

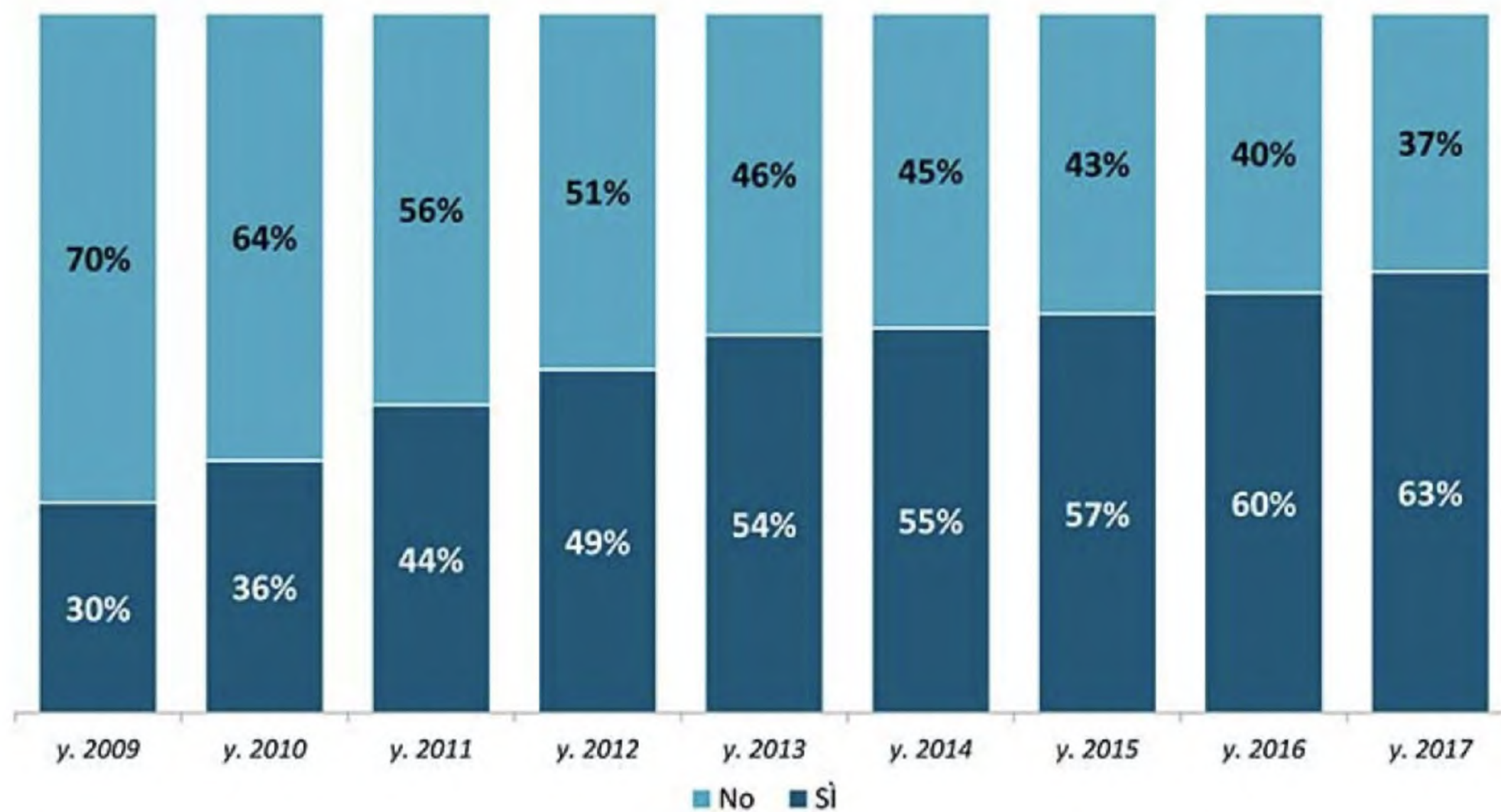
Strumenti rotanti per la protesi digitale: preparazione, finitura e lucidatura

Bologna 25/01/2019

Dott. Claudio de Vito

**Protesi digitale:
metodo per la realizzazione di
protesi attraverso la tecnologia
CAD/CAM**

CAD-CAM: uso della tecnica nella realizzazione di protesi fissa

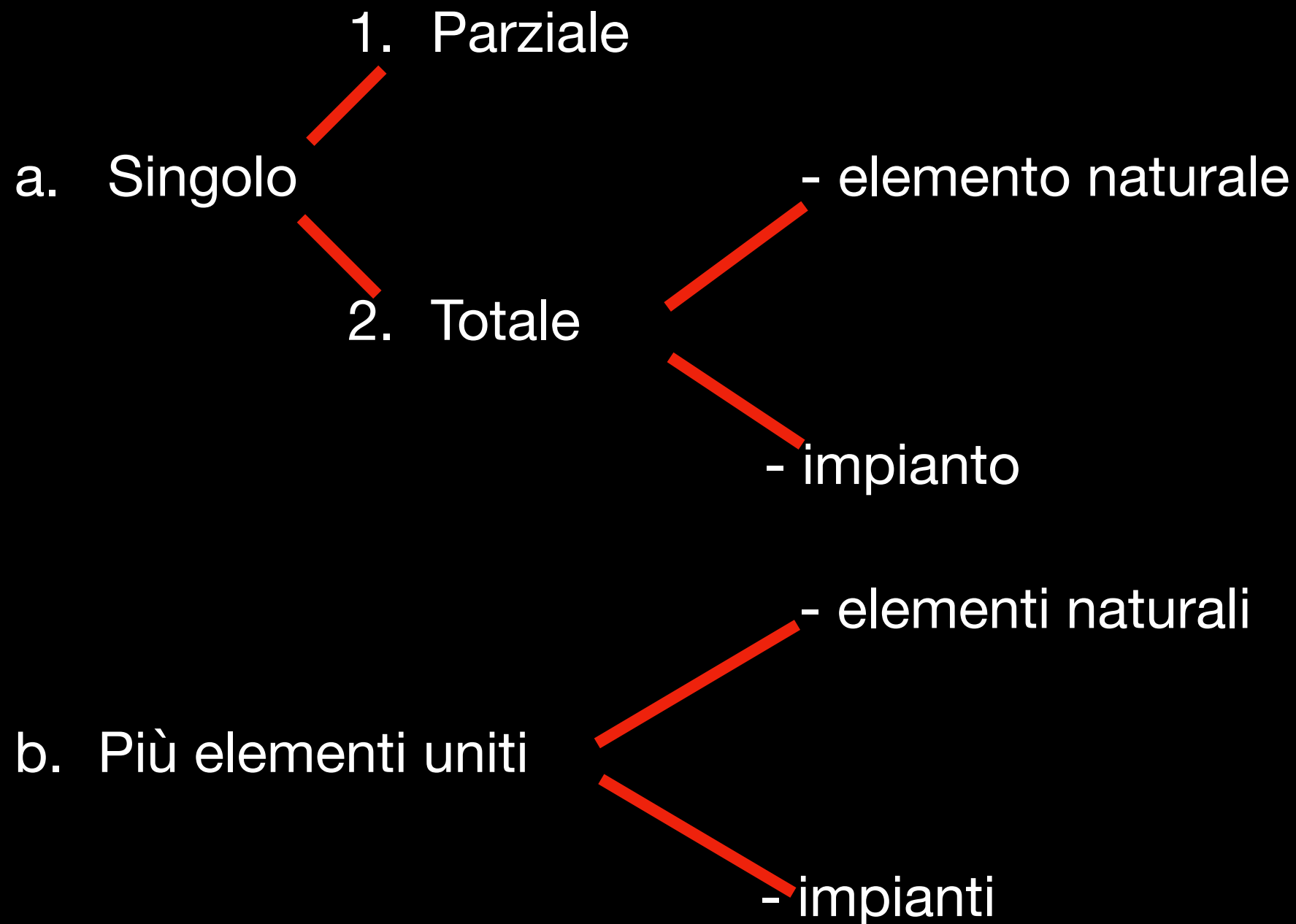


www.dentalmonitor.com

Il flusso di lavoro, che sfrutta la tecnologia digitale, prevede necessariamente la conoscenza di diversi aspetti della protesi:

- tipologia di restauro
- scelta del materiale
- **preparazione**
- tecnica di scansione
- software di progettazione
- fresaggio
- **finitura e lucidatura**
- cementazione
- **ritocchi**

Tipologia del restauro



Scelta del materiale

- Per temporaneo
 - PMMA, composito
- Per definitivo
 - composito, ceramica ibrida, ceramica, ossido di zirconia, soluzioni ibride.

Quale tipo di preparazione?

Ci sono indicazioni cliniche per preparazioni orizzontali ed altre per quelle verticali.

NON BISOGNA SEGUIRE LE MODE

Scelta una metodica, bisogna seguirne il protocollo clinico e tecnico, differente l'uno dall'altro.

Non è consigliabile eseguire metodiche ibride

Linee guida per le preparazioni

IVOCLARVIVADENT - IPS e.max CAD

Indicazioni per la preparazione

Una lavorazione di successo con IPS e.max CAD è realizzabile soltanto rispettando le direttive e gli spessori sotto riportati.

Regole generali per la preparazione di restauri in ceramica integrale

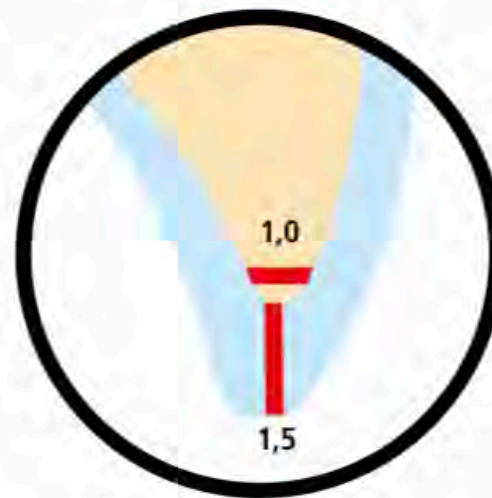
- assenza di angoli e spigoli
- preparazione a spalla con bordo interno arrotondato rispettiv. preparazione a Chamfer
- le dimensioni indicate rispecchiano le dimensioni minime del restauro IPS e.max CAD
- il raggio dei bordi del moncone preparato, in particolare in caso di denti anteriori, deve ammontare a min. 1,0 mm (geometria dello strumento di rifinitura) per garantire un'ottimale fresatura attraverso l'unità CAD/CAM.



Preparazione a spalla



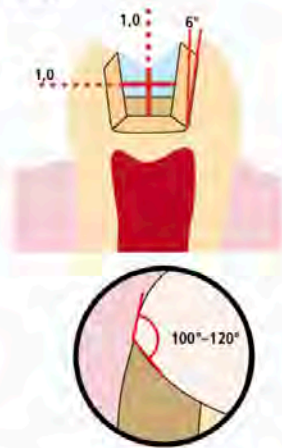
Preparazione a Chamfer



Se non vengono rispettati gli **spessori minimi delle pareti** e le **sezioni delle connessioni** indicati, si può arrivare all'insuccesso clinico, come p.e. incrinature, distacchi o frattura del restauro.

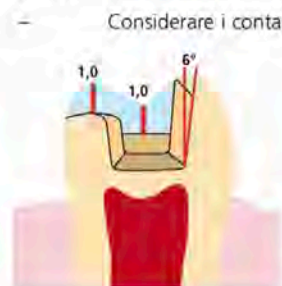
IVOCLARVIVADENT - IPS e.max CAD

Inlay



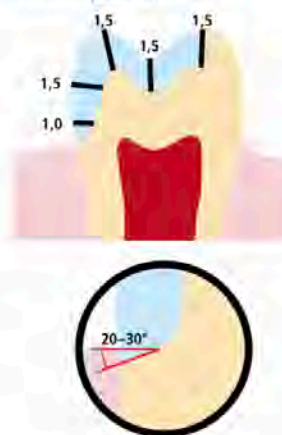
- Considerare i contatti antagonisti statici e dinamici.
- Non realizzare i bordi della preparazione nei contatti centrici con l'antagonista.
- In zona delle fessure, prevedere min. 1,0 mm di profondità di preparazione e min. 1,0 mm di larghezza dell'istmo.
- Realizzare l'incassettatura prossimale in modo leggermente divergente (angolazione di preparazione 6°), angolo di 100°-120° fra le pareti cavitare prossimali e le superfici prossimali prospettive dell'inlay.
- In caso di superfici prossimali convesse accentuate, senza sufficiente supporto del gradino prossimale, non realizzare contatti delle creste marginali sull'inlay.
- Arrotondare i bordi interni e le zone di passaggio, per evitare concentrazioni di tensione nella ceramica.
- Non effettuare preparazioni Slice-cut o a finire.

Onlay



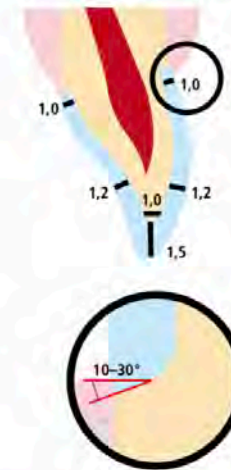
- Considerare i contatti antagonisti statici e dinamici.
- Non realizzare i bordi della preparazione nei contatti centrici con l'antagonista.
- In zona delle fessure, prevedere min. 1,0 mm di profondità di preparazione e min. 1,0 mm di larghezza dell'istmo.
- Realizzare l'incassettatura prossimale in modo leggermente divergente (angolazione di preparazione 6°), angolo di 100°-120° fra le pareti cavitare prossimali e le superfici prossimali prospettive dell'onlay.
- In caso di superfici prossimali convesse accentuate, senza sufficiente supporto del gradino prossimale, non realizzare contatti delle creste marginali sull'onlay.
- Arrotondare i bordi interni e le zone di passaggio, per evitare concentrazioni di tensione nella ceramica.
- Non effettuare preparazioni Slice-cut o a finire.
- In zona dell'incappucciamento delle cuspidi considerare uno spazio di almeno 1,0 mm.

Corone parziali



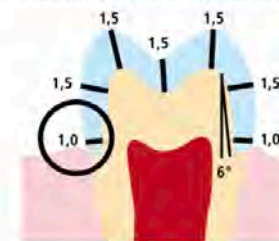
- Considerare i contatti antagonisti statici e dinamici.
- Non realizzare i bordi della preparazione nei contatti centrici con l'antagonista.
- In zona dell'incappucciamento delle cuspidi considerare uno spazio di almeno 1,5 mm.
- Preparazione a spalla con bordo interno arrotondato rispettivamente preparazione a Chamfer in angolazione di ca. 20°-30°. Larghezza della spalla/Chamfer min. 1,0 mm.

Corona anteriore/pilastro del ponte nei settori anteriori



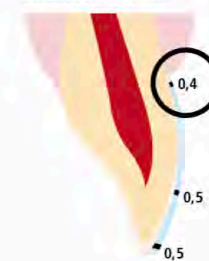
- Ridurre la forma anatomica rispettando gli spessori minimi indicati. Preparazione a spalla con bordo interno arrotondato rispettivamente preparazione a Chamfer in angolazione di ca. 10°-30°. Larghezza della spalla / Chamfer circolare min. 1,0 mm.
- Riduzione del terzo coronale - occlusalmente/incisalmente - di min. 1,5 mm.
- Riduzione in zona vestibolare rispettivamente orale di min. 1,2 mm.
- Per la cementazione convenzionale rispettivamente autoadesiva, la preparazione deve presentare superfici ritenive ed una sufficiente altezza del moncone.

Corona posteriore/Pilastro di ponte nei settori premolari



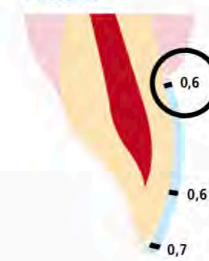
- Ridurre la forma anatomica rispettando gli spessori minimi indicati. Preparazione a spalla con bordo interno arrotondato rispettivamente preparazione a Chamfer in angolazione di ca. 10°-30°. Larghezza della spalla / Chamfer circolare min. 1,0 mm. Angolazione della preparazione 6°.
- Riduzione del terzo coronale occlusalmente di min. 1,5 mm.
- Riduzione in zona vestibolare rispettivamente orale di min. 1,5 mm.
- Per la cementazione convenzionale rispettivamente autoadesiva, la preparazione deve presentare superfici ritenive ed una sufficiente altezza del moncone.

