

# The Golden Ruler

## A simple device to solve dental esthetic problems



### Key words

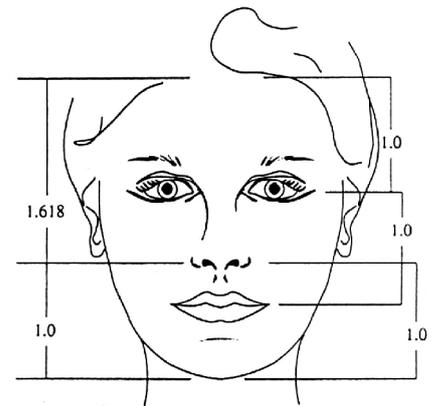
Teeth proportions, face proportions, the Golden Proportions.

### Summary

With the help of an instrument, which is stable after measuring and sterilisable the esthetic proportions of the patient's face can be measured and compared. Disproportions can easily be detected. It is then easier for the dentist to explain to his patient how unattractive esthetics can be improved and how the important, beautiful smile can be created. The natural teeth and facial esthetics which are for all patients desirable, become simple to measure. They are for the entire dental team including also the dental laboratory technician easy controllable.

### Introduction

A beautiful reconstruction which is a copy of the ideal natural model is the best what modern dentistry should be aiming for. However before embarking upon such work the following questions must be answered : what is beautiful, what does the patient consider to be beautiful, what fits harmoniously in the patients face and what can be achieved?



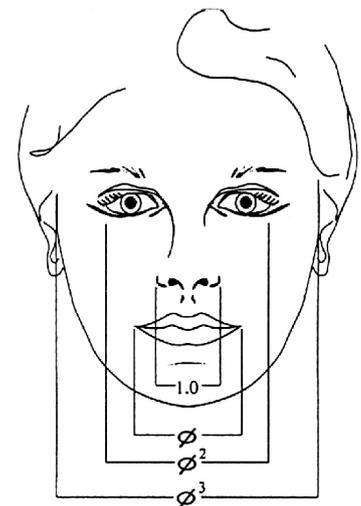
Measuring instruments for certain facial proportions have been in existence for quite some time. However they have the disadvantage that they can be used only in the laboratory like the Proporzio metro Aureo according to Jurowich (see Ref. 3) or are unstable or that they can, like the Craniometer according to Knebelmann (see Ref. 4) or the compass according to Spirgi-Nally - Chevrolet (see Ref. 10), only be used to measure the total vertical dimension. With the Craniometer the distance eye corner - ear entrance is measured and compared with the distance from the inferior border of the nose to the inferior border of the chin in a habitual position.

The Spirgi compass measures the distance from the inferior border of the nose to the inferior border of the chin during the relaxed mmm saying. With these instruments no indication can be obtained of where the occlusal plane is situated or if in case of loss of the vertical dimension this is due to wear of the upper or wear of the lower teeth. The determination of the incisal border position of the upper centrals is with these instruments not possible.

Even when we believe to have placed an esthetically correct reconstruction, this does by no means guarantee that it pleases the patient. He sees our work from a completely different perspective than we do. He judges it according to his criteria.

Our patients frequently worry about the esthetics of their face and particularly their lips and teeth. According to a publication of Phillips (see Ref. 7) more than 2% of the American population suffer from "Body Dysmorphic Disorder BDS". The cause of such psychological problems is often due to the lack of professional explanations, of comparison and measuring possibilities.

In the following part an instrument is being shown with the help of which a dentist can facilitate his work or with which (in front of a mirror) in a simple way esthetic problems can be explained to the patient or to the companion person.



### The Golden Proportions of the face

Levinson (see Ref. 5), Mack (see Ref. 6) and Ricketts (see Ref. 8) described the rules of the Golden Proportions of the dentally related facial features. It concerns not only the width of the teeth and the lips but also the dental vertical dimension. The proportions are not absolutely precise but they are generally measurable, even with physiological age changes, which sooner or later in life will occur. It is also Important to remember the research made by Gilles and Schwartz (see Ref. 2) which shows, that the length of our teeth to each other, e.g. the central to the lateral incisor is not proportional.



Fig. 1

The Golden Ruler ( Safident Comp. CH 1196 Gland )  
An instrument with which the Golden Proportions can be measured.  
The instrument is sterilisable and stable after measuring, allowing quick comparisons.

During the introductory discussion it is useful to familiarize the patient with golden proportions. This is easily demonstrated to the patient with his finger parts.



Fig. 2

The Golden Proportion measuring at the index finger.  
The finger parts in their length like other parts of the body proportional to each other.

