Using Cadavers as Models for Dermatopathology Education with First Year Medical Students

J Beria, M Hurtado, M Plummer

Citation

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Abstract

Skin lesions are readily accessible to both patients and physicians, and are therefore often subject to evaluation. Most physicians, especially dermatologists, will format a general impression based on gross morphology of the lesion. If unsure or worrisome, the lesion will be excised and histologically assessed. However, many benign skin lesions do not undergo microscopic scrutiny. Both study and experience contribute to the physicians' overall diagnostic ability to determine if excision is needed. It is not feasible or recommended that all skin lesions be removed to confirm their histology, especially if benign. However, medical students in the process of learning dermatopathology have yet to establish clinical acumen. On live patients they must rely on those with more experience to guide them. In the first year of medical school, though, students have the opportunity to work with cadavers for anatomy dissection. Here there is a resource present to help the medical students in skin lesion study. With cadavers donated for medical education research, all skin lesions may be removed and histologically assessed, thus giving accurate feedback to students. In this study two first year medical students were asked to grossly diagnose skin lesions on cadavers based on the knowledge they acquired in their first year of study. The skin lesions were grouped into pigmented and nonpigmented lesions. Using 25 specimens from each cohort, an initial gross/clinical diagnosis was made by the students and the lesions were then diagnosed histologically by a board-certified pathologist. The percentage of accurate diagnoses made by the students was determined by percentage. It was found that the students could diagnose both pigmented and non-pigmented skin lesions equally (13/25) with 52% accuracy and that there was no difference in accuracy between the pigmented and non-pigmented skin lesions. Since cadavers were used, all the skin lesions could be safely removed and evaluated histologically, which is often not done in live persons.

INTRODUCTION

Skin lesions are often brought to the attention of primary care physicians[1] . Recent studies have shown that errors committed by primary care physicians tend to occur more often in the diagnosis of skin lesions [2] . Nevertheless, dermatopathology education hours in medical school do not seem to reflect the knowledge base required to become familiar with these common manifestations of general health. After one year of medical school, how much does a medical student know regarding routine skin lesions? Are pigmented lesions, by their nature, more easily identifiable and therefore more diagnosable than non-pigmented lesions for first year medical students?

In this study the ability of two first year medical students to grossly diagnose skin lesions on cadavers is assessed, and whether this is an easier task to perform on pigmented versus non-pigmented skin lesions is evaluated. Unlike live patients, in which histological evaluation is not always offered because many physicians base their diagnoses on gross appearance only, all the cadaver skin specimens can be excised and examined microscopically. The medical students' ability to accurately diagnose the lesions should be based on the knowledge acquired in the first year of medical school. After the initial gross/clinical diagnosis is made by the students, histological evaluation by a board certified surgical pathologist will follow. If the pathologist's histological diagnosis correlates with the students' gross/clinical diagnosis, this will be considered an accurate assessment by the students. Analysis of the results will follow.

METHODS

The population consisted of six cadavers from the New York College of Osteopathic Medicine anatomy laboratory which were donated for dissection and research to the Anatomy Department. Twenty -five pigmented and twenty-five non-

pigmented skin lesions were harvested. The site and size of the lesion, and the gross morphological features were recorded. Based on these findings, two first year medical students recorded their gross/clinical diagnosis. The lesion was then completely excised and placed in 10% buffered formalin solution.

In the histology laboratory, the skin lesions were processed, embedded in paraffin, sectioned and stained with hematoxylin and eosin (H&E). The slides were reviewed and a histological diagnosis was made by a board certified surgical pathologist. Levels were ordered as deemed necessary. Special stains of S100 protein and Factor XIII were ordered on one specimen to help in diagnosing a benign spindle cell lesion (see results).

The results were tabulated and accuracy by percentage was assessed by comparing the pathologist's histological diagnosis with the medical students' gross/clinical diagnosis.