Faccetta sottile



- La preparazione deve possibilmente avvenire nello smalto.
- Non apportare i limiti di preparazione incisali nelle superfici di abrasione e delle occlusioni dinamiche.
- Lo spessore minimo della faccetta sottile in zona cervicale e labiale è di 0,4 mm. Per il bordo incisale è necessario prevedere uno spessore del restauro di 0,5 mm.
- In caso di sufficiente spazio è possibile anche rinunciare ad una preparazione.

Faccette



- La preparazione deve possibilmente avvenire nello smalto.
- Non apportare i limiti di preparazione incisali nelle superfici di abrasione e delle occlusioni dinamiche.
- Ridurre in zona cervicale rispettivamente labiale di min. 0,6 mm ed il bordo incisale di min. 0,7 mm.

IVOCLARVIVADENT - IPS e.max ZirCAD

Indicazioni per la preparazione

Prima di iniziare con la ricostruzione vera e propria, prestare attenzione ad una preparazione idonea per la ceramica. Una lavorazione di successo con IPS e.max ZirCAD è realizzabile soltanto rispettando le direttive e gli spessori sotto riportati.

Regole generali per la preparazione di restauri in ceramica integrale



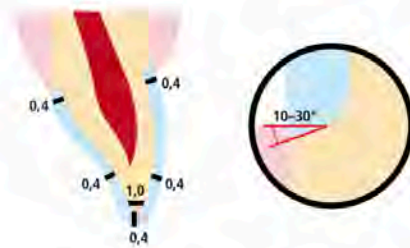
Preparazione a spalla



Preparazione a Chamfer

- nessuna preparazione di angoli e spigoli
- la preparazione ideale è una preparazione a spalla con bordo interno arrotondato, rispettivamente una preparazione a Chamfer.
- Le dimensioni indicate rispecchiano le dimensioni minime del restauro IPS e.max ZirCAD
- Il diametro dei bordi del moncone preparato deve essere di almeno 1 mm (geometria dello strumento di rifinitura), per garantire un'ottimale lavorazione da parte dell'unità CAM.

Linee guida per la preparazione per corone singole - ponti di 3 elementi



- Ridurre uniformemente la forma anatomica rispettando gli spessori minimi indicati per le pareti.
- La preparazione ideale è una preparazione a spalla con bordi interni arrotondati, rispettivamente una preparazione a Chamfer con 0,6 mm di larghezza della spalla/Chamfer per una corona latero-posteriore e 0,4 mm per una corona anteriore.
- Incisalmente/occlusalmente la corona latero-posteriore deve essere ridotta di almeno 0,6 mm e la corona anteriore di almeno 0,4 mm.
- La riduzione in area labiale/linguale dovrebbe essere di min. 0,4 mm per corone anteriori e di 0,6 mm per le corone latero-posteriori.
- Per la cementazione convenzionale rispettivamente autoadesiva devono essere create superfici ritentive (altezza del moncone min. 4mm).
- angolazione della preparazione:
4-8° con cementazione convenzionale ed autoadesiva, >6° con cementazione adesiva

Criteri per la conformazione

Il design del restauro è la chiave di successo per restauri in ceramica integrale di lunga durata. Quanta più attenzione viene riposta nella conformazione, tanto migliore sarà il risultato finale ed il successo clinico.



Gli **spessori minimi** riportati qui di seguito devono essere rispettati per ottenere il colore dentale della scala colori e per soddisfare i **requisiti delle direttive per la preparazione**.
Gli spessori minimi si riferiscono agli spessori di IPS e.max ZirCAD.

IVOCLARVIVADENT - Tetric CAD

Indicazioni per la preparazione

Una lavorazione di successo con Tetric CAD è realizzabile soltanto rispettando le direttive e gli spessori per la preparazione sotto riportati.

Regole generali per la preparazione di restauri in composito



Preparazione a spalla

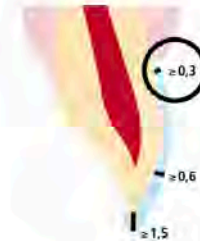


Preparazione a Chamfer

Faccette

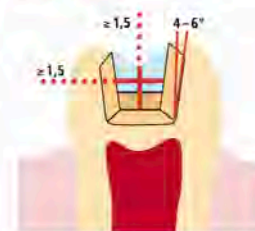


- La preparazione deve possibilmente avvenire nello smalto.
- Non apportare i limiti di preparazione incisali nelle superfici di abrasione e delle occlusioni dinamiche.
- Ridurre in zona cervicale di min. 0,3 mm, in zona labiale di min. 0,6 mm ed il bordo incisale di min. 0,6 mm.

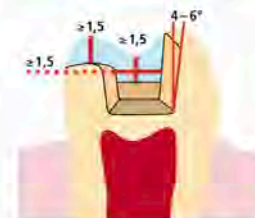


- Nella preparazione con incassatura oro-incisale del bordo incisale (riduzione labiale/incisale) la profondità di preparazione in zona cervicale ammonta a min. 0,3 mm ed in zona labiale a min. 0,6 mm.
- Il bordo incisale deve essere ridotto di 1,5 mm.
- Lo spessore della riduzione incisale, dipende dalla trasparenza desiderata dello smalto da ricostruire.
- Tanto più trasparente deve essere l'effetto del bordo incisale della faccetta, e tanto maggiore dovrà essere la riduzione. Denti decolorati devono eventualmente essere rifiniti maggiormente.

Inlay / Onlay



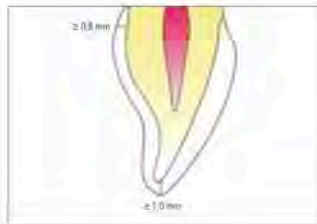
- Considerare i contatti antagonisti statici e dinamici.
- Non realizzare i bordi della preparazione nei contatti centrici con l'antagonista.
- In zona delle fessure, prevedere min. 1,5 mm di profondità di preparazione e min. 1,5 mm di larghezza dell'istmo.
- Realizzare l'incassatura prossimale in forma leggermente divergente (angolo di preparazione 4-6°)
- In caso di superfici prossimali convesse accentuate, senza sufficiente supporto del gradino prossimale, non realizzare contatti delle creste marginali sull'inlay/onlay.
- Arrotondare i bordi interni e le zone di passaggio, per evitare concentrazioni di tensione nel restauro.
- Non effettuare preparazioni Slice-cut o a finire.
- Per gli onlay, in zona dell'incappucciamento delle cuspidi min. 1,5 mm



VITA ENAMIC® Spessori e direttive per la preparazione

Spessori e direttive per la preparazione

Per assicurare il successo clinico di restauri in VITA ENAMIC, vanno osservati i seguenti **spessori minimi**:



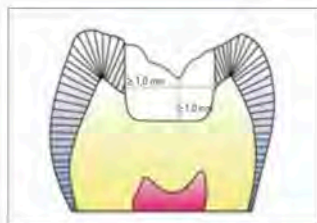
Corone frontali

Incisale: **min. 1,0 mm**
Circolare: **min. 0,8 mm**



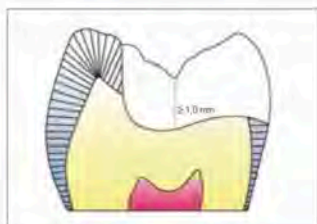
Corone posteriori

Occlusale: **min. 1,0 mm**
Circolare: **min. 0,8 mm**



Inlays

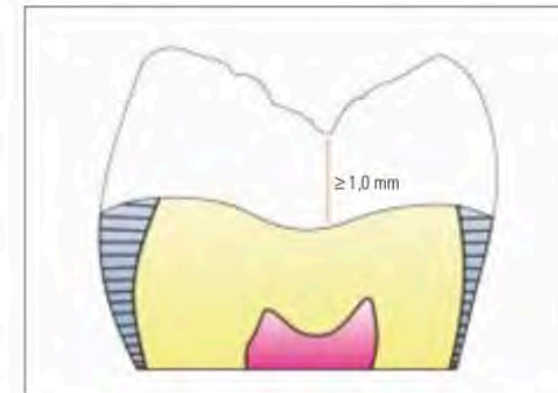
Occlusale: **min. 1,0 mm**
Zona dell'istmo: **min. 1,0 mm**



Onlays

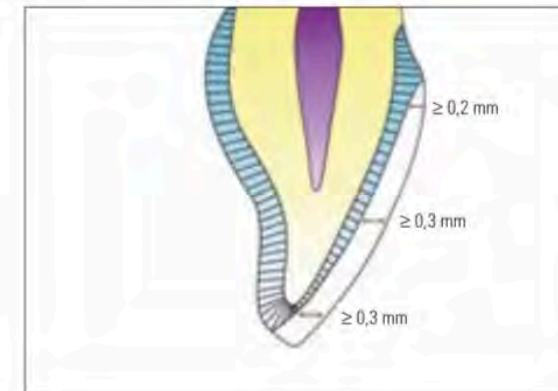
Occlusale: **min. 1,0 mm**

VITA ENAMIC® Spessori e direttive per la preparazione



Tavolati occlusali

Occlusale: **min. 1,0 mm**



Faccette

Incisale: **min. 0,3 mm**
Labiale: **min. 0,3 mm**
Cervicale: **min. 0,2 mm**

VITA YZ[®] T / VITA YZ[®] HT – Configurazione della struttura

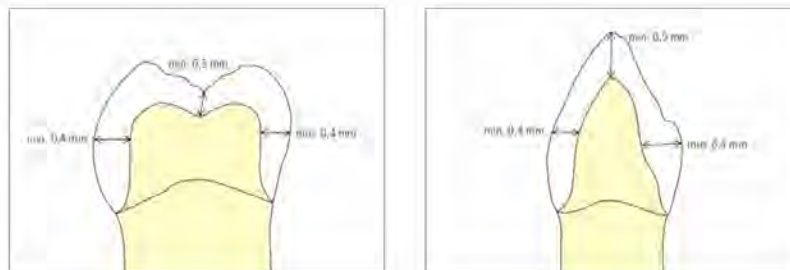
Per garantire un successo clinico di lungo periodo dei restauri in VITA YZ T e VITA YZ HT attenersi assolutamente agli spessori minimi delle pareti sia per restauri completamente anatomici che ridotti.
Evitare spigoli vivi sulle strutture.

Configurazione della struttura per restauri con rivestimento estetico



- Forma anatomica ridotta
- Sostegno della cuspidè (seguendo l'andamento anatomico)
- Spessore del rivestimento estetico max. 2 mm

Configurazione di restauri completamente anatomici



VITA YZ[®] T / VITA YZ[®] HT – Avvertenze per la preparazione

La preparazione può essere effettuata con becco di flauto o a spalla con angolo interno arrotondato. L'angolo di preparazione verticale deve essere di min. 3°. Tutti i passaggi dalle superfici assiali a quelle occlusali o incisali devono essere arrotondati.
Sono auspicabili superfici uniformi e lisce.

Per ulteriori indicazioni sulle direttive per la preparazione consultare la brochure „Aspetti clinici“ Nr. 1696.



Preparazione a spalla o a becco di flauto



Preparazione tangenziale - controindicata

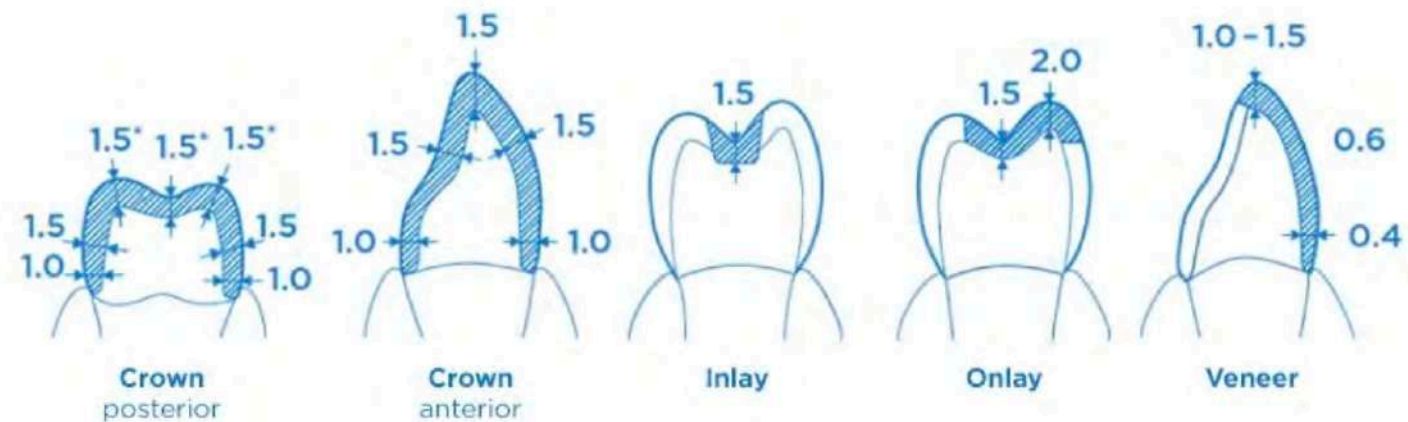


Preparazione a becco di flauto scorretta - controindicata

Dentsply Sirona - Celtra Duo

Preparing Celtra Duo (ZLS)

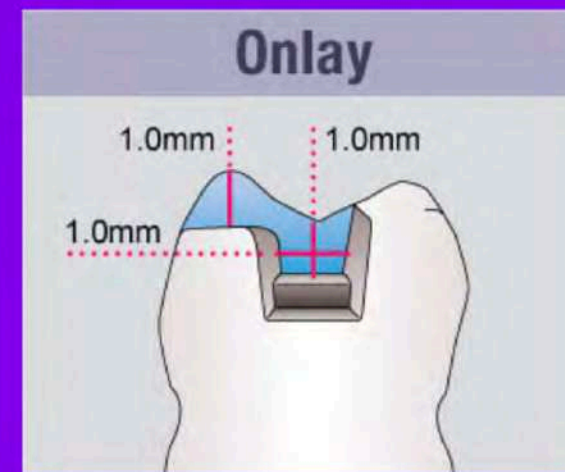
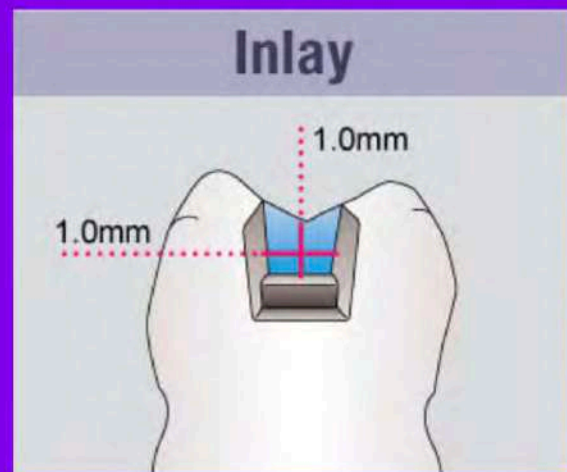
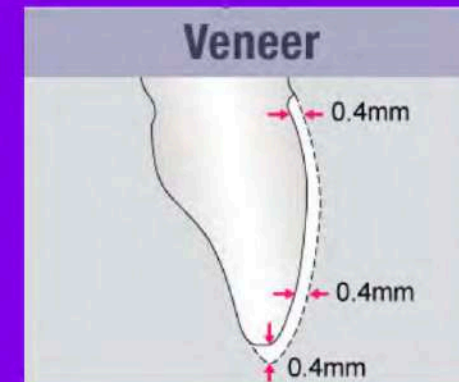
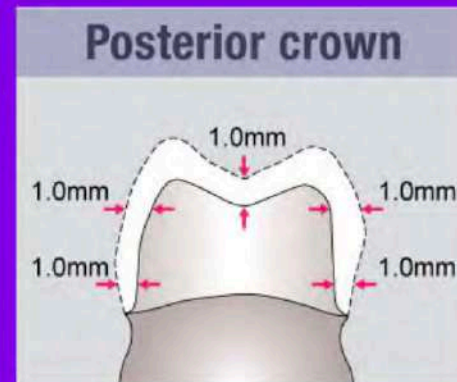
The preparation requirements of Celtra Duo (ZLS) are similar to other all-ceramic restorations. Clinicians should aim for 1.5mm to 2mm of occlusal reduction with at least 1mm of axial reduction.