After demonstration of the finger proportions, the patient has a better understanding of what we try to obtain with our prosthetic or orthodontic work . Demonstrating in front of a mirror incorrect proportions between the vertical dimension, of the lip and tooth width when smiling are easily understood by most patients. Demonstrating proportional relationships this way can enhance patient confidence and when repeated a completion of treatment is particularly reassuring.

**The vertical dimension and the determination of the incisal position of the upper centrals.**

Dental vertical dimension was defined recently (Fig. 1) as follows : "The term rest vertical dimension refers to the length of the patient's facial profile when the mandible is in its rest position in relation to the maxilla". Further on it is stated that the dental vertical dimension should be determined by lifting and lowering of the lower jaw in relation to the upper jaw. Not a very simple procedure.

A common way of assessing vertical dimension is to observe mandibular movements during speech and to evaluate phonetics. A more objective method is to measure proportions with a Golden Ruler, using the anterior point of the lower nasal bone and the pogonion as reference points. Similarly, the most appropriate dimensions of the central incisor can be determined using proportions.

Spear (see Ref. 9) wrote "The starting point for esthetic and functional treatment planning is the maxillary central incisor because this tooth, together with the mandibular incisors, determines also protrusive guidance patterns".

$$\begin{aligned} \text{The anterior point of the lower nasal bone - Incisal length of central incisor} &= 1 \\ \text{Incisal length of central incisor - Pogonion} &= 1,618 \end{aligned}$$

With the Golden Ruler the measure should be taken on a relaxed patient. For that he should wet his lips with his tongue and then bring the lips gently into contact. For the determination of the vertical dimension the two lateral wings of the instrument are brought into contact with the before marked anterior point of the lower nasal bone and the pogonion.



Fig. 3

The instrument on the face of a relaxed patient.  
The sidearms have contact with the marked anterior part of the lower anterior nasal bone and the pogonion point

After the measuring shown in (Fig.3) the patient is asked to rise his upper lip. The middle part of the instrument (Fig.4) points to the incisal border of the central incisor, the most important reference point in the determination of the vertical dimension.

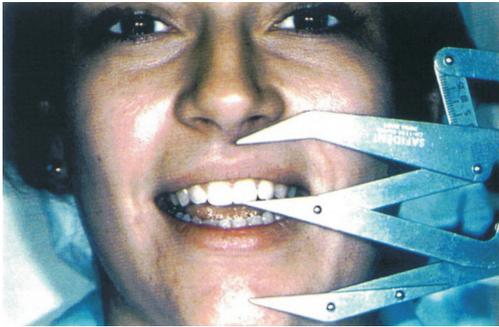


Fig. 4

The incisal part of the central incisor is precisely corresponding to the Golden Proportions

This point facilitates prosthetic work e.g. the reconstruction of worn down teeth or the determination of the occlusal plane for full denture prosthetics or the position of the incisors in an orthodontic treatment.

**The proportions of the front teeth**

Ricketts (7) calls the teeth proportion "The divine Progression". The front teeth should have the following width proportions :

- The central incisor is 1,618 times larger than the lateral (Fig. 5).
- The lateral incisor is 1,618 times larger than the visible part of the canine seen from the the vertical axis.
- From the same perspective the visible part of the canine is 1,618 times larger than the visible part of the first bicuspid.
- The full visible part of the anterior teeth between the incisal points of the canines is 1,618 times larger than the lower four incisors (Fig.6 and 7)

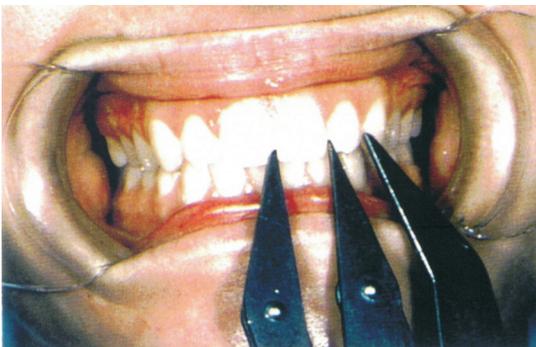


Fig. 5

The Golden Proportions of the upper incisors.

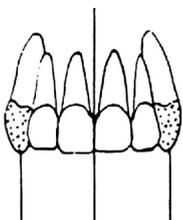


Fig. 6

The measured distance between the cusps of the upper cuspids is 1,618.

