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Integration of the Cutaneous Cadaver Laboratory into Preclinical Curriculum: A Feasibility Study

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Abstract

Primary care physicians often initially assess skin lesions and determine which patients require specialized dermatologic care. However, there is insufficient training in diagnosing and managing dermatologic conditions in most medical school's curricula. The cutaneous cadaver laboratory described herein was created for preclinical students to increase familiarity with dermatologic lesion identification. Lesions were identified by preclinical medical students and a dermatopathologist. Students practiced describing lesions, and a list of clinical diagnoses was developed. Dermatology residents supervised students as they biopsied lesions for histological processing. Lesion histology was reviewed to compare clinical and pathologic impressions. From 2014 to 2019, there were 24 discrepancies between clinical and pathologic impressions, yielding 72.4% diagnostic accuracy (63/87). The use of embalmed cadavers appears to be nearly as effective as live patients for teaching purposes. Similar sessions may be adopted at other medical schools to increase student exposure to dermatologic conditions. These sessions represent integrated medical curriculum, where clinical medicine is woven throughout all four years of medical school, which is emphasized by the Liaison Committee on Medical Education as a medical school standard. Longitudinal studies are needed to determine whether augmenting training, at the preclinical level, leads to improved confidence and competence at skin lesion diagnosis.

Keywords: ***Medical education; Dermatology; Cadavers; Anatomy; Teaching; Skin diseases***

1. Introduction

The shortage of dermatologists, combined with growing patient need, highlight the importance of equipping all medical students with a solid basic understanding of dermatology [1]. Yet, most medical students receive limited exposure to dermatology during their training. In a study of fourth-year medical students, greater than 50% of participants lacked confidence

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when diagnosing simple dermatologic lesions [2]. This sentiment persists amongst medical professionals. Less than 40% of surveyed primary care residents rated their medical school curriculum as 'adequate preparation' to diagnose common skin lesions [3]. A recent survey of medical schools in the United States (US) found that most schools lack a dedicated dermatology course or a required clinical rotation [4]. Administrators noted challenges to incorporating dermatologic education into curricula include limited time and difficulty integrating dermatologic conditions into existing courses. We created the cutaneous cadaver laboratory in 2013 for preclinical students to increase familiarity with dermatologic lesion identification, to allow practice of biopsy and suturing techniques, and to review the histopathology of skin lesions. Here we describe the integration of a cutaneous cadaver laboratory into preclinical curriculum and determine the clinical diagnostic accuracy of cutaneous lesion identification using cadavers.

The preclinical dermatology elective at the Warren Alpert Medical School of Brown University is comprised of seven lectures by dermatology faculty, a biopsy and suturing workshop using pig's feet, and a two-part cadaver laboratory session. This cutaneous cadaver session is held at the end of the elective after students have learned how to describe basic skin lesions. During the first part of the session, students describe skin lesions on cadavers and are encouraged to render clinical diagnoses. The faculty advisor provides the final clinical diagnosis, including teaching points about the condition. Students then perform shave and punch biopsies and practice suturing guided by dermatology residents. All biopsies are placed in formalin, and the specimens are processed through the pathology laboratory. During the second part of the laboratory session, students and the faculty advisor review the processed slides with a multi-headed teaching microscope to develop a histologic diagnosis. Clinical impressions and histologic diagnoses were compared the assess the clinical diagnostic accuracy of using cadavers. This teaching session has occurred annually since spring 2013. Results of the 2013 and 2015 sessions were unavailable and not included in data analysis.

A total of 97 lesions were identified 2014 to 2019 during five laboratory sessions (TABLE 1). There were 87 lesions in which both the clinical and histologic diagnoses were available. There were 24 discrepancies (TABLE 2) between clinical and pathologic impressions, yielding 72.4% diagnostic accuracy (63/87).

TABLE 1. **Summary table of cutaneous lesions clinically diagnosed. When multiple diagnoses were considered the leading clinical diagnosis was recorded.**

Clinical Diagnoses	Count
Acrochordon	2
Actinic keratosis	2
Atypical nevi	1
Basal cell carcinoma	2
Café-au-lait	1
Cherry angioma	7
Dermatofibroma	2
Dilated pore	1
Ecchymosis	1
Grover's disease	1
Hemangioma	1
Lentigines	2

Metastatic lung cancer	2
Milium	1
Nevus	12
Nevus lipomatosis superficialis	1
Nipple	1
Purpura	3
Scar	3
Seborrheic dermatitis	1
Seborrheic keratosis	34
Solar elastosis	1
Squamous cell carcinoma	2
Stasis dermatitis	2
Stucco keratosis	1
Tattoo	2
Tinea cruris	2
Wart	1

TABLE 2. **Discrepancies between clinical and histologic diagnoses.**

Clinical Diagnosis	**Histologic Diagnosis**
Acrochordon	Intradermal nevus
Acrochordon	Intradermal nevus
Atypical nevi	Lentiginous hyperplasia
Basal cell carcinoma	No significant findings
Cherry angioma	Telangiectasia
Congenital nevus	Purpura
Hemangioma (thrombosed vessel)	Epidermal necrosis
Lentigines	Seborrheic keratosis reticulated pattern
Lung metastases	Superficial arteriole
Lung metastases	Cherry angioma and intraepidermal pustule
Milium vs Intradermal melanocytic nevus vs Epithelioma	Basal cell carcinoma
Nevus	Cherry angioma
Nevus Lipomatosis Superficialis	Acrochordon (fibroepithelial polyp)
Nevus vs Scar	Seborrheic keratosis
Pedunculated seborrheic keratosis	Compound nevus
Regressing nevus	Neurofibroma
Seborrheic keratosis	Mild perivascular inflammation
Seborrheic keratosis	Lentigo
Squamous cell carcinoma	Seborrheic keratosis
Squamous cell carcinoma	Basal cell carcinoma
Stasis dermatitis	Papillary dermal fibrosis, interstitial inflammation
Scar (hypopigmented region)	Mild angiectasia
Tinea cruris	Mild epidermal hyperplasia
Wart vs Seborrheic keratosis	Intradermal nevus

2. Discussion

The cutaneous cadaver laboratory was developed without knowledge of the Cadaveric Skin Biopsy Project, however the two are similar in content [5]. Authors of the Biopsy project found that students highly valued the opportunity to practice clinical procedures and that the sessions improved their understanding of dermatology. However, the authors did not quantify whether

lesion identification using cadavers successfully mimics skin examination on patients. Our findings provide evidence that further supports use of embalmed cadavers as the diagnostic accuracy is comparable to that with live skin. The accuracy using cadavers (72.4%) closely matches the accuracy of practicing dermatologists on common neoplastic and cystic lesions (75%) [6].

The cutaneous cadaver laboratory curriculum provides benefits to both medical students and dermatology residents. Students are able to gain hands-on practice in biopsy and suture techniques, while residents are able to hone their teaching skills. Moreover, the Liaison Committee on Medical Education emphasizes the need for medical schools to have "coordinated and integrated content within and across academic periods of study" [7]. As such, the integrated curriculum, in which clinical medicine is woven throughout all four years of medical school has gained increasing popularity over the past two decades. Establishing cutaneous cadaver laboratory sessions across institutions is a feasible opportunity for medical schools interested creating a more integrated curriculum.

3. Conclusion

To our knowledge, only three medical schools have incorporated cadavers into their dermatology curriculum. Two schools use cadavers for lesion diagnosis and one for biopsy practice [5,8,9]. Medical schools should consider implementing cadaver laboratory sessions as students rate similar programs favorably and direct program costs are minimal. The cadavers were obtained for the first-year anatomy course and expired suture was used. Suturing tools were borrowed and sterilized by students prior to return. The proposed curriculum offers an innovative method to introduce preclinical medical students to clinical pathologic correlation, dermatology and dermatopathology.

4. Potential Conflicts of Interest

The authors declare no conflicts of interest.

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