As with all CEREC restorations, the margins are the most critical part of the preparation and should be smooth and polished. Any milled restoration requires smooth polished margins so that the milling unit can adequately mill Celtra Duo (ZLS) restorations with ease.

MINIMIZING WALL THICKNESS

As an all-ceramic option, zirconia has excellent mechanical properties. KATANA™ Zirconia Block, a highly translucent form of zirconia, has better mechanical properties than LS glass. This means that it is possible by using KATANA™ Zirconia Block to design a thinner restoration than those that can be fabricated using LS glass. This results in both great mechanical properties and beautiful esthetics, with no compromise!

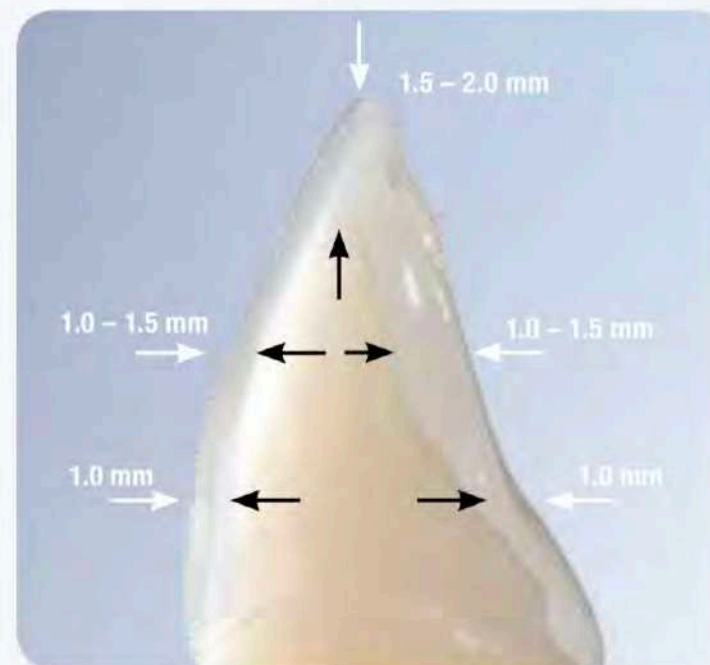


3m Lava

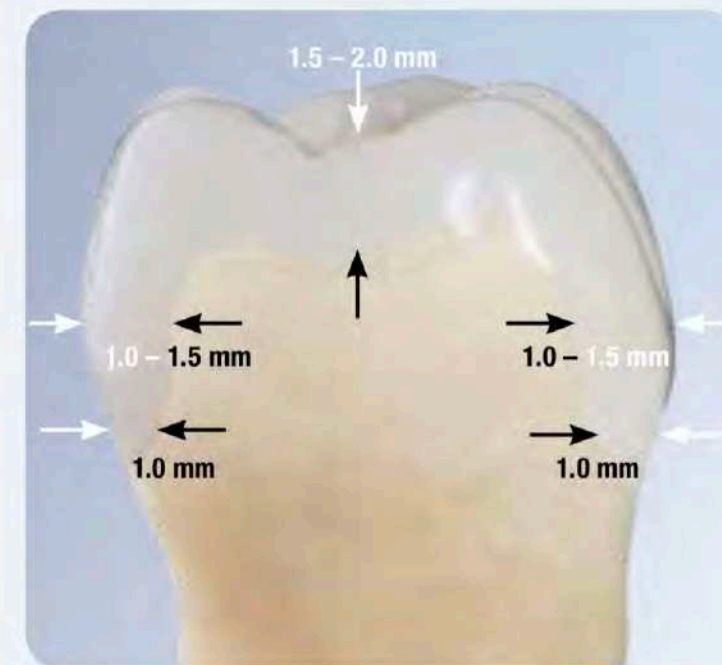
La preparazione ideale: a spalla o a chamfer?

È sufficiente una riduzione della struttura dentale basata sulle dimensioni indicate di seguito. Raccomandiamo una matrice della situazione clinica iniziale al fine di controllare il progredire della preparazione del dente. Idealmente, la preparazione include una spalla arrotondata o un chamfer con angolo orizzontale di almeno 5°. L'angolo di preparazione verticale dovrebbe essere di almeno 4°. L'angolo interno della preparazione a spalla deve avere un contorno arrotondato. Tutti i bordi occlusali e incisali devono essere arrotondati.

L'estremità marginale della preparazione ha bisogno di essere continua e chiaramente visibile. Si deve evitare il bisello.



Preparazione raccomandata per denti anteriori.



Preparazione raccomandata per denti posteriori.

Fotografia creata da
Dr. Carlos Eduardo Sabrosa,
Rio de Janeiro, Brasile.

Labiale

- Riduzione labiale media: 0,5mm
- Rispettare l'andamento vestibolare del contorno dei denti

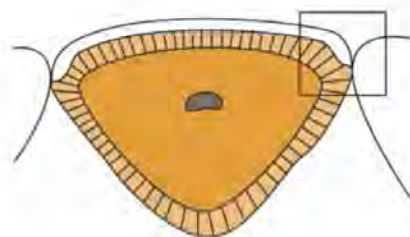


Cervicale

- Spalla leggermente arrotondata o scanalatura parallela al bordo gengivale, andamento sopragengivale

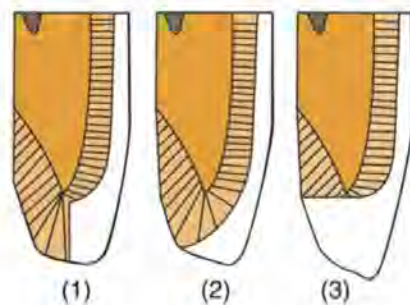
Proximale

- Tendere ai margini prossimali nel senso di una scanalatura
- Cingere il dente con andamento "a forma di sella"
- Se possibile, mantenere i punti di contatto naturali



Incisale

- "Scanalatura" labiale-incisale senza prolungamento (1)
- Una leggera riduzione consente uno strato in ceramica più spesso per una caratterizzazione maggiormente personalizzata (2)
- Per il "prolungamento" spianare il bordo incisale e arrotondare il bordo (3)



Requisiti di un restauro per impronta ottica

Visibile

Asciutto

Con margini netti e puliti

E' comunque importante sottolineare che tutti gli scanner intraorali oggi disponibili sul mercato "registrano ciò che vedono". L'impronta ottica prevede quindi la gestione dei tessuti molli e l'eliminazione dei liquidi orali (sangue, saliva, fluido crevicolare) esattamente come accade per l'impronta tradizionale.

L'IMPRONTA OTTICA IN PROTESI

Accademia Italiana di Odontoiatria Protesica (AIOP) Dott. Carlo Monaco & Dott. Giacomo Ori

Importanza della finitura e lucidatura

- **Usura dell'antagonista**
- **Accumulo di placca**
- **Alterazione del colore e/o traslucenza del restauro**
- **Distacco del restauro (perdita di adesione)**
- **Resistenza alla frattura del restauro**
- **Discomfort**

The effect of glazed and polished ceramics on human enamel wear.

Christof J. Jansen, J. M. van't Hof-Grootenboer

Author information

Abstract
This in vitro study compared the effect of glazed and polished dental ceramics on the wear of human enamel. Five specimens were tested under standard test after 150,000 and 300,000 simulated chewing cycles. Wear was determined from collected digital data and analyzed before and after testing. Statistical comparisons were analyzed. Polished ceramics produced less enamel wear. The amount of enamel area for opposing IPS Empress ceramics was significantly higher ($p < .021$) than wear provided by the other ceramics. The enamel wear rate was higher at the first 150,000 cycles, and polishing increased ceramic roughness, except for the IPS Empress ceramic. Polishing of dental ceramics at the contact area decreases test, prognostic enamel wear.

DOI: 10.1177/0309309916666666

Keywords: dental ceramics, wear, polishing, enamel, enamel wear

The influence of surface roughness and surface-free energy on supra- and subgingival plaque formation in man. A review of the literature.

Samuel J. Watts, D.D.

Author information

Abstract
In the oral cavity, an open growth system, bacterial adhesion on the non-shedding surfaces is the most effective the only way to survive. This adhesion occurs in 4 phases: the transport of the bacterium to the surface, the total adhesion with a reversible and irreversible stage, the attachment by specific interactions, and finally the colonization in order to form a biofilm. Different host surfaces are available in the oral cavity (teeth, filling material, dental implants, or prostheses), all with different surface characteristics. In a healthy situation, a dynamic equilibrium exists on these surfaces between the forces of retention and those of removal. However, an increased bacterial accumulation often results in a oral cavity disease, if a bacterium flourishes in the presence of dental plaque, adhesion and stagnation. The aim of this review is to examine the influence of the surface roughness and the surface free energy in the adhesion process. Both in vitro and in vivo studies underline the importance of both variables in supra- and subgingival plaque formation. Rough surfaces and concrete plaque formation and maturation, and high-energy surfaces are shown to attract more plaque. In fact, the plaque sticks strongly and is almost specific bacteria. Although both variables interact with each other, the influence of surface roughness overrules that of the surface free energy. For the subgingival environment, soft-tissue barriers for microorganisms to penetrate the importance of surface characteristics eventually decreases. However, the influence of surface roughness and surface-free energy on subgingival plaque buildup the demand for smooth surfaces with a low surface free energy in order to minimize plaque formation, thereby reducing the occurrence of caries and periodontitis.

DOI: 10.1177/0309309916666666

Keywords: plaque, surface roughness, surface free energy

Effect of finishing condition on fracture strength of monolithic ceramic crowns.

Yusuf Altun, Mustafa Altun

Author information

Abstract
The main aim is to evaluate the best polishing method of monolithic dental ceramic crowns, and the effect of surface finishing properties strength. In this in vitro study, two different groups (polished by diamond spray and polished by water abrasive) were analyzed by surface roughness testing, and 3-ray ultrasonic (3RU) test. The control crown was fabricated in groups corresponding to different surface treatments and mechanical stress measurements (specimens subjected to uniaxial 1 kg for 1 mm). Specimens studied were at 37°C for 24 h. There is the typical surface using 3RU ultrasonic apparatus (3RU-3000). The testing conditions were carried out. Fracture was performed manually. The groups finished fracture strength after polishing. This suggests the maximum strength can be achieved by polishing the polished process. However, the fracture strength increases with surface roughness (p < .05).

Keywords: crown, design, ceramic, stress, finishing, crown, fracture, strength

DOI: 10.1177/0309309916666666

In vitro wear behavior of alumina opposing enamel: a systematic review.

Samuel J. Watts, D.D., J. M. van't Hof-Grootenboer

Author information

Abstract
The aim of this systematic review was to determine whether enamel wear opposing alumina (including zirconia) ceramic dental restorations is associated with increased supra- and subgingival plaque formation. The search was conducted using PubMed, Cochrane, Embase, and Scopus. The search terms used were "enamel wear", "alumina", "ceramic", "enamel", "wear", and "abrasion". The search was limited to English language articles published between 1980 and 2015. The search was limited to human studies. The search was limited to in vitro studies. The search was limited to studies that used a standardized wear test. The search was limited to studies that used a standardized wear test. The search was limited to studies that used a standardized wear test.

Keywords: alumina, enamel, wear, abrasion, plaque, formation, supra- and subgingival

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Keywords: alumina, enamel, wear, abrasion, plaque, formation, supra- and subgingival

DOI: 10.1177/0309309916666666

Keywords: plaque, surface roughness, surface free energy

Effect of surface finishing on the colour stability and translucency of dental ceramics.

Christof J. Jansen, J. M. van't Hof-Grootenboer

Author information

Abstract
BACKGROUND: The purpose of this study was to investigate the effects of staining solutions and surface finishing on the colour stability and translucency of light ceramic (LC) and resin composites (RC) restorations.

METHODS: Twenty four groups consisting of 10 specimens (240 specimens in total) were created out of LC and RC, including six groups to be stored in distilled water versus the staining groups. The Vita Chroma technical set, GSK's pigments, medium and fine filler shades and Sof-Lex polishing discs were used as staining instruments. Cup, tea, and coffee were used as staining solutions. The colour differences (ΔE) and translucency parameter (TP) were evaluated by a spectrophotometer. Data were analyzed by a One-way Analysis of Variance (ANOVA) and Mann-Whitney U test.

RESULTS: There was a statistically significant difference between the ΔE^{ab} values of the LC specimens in the coffee groups and the ΔE^{ab} values of the RC groups ($p = 0.02$). The ΔE^{ab} values of the RC specimens in the coffee and tea groups were significantly lower than the specimens in the water groups ($p = 0.00$). The TP values of the polymer groups were higher than the Sof-Lex groups and the Sof-Lex groups in both LC and RC materials ($p < 0.00$).

CONCLUSIONS: Increased ΔE^{ab} values were observed in RC specimens stored in a coffee solution compared to the specimens stored in a tea or water solution. Both of the RC specimens stored in coffee and tea had higher ΔE^{ab} values than the LC specimens stored in the water. The TP values of both LC and RC specimens stored in the coffee solution increased.

Keywords: dental, colour, staining, surface, finishing, translucency

DOI: 10.1177/0309309916666666

Keywords: plaque, surface roughness, surface free energy

The Effect of Surface Treatment on Shear Bond Strength between F-TSP and Versar Ceramic: A Systematic Review and Meta-Analysis.

Samuel J. Watts, D.D., J. M. van't Hof-Grootenboer

Author information

Abstract
The aim of this systematic review was to determine whether enamel wear opposing alumina (including zirconia) ceramic dental restorations is associated with increased supra- and subgingival plaque formation. The search was conducted using PubMed, Cochrane, Embase, and Scopus. The search terms used were "enamel wear", "alumina", "ceramic", "enamel", "wear", and "abrasion". The search was limited to English language articles published between 1980 and 2015. The search was limited to human studies. The search was limited to in vitro studies. The search was limited to studies that used a standardized wear test. The search was limited to studies that used a standardized wear test.

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Keywords: alumina, enamel, wear, abrasion, plaque, formation, supra- and subgingival

DOI: 10.1177/0309309916666666

Keywords: plaque, surface roughness, surface free energy

Grinding damage assessment for CAD-CAM restorative materials.

Samuel J. Watts, D.D., J. M. van't Hof-Grootenboer

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Abstract
OBJECTIVES: To assess surface/subsurface damage after grinding with diamond discs on five CAD-CAM restorative materials and to estimate potential losses in strength based on crack size measurements of the generated damage.

METHODS: The materials tested were: Lithium disilicate (LIT) glass-ceramic (e.max CAD), leucite glass-ceramic (LEU) (Empress CAD), feldspar ceramic (VM2) (Vita Mark II), feldspar ceramic-resin infiltrated (EN) (Enamic) and a composite reinforced with nano ceramics (LU) (Lava Ultimate). Specimens were cut from CAD-CAM block and pair-wise mirror polished for the bonded interface technique. Top surfaces were ground with diamond discs of respectively 75, 54 and 18µm. Chip damage was measured on the bonded interface using SEM. Fracture mechanics relationships were used to estimate fracture stresses based on average and maximum chip depths assuming those to represent strength limiting flaws subjected to tension and to calculate potential losses in strength compared to manufacturer's data.

RESULTS: Grinding with a 75µm diamond disc induced on a bonded interface critical chips averaging 100µm with a potential strength loss estimated between 33% and 54% for all three glass-ceramics (LIT, LEU, VM2). The softer materials EN and LU were little damage susceptible with chips averaging respectively 26µm and 17µm with no loss in strength. Grinding with 18µm diamond discs was still quite detrimental for LIT with average chip sizes of 43µm and a potential strength loss of 42%.

