

INTRODUCTION

- High-resolution three-dimensional (3D) imaging may offer objective and detailed skin lesion characterization and quantification
- Validation and clinical application lacking

AIMS

- Investigate accuracy, precision, and inter-operator variability of 3D camera with standard object
- Assess applicability 3D imaging to quantify treatment effect on skin lesions clinically

METHODS

3D Camera: standard object, and four trained operators.

Assessments:

- Accuracy:** 0.5mm ruler and digital caliper
- Inter-operator variability:** repeated image capture of a standard object
- Precision:** repeated image capture of standard object on different time points by one operator
- Clinical 3D photography:** serial warts measurements in 6-wks topical treatment trial;
- Analysis:** DermaPix software with manual and propagated reference contours

RESULTS

ACCURACY

Excellent correlation 3D measurements and defined lengths (Fig. 1)

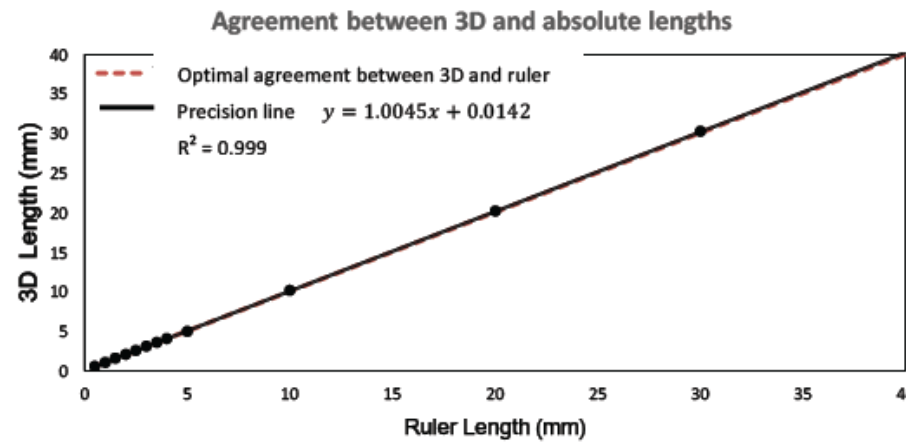


Figure 1. Agreement between 3D and absolute ruler length

INTER-OPERATOR VARIABILITY

Small CV's for inter-observer variability (Table 1)

	Inter-Operator Variability			Inter-Day Variability (CV%)			
	Mean	CV	SD	#1	#2	#3	#4
Volume	104.7 mm	0.9 %	±0.002	1.8%	1.4%	3.8%	3.6%
Diameter	10.8 mm	1.1 %	±0.004	1.7%	0.7%	0.9%	1.3%
Height	1.4 mm	2.2 %	±0.001	4.0%	2.6%	3.9%	4.3%

Table 1. Mean of four operator measurements and corresponding CV's and the inter-day variation for each operator.

PRECISION / ACCURACY

Small difference between 3D and manual caliper measurements indicate high accuracy (Table 2).

	3D Manual contour	3D Reference contour	Caliper	% Difference	
	Mean	Mean		Manual	Reference
Volume	164.4	185.7	-	-	-
Diameter	11.7	12.2	11.2	4.2	9.1
Height	4.3	4.4	4.3	1.4	1.4
Av Height	1.8	1.7	-	-	-

Table 2. Difference in 3D contours and caliper measurements

CLINICAL 3D PHOTOGRAPHY

- High correlation between 3D and caliper measurements for diameter and height of 1174 cutaneous warts (Fig. 2)

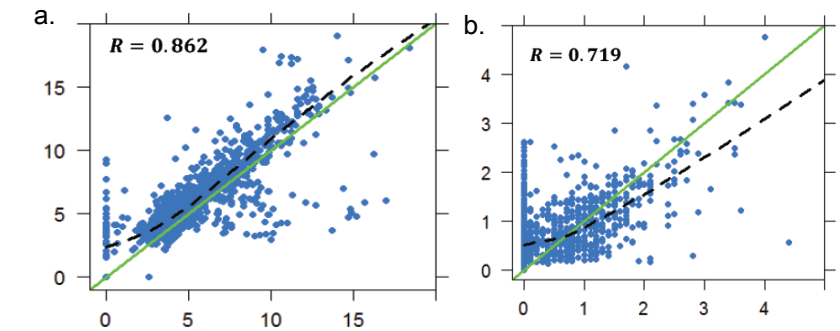


Figure 2. Agreement 3D and caliper measurements of wart diameter (a) and height (b). X-axis: caliper measurements; Y-axis: 3D measurements.

- Strong agreement measured 3D data and observed change in lesion size (Fig. 3)

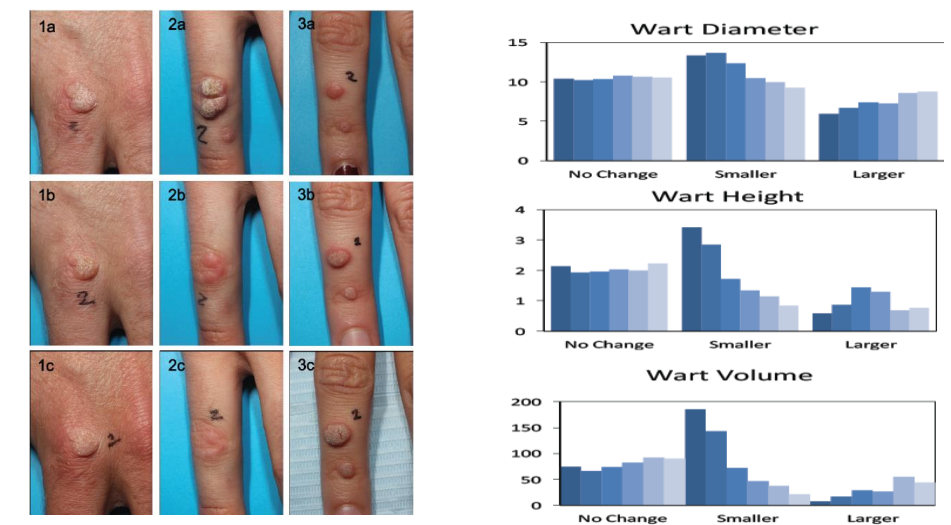


Figure 3. Clinical photography versus change in lesion size by 3D analysis

CONCLUSIONS

3D photography: valid and objective tool to evaluate height, diameter, and volume of skin lesions with

- High accuracy
- Low inter-operator variability
- High precision
- Visual aid and objective quantification

Clinical application of 3D imaging suggests superiority over standard assessment