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Original Research

## Utility of international store-and-forward teledermatopathology among a cohort of mostly female patients at a tertiary referral center in Afghanistan<sup>☆</sup>

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## ABSTRACT

**Background:** The variety and complexity of dermatologic diseases in Afghanistan and the associated diagnostic resource constraints have not been previously studied. Moreover, the utility of store-and-forward teledermatopathology in this resource-limited setting has not been investigated.

**Methods:** A retrospective analysis was conducted of 150 store-and-forward teledermatopathology cases that were composed of a clinical history, clinical images, and histologic images that were sent from an academic teaching hospital in Kabul to a dermatology-trained dermatopathologist at Emory University in the United States between November 2013 and June 2017. For each case, the histologic impression of the Emory dermatopathologist was compared with that of the Kabul-based general pathologist and the clinical differential diagnosis and histologic impression of the Kabul-based dermatologist.

**Results:** Eighty-one of the cases that were analyzed were from female patients. The diagnosis after telepathology consultation differed from the first entity in the clinical differential diagnosis in 34.7% of cases. The telepathology consultation refined the Afghan general pathologist's histologic impression 45.5% of the time and the Kabul-based dermatologist's histologic impression 24.3% of the time. A clinically significant difference in care was made in 19.3% of cases for which an analysis could take place between the histologic impressions of the Emory dermatopathologist and U.S.-trained dermatologist. The most common resource constraints that limited a definitive diagnosis were the inability to perform infectious stains and cultures to identify specific pathogens (19.3% of cases) and immunofluorescence studies to confirm autoimmune bullous disease (6.7% of cases).

**Conclusions:** These results highlight the important diagnostic role that teledermatopathology can serve in resource-limited settings such as in Afghanistan.

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## Introduction

Medical literature on dermatologic diseases in Afghanistan consist primarily of articles that describe the epidemiology, clinical features, and treatments of cutaneous leishmaniasis in Afghans and foreign military personnel as well as articles that document other skin diseases among foreign military personnel in Afghanistan. Additionally, little is known about the resource constraints faced by dermatologists in Afghanistan and the role of teledermatology and telepathology in

this context (Driver et al., 2012; Faulde et al., 2008; Jebran et al., 2014; Reithinger et al., 2004; Safi et al., 2012; Shair, 1978a, 1978b; Shaw, 1967; Van Thiel et al., 2010).

The Department of Dermatology at Emory University has an ongoing collaboration with the Department of Dermatology at an academic teaching hospital in Kabul, Afghanistan. A dermatology-trained dermatopathologist at Emory University receives cases in teleconsultation from a U.S.-trained dermatologist who is based at the teaching hospital. These cases consist of clinical and histologic images as well as detailed clinical histories that are sent in email form. This study sought to investigate how store-and-forward (SAF) static teledermatopathology impacts diagnostic outcomes and patient management in this resource-limited setting.

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## Materials and methods

A retrospective analysis was conducted of teledermatopathology cases that were referred from the teaching hospital in Afghanistan to a dermatology-trained dermatopathologist at Emory University between November 2013 and June 2017. The Emory institutional review board deemed this study exempt.

The Department of Dermatology at the teaching hospital in Afghanistan performs a limited number of biopsies per month due to cost and these are generally reserved for difficult cases that cannot be diagnosed and/or treated on the basis of clinical findings alone. When a biopsy is performed at the teaching hospital, the tissue is processed at a local pathology laboratory and the sections are interpreted by a general pathologist (who does not have dermatopathology fellowship training) at this facility.

The general pathologist examines hematoxylin-eosin stained slides and determines the fields and magnifications to be imaged. Static images are captured with a microscope-mounted digital camera (Spot insight QE, Model #4.2, Serial # 222135, 2 megapixel, Diagnostic Instruments, Inc., Sterling Heights, MI). The general pathologist then sends these images along with his histologic impression of the images to the dermatologist who performed the biopsy. The photographs were in JPEG format and most with a resolution of 1600 x 1200 pixel and ranging in size from 200 kb to 500 kb.

The emails that were sent from the Kabul-based dermatologist to Emory University for a given case contained a detailed clinical history and clinical differential diagnosis as well as attachments with the associated clinical and histologic images. None of the histologic photographs were compressed before email transmission. In addition, the emails contained the Afghan general pathologist's histologic impression as well as that of the dermatologist. The Emory University dermatopathologist, who is board certified in dermatology and actively sees patients at The Emory Clinic in addition to reviewing slides, then reviews the history and clinical and histologic photographs and provides a histologic impression on the basis of this information. The histologic impressions from the dermatologist and dermatopathologist result from a correlation of the clinical history and photographs with histologic findings.