SIGNIFICANCE: It is essential to understand that when grinding glass-ceramics or feldspar ceramics with diamond discs surface and subsurface damage are induced which have the potential of lowering the strength of the ceramic. Careful polishing steps should be carried out after grinding especially when dealing with glass-ceramics.

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Keywords: CAD-CAM, Ceramic, Composite, Damage, Fractograph, Grinding, Strength

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Keywords: plaque, surface roughness, surface free energy

Internal adjustments decrease the fatigue failure load of bonded simplified lithium disilicate restorations.

Samuel J. Watts, D.D., J. M. van't Hof-Grootenboer

Author information

Abstract
OBJECTIVE: To investigate the effect of triangle surface adjustment of simplified lithium disilicate systems, restorations adhesively cemented to a dentin-like material on its fatigue behavior.

METHODS: Ceramic discs (IPS e.max CAD) were prepared and an in Lab simulation of machining roughness was performed by grinding with 600 paper (#60). Ceramic chips were divided into 4 groups according to the internal adjustment of the cementation surface: no adjustment (CTRL), adjustment with a margin (M), free (F), or extra free (FF) diamond bur. Dentin-like material discs were also prepared. Ceramic disc triangle surfaces were etched (5% hydrofluoric acid; 20s) and received a silane coating. Dentin-like material discs were etched (10% hydrofluoric acid; 1min) and received a primer coating. Pairs of ceramic/dentin-like material were adhesively cemented (Multibond Adhesive) and fatigue failure load tests were performed using the staircase approach (20,000 cycles; 20Hz). Roughness, topographic and fractographic analyses were performed. Statistical analysis were carried out through ANOVA tests.

RESULTS: All ground groups (M=521.3 N, F=535.9 N, FF=578.2 N) presented lower fatigue failure load values than the control (1241.0 N). H diamond bur created a rougher surface than F (Ra and Rz parameters). However, FF was similar to F and M for Ra, and similar to F for Rz.

SIGNIFICANCE: The adjustments on the triangle surface of simplified lithium disilicate cement restorations greatly decreased the fatigue failure load even using an extra-free diamond bur. Care should be taken when internal adjustments are needed.

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Keywords: accelerated fatigue, CAD/CAM simulation, Clinical adjustment, Mechanical behavior, Material restorations, Staircase method

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Keywords: plaque, surface roughness, surface free energy

Polishing effects and wear performance of chairside CAD/CAM materials.

Youssef M¹, Sabah A², Hani A³, Youssef M⁴

✉ Author information

Abstract

OBJECTIVES: To investigate the surface roughness of CAD/CAM materials immediately after milling and after different abrasive and abrasive polishing procedures. A two-body wear test was performed to compare the different wear characteristics of the materials and the corresponding antagonists.

MATERIALS AND METHODS: Sixty-two (n = 12 per material) from different CAD/CAM resins (three composites: Core Ultra, Conquest, BELLUXY; Glass ion hybrid ceramic: VITA Enamic; three zirconia: Celux Duo, VITA Suprinity, IPS-E max CAD) were polished according to the manufacturer's instructions. The effect of different polishing procedures was investigated by comparing surface roughness (Ra, Rmax) after abrasive polishing and after chairside polishing. Wear behavior (mass, volume, and maximum wear) of specimens and antagonists as well as changes in surface roughness were determined in a pin-on-block wear test. Statistical analysis was performed with a one-way analysis of variance (ANOVA) followed by multiple-comparison post hoc test and a multivariate ANOVA/Tukey's significant difference post hoc test ($\alpha = 0.05$). SEM micrographs were used for the qualitative evaluation of surfaces and wear traces.

RESULTS: After abrasive high-gloss polishing, ceramics and composites exhibited Ra values between 0.08 and 0.16 μ m and between 0.11 and 0.15 μ m, respectively. After chairside high-gloss polishing, values varied between 0.02 and 0.09 μ m for composites and between 0.06 and 0.16 μ m for resin composites. No significant differences were found between labials and chairside pre- and high-gloss polishing. For the ceramics, lower mean wear depths between -102.2 \pm 10.0 μ m and -107.3 \pm 10.0 μ m were identified compared to the resin composites (who exhibited wear depths between -103.1 \pm 18.4 and -170.3 \pm 23.9 μ m). For maximum wear depth and volume, a difference ranking of the materials was found. Antagonistic wear varied between -12.0 \pm 0.4% and 30.0 \pm 0.9% and was higher for the ceramic oxidized and glass Ultraform. For all materials, a roughness between 0.20 and 2.76 μ m (Ra) was identified after wear procedure.

CONCLUSIONS: Chairside polishing is as effective as abrasive polishing, although surfaces were directly exposed (roughened) only before the chairside polishing. Wear was lowest for ceramics, followed by the resin-infiltrated resins and the resin composites.

CLINICAL RELEVANCE: Polishing after milling or adjustment is essential to guaranteeing optimal clinical performance. Chairside polishing after adjustment leads to comparably smooth surfaces as abrasive polishing after milling and grinding. Clinicians are expected to extend wear wear time resin composites under clinical conditions.

KEYWORDS: CAD/CAM; Ceramic; Damage; Defect; Different abrasive; Different abrasive; Polishing; Wear composite; Resin-infiltrated resins; Wear; Zirconia-infiltrated resins

10.1016/j.jmb.2017.05.003

Fatigue strength of yttria-stabilized zirconia polycrystals: Effects of grinding, polishing, glazing, and heat treatment.

Zouari CP¹, Gualtieri LF², Ricci MP², Roveda GCR⁴, Valente LF⁵.

✉ Author information

Abstract

This study aimed to evaluate and compare the effect of different surface post-processing treatments (polishing, heat treatment, glazing, polishing + heat treatment and polishing + glazing) on the superficial characteristics (micromorphology and roughness), phase transformation and fatigue strength of a Y-TZP ceramic ground with diamond bur. Discs of Y-TZP ceramic were manufactured (ISO:6872-2015; final dimensions of 15mm in diameter and 1.2 \pm 0.2mm in thickness) and randomly allocated according to the surface condition: Ctrl - as-sintered; Gr - ground with coarse diamond bur; Gr+HT - ground and subjected to the heat treatment; Gr+Pol - ground and polished; Gr+Pol+HT - ground, polished and heat treated; Gr+Gl - ground and glazed; Gr+Pol+Gl - ground, polished and glazed. The following analyses were performed: roughness (n = 25), surface topography (n = 2), phase transformation (n = 2) and fatigue strength by staircase method (n = 20). All treatments influenced to some extent the surface characteristics of Y-TZP, being that polishing reduced the surface roughness, the m-phase content and improved the fatigue strength; glazing led to the lowest roughness values (Ra and Rz), although it showed the worst fatigue strength; heat treatment showed limited effect on surface roughness, led to complete reversion of the existing m-phase content to t-phase, without enhancing fatigue performance. Thus, a polishing protocol after clinic adjustment (grinding) of monolithic restorations based on polycrystalline zirconia material is mandatory for surface characteristics and fatigue performance improvements.

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KEYWORDS: Anesthetics; Dental ceramic; Glazing; Grinding; Zirconium oxide partially stabilized by yttrium

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Wear behavior of dental Y-TZP ceramic against natural enamel after different finishing procedures.

Wang S¹, Zhou J², Zhou K³, Zhou M⁴, Zhou J⁵, Zhou J⁶

✉ Author information

Abstract

OBJECTIVE: The aim of this in vitro study was to evaluate the influence of different finishing procedures on the wear behavior of zirconia against natural enamel.

METHODS: Sixty-four specimens (16 mm \times 16 mm \times 2 mm) were divided into four experimental groups based on Y-TZP ceramic. Four different groups with 16 specimens each were formed according to the following finishing procedures: P1 (smooth), P2 (rough), P3 (smooth), and P4 (smooth). The specimens were divided into four groups: P1 (smooth), P2 (rough), P3 (smooth), and P4 (smooth). The specimens were subjected to the four-body wear method (ASTM G154) against natural enamel. The wear test was performed with specimens by measurement of the vertical distance loss with a wear tester. Surface roughness was measured by means of a white-light interferometer.

RESULTS: The surface roughness was significantly different among the polished, smooth-finished, and glazed ceramic specimens (ANOVA, post hoc Bonferroni, $p < 0.05$). The results of the one-way ANOVA indicated that the finishing procedure significantly affected enamel wear ($p < 0.05$). The post hoc test indicated that the specimens finished with the rough diamond showed significantly higher antagonistic wear than the polished ones. Polished groups showed the lowest wear of the antagonistic enamel, with a mean value of 111.14 (SD = 121.96), and resulted in enamel wear that was not significantly different from that of the glass ceramic finish group. The significant linear correlation (due to four) between pre-testing surface roughness and enamel wear.

CONCLUSIONS: It is crucial to avoid either over-polishing or coarse and lead dental procedures (P2), the surface must be well polished if clinical adjustment with coarse diamonds is performed. The polishing step reduces the wear of the opposing enamel.

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Three-body wear potential of dental yttrium-stabilized zirconia ceramic after grinding, polishing, and glazing treatments.

Abdel H¹, Hani A², Hani A³, Sabah A⁴

✉ Author information

Abstract

STATEMENT OF PROBLEM: Zirconia complete-coverage crowns are being widely used as restorations because of their improved esthetic characteristics. Data about the enamel wear potential of this ceramic after chair side adjustments are sparse.

PURPOSE: The purpose of this study was to investigate the 3-body wear of enamel opposing 3 types of ceramic (dense sintered yttrium-stabilized zirconia; Crystal Zirconia; DLMS) (Z), a lithium disilicate (IPS e-max CAD; Ivoclar Vivadent) (E), and a conventional low-fusing feldspathic porcelain (VitaVMK-Master; Vita Zahnfabrik) (P), treated to impart a rough, smooth, or glazed surface.

MATERIAL AND METHODS: Twenty-four specimens of each of the zirconia and the lithium disilicate ceramic were sectioned from computer-aided design and computer-aided manufacturing blocks into rectangular plates (15 \times 12 \times 2 mm). Twenty-four specimens of the feldspathic porcelain were formed into disks (12 mm diameter) from powders compressed in a silicone mold. All specimens (n = 72) were prepared according to the manufacturers' recommendations. Specimens of each ceramic group were placed into 1 of 3 groups: group R, rough surface finish; group S, smooth surface finish; and group G, glazed surface finish. A total of 9 groups with 8 specimens each were placed in a 3-body wear simulator, with standardized enamel specimens (n = 72) acting as the substrate. The wear of the enamel specimens was evaluated after 50,000 cycles. The data were analyzed with 2-way ANOVA and the Tukey HSD multiple comparison test ($\alpha = 0.05$).

RESULTS: The data showed that the smooth zirconia group (ZS) was associated with the least amount of enamel wear (1.26 \pm 0.55 mm(2)). The most antagonistic enamel wear was associated with the glazed groups ZG (5.58 \pm 0.66 mm(2)), EG (3.29 \pm 1.29 mm(2)), and PG (4.2 \pm 1.27 mm(2)).

CONCLUSIONS: The degree of enamel wear associated with monolithic zirconia was similar to conventional feldspathic porcelain. Smoothly polished ceramic surfaces resulted in less wear of antagonistic enamel than glazing.

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Surface roughness of chairside-based Y-TZP ceramic after heat treatment.

Zouari CP¹, Gualtieri LF², Ricci MP², Roveda GCR⁴, Valente LF⁵

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Materiali e metodi

Sono stati fresati, con lo stesso progetto, sei differenti blocchetti. I campioni, trattati come da protocollo, sono stati divisi in tre parti: mesio-vestibolare, disto vestibolare e palatale. Le superfici sono state trattate con diverse frese e gommini. Le misurazioni sono state eseguite con un rugosimetro Alicona Infinite Focus, presso il laboratorio di Komet Dental a Lemgo in Germania

La parte disto-vestibolare è stata trattata utilizzando frese del commercio, in un singolo passaggio, cercando di utilizzare una granulometria quanto più adeguata al materiale in esame, mentre la parte mesio-vestibolare è stata trattata con il protocollo del Komet Digital Prosthetic Essential Kit (Ref. 4685).

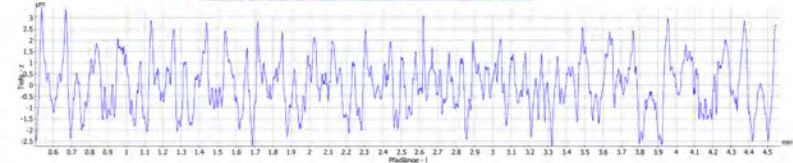
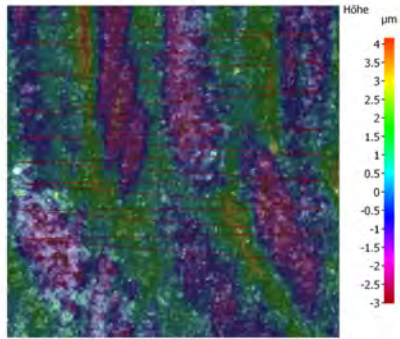
La superficie palatale, non trattata con frese, è stata usata per il controllo.

Questo studio è stato realizzato in singolo cieco in quanto il laboratorio tedesco non era a conoscenza né dei materiali esaminati né di come fossero state trattate le superfici.



Messprotokoll Profilmessung

Probe A-1 partical treatment_x50



Ra: 0.957µm
Rq: 1.172µm
Rz: 5.566µm

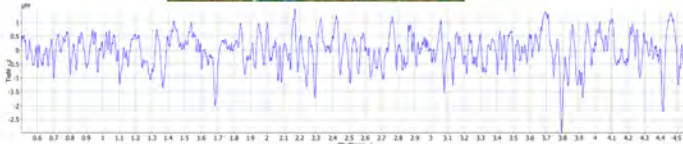
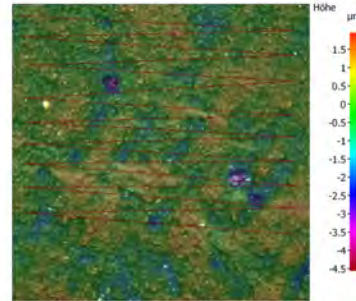
Filter:

Hochpass - Rauheitsprofil
Lc:= 800.000µm



Messprotokoll Profilmessung

Probe A-1 palatinal_x50



Ra: 0.452µm
Rq: 0.587µm
Rz: 3.079µm

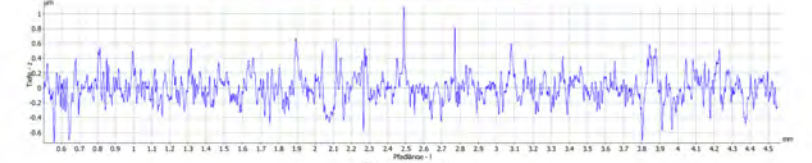
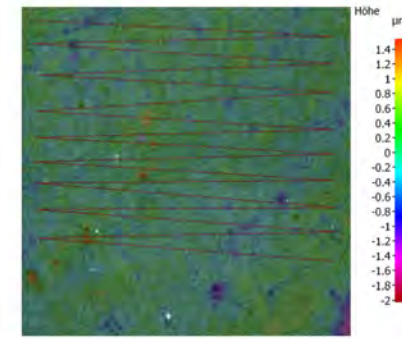
Filter:

Hochpass - Rauheitsprofil
Lc:= 800.000µm



Messprotokoll Profilmessung

Probe A-1 complete treatment_x50



Ra: 0.145µm
Rq: 0.193µm
Rz: 1.271µm

Filter:

