Letters

RESEARCH LETTER

AAFPRS ANNUAL FALL MEETING FEATURED ARTICLE

A New Method for Photocephalometry

Whereas 3-dimensional surface imaging and stereophotogrammetry allow plastic surgeons the unparalleled ability to perform quantitative and morphometric analysis, digital still photography remains the mainstay in aesthetic photodocumentation as a result of lower cost and wider adoption.

Standard still photographs are obtained by positioning the patient in standard facial views for accurate preoperative and postoperative facial analysis. Although this method provides accurate assessment of facial ratios (ie, nasal projection according to Goode, Simons, or Crumley), whole measurements, such as radix proportion, may not meaningfully be translated from photographs to operating room table.[1-4] As a solution, patients may be instructed to hold a ruler while images are obtained. This process can be surprisingly challenging for many patients and is unnecessarily cumbersome for the nonexpert photographer.

We present a simple, cost-effective technique for obtaining preoperative and postoperative cephalometric measurements from digital facial photographs using an adhesive ruler affixed to sunglasses.

Methods | Consent for photography was obtained prior to obtaining photographs. Approval from the University of California Irvine Institutional Review Board was not sought because this technique is exempt from review as it does not involve any intervention or risk of loss of sensitive information.

Photographic Technique. Prior to obtaining photographs, subjects are given ruled sunglasses positioned above the trichial line and displacing any hair away from the forehead and face (**Figure**). A second ruler is held in close approximation to the desired plane of imaging as a calibration standard. Sunglasses were affixed with millimeter rulers on frontal and lateral aspects. Photographs were taken in frontal, lateral, and three-quarters views along the Frankfort horizontal plane, with a tripod-mounted digital single-lens reflex camera using a 105-mm macro lens and camera-mounted flash under standardized conditions. Care was taken to maintain fixed distances and consistent positioning.

Validation. The pixel length of 1 cm for each ruler was digitally measured using ImageJ, version 1.50i (National Institutes of Health), with 10 measurements on each ruler. Paired-samples *t* tests were conducted using SPSS, version 21 (IBM Corporation) for measurements of the ruled sunglasses and calibration standard for each of the views of the face.

Results | Mean, standard deviation, percent difference, and paired-samples *t* test of pixel length measurements are provided in the **Table**. There was no significant difference in mean (SD) measurements between the ruled sunglasses and the calibration standard from frontal right-mounted flash (92.93 [0.08] vs 92.84 [0.31] pixels; $P = .61$), left-mounted flash (93.78 [0.48] vs 93.28 [0.34] pixels; $P = .29$), right-lateral (121.52 [1.10] vs 122.07 [0.24] pixels; $P = .23$), and left-lateral views (96.68 [0.57] vs 97.27 [0.17] pixels; $P = .14$). Percent differences for the aforementioned views ranged from 0.11% to 0.61%. For both three-quarters views, there was a significant difference between mean (SD) pixel lengths: right, 114.52 (0.33) vs 109.72 (0.63) (difference, 4.29%; 95% CI, 3.57%-5.01%; $P < .001$), and left, 116.27 (0.73) vs 112.85 (0.64) (difference, 2.99%; 95% CI, 2.10%-3.87%; $P = .003$).

Figure. Standard Facial Views With Ruled Sunglasses

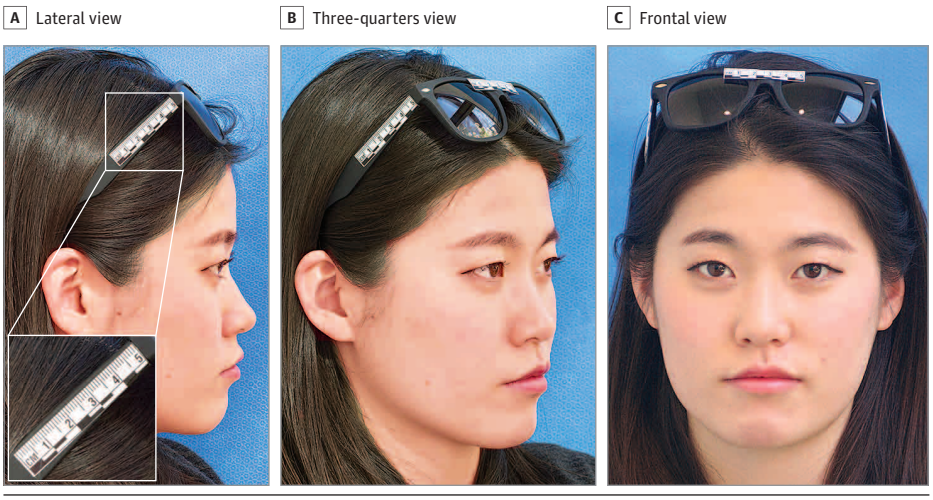

Table. Mean, Standard Deviation, Percent Difference, and Paired-Samples *t* Test for Comparison Between Digital Measurements From Ruled Sunglasses and the Calibration Standard