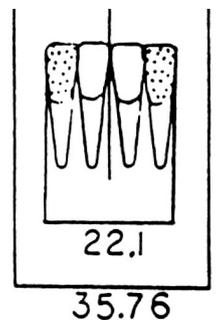


Fig. 7

In precise Golden Proportion to fig. 06 the lower four incisors (distance 1).

Also the labial and the palatinal sides of the front teeth crown parts have Golden Proportion relations :

- The buccal surfaces of the incisors are divided in two parts by a line in the region 1 - 1,618. The part 1,618 from this line on to the incisal border is flat, the part 1 toward the gingiva is rounded (Fig. 8 and 9).



Fig. 8

The labial surface of the central incisor part toward the gingiva is rounded to 1.618. The 1.618 part is flat, the 1

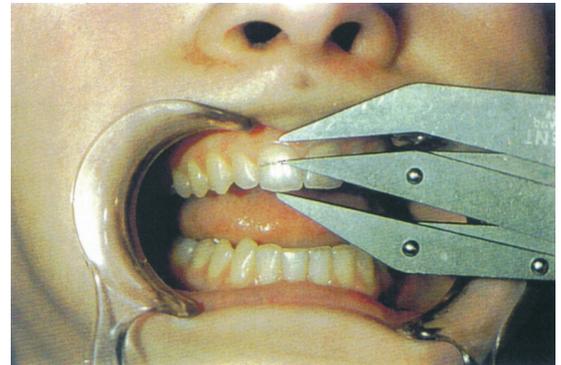


Fig. 9

Measuring with the Golden Ruler of the buccal surface described in (Fig. 8) results at line 1.

The lateral bulges are in the cingulum of a front tooth in good shape sector 1,618.

**The importance of the facial proportions**

For orthodontic treatment or a prosthetic reconstruction not only the teeth but also the lip proportions and the smile width must be checked and if necessary corrected.

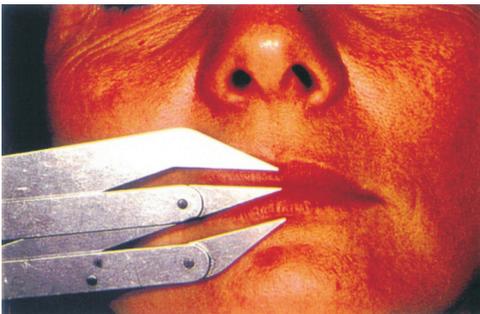


Fig. 10

The Golden Proportions of the lips width. The inferior lip should be 1,618 times larger than the upper lip.

The attractive smile depends not only on the correct proportions of the front teeth and the lips. The buccal walls of the upper first premolars limit the so called smile width, which is in proportion with the eye width.



Fig. 11

Measuring of the eye width.



Fig. 12

Measuring of the smile width. The buccal wall distance of the upper bicuspids is in proportion with the eye width.

The non respect of the eye width 1 to the smile width 1,618 through buccal overcontouring or the too buccally placement of teeth, as we see it often in full dentures, is an intrusion into the free zone between the dental arch and the cheek, into the smile space, into the buccal corridor. This intrusion looks unnatural to the observer and he probably thinks that the person he is watching does not have natural teeth.

### The Golden Ruler in the dental laboratory

The Golden Ruler is also useful for the dental laboratory technician, especially for esthetic work in the front area and for important prosthetic reconstruction like full dentures. Therefore the laboratory technician must know the eye width of the patient, he must control his work from a precise vertical view and measure the different proportions.

As the laboratory technician frequently turns the articulator and not always checks the front teeth proportions, we see particularly upper canines which are not very natural looking. It is a must to respect the 1,618 proportion of the lateral incisor when compared with the visible part of the canine. If the frequently too far distally placed buccal eminence is moved medially displaced, then the canines look more natural.

Also side teeth have Golden Proportions:

- The total width of a molar or premolar is 1,618 times larger than the cross distance of their cuspids.
- The distance between the buccal wall of the first two lower molars is 1,618 times the width of the lower front teeth (teeth 43 - 33).

A right wax up of posterior teeth particularly for beginners is difficult. The placement of the cusps is much easier when a Golden Ruler is used. For a crown first the buccal wall of the prepared tooth is waxed up. Then the lingual wall is waxed and the tooth width measured as 1,618 part. The cross distance of the cuspids is the part 1. In a wax up course the flatly ground occlusion of the plaster teeth should be measured in their width and then with a pencil the locations of the cusps can be marked.