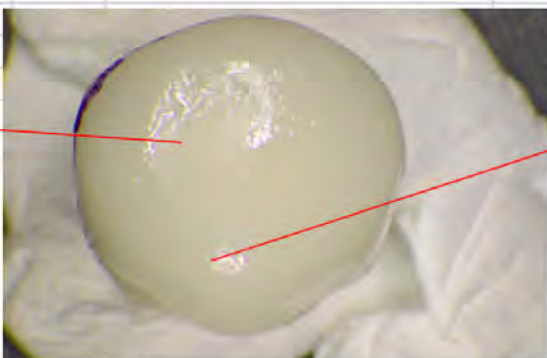
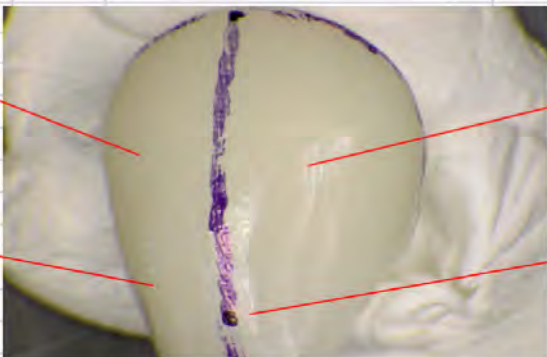
Hochpass - Rauheitsprofil
Lc:= 800.000µm

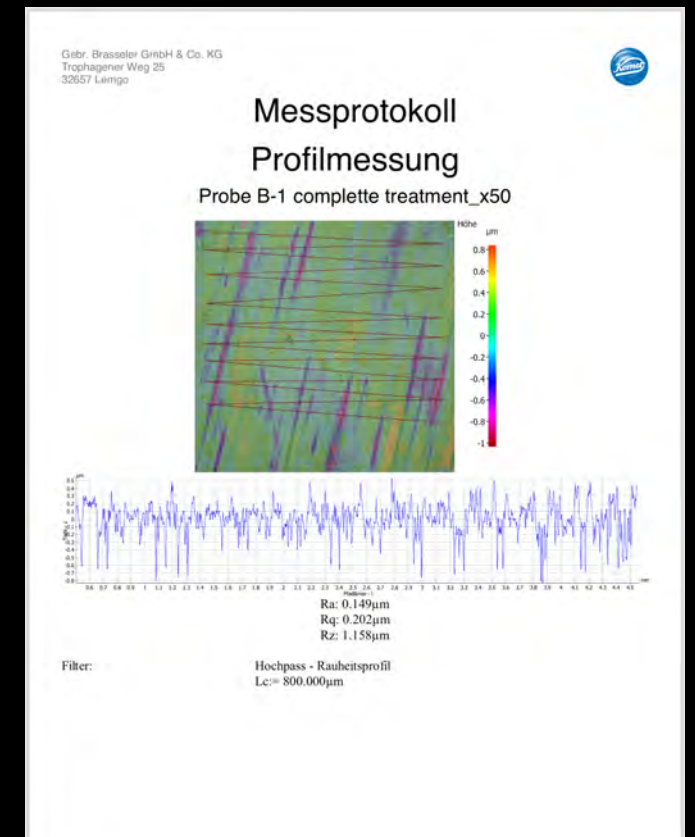
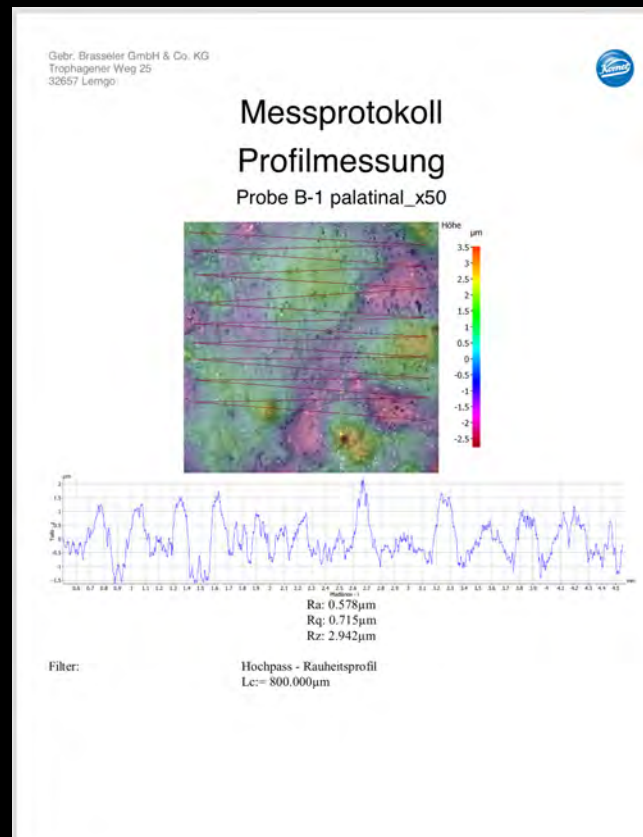
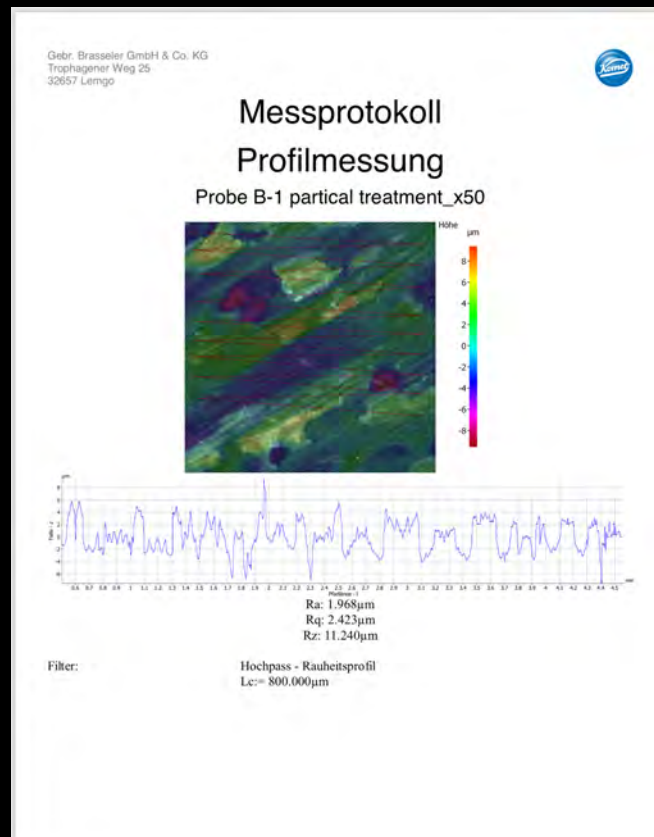
VITA Enamic



Probe A**Probe B****Probe C****Probe D****Probe E****Probe F**

Probe A			
Nr.	Benennung	Rz Ergebnis [µm]	Sonstiges
1	Probe A-1 partical treatment	5,6	grobe Oberfläche
2	Probe A-2 partical treatment	6,5	grobe Oberfläche
3	Probe A-1 complete treatment	1,3	-
4	Probe A-2 complete treatment	1,4	-
5	Probe A-1 palatinal	3,1	bearbeitete Fläche?
6	Probe A-2 palatinal	4,4	starker Glanz





Ivoclar E.Max



Probe A

Probe B

Probe C

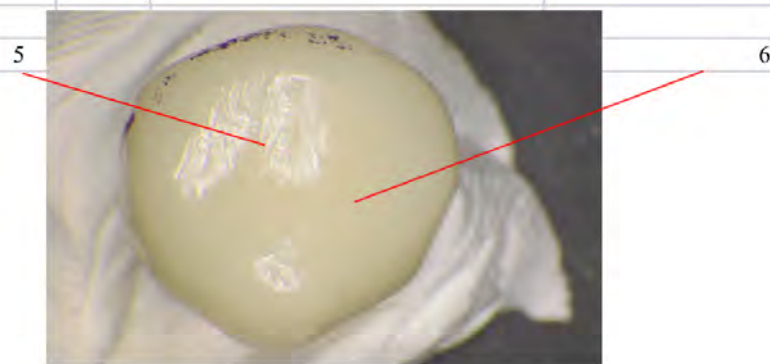
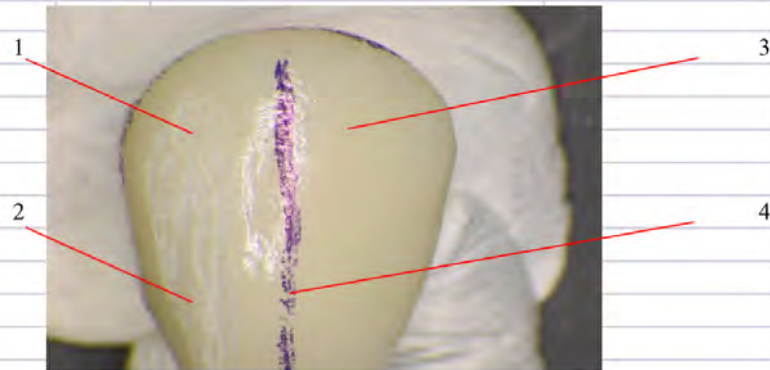
Probe D

Probe E

Probe F

Probe B

Nr.	Benennung	Rz Ergebniss [μm]	Sonstiges
1	Probe B-1 partical treatment	11,2	grobe Oberfläche
2	Probe B-2 partical treatment	10,9	grobe Oberfläche
3	Probe B-1 complete treatment	1,2	-
4	Probe B-2 complete treatment	1,0	-
5	Probe B-1 palatinal	2,9	-
6	Probe B-2 palatinal	2,4	-

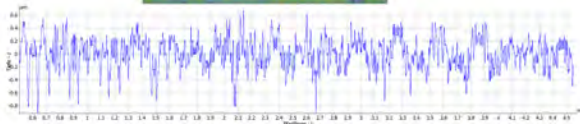
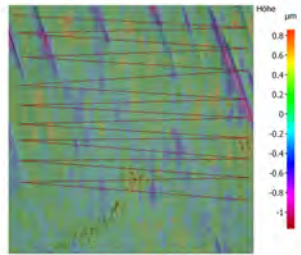


R



Messprotokoll Profilmessung

Probe C-1 complete treatment_x50



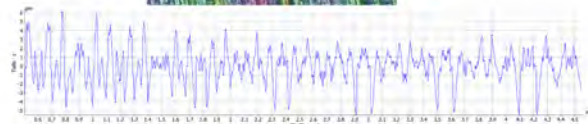
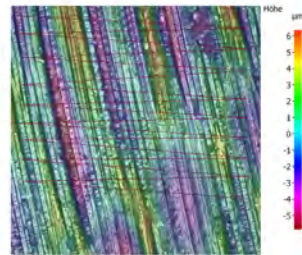
Ra: 0.180µm
Rq: 0.231µm
Rz: 1.363µm

Filter: Hochpass - Rauheitsprofil
Lc:= 800.000µm



Messprotokoll Profilmessung

Probe C-1 partial treatment_x50



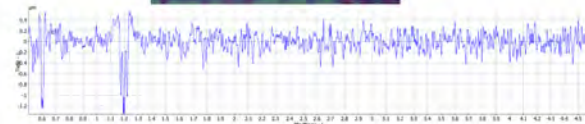
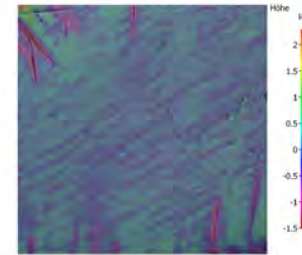
Ra: 1.438µm
Rq: 1.907µm
Rz: 9.356µm

Filter: Hochpass - Rauheitsprofil
Lc:= 800.000µm



Messprotokoll Profilmessung

Probe C-2 complete treatment_x50



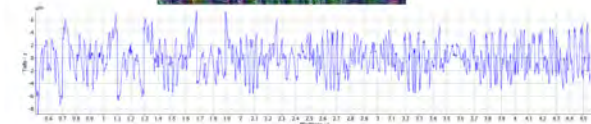
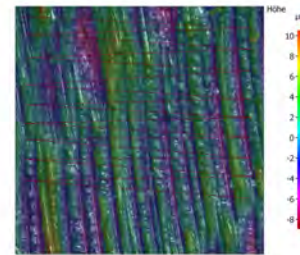
Ra: 0.137µm
Rq: 0.200µm
Rz: 1.064µm

Filter: Hochpass - Rauheitsprofil
Lc:= 800.000µm



Messprotokoll Profilmessung

Probe C-2 partial treatment_x50



Ra: 1.960µm
Rq: 2.480µm
Rz: 12.177µm

Filter: Hochpass - Rauheitsprofil
Lc:= 800.000µm

VOCLAR ZirCAD



Probe A

Probe B

Probe C

Probe D

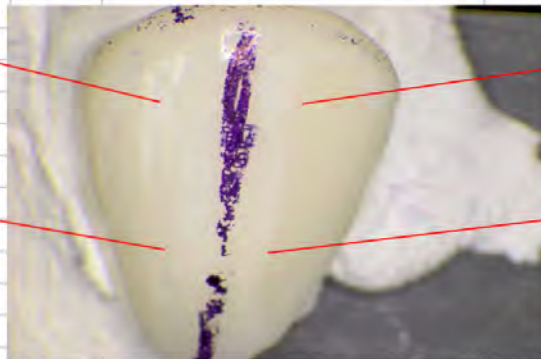
Probe E

Probe F

Probe C

Nr.	Benennung	Rz Ergebnis [μm]	Sonstiges
1	Probe C-1 partical treatment	9,4	tiefe Rillen
2	Probe C-2 partical treatment	12,2	tiefe Rillen
3	Probe C-1 complete treatment	1,4	-
4	Probe C-2 complete treatment	1,1	-
5	Probe C-1 palatinal	nicht messbar	glänzende Oberfläche
6	Probe C-2 palatinal	nicht messbar	glänzende Oberfläche

