Introduction

Mycetoma is a serious neglected tropical disease that is caused by a chronic and progressively destructive infection of the subcutaneous tissues, usually in the foot area. To date, mycetoma-induced lesions are commonly monitored clinically or by using magnetic resonance imaging (MRI) that is considered the gold standard. However, MRI is expensive, has limited availability in developing countries and cannot be used outside clinical settings.

Novel 3-dimensional (3D) scanning technologies are being increasingly used for a wide range of different medical purposes such as the diagnosis of growth defects, assessment of melanomas and designing patient-specific prosthetics. 3D scanners are relatively inexpensive, portable and easy-to-use, and can create high-resolution 3D surface models of virtually any body part. Such 3D surface models allow objective, quantitative 3D analysis of body parts over time.

Methods

In this study we examined the usability of 3D optical scanning in patients with lower limb eumycetoma with limited size lesions (2-10 cm) who were recruited in a randomized controlled phase-2 drug trial in Khartoum, Sudan. MRI scans of the subcutaneous lesions on the lower limb were acquired at regular time intervals (t= 0, 3, and 6 months). Furthermore, 3D scans were acquired at t= 0,1,2,3 weeks and 1,2,3, and 6 months. The 3D scans were aligned with the MRI scan to measure the volume of the lesion. (Fig1)

Changes in volume of the lesion and skin texture was measured by comparing sequential 3D scans. (Fig 2)

Results

Alignment of the 3D scans with the corresponding MRI scans proved to be feasible and allowed quantitative assessment of the entire lesion. In the first ten patients studied the volume of the lesion varied between 3 and 30 ml.

Second, repeated 3D scans allowed the assessment of the superficial part of the lesion. In those with minimum 3 months follow-up, 7 of the lesions were unchanged; in 3 cases the lesions showed reduction in size, between month 1 and 2.

Conclusions

3D scanning can offer a safe, accurate and easily repeatable alternative to existing medical imaging technologies such as MRI in monitoring clinical progress in mycetoma. This cutting-edge digital technology could also be valuable for the evaluation of other skin lesions, and has the potential for use under field conditions in developing countries.

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