Facial View, Flash Mount	Mean (SD), Pixels		Difference, % (95% CI)	*P* Value
	Ruled Sunglasses (n = 10)	Calibration Standard (n = 10)		
Frontal				
Right-mounted	92.93 (0.08)	92.84 (0.31)	0.11 (0.09-0.56)	.61
Left-mounted	93.78 (0.48)	93.28 (0.34)	0.53 (0.02-1.44)	.29
Three-quarters				
Right-mounted	114.52 (0.33)	109.72 (0.63)	4.29 (3.57-5.01)	<.001
Left-mounted	116.27 (0.73)	112.85 (0.64)	2.99 (2.10-3.87)	.003
Lateral				
Right-mounted	121.52 (1.10)	122.07 (0.24)	0.45 (0.06-1.57)	.23
Left-mounted	96.68 (0.57)	97.27 (0.17)	0.61 (0.08-1.27)	.14

Discussion | Using a pair of sunglasses modified to include an affixed ruler, we were able to accurately obtain anthropometric measurements for facial analysis and operative planning. The differences in measurements between ruled sunglasses and the calibration standard for both three-quarters views is most likely accounted for by user error. A small change in the angle θ of the calibration standard away from the midsagittal plane of the head would lead to a distortion in measurement of the ruler proportional to $\cos\theta$. Deviations in other planes away from the imaging plane would yield similar distortions. Because the ruled sunglasses are fixed in motion with the head, measurements obtained using the sunglasses method are more reliable than previous standards such as the handheld ruler. Further limitations include access to 3-dimensional surface imaging, lens distortion, and sample size.

Digital photography has become widely available, and standard facial views allow for consistent preoperative documentation, operative planning, and postoperative outcomes analysis. Our method of using ruled sunglasses is cost-effective and reliable and removes reliance on the patient during facial photography. This is an easily adopted approach that augments photodocumentation with quantitative measures and may translate to measurable improvements in outcomes.

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Sudy concept and design: Gu, Hu, Wong.
Acquisition, analysis, or interpretation of data: All authors.
Drafting of the manuscript: Gu, Hu.
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1. Henderson JL, Larrabee WF Jr, Krieger BD. Photographic standards for facial plastic surgery. *Arch Facial Plast Surg*. 2005;7(5):331-333.

2. Santosa KB, Fattah A, Gavilán J, Hadlock TA, Snyder-Warwick AK. Photographic standards for patients with facial palsy and recommendations by members of the Sir Charles Bell Society [published online January 26, 2017]. *JAMA Facial Plast Surg*. doi:10.1001/jamafacial.2016.1883

3. Özücer B, Dizdar D. Intraoperative visual documentation using smart mobile devices: a simple solution for facial plastic surgeons. *JAMA Facial Plast Surg*. 2016;18(5):397-398.

4. Naini FB. The Frankfort plane and head positioning in facial aesthetic analysis—the perpetuation of a myth. *JAMA Facial Plast Surg*. 2013;15(5):333-334.

Efficacy and Safety of Titanium Miniplates for Patients Undergoing Septorhinoplasty

Reliable long-term results in septorhinoplasty demand structural stability. This is often achieved with cartilaginous grafts, which may demonstrate warping and movement. Various techniques, including perichondrial stripping and symmetrical shaving, combat warping, but none are reliable.[1] Other techniques involve the use of K-wires for preventing costal cartilage graft warping, absorbable plates for stabilizing septal cartilage grafts, and titanium plates for preventing dorsal onlay graft warping.[2-4]

A need for rigid fixation arises in the treatment of severe anterocaudal septal deviation. In these cases, one of us (S.M.) has performed modified extracorporeal septoplasty, termed *anterior septal reconstruction* (ASR), wherein the caudal two-