1

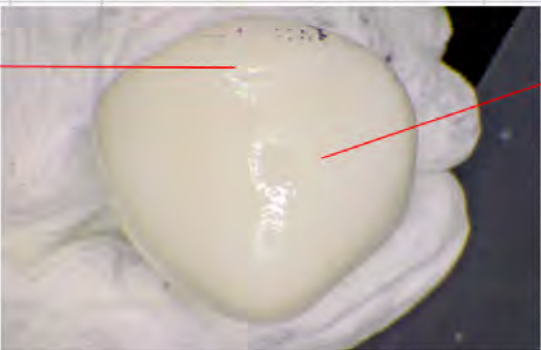


3

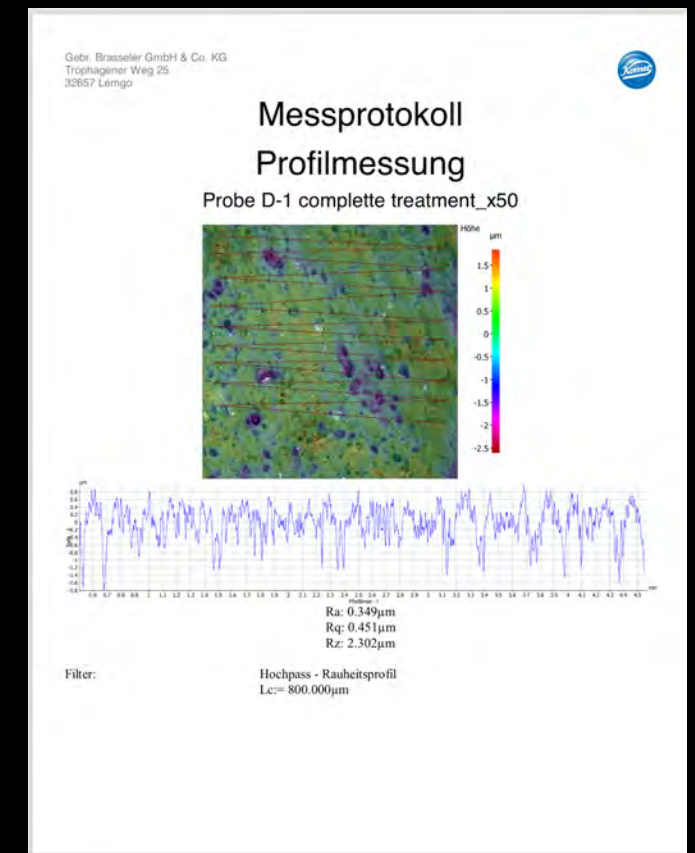
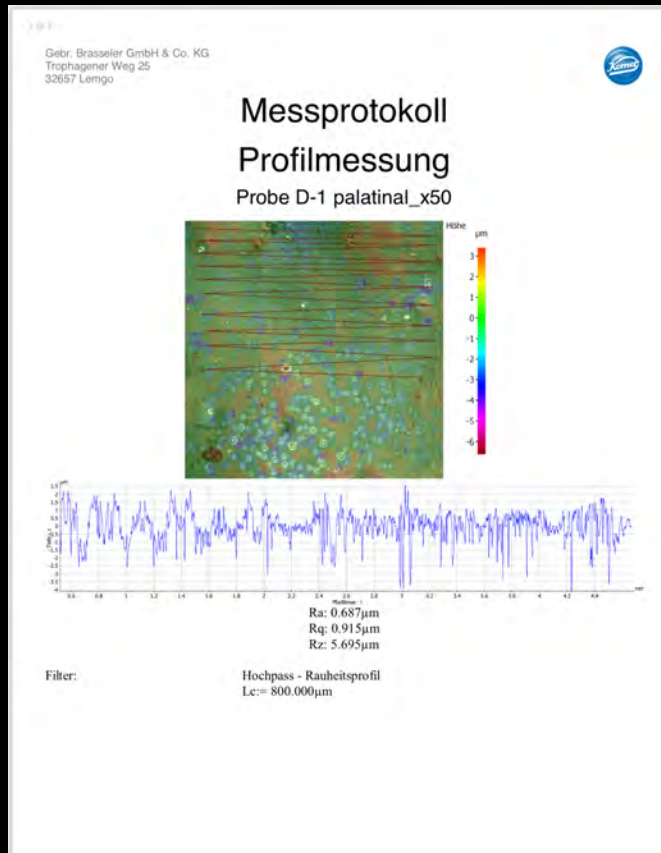
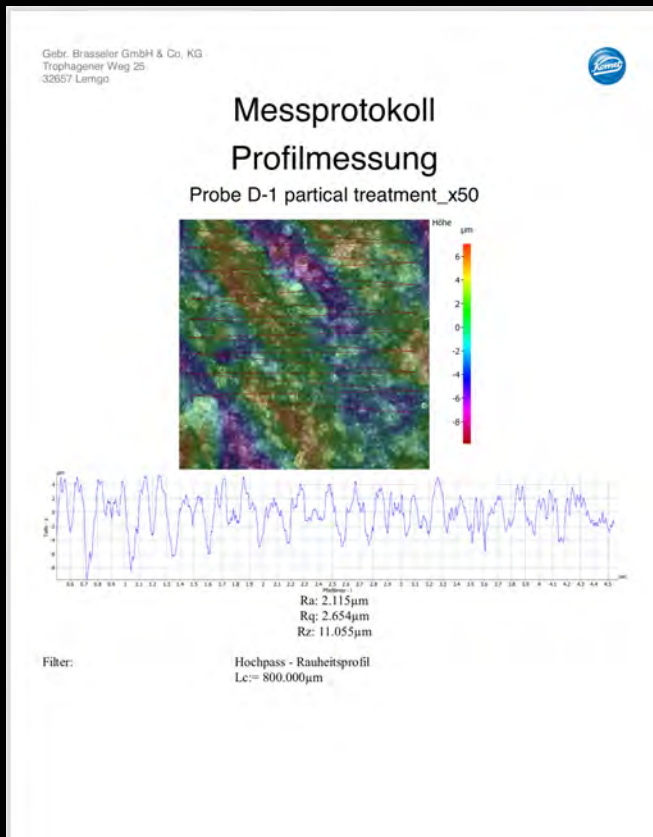
2

4

5



6



GC Initial



Probe A

Probe B

Probe C

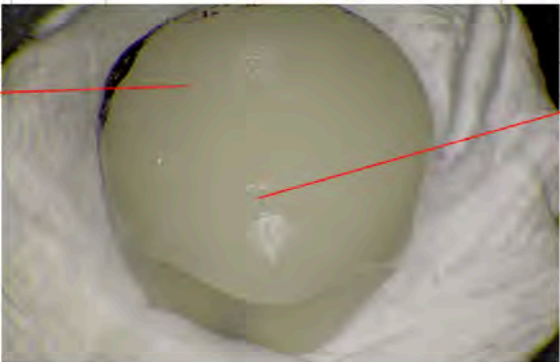
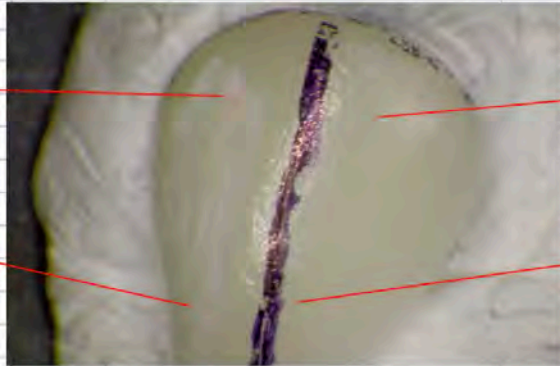
Probe D

Probe E

Probe F

Probe D

Nr.	Benennung	Rz Ergebniss [μm]	Sonstiges
1	Probe D-1 partical treatment	11,1	tiefe Rillen
2	Probe D-2 partical treatment	12,8	grobe Oberfläche
3	Probe D-1 complete treatment	2,3	-
4	Probe D-2 complete treatment	2,0	-
5	Probe D-1 palatinal	5,7	-
6	Probe D-2 palatinal	5,1	-

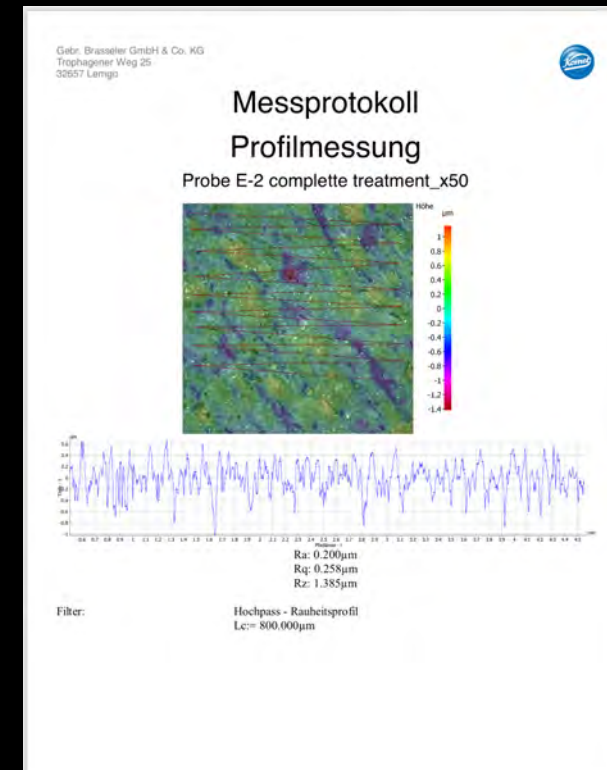
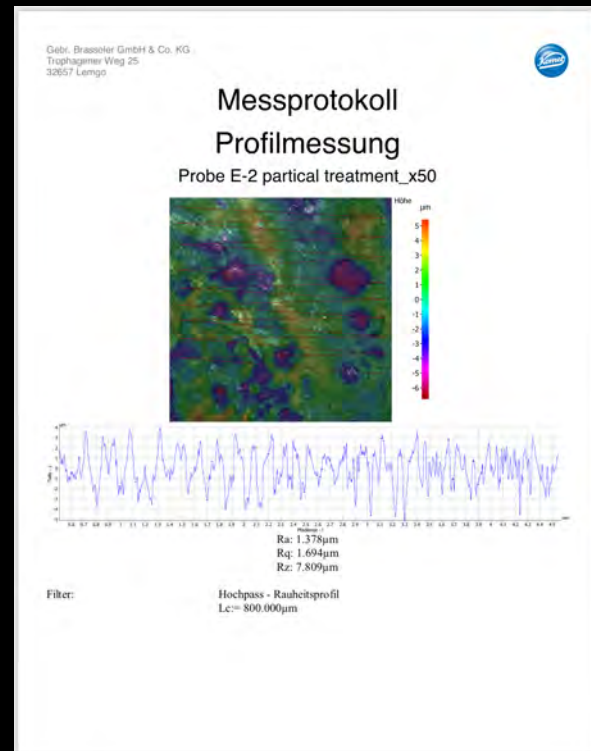


3

4

6

VITA CADtemp



Probe A

Probe B

Probe C

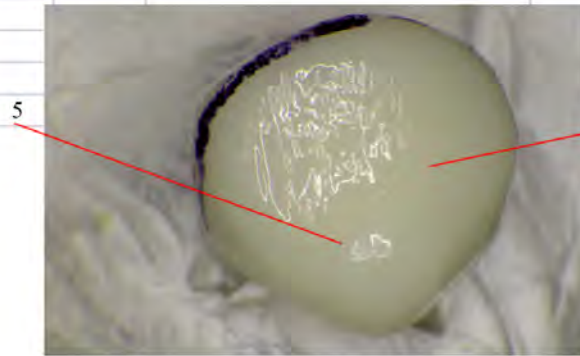
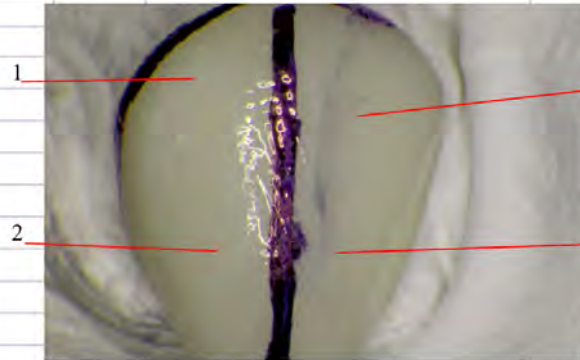
Probe D

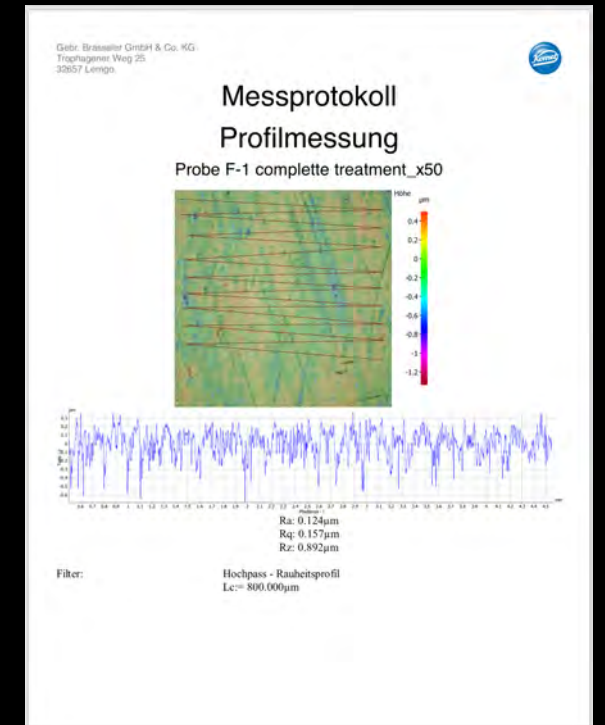
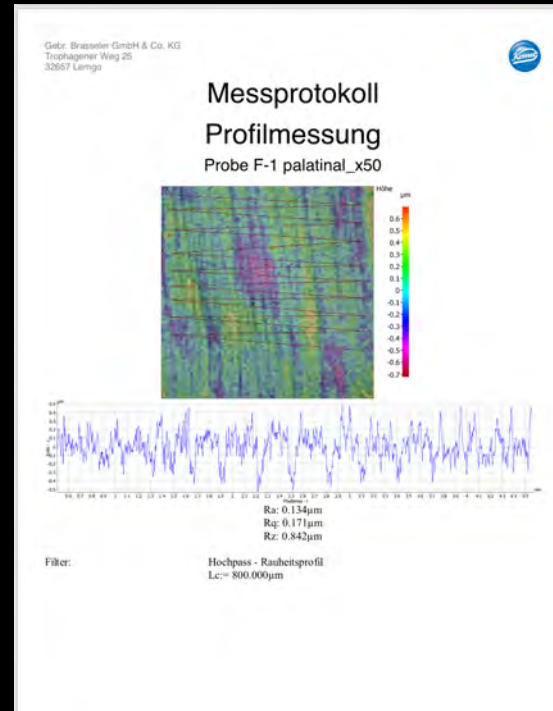
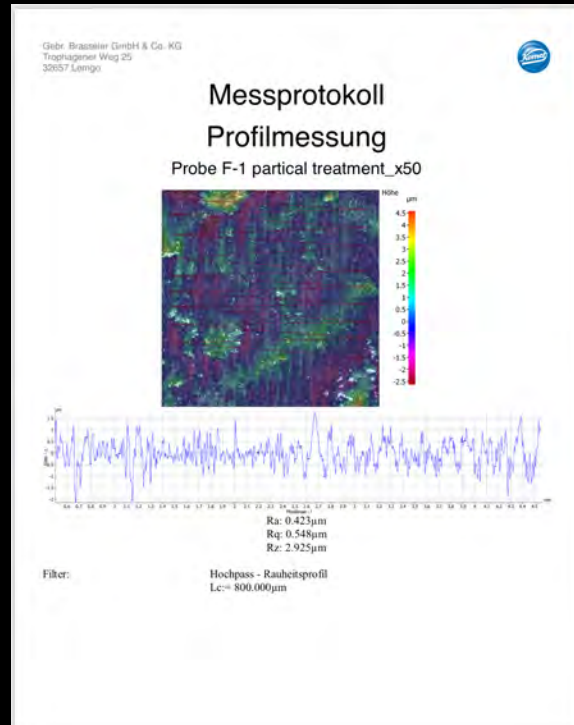
Probe E

Probe F

Probe E

Nr.	Benennung	Rz Ergebniss [μm]	Sonstiges
1	Probe E-1 partical treatment	7,5	grobe Oberfläche
2	Probe E-2 partical treatment	7,8	grobe Oberfläche
3	Probe E-1 complete treatment	1,1	-
4	Probe E-2 complete treatment	1,4	-
5	Probe E-1 palatinal	nicht messbar	glänzende Oberfläche
6	Probe E-2 palatinal	nicht messbar	glänzende Oberfläche





IVOCLAR Tetric



Probe A

Probe B

Probe C

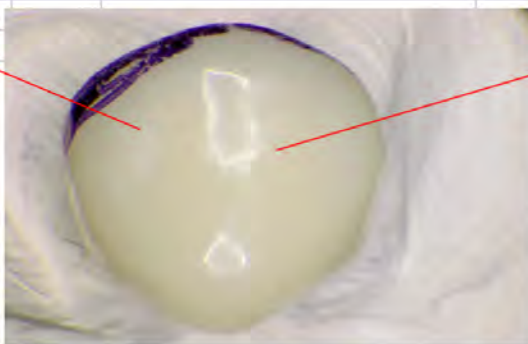
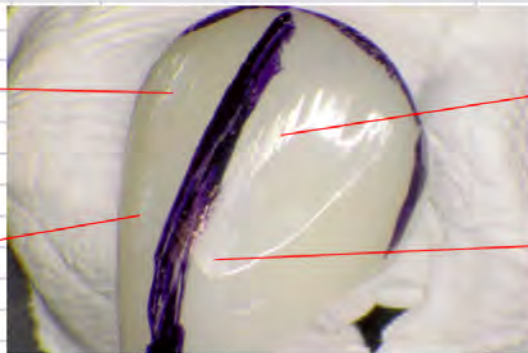
Probe D

Probe E

Probe F

Probe F

Nr.	Benennung	Rz Ergebniss [μm]	Sonstiges
1	Probe F-1 partical treatment	2,9	-
2	Probe F-2 partical treatment	8,2	grobe Oberfläche
3	Probe F-1 complete treatment	0,9	-
4	Probe F-2 complete treatment	0,8	-
5	Probe F-1 palatinal	0,8	bearbeitete Fläche?
6	Probe F-2 palatinal	1,2	bearbeitete Fläche?