RESULTS

The most common pigmented skin lesion which the medical students grossly diagnosed was junctional nevus [8/ 25] followed by sebborheic keratosis (SK) [7/ 25]. The most accurately diagnosed skin lesions confirmed histologically were: angioma 100% [2/2], ecchymosis 100% [1/1], SK 85.71% [6/7], and junctional nevus 50% [4/8]. SEE BAR GRAPH 1. The most common overall histological diagnosis was SK [16/25].

The most common non-pigmented skin lesion grossly diagnosed by the medical students was SK [8/ 25], followed by basal cell carcinoma (BCC) [7/ 25]. The most accurately diagnosed lesions with histological confirmation were: skin tag/soft fibroma 100% [2/2], vitiligo 100% [1/1], SK 77.7% [7/9], and epidermal inclusion ("sebaceous") cyst 100% [2/2]. SEE BAR GRAPH 2. The most common overall histological diagnosis was again SK [15/25].

Based on the results, the ability of the first year medicial students to identify and grossly diagnose pigmented and non-pigmented skin lesions was the same. The students were accurate in diagnosing 52% (13/25) total skin lesions for the pigmented cohort and also for the non-pigmented cohort.

Figure 1

Table 1: Pigmented skin lesions

*correct/accurate diagnosis

Specimen	Location	Gross Diagnosis	Histologic Diagnosis
1-JB-S5	RLQ	SK	Neurofibroma
2-JB-S5 *	R knee	jxn nevis	solar lentigo with early jxn nevis
3-JB-S5	R pre-auricular	AK	SK
4-JB-S5 *	R lateral neck	jxn nevis	solar lentigo with early jxn nevis
5-JB-S5	L mid-quadrant	jxn nevis	SK
6-JB-S5 *	mid back	SK	SK
7-JB-S5 *	R medial writst	SK	SK
8-JB-S4	L temple	compound nevis	SK
9-JB-S4	R temporal	AK	SK
10-JB-S4 *	L chest	SK	SK
11-JB-S4 *	L clavicular area	SK	SK
12-JB-S6 *	L lower nipple	angioma	angioma
13-JB-S6 *	mid chest	angioma	angioma
14-JB-S6	R inner acanthus	compound nevis	SK
15-JB-S1	L nipple	jxn nevis	SK
16-JB-S1 *	LLQ	Ecchymosis	ecchymosis
17-JB-S1 *	L medial knee	jxn nevis	solar lentigo with early jxn nevis
18-JB-S1	L ear	jxn nevis	AK and SK
19-JB-S1 *	L zygomatic arch	SK	SK
20-JB-S2 *	RLQ	SK	SK
21-JB-S4	L thigh	compound nevis	SK
22-JB-S6 *	R neck	jxn nevis	solar lentigo with early jxn nevis and severe AK.
23-JB-S6	anterior mid neck	jxn nevis	SK
24-JB-S6	L mid axillary line	dermatofibroma	congenital dermal nevus
25-JB-S6	R temple	AK	SK

Figure 2

Table 2: Non-pigmented skin lesions

*correct/accurate diagnosis

Specimen	Location	Gross Diagnosis	Histologic Diagnosis
1-MH-S5 *	L lateral breast	skin tag (soft fibroma, acrochordons, fibrolipomas)	skin tag (soft fibroma, acrochordons, fibrolipomas)
2-MH-S5 *	R midaxillary line	skin tag (soft fibroma, acrochordons, fibrolipomas)	skin tag (soft fibroma, acrochordons, fibrolipomas)
3-MH-S4 *	L antecubital fossa	xanthoma	xanthoma
4-MH-S4 *	L lateral upper arm	vitiligo	vitiligo
5- MH-S4	R antecubital fossa	SK	Xanthoma
6-MH-S6 *	L lateral thigh	SK	SK
7-MH-S6 *	L bicep	SK	SK
8-MH-S6 *	L flank	SK	SK
9-MH-S6	R temporal	AK	SK
10-MH-S6	R preauricular	AK	SK
11-MH-S6 *	inner acanthus	epidermal "sebaceous" cyst	epidermal "sebaceous" cyst
12-MH-S6 *	R upper chest	epidermal "sebaceous" cyst	epidermal "sebaceous" cyst
13-MH-S1	L nipple	verruca	SK
14-MH-S4 *	R temple	SK	SK
15-MH-S4	L nipple	dermatofibroma	Angioma
16-MH-S5	L forehead	BCC	AK
17-MH-S5	R mandibular angle	BCC	SK
18-MH-S6	L nipple	BCC	SK
19-MH-S6 *	mid abdomen	SK	SK
20-MH-S6	R neck	BCC	SK
21-MH-S6	R temple	BCC	SK
22-MH-S6	L cheek	BCC	SK
23-MH-S6 *	L leg above knee	SK	SK
24-MH-S6 *	R flank	SK	SK
25-MH-S6	R cheek	BCC	Epidermal Cyst