An Excel spreadsheet was compiled that included the following information for each of the 150 cases: patient age, sex, clinical history, pre-consultation clinical differential diagnosis, pre-consultation histologic impression from the general pathologist, pre-consultation histologic impression from the dermatologist, histologic impression from the Emory University dermatopathologist, general category of final diagnosis, specific final diagnosis, and resource constraints that limited the ability to assign a specific diagnosis.

For each case, the histologic impression of the Emory University dermatopathologist was compared with the first entity in the clinical differential diagnosis. The former was also compared with the histologic impressions of the general pathologist and dermatologist in Kabul. A binary system for diagnostic concordance was utilized in each of these three comparisons and the dermatopathologist's impression was treated as the golden standard. The term "histologic impression" describes the histologic diagnosis and/or description provided by an individual reviewer.

In cases for which a definitive histologic diagnosis could not be made by the Emory University dermatopathologist, the histologic descriptions between the individuals were compared instead. An individual's histologic impression was considered refined if the dermatopathologist arrived at a different diagnosis or provided a substantially different histologic description. This discordance may or may not have made a clinically meaningful difference in care. Reasons for the inability to render a specific diagnosis by the Emory University dermatopathologist included resource constraints (e.g., lack of infectious histochemical stains, lack of access to immunohistochemical

stains) as well as other facts such as the intrinsic difficulty of pathology of inflammatory skin disease.

In cases for which the dermatopathologist's histologic impression refined that of the dermatologist, an attempt was made to determine whether the collaboration affected the clinical management of the patient. If, for example, the two individuals made different diagnoses on a case but both diagnoses were benign neoplasms that did not require further intervention, then the collaboration was deemed not to have affected the clinical management of that case.

A clinically meaningful difference was also not made if, for example, both individuals diagnosed distinct eczematous dermatoses for which the treatments were the same (e.g., topical corticosteroid medications). However, if one individual felt the disorder was papulosquamous and the other eczematous, then this difference of interpretation would correspond to a clinically significant difference in care because although the initial treatment management might be topical corticosteroid medications, more aggressive interventions diverge for these entities.

## Results

In total, 150 cases were included in the analysis including 81 female and 69 male patients. Average patient age at the time of presentation was 39.3 years with a range of 9 months to 85 years. The average duration of symptoms prior to presentation was 4.1 years. The diagnostic categories into which the diseases fell are shown in Table 1.

The diagnosis after telepathology consultation differed from the first entity in the clinical differential diagnosis 34.7% of the time. Telepathology consultation refined the Afghan general pathologist's histologic impression 45.5% of the time and the U.S.-trained dermatologist's histologic impression 24.3% of the time. For the 34 cases for which teleconsultation refined the dermatologist's histologic impression, this discordance altered the clinical management of the patient in 27 of those cases. The results of these analyses are summarized in Table 2. (Note: in the second column of Table 2, the number of analyzable cases for each of the three comparisons falls short of the 150 total cases due to some instances where the clinical differential diagnosis, Afghan pathologist's histologic impression, or U.S.-trained dermatologist's histologic impression was not provided for a given case, for example if one of the parties was on leave.)

The most common resource constraints that limited a definitive diagnosis were the inability to perform infectious histochemical stains and cultures to identify specific pathogens (n = 29; 19.3% of cases) and immunofluorescence studies to confirm autoimmune

**Table 1**  
Diagnostic categories of cases

Diagnostic Category	No. of cases (% of total cases)
Malignant neoplasms	43 (28.7)
Infectious diseases	32 (21.3)
Rheumatologic dermatoses	11 (7.3)
Autoimmune bullous diseases	10 (6.7)
Papulosquamous diseases	8 (5.3)
Genodermatoses	8 (5.3)
Other	6 (4.0)
Eczematous dermatoses	5 (3.3)
Lichenoid dermatoses	5 (3.3)
Benign neoplasms	5 (3.3)
Non-infectious granulomatous diseases	4 (2.7)
Unknown	3 (2.0)
Neutrophilic dermatoses	3 (2.0)
Adnexal disorders	2 (1.3)
Alopecias	2 (1.3)
Deposition disorders	1 (0.7)
Panniculitides	1 (0.7)
Vasculitides	1 (0.7)

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