La misura della rugosità **Ra**, espressa in micron, è il valore medio aritmetico degli scostamenti (presi in valore assoluto) del profilo reale della superficie rispetto alla linea media.

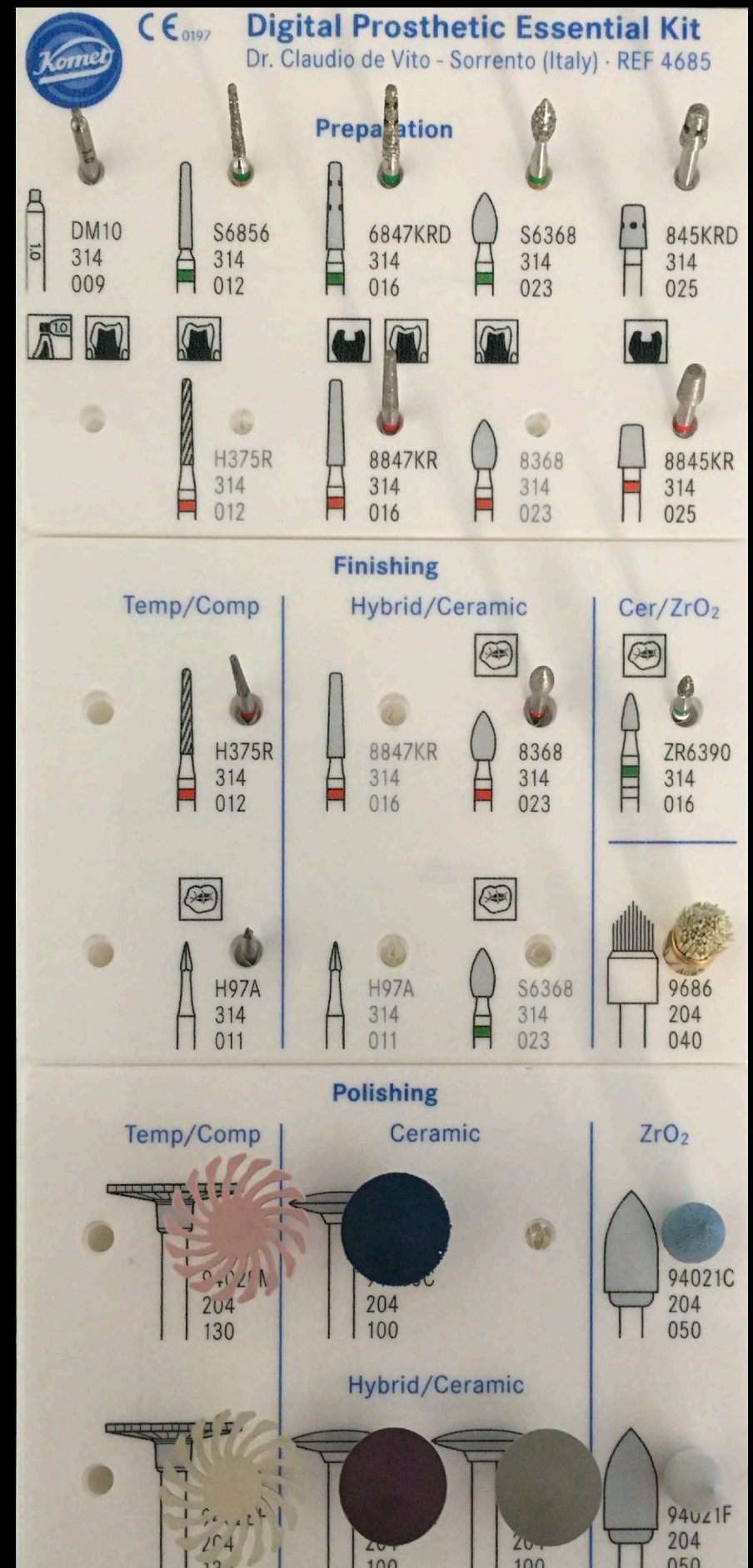
Rq, invece, rappresenta la media quadratica degli scostamenti dei punti del profilo dalla linea media; tale parametro, essendo una media quadratica è più sensibile ai bruschi scostamenti del profilo da un andamento regolare ed è in generale maggiore rispetto al valore Ra.

Rz è la media aritmetica dei valori assoluti dei 5 picchi più alti e delle 5 valli più profonde compresi in un intervallo.

L'analisi dei risultati mostra chiaramente che le superfici trattate secondo il protocollo del **Digital Prosthetic Essential Kit** sono molto più levigate delle superfici trattate con la singola fresa. Questo era facilmente intuibile ancora prima di eseguire lo studio, ma **il risultato straordinario è rappresentato dal fatto di aver ottenuto, in molti casi, una superficie più levigata di quella ottenuta seguendo il protocollo fornito dall'azienda produttrice.**

Digital Prosthetic Essential Kit

Preparazione
Finitura
Lucidatura



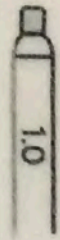
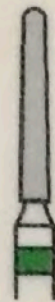
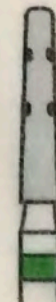
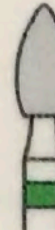
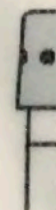







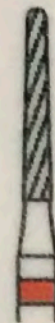
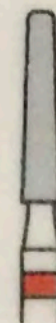




CE 0197

Digital Prosthetic Essential Kit

Dr. Claudio de Vito - Sorrento (Italy) - REF 4685

Preparation

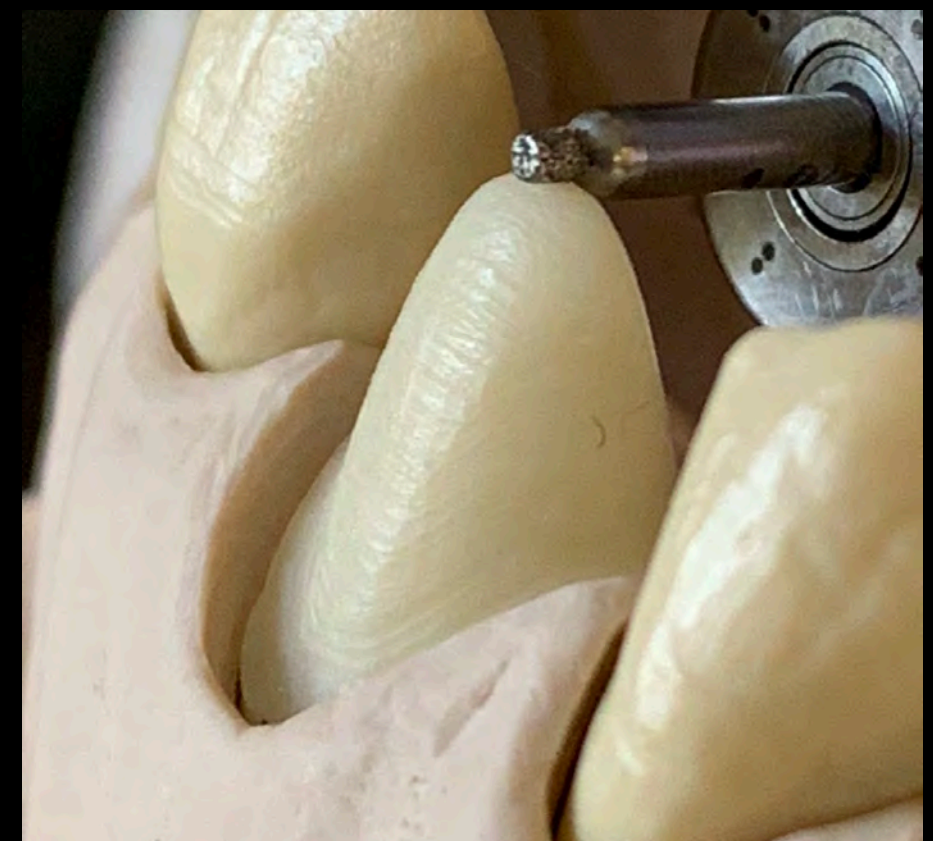
 DM10 314 009	 S6856 314 012	 6847KRD 314 016	 S6368 314 023	 845KRD 314 025
 		 		
 H375R 314 012	 8847KR 314 016	 8368 314 023	 8845KR 314 025	

Preparation

Per restauri parziali e totali

Questa fresa è usata per marcare la profondità di preparazione in tutti gli ambiti della restaurativa e soprattutto per aiutare a dare il giusto spessore alla preparazione nella zona incisale.

Frequentemente il diametro della testa della fresa della fresatrice che deve preparare la corona nella sua parte cava è di almeno 0,8mm; una preparazione con uno spessore incisale inferiore non può essere riprodotta dalla fresatrice che quindi produrrebbe un restauro incongruo. L'uso della sola parte lavorante sul margine incisale della preparazione garantisce uno spessore di 1mm.



Fresa anello verde da 012,
conica a testa arrotondata,
puo' essere usata per
preparazioni minime sia di
corone che di faccette. Dato
il suo spessore ridotto trova
applicazione anche nella
preparazione delle zone
prossimali

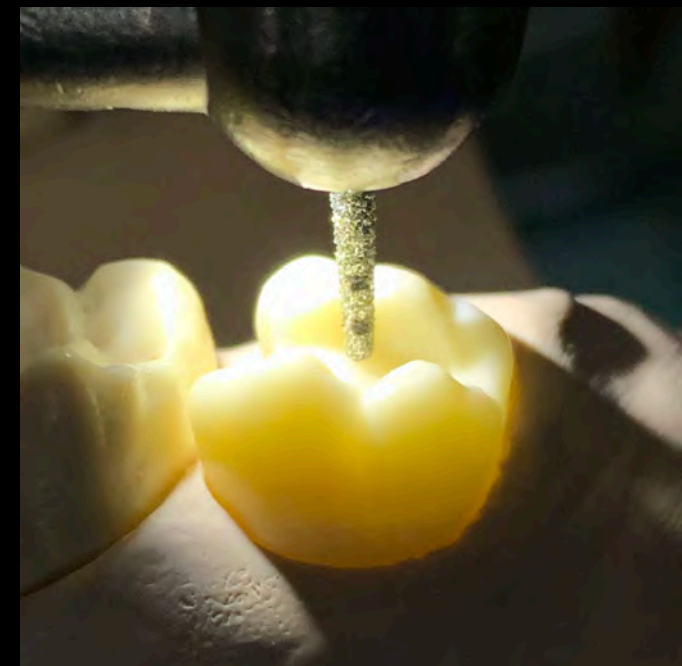
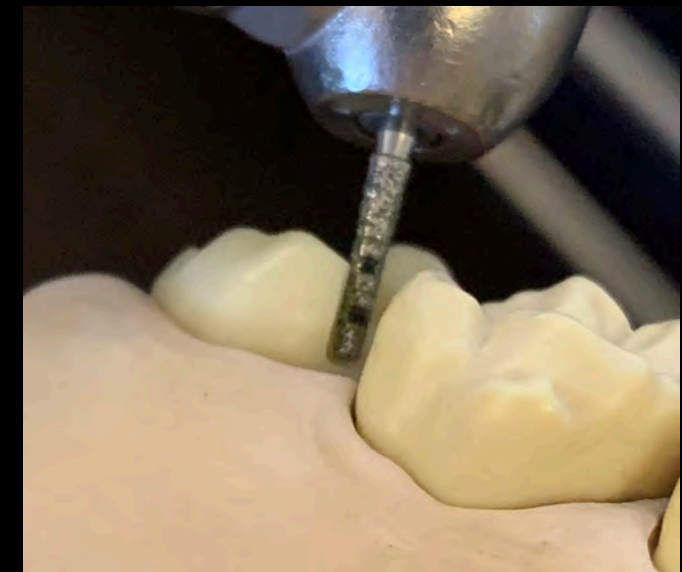


Fresa anello verde, conica da 016 a testa piatta con bordi arrotondati.

Da utilizzare per la preparazione orizzontale di corone in modo da facilitare l'uso di scanner intraorali per impronta ottica.

Importanti gli indicatori di profondità a 2 e 4mm.

Questi facilitano la corretta preparazione di cavità per inlay informando il clinico dello spessore necessario da dare al restauro.



Palla da rugby anello verde per riduzione occlusale e linguale.

Ha una particolarità: è appuntita. Questa caratteristica viene sfruttata per migliorare l'anatomia occlusale di restauri eseguiti con materiali ceramici molto resistenti. Infatti trova spazio anche nella sezione "finitura"



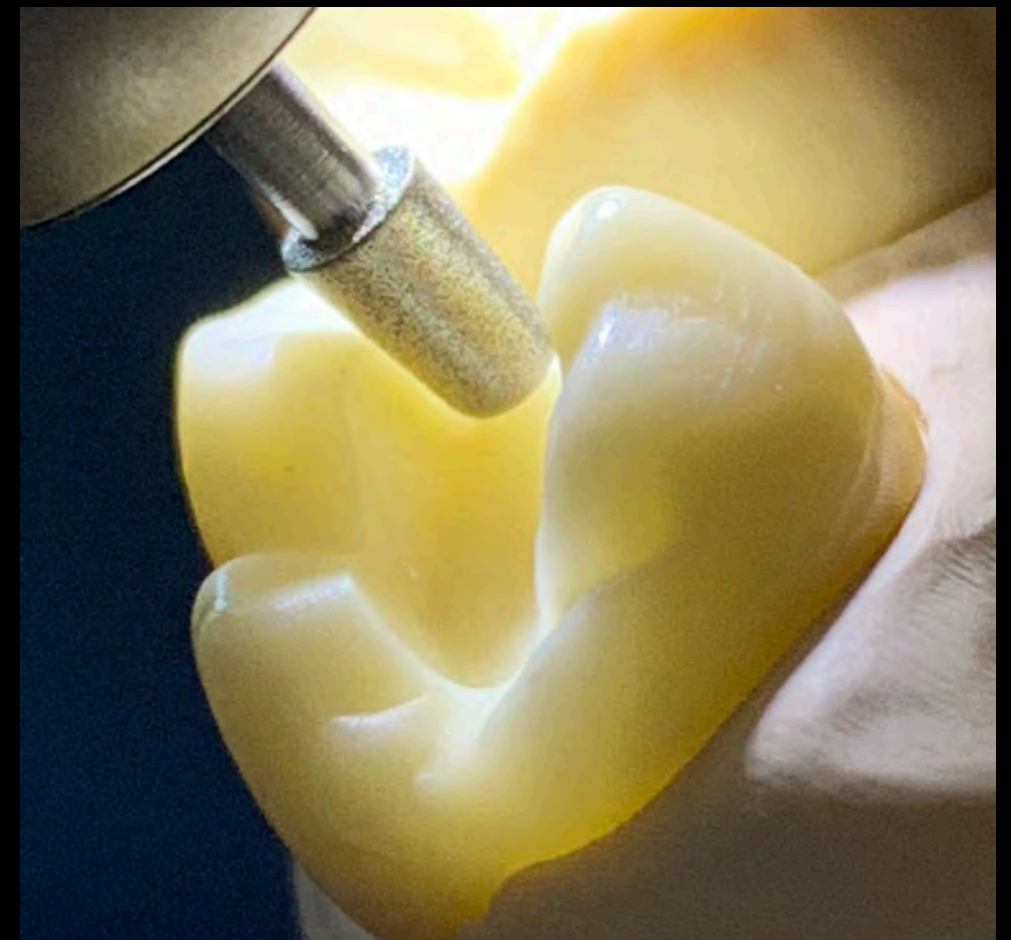
Tronco-conica, bordi arrotondati, con contrassegno di profondità a 2mm.

Fresa per intarsi da 025.

Comodissima in quanto conferisce alla preparazione della cavità i requisiti minimi di profondità e di spessore laterale affinché il restauro sia eseguito in sicurezza.

