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Aim or purpose: The incidence of chronic kidney disease is increasing, and patients receiving treatment in nephrology wards including hemodialysis, peritoneal dialysis and renal transplant will be directed to dental specialists.
The purpose of this study was to examine the odonto – periodontal changes in patients with chronic kidney disease and the manner in which it influences periodontal pathology.
Materials and methods: The study was conducted on a group of 42 patients with chronic renal failure, of which 28 are undergoing hemodialysis, 8 – continuous ambulatory peritoneal dialysis, and 6 – continuous cycler-assisted peritoneal dialysis and control group of 88 patients without a renal pathology. A set of standard peridontal parameters (probing pocket depths, recession and clinical attachment level) were recorded for all participants.
Results: A statistically significant association was observed between the number of teeth covered by dental plaque and calculus and the number of elements bleeding on probing.
Conclusions: Patients with chronic kidney disease show a higher prevalence and more severe periodontal disease than those not suffering from renal impairment. Since periodontal clinical examination is not part of the standard set of investigations in these patients, severe periodontitis may be an overlooked source of systemic inflammation which can worsen chronic inflammatory status.

Free Communication Session 23 | 29.08.2017, 16:30–17:30 | Room A9.11

Theme: Prosthodontics

FC089
Surface Roughness and Hardness of PMMA with ZrO_2 Nanoparticles Addition
Gülfem Ergün[1], Zeynep Şahin[2], Ayşe Seda Ataol[3]
[1]*Gazi & Mersin University, Faculty of Dentistry, Department of Prosthodontics, Mersin, Turkey,* [2]*Private prosthodontic practice, Ankara, Turkey,* [3]*Mersin University, Faculty of Dentistry, Department of Prosthodontics, Mersin, Turkey*

Aim or purpose: The aim of this study was to evaluate surface roughness and hardness of heat-cured PMMA reinforced with 5%, 10% and 20% tetragonal zirconium oxide-yttria stabilized (ZrO_2) nanoparticles (nano- ZrO_2) after aging by thermocycling.
Materials and methods: A total of 160 specimens were fabricated from heat-cured PMMA for two different test parameters. The specimens were divided into four groups according to the ratio of nano- ZrO_2 added to heat-cured PMMA; Group 1: 5% nano-ZrO_2; Group 2: 10% nano-ZrO_2; Group 3: 20% nano-ZrO_2 and Group 4: heat-cured PMMA without nano-ZrO_2 (control group). Then the all test specimens were divided into two subgroups (thermocycle and water storage). They were subjected to the tests of surface roughness and hardness. Two test specimens selected from each hardness test