

# Editorial

## Digital gadgets and computers in dermatology

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The last decade of the 20th century saw lot of things that had been science fiction or fantasy converted to reality. For example, the 1960s iconic television show *Star Trek* introduced a "flip communicator" that seemed to have inspired flip phones. The same show's "medical tricorder," with its diagnostic scanning wand, is not yet a reality, but, with a variety of noninvasive diagnostic devices in all areas of medicine including dermatology,<sup>1</sup> we may be getting closer.

The technology sector of healthcare is entering a new evolutionary phase. The medical community has an obligation to the public to provide the safest, most effective healthcare possible. This is more achievable with the use of computer technology at the point of care, and small, portable devices could fulfil this role. Non-invasive skin imaging techniques have proliferated over the last decade. Whilst most have a research role, some are routinely used in dermatology

applications. Dermatologists should understand certain basic concepts about images and imaging techniques to take advantage of progress in this field and eventually apply it to their own research and/or clinical practice.

### Magnifiers

Most dermatologists find some type of magnifying system useful in their practice. Evaluation of magnifiers ranging from simple low-power, single-lens systems to a Zeiss operating microscope was done<sup>2</sup> which reviewed the various types of magnifiers available for examining the skin surface and described their optical characteristics. For the dermatologist a binocular loupe with magnification of 3X to 4X appears to be the most useful diagnostic magnifying device. Higher magnifications failed to yield additional clinically useful detail while low-power binocular magnifiers of 2X to 2.5X, although useful as a surgical aid, provided less-than-optimal magnification for diagnostic purposes. The ideal magnifier for each practitioner will depend on subjective needs, as well as optical characteristics.

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clinics. This technology has a wide range of educational, clinical, and research

## Dermoscopes

A dermoscope (dermatoscope) also called skin surface microscope, epiluminescence microscope or episcope is a non-invasive, diagnostic tool which visualizes subtle clinical patterns of skin lesions and subsurface skin structures not normally visible to the unaided eye. Some dermoscopic patterns are observed consistently with certain diseases and these then could be used for their diagnosis. Since its introduction, dermoscopy technique has undergone extensive improvement; the instruments have become more readily available; and the diagnostic indications, benefits, and limitations have been better delineated. Hence, this office procedure may obviate the need for a skin biopsy for diagnosis and for follow-up. The facility of storage of images and the results being immediately available are added advantages. Basically, a dermoscope is functionally similar to a magnifying lens but with the added features of an inbuilt illuminating system, a higher magnification which can be adjusted, the ability to assess structures as deep as in the reticular dermis, and the ability to record images.

Dermoscopes have been largely used in white skinned individuals for the study of melanocytic nevi and melanoma. However, it can be used to diagnose other conditions too, e.g. psoriasis,<sup>3</sup> lichen planus,<sup>3</sup> dermatofibroma,<sup>4</sup> Darier's disease,<sup>5</sup> cicatricial alopecia,<sup>6</sup> seborrheic keratosis<sup>7</sup> and urticarial vasculitis.<sup>8</sup> Dermoscopy has also been used to calculate the follicular density in the donor area before follicular unit hair transplantation and in monitoring

adverse effects of potent topical corticosteroids in psoriasis.<sup>9</sup>

## Confocal laser microscope

The confocal microscope was invented by Marvin Minsky in 1955. There has been considerable improvement in the resolution, contrast, depth of imaging and field of view. Over the years a small, portable confocal microscope similar to a dermoscope has been developed.

The confocal laser microscope is a novel and interesting noninvasive tool for imaging skin lesions and subsurface skin lesions that are not visible to the naked eye or even by dermoscopy. Skin can be imaged *in vivo* or freshly biopsied (*in vitro*) skin specimens can be visualized immediately without the processing required for routine histopathology.<sup>10</sup> Dynamic events (real time imaging) in the epidermis, papillary dermis and superficial reticular dermis to a maximum depth of 350  $\mu\text{m}$  below the stratum corneum can also be visualized.<sup>11</sup> It has potential for diagnosing skin lesions with precision and could also become a tool for monitoring treatments in some cases.

Uses in dermatology include:

- Microscopic analysis of skin structures (including hairs and nails).<sup>12-14</sup>
- *In vivo* imaging of skin lesions, detect malignant changes in actinic keratoses and other premalignant conditions.<sup>15</sup>
- For diagnosis of dermatophyte infections,<sup>16</sup> visualization of mite, *Sarcoptes scabiei*.<sup>17</sup>

- To monitor treatment for skin disorders e.g., in psoriasis to assess reduction in activity of T-cells after steroid therapy.<sup>17</sup>
- To visualize dynamic events at the cellular level in conditions like allergic contact dermatitis, folliculitis etc.<sup>18</sup>
- *In vivo* imaging of intradermal tattoos for accurate laser treatment.<sup>19</sup>

Many other uses are being explored for dermatological indications. Advantages of confocal microscopy include rapid, noninvasive technique allowing early diagnosis and management and high resolution images as compared to CT scan, MRI and ultrasonography for dermatological use. Disadvantages of confocal microscopy include its high cost and relatively smaller field of vision.

### **Personal digital assistants**

Personal digital assistants (PDA) are lightweight computers that capture and display data via tapping on their screens with a stylus and are easily linked to desktop and network computers. They have been used in medicine for a variety of purposes, and many believe personal digital assistant use can improve the provision of medical care.

For physicians, hand-held computers are gaining popularity as point of care reference tools. In addition to serving as portable medical reference sources, these devices can be internet-enabled, allowing them to communicate over wireless wide and local area networks. With enhanced wireless connectivity, hand-held computers can be

used at the point of patient care for charge capture, electronic prescribing, laboratory test ordering, laboratory result retrieval, web access, e-mail communication, and other clinical and administrative tasks. Physicians in virtually every medical specialty have begun using these devices in various ways.<sup>20</sup>

Concerns and drawbacks mentioned by the technology sector of healthcare are entering a new evolutionary phase. The medical community has an obligation to the public to provide the safest, most effective healthcare possible. This is more achievable with the use of computer technology at the point of care, and small, portable devices could fulfil this role.

A survey done by the American College of Physicians predicted that 67% of physicians would be using PDAs by the end of 2002. These devices are used not only by the new generation of residents and physicians, but by all ages and all specialties. PDAs are used not only as personal planners and contact lists but also for medical purposes such as patient billing and bedside medical references. Physicians who have rapid and easy access to information are increasingly using that data when treating patients. This should ensure appropriate therapy and also reduce medical errors by ensuring proper dosing and treatment.

### **Future**

Meanwhile, other imaging techniques, such as high-resolution ultrasonography, spectroscopy and optical coherence tomography may yet find a role in diagnosis and disease monitoring.<sup>21</sup>

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