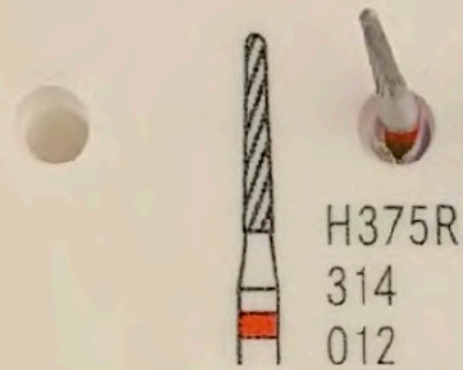


Tronco-conica, testa piatta,
bordi arrotondati. Fresa per
rifinire le cavità per inlay
realizzate con la 845KRD.

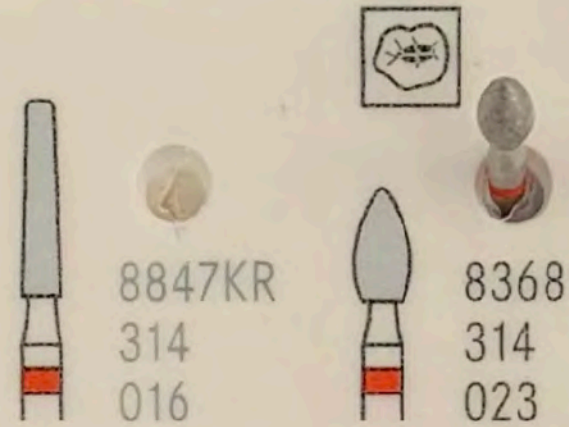


Finishing

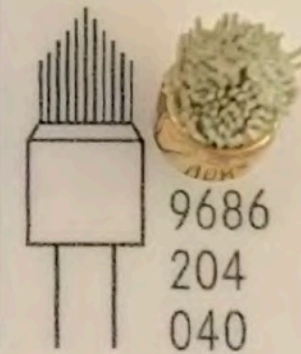
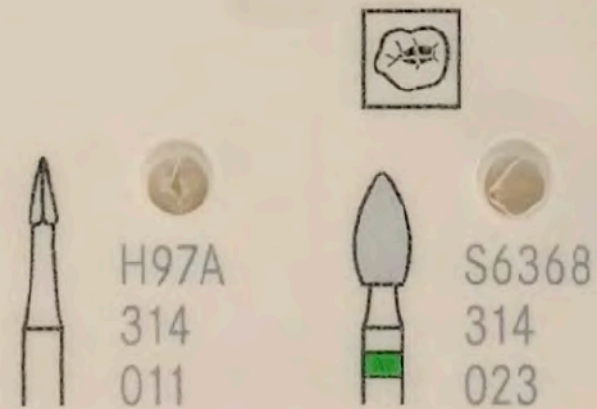
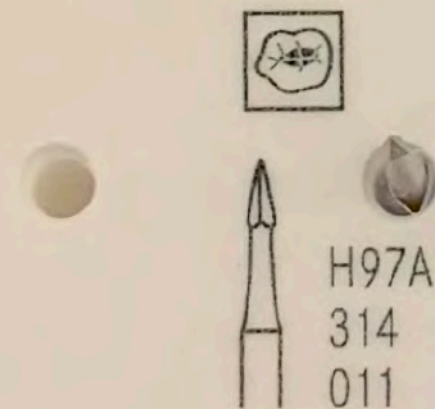
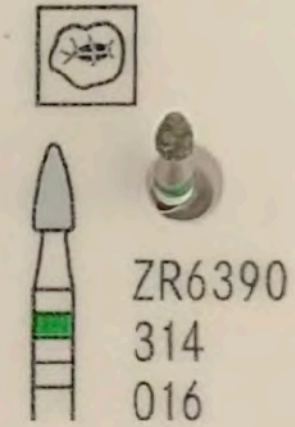
Temp/Comp



Hybrid/Ceramic



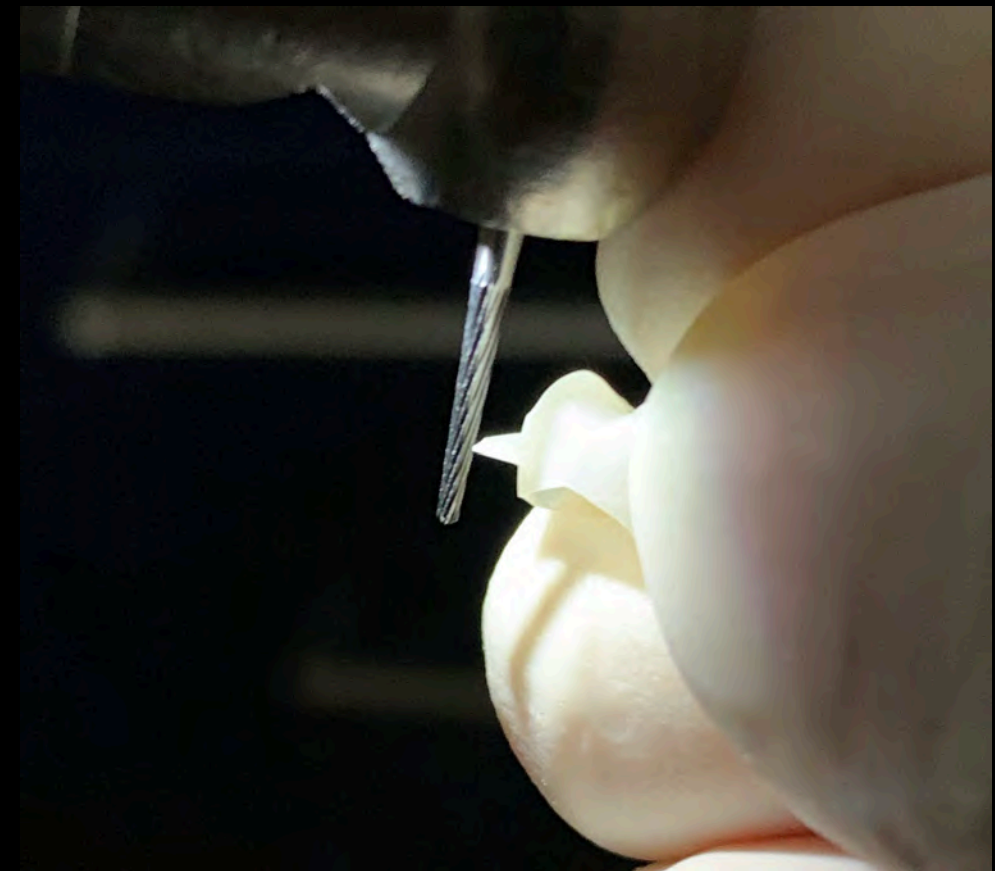
Cer/ZrO₂



Finishing

Pre e post cementazione

Fresa anello rosso in carburo di tungsteno da 012, conica a testa arrotondata per rifinire i monconi dopo la S6856. È una dodici lame e per questo trova posto anche nella sezione “finitura” : si adopera delicatamente su materiali a matrice resinosa come PMMA e compositi. Non “impasta”.



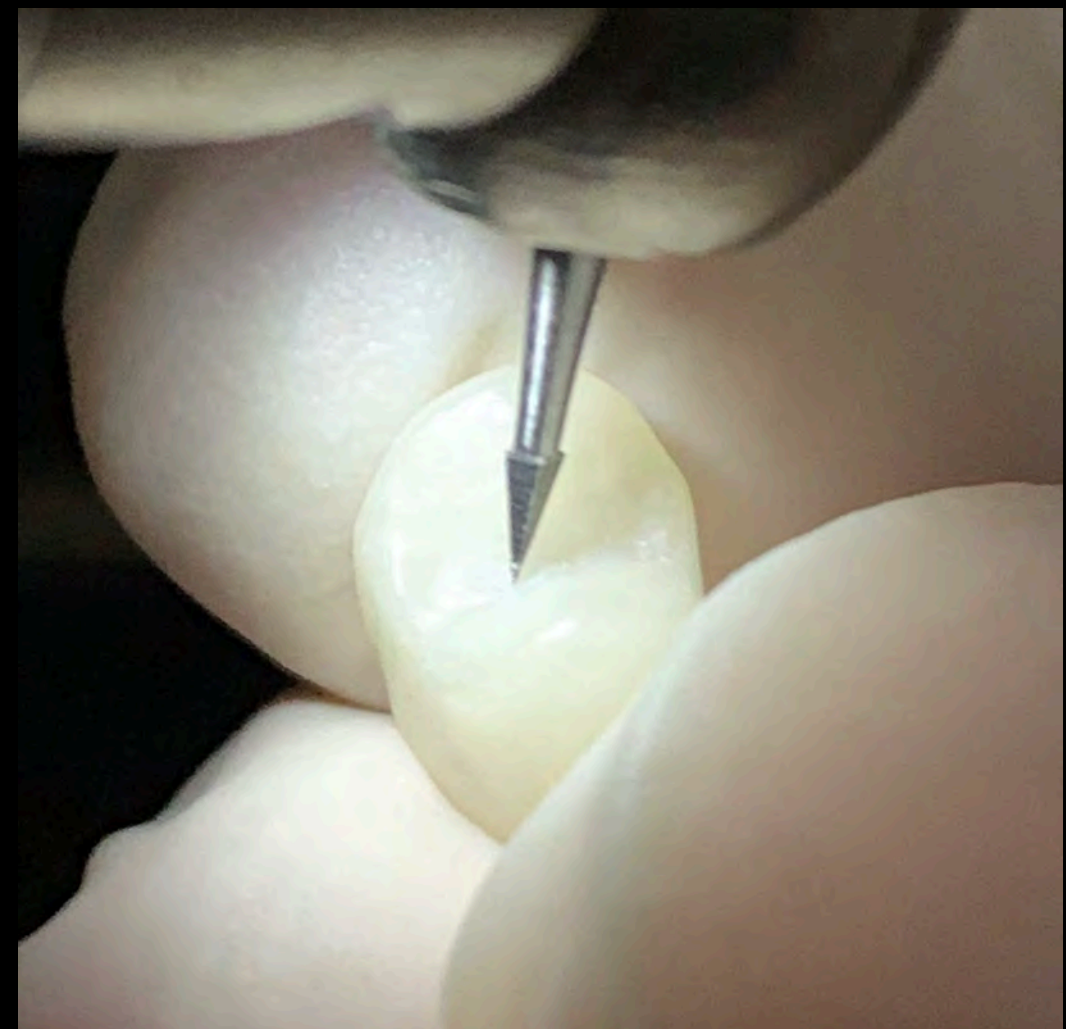
Fresa anello rosso da 016,
conica, testa piatta con bordi
arrotondati. Per la rifinitura dei
monconi e delle cavità
prossimali preparate con la
6847KRD. Può essere usata
anche per la finitura di restauri
utilizzati in ceramica ibrida ed in
ceramica.



Fresa anello rosso, palla da rugby. Ovviamente analoga alla S6368. Si può usare per la modellazione e finitura della superficie occlusale di restauri realizzati in ceramica e ceramica ibrida.



Fresa a 4 lame in carburo di tungsteno. Molto tagliente. Perfetta per solchi e fossette di restauri a matrice resinosa.



Diamantata per ceramica
e ossido di zirconio. Per
ritocchi occlusali.

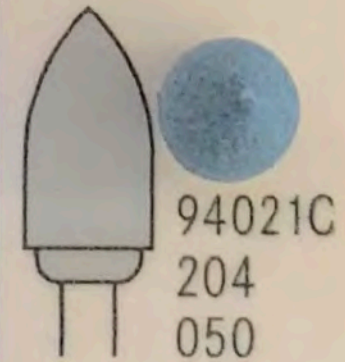
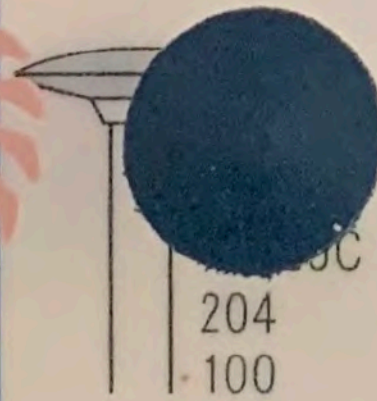
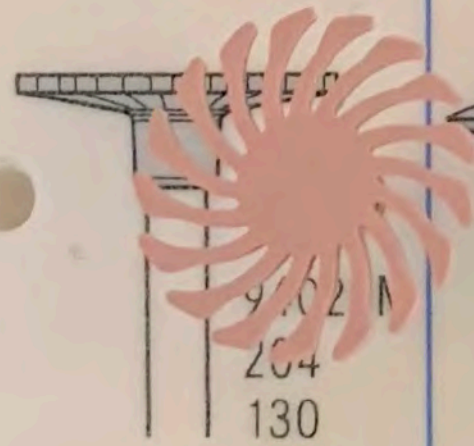


Polishing

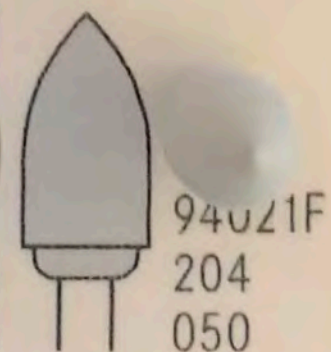
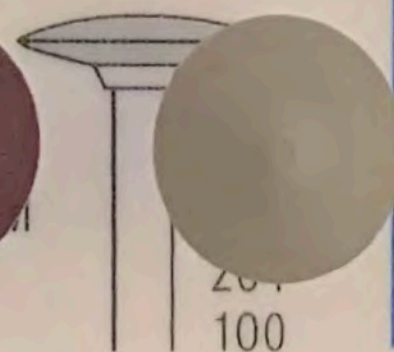
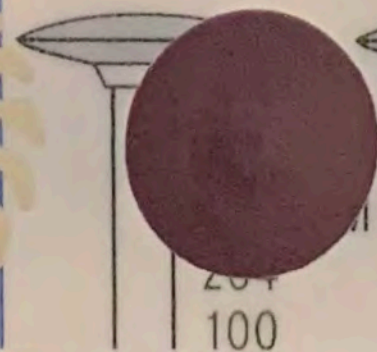
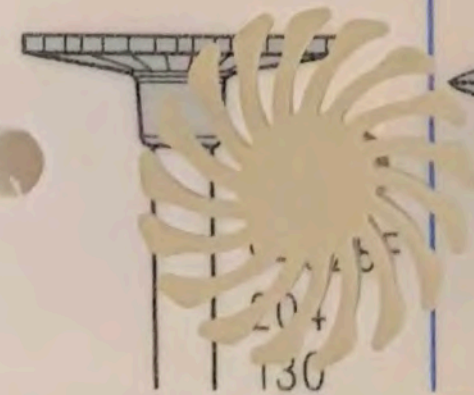
Temp/Comp

Ceramic

ZrO₂



Hybrid/Ceramic



Polishing

Lucidatura di vari materiali

Gommini a spirale per raggiungere tutte le superfici. Due passaggi per ottenere il risultato migliore: prima il rosa poi il giallo. Vanno usati su superfici umide. Per PMMA, temporanei e compositi.



Gommini diamantati per
ceramica. Da usare in
sequenza: blu, rosa, grigio.
Per la lucidatura della
ceramica ibrida si
consigliano solo gli ultimi
due.



Gommini per ceramica dura ad alte prestazioni, ossido di zirconio. Da usare in sequenza: prima il blu poi il grigio.



Spazzolino a punta a fibre speciali con particelle integrate di carburo di silicio. Per la lucidatura senza paste di materiali ceramici e compositi. La forma consente di essere efficace su tutte le zone.





DIGITAL PROSTHETIC ESSENTIAL KIT

aut. Dr. Claudio De Vito



Il Digital Prosthetic Essential Kit è composto da tutti i professionisti che usano i diversi materiali preziosi in commercio per realizzare restauri protesici. Fornisce un set di strumenti per i tracciati post-cementazione.



Per maggiori informazioni visitate il sito
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Grazie a tutti