A photographic technique for the measurement of clinical crown height

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SUMMARY

As it is not always possible to obtain plaster of paris study models an alternative method using colour transparencies was developed to measure clinical crown height. Results obtained by this technique were compared to those obtained from study models of the same individuals. No statistically significant differences could be found between the measurements made by the two methods other than the upper lateral incisors. This method appears suitable for longitudinal and epidemiological studies of the position of the gingival margin.

OPSOMMING

Aangesien dit nie altyd moontlik is om gips studie-modelle te bekom nie, is 'n alternatiewe metode ontwikkel wat van kleurskyfies gebruik maak om kliniese kroonhoogte te meet. Resultate verkry deur middel van hierdie tegniek is vergelyk met die verkry van studie-modelle van dieselfde persone. Geen statisties noemenswaardige verskille is gevind tussen die resultate van die twee metodes nie, behalwe vir die maksillêre tweede snytande. Hierdie metode skyn geskik te wees vir lengteliggende en epidemiologiese studies van die posisie van die gingivalerand.

The position of the gingival margin indicated by measuring clinical crown height on orthodontic study models has been reported for white children aged 6-16 years (Volchansky and Cleaton-Jones, 1976), and also for dental undergraduate students aged 17-18 years (Volchansky and Cleaton-Jones, 1976).

It is not always possible, especially in field studies, to obtain plaster of paris study models, but in such instances it is usually possible to take good clinical colour transparencies.

The purpose of the present study was to determine whether standardised clinical colour transparencies could be used in place of study models, in clinical crown height measurement studies.

MATERIALS AND METHODS

The clinical crown heights of 38, 17-18 year old dental undergraduate students were first measured on the anterior teeth of study models utilizing the technique of Volchansky and Cleaton-Jones (1976). These measurements were made with Vernier calipers in good light using the following landmarks. On the incisor teeth from the deepest curvature of the labial gingival margin to the middle of the incisal edge; on the canines from the deepest curvature of the buccal gingival margin to the tip of the canine crown.

The same students were photographed, under field conditions, using a 35 mm Canon F-1 single lens reflex camera, fitted with photographic bellows, a 100 mm macrolens and electronic flash, set to provide a subject to film distance of 21 cm. The film used was Ektachrome X. Three intra oral views of each of the 38 dental undergraduates were taken, with the horizontal axis of the viewfinder parallel to the occlusal plane, to give photographic coverage from the first molar on the one side to the first molar on the opposite side in both the mandible and the maxilla.

Prior to commencement of the photographic measurements, a set magnification was established by utilizing a standard photograph with the addition of a 2 mm diameter adhesive disc on a tooth (Fig. 1). This photograph was projected onto a viewing table (Volchansky *et al*, 1975), the disc measured and a fixed magnification thereby established. This was maintained throughout the study. The anterior teeth from the canine to canine in both the mandible and maxilla were measured using Vernier calipers and the identical landmarks to those employed on the study models (Fig. 2).

The measurements were then reduced by the amount of the magnification and transferred onto IBM computer punch cards and processed in an IBM 370.158 computer using the Statistical Package for Social Sciences (Nie *et al*, 1975). Statistical analysis utilized the paired Student's t test.

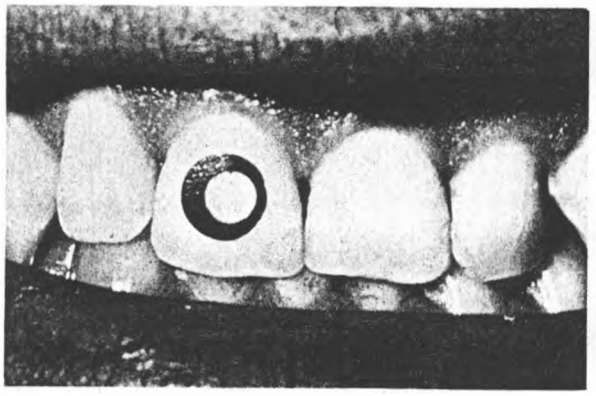


Fig. 1. **Disc used to establish magnification on tooth.**

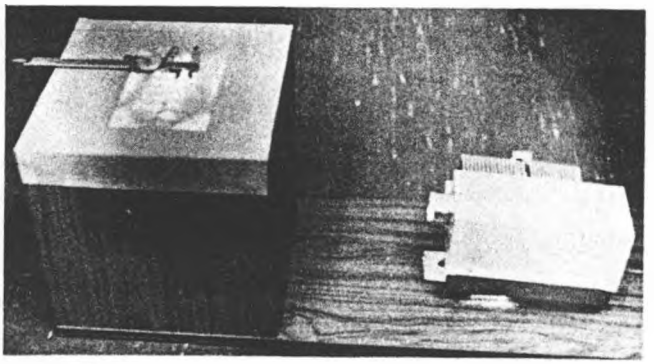


Fig. 2. **Colour transparency on viewing table for measurement.**

Table I. Mean Clinical Crown Height Measurements in mm (± standard deviations)

Tooth	13 *	12 **	11 *	21 *	22 **	23 *
Study model	9,6 ± 1,0	8,2 ± 0,7	9,9 ± 0,8	9,9 ± 0,8	8,6 ± 0,7	9,9 ± 0,9
Photograph	9,8 ± 0,9	8,6 ± 0,9	10,0 ± 0,9	10,0 ± 0,8	8,2 ± 0,7	9,7 ± 1,2
Tooth	43 *	42 *	41 *	31 *	32 *	33 *
Study model	9,9 ± 0,9	8,3 ± 0,8	8,1 ± 0,9	8,3 ± 0,8	8,5 ± 0,9	9,9 ± 1,1
Photograph	9,8 ± 0,9	8,5 ± 0,7	8,0 ± 0,8	8,1 ± 0,6	8,3 ± 0,7	10,0 ± 1,0

* = Not significant
** = $p < 0{,}001$

RESULTS

Table I shows the mean clinical crown measurements in mm. In all the teeth except the upper lateral incisors on both sides no statistically significant differences could be found between the measurements made on the study models and those made on the colour transparencies.

In the case of the upper lateral incisors, there were conflicting results on the left and right sides. On the left the photographic measurements were significantly less than the study model measurements ($p<0{,}001$) while on the right side, the opposite was true ($p<0{,}001$). On both sides this difference was only 0,4 mm.

DISCUSSION

This study has shown that by utilizing a standard photographic technique measurements made of clinical crown heights on colour transparencies were comparable to those made on study models. Only in the case of the upper lateral incisors was a degree of difference found. This is probably due to the more palatal position of these teeth which produced some shadowing at the gingival margin, making the outline of the gingival margin hazy and difficult to measure. While this amount was statistically significant, in clinical terms 0,4 mm was not thought to be excessive.

Colour photographs have been used to assess gingival change, (Lees, 1974); the evaluation of gingival inflammation (Suomi, McClendon and Frandsen, 1972; Pilot, 1968), while experimental caries in man was recorded photographically by Edgar, Jenkins and Rugg-Gunn (1976). All found the technique acceptable.

The technique described in this article appears suitable for both longitudinal and epidemiological studies of the position of the gingival margin.

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