Figure 3

Table 3: Cadaver demographics

Cadaver	Age	Sex
S1	69	Male
S2	80	Female
S3	85	Female
S4	94	Male
S5	90	Female
S6	84	Male

Figure 4

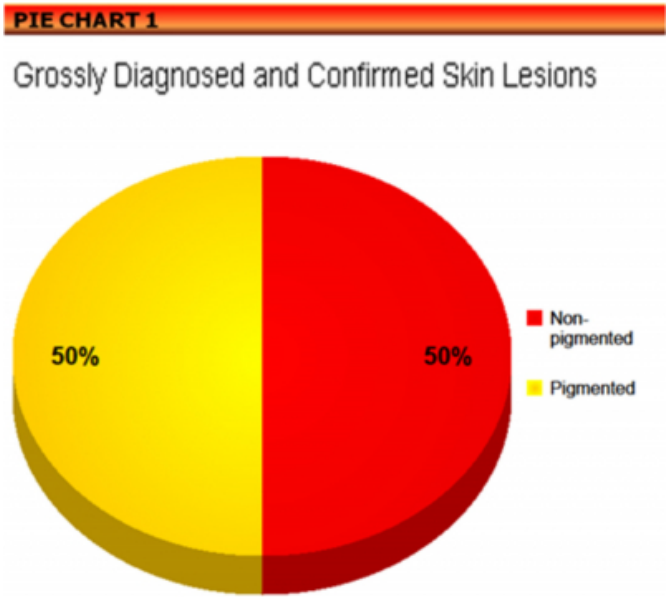


Figure 5

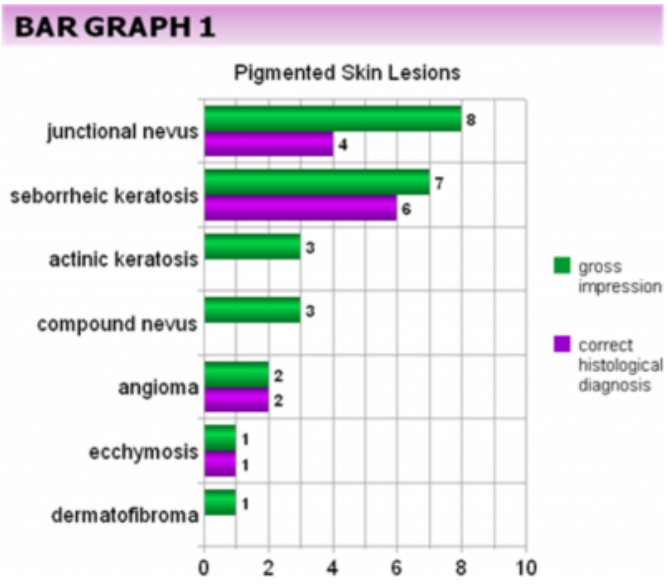
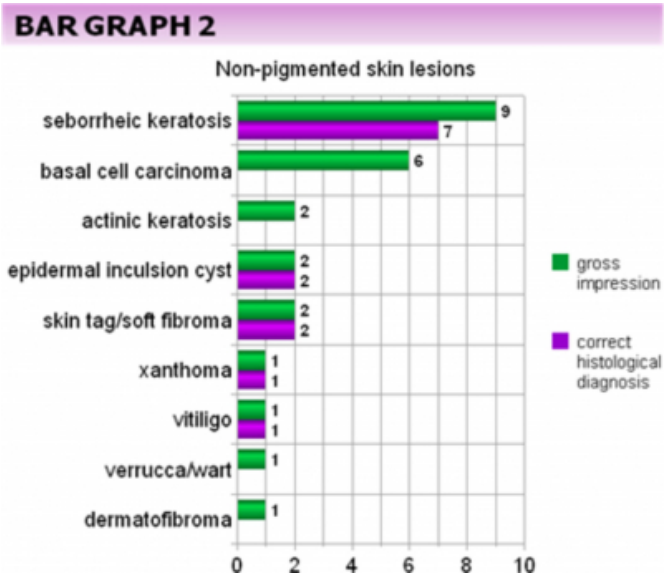


