome shaped nevi and benign tumors, non-melanotic malignant tumors (superficial basal cell carcinoma)
Excisional biopsy	Subcutaneous or deep dermal tumors, deep inflammatory diseases (erythema nodosum), malignant melanoma, atypical pigmented lesions
Incisional biopsy	Inflammatory dermatosis (porokeratosis)
Fine needle aspiration	Lymph node, thyroid gland, benign or malignant salivary gland tumors, dermoid cyst, cystic lesions in neck
Saucerization biopsy	Vesicobullous disorders, seborrheic keratosis
Wedge biopsy	Subcutaneous mycosis, margin of squamous cell carcinoma, tuberculosis verrucosa cutis etc.

Supplies and instruments needed for skin biopsy

[9]

Following are minimum necessary instruments including other supplies that we need to have in our outpatient room or theatre to suffice a skin biopsy.

- Isopropyl alcohol, povidone-iodine or chlorhexidine for skin preparation
- Sterile gauzes
- Cotton/ plastic drapes- preferably fenestrated
- Disposable syringes 1 and 3 ml
- Needles 30G for injections and 22G for drawing solution
- Lignocaine 1% or 2% with/without adrenaline
- Disposable surgical blade # 15
- Double edge razor blade cut in halves
- Disposable punches 4, 6 and 8mm
- Toothed and non-toothed small tissue forceps
- Small tissue scissors
- Needle holder
- 20% aluminum chloride
- Packed alcohol swabs
- Antibiotic ointment
- Band-Aid (spot/ rectangular)
- Non-adherent dressings
- 10% formalin specimen bottle
- Surgical marking pen
- Pathology request forms
- Patients instructions

Preparation of biopsy site and use of anesthesia, some practical considerations

Usually 1 or 2 % lignocaine, isopropyl alcohol, povidone-iodine or chlorhexidine gluconate are used to prepare the biopsy site. Marking with surgical marker or gentian violet can be extremely useful in incisional and excisional biopsies.

Regarding local anesthesia, usually lidocaine with adrenaline is used, however, adrenaline is best avoided and plain lidocaine is to be used in case of fingers, toes and penis; patients suffering from Raynaud's phenomenon and within six months of major cardiac events. Major contraindications to use of lidocaine are pregnancy and hypersensitivity. Up to 20ml of 1% and 10ml of 2% plain lignocaine are maximum doses while 50ml of 1% lignocaine with 1: 200000 adrenaline and 25ml of 2% lidocaine with 1:200000 adrenaline are safe.[1,9] Make sure to inject in subcutis rather than in dermis because it may cause artefacts in histology specimen.

Infiltrative anesthesia is to be avoided in case of mast cell disorders because of risk of degranulation. Regarding scalp biopsy it is important to consider trichoglyphics and punch should be directed parallel to direction of emerging hair.[10]

Techniques of important types of skin biopsy procedures in practice

Incisional biopsy It is attempted when we need to evaluate certain inflammatory dermatoses and the chances of malignancy are less likely. Usually a part of normal skin is removed along with. If the lesion is small enough to be removed in toto, we call it excisional biopsy.

For incisional biopsy the direction of the ellipse of skin, which includes pathological, as well as, normal skin has to be parallel to skin tension or Langer lines (**Figure 1**) in order to have better healing and scar.[11] It holds true for all types of biopsies on face as well.

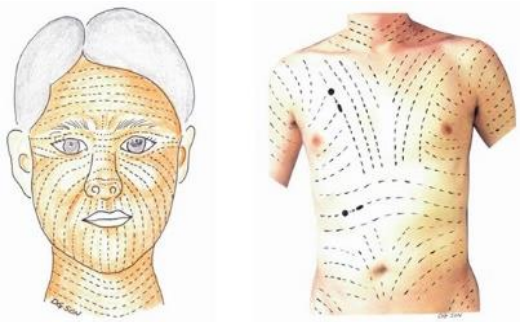

Figure 1 Langer lines on face and trunk.

Figure 2 Marking an ellipse of skin to be removed parallel to skin tension lines

After checking for adequate anesthesia, determine skin tension lines and with the help of surgical pen draw an ellipse of skin to be removed parallel to these lines keeping 30 degree angles at each apex, 2-5mm margin of surrounding skin and length 3 times the width (**Figure 2**).[9,12]

Holding the blade perpendicular to skin surface, start incising using tip and gradually coming to belly of blade towards middle and going again to tip of blade for other edge. Carefully lifting the edge with forceps, completely undermine the tissue at level of subcutaneous fat. Apply pressure in advance of closure.[12]

Shave biopsy[12,13] It is a simple, quick and sutureless technique. There are two kinds of shave biopsy; superficial and deep also called saucerization biopsy. A double-edge razor blade held in a manner with concavity facing up is used on an elevated lesion in sweeping strokes rather than sawing motion. Near the end of biopsy stabilize the lesion with index finger to avoid unnecessary tears. The blade should be parallel to the skin surface to avoid uneven depths. Superficial shave biopsy removes epidermis and only superficial part of dermis and can also be performed with the help of surgical blade.

Deep or saucerization biopsy removes epidermis and papillary, as well as, upper part of reticular dermis.

Intraoperative complications; their prevention and management [10]

Table 4 enlists the common complications encountered during skin biopsy. Other uncommon or rare complications could be failure to close the wound properly, wound

Table 4 Intraoperative Complications; their prevention & management[10]

Complications	*Prevention*	*management*
Hypersensitivity	Prior intradermal/patch test	Manage as anaphylaxis with hydrocortisone, adrenaline, pheniramine etc.
Pain	Alkalinize the anesthetic, small-guage needle, slow injection, avoid over inflation, divert patients attention	
Bleeding	Avoid vascular areas, adrenaline where possible, chalazion clamp	Pressure application, swab soaked in hydrogen peroxide/ aluminum chloride 20-40%, suture, cauterization
Scaring	Avoid patients with tendency of scarring, prevent infection	Intralesional injections, surgical excision of scar and suturing
infection	Preparation of biopsy site, use sub cutis deep incisions, topical and systemic antibiotics	Topical and/or systemic antibiotics

dehiscence, overgranulation, incomplete excision rate and distortion of local anatomy.[1] Proper techniques and protocols of each type of skin biopsy however, are prudent in addition to what has been mentioned above and being beyond the scope of this article, shall be emphasized separately.

Conclusion

Skin biopsy if performed with complete awareness of all the pre- and post-procedure protocols by trained dermatosurgeon is an unmatched, definitive diagnostic and curative step towards management of long-term confusing dermatoses. One should not hesitate taking biopsies where definitely required and avoid unnecessary procedures at the same time. Teaching the postgraduate students about every aspect is prudent to continue safe surgical practices

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