### The proportion control test made on the patient

Particularly older patients have doubts that a worn down full denture must be remade or that severely worn down teeth should be reconstructed in order to improve their facial look. They must be shown precisely where the anterior crest of the lower nasal bone and the pogonion are located. Then they should be given a Golden Proportion measuring instrument for temporary use at home. They appreciate this very much as they can judge in front of their own mirror their proportions and see their teeth abrasion. Female patients can also check the width of their lips after the placement of lipstick.

Without disturbance the patients are able to place a transparent splint part, made after a wax up. They should fill it with differently colored, moistened flour. This way a patient who has doubts, can be motivated to accept the proposed treatment with only a small time loss for the dentist. Important is the fact that they do not feel being persuaded of something they do not desire.



Fig. 13

Severely worn down teeth of an elderly woman, who after the demonstration with a Golden Ruler accepted the treatment she had refused for years.

### A decisive professional failure

I had my biggest professional failure with a female patient of close to 50 years of age. She had massively worn down her teeth. After she had worn for several months temporaries I inserted the (in my opinion) esthetically improved final total reconstruction. My office personnel judged the work positively, I liked it and placed it with temporary cement. One week later the patient agreed to have the reconstruction permanently cemented. Two days later at the control appointment the patient said nothing particular. It was a big surprise to me when a couple days later the same patient phoned and talked to me in a very unpleasant way. She told me, that her sister had come to visit her and judged the teeth which I had placed as horribly long and had said that the lips were too large and her smile too sexy ... she told me that she would not pay my bill. I was upset and searched for the errors I had made..

I realized that I had not said anything to the patient about the Golden Proportions, the teeth, lip and face proportions. I had placed the finished reconstruction without measuring the correctness of my visual judgement. I should have given the patient the necessary proof, that the placed work fitted harmoniously into her face. I learn from this unpleasant experience. Since I have a proportion measuring device at my disposition, at the start of every treatment involving esthetic problems, at every try

in and after final cementation I remeasure and show the patient the proportions. I do no longer rely only on my own esthetic view.

### Discussion

The demands of our patients concerning dental treatment have become bigger. Bigger are also the doubts if a new prosthetic treatment is indicated and if the dentist really has proposed the optimal esthetic solution. Patients have no longer blind confidence. They are in doubt and scared by the idea that an acquaintance at work or a member of the family might find something to criticize. Thanks do to the proportion controls the patients are more confident in our esthetic prosthetic work.

### Conclusions

The Golden Ruler or similar instruments facilitate the dental work. Not to use them is also psychologically wrong. We must measure if we want to work esthetically and functionally correct. To judge only with phonetic testing and our own look at our work is no guarantee. To measure the distances of points and to compare them is safer. After the placement of prosthetic work not only the patient but also the treatment team has confidence that the work corresponds to the expected harmonious esthetic goal.

### Recommendations

The Golden Ruler and similar instruments facilitate the dental work. Not to use them is also psychologically wrong. We must measure, if we want to work correct esthetically and functionally. To use only phonetic tests and to determine esthetics by looking at the work can create problems. To measure the distance of points and to compare them is safer, as the patient understands the problem better. This gives at the time of the placement of prosthetic work as much to the dentist as to the patient the assurance that the work corresponds to basic esthetic requirements.

### References

1. Academy of Prosthodontics: Concept and Practice in Prosthodontics 1994  
Prosthet Dent 75: 73-94, 1995
2. Gillen R.J., Schwartz R.S., Hilton T.J., Evans D.B. : An analysis of selected tooth proportions,  
Int J Prosthetics 7 : 410-417, 1994.
3. Jurovich K. : L'Esthetica, Il Nuovo Laboratorio Odontotecnico, Roma, 9 : 109-121 1992.
4. Knebelman St. : Craniometrics Technique Guide, Dental Equipment + Supplies 42: Sept/Oct 1998.
5. Levinson E. : Dental esthetics and the golden proportion, J Prosthet Dent 40: 244-252, 1978.
6. Mack M.R. : Perspective of facial esthetics in dental treatment planing.  
J Prosthet Dent 75: 169-176, 1996.
7. Philips K. A. : The Broken Mirror, 61-63, Oxford University Press 2000.
8. Ricketts R.M. : Divine proportion in facial esthetics. Clin Plast Surg 9 : 401-422, 1982.
9. Spear F. : The maxillary central incisal edge : A key to esthetic and functional treatment planing.  
Comp Contin Educ Dent 20 : 512-516, 1999.
10. Spirigy M., Berta J.J., Chevrolet S. : Instrument zur Bestimmung der Ruhelage,  
Die Zahntechnik 2 / 1981, CH 8840 Einsiedeln.