Figure 6



DISCUSSION

In this study two first year medical students attempted to grossly diagnose skin lesions in a cadaveric population and assess their level of knowledge based on the results of histololgical analysis. This opportunity is available to the students in a population of cadavers because all lesions are able to be excised, benign, suspicious, or malignant for the sake of educational purposes not possible in live patients where unnecessary excision would be challenged even in a planned study. The skin lesions were also grouped into pigmented versus nonpigmented lesions in an attempt to see if that classification made the process of gross diagnosis easier for the students. Finally in this study, we also hope to

bring awareness for the possible need of an increase in dermatopathology hours early within the medical school curriculum.

Within the pigmented cohort, the most common gross/clinical diagnosis made by the students was junctional melanocytic nevi [8/25]. However, as BAR GRAPH (1) indicates, this particular diagnosis was only histologically correct 50% [4/8] of the time. Seborrheic keratosis, the most common skin lesion confirmed histologically [16/25], was diagnosed grossly seven times by the students and was histologically correct six times (85.71%). Out of the remaining lesions, there were great discrepancies. Actinic keratosis, compound nevus, and dermatofibroma had accuracies in gross diagnosis of 0% each, whereas both angioma and ecchymosis had 100% correlation between gross impression and histological confirmation. However, angioma and ecchymosis were a much smaller sample size (two and one, respectively) than seborrheic keratosis or junctional nevus. Of all the pigmented skin lesions, the students accurately diagnosed 13/25 or 52%. Of the accurately diagnosed lesions, the majority 6/13 or 46% were seborrheic kerotoses.

As for the non-pigmented skin lesions, both the most common gross diagnosis and histological diagnosis was seborrheic keratosis. As the BAR GRAPH (2) indicates, the gross/clinical diagnosis of nine seborrheic keratoses was histologically confirmed in seven (77.8%). However, the second most common gross diagnosis made on non-pigmented lesions was basal cell carcinoma which had 0% histological confirmation. The students were able to 100% grossly indentify two “sebaceous cysts”/epidermal inclusion cysts, two skin tags/soft fibromas, one xanthoma, and one vitiligo lesion. They thought two non-pigmented skin lesions were actinic keratoses and one was a dermatofibroma, but these were completely incorrect when evaluated histologically. Again, the students accurately diagnosed a total of 13 out of 25 lesions, and the majority were also seborrheic keratoses, 7/13 or 54%.

The overall results indicated that the first year medical students were able to accurately diagnose 52% of both pigmented and non-pigmented lesions, and most of those were the common benign seborrheic keratosis. Pigmented skin lesions were not any easier for the students to make a gross/clinical diagnosis than non-pigmented skin lesions or vice versa.

The medical students’ rationale for their main gross/clinical diagnoses (seborrheic keratosis, junctional nevi and basal cell carcinoma) was based on their understanding from the literature and their cumulative knowledge summarized here.

Grossly, junctional nevi are usually macules, which are flat, circumscribed lesions differing in color or appearance from the surrounding skin. They have rounded borders and are uniformly pigmented, from tan to dark brown and sometimes even black. [3]

Seborrheic keratoses are the most common benign tumor in older individuals. They have a variety of clinical appearances and develop from the proliferation of epidermal cells. [4] Seborrheic keratoses can manifest as solitary or multiple lesions and can occur on any part of the body except the palms and soles. [5] They have a predilection for sites such as the chest, interscapular region, waistline and forehead, are usually verrucous, scaling, greasy and sharply differentiated from the surrounding skin; and, their color varies from flesh-colored to black or even red if irritated or inflamed. [6] Sebborheic keratoses can be flat or raised and generally tend to have a “stuck on” appearance. [7]

Basal cell carcinoma is the most common cancer of the skin, accounting for almost 70% of all cutaneous malignancies. [8] It has a broad range of clinical presentations, ranging from papulonodular (elevated dome-shaped lesion) with a pearly translucent edge, an ulcerative destructive lesion, a pale plaque (broad, flat, elevated lesion) with variable indurations, an erythematous plaque with visible telangiectasia, or a partly cystic nodule. [9] The majority of basal cell carcinomas are non-pigmented; however, approximately 2-5% of lesions are pigmented; furthermore, these lesions are most prevalent in areas of sun exposed skin and are principally found in fair skinned individuals and rare in darker populations. [10]

The population of cadavers in this study consisted of the elderly ranging from ages 69 to 94 of light to medium skin tone. Knowing the gross morphological features of these skin lesions and taking the cadaver population into consideration, the medical students made gross/clinical diagnoses based upon their accumulated knowledge after one year of medical school. As seen, even though seborrheic keratosis was the most common overall finding, basal cell carcinoma and junctional nevi gross diagnoses were often inaccurate (basal cell had 0% correlation with histology and junction nevi had 50% correlation) in the non-pigmented and pigmented cohort, respectively. Upon histological review both were most likely found to be SK. The medical students’

rationale for this error was that the differential diagnoses within these three lesions (BCC, junctional nevi and SK) overlap. The students purported that these lesions are all prevalent in the elderly as well as on sun exposed skin. [11] The gross color of SK varies and can either be pigmented or non-pigmented, which adds to the confusion in differentiating it from BCC and junctional nevi. [12] With their limited knowledge as first year medical students, they may not have applied more strict criteria in delineating between the lesions, i.e. junctional nevi are usually flat, the majority of basal cell carcinoma are not pigmented, SKs are stuck on in appearance and rough in texture, etc. Furthermore, they assessed these lesions on a cadaver population, which may itself have limitations because of post-mortem changes. The color and texture of skin lesions in general were not as obvious and might have been compromised due to the preservation of the cadavers. Nevertheless, a case can still be made for experienced clinicians to submit all suspected seborrheic keratoses for histological evaluation as gross/clinical misdiagnosis can occur. [13]

Other limitations in this study included a small sample size both in cadaver numbers and medical students. One option would be to repeat this study and increase our sample population of cadavers as well as incorporate more first year medical students. A second option would be to repeat the study as outlined above along with incorporating second year, third year, or fourth year medical students. In doing this, there would be more statistical power to analyze the accuracy across students (inter and intra relationships amongst the different years and examine cumulative dermatopathology knowledge in medical school). Nevertheless, it still holds true that dermatopathology education may need to be improved within the standard medical education curriculum, as primary care physicians are often the first to encounter such skin manifestations.[14] More so, this change should especially be considered in osteopathic medical schools, since they tend to have a greater population of students who pursue primary care. Here at the New York College of Osteopathic Medicine, we have a course devoted solely to the Integumentary System which occurs during the first half of the first year of the lecture based curriculum and lasts approximately five weeks. The two students involved in this study are part of the patient based learning curriculum and do not participate in a formal Integumentary System course.

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Author Information

Jasmine Beria, MSII
New York College of Osteopathic Medicine at the New York Institute of Technology

Mariana Hurtado, MSII
New York College of Osteopathic Medicine at the New York Institute of Technology

Maria M Plummer, MD
New York College of Osteopathic Medicine at the New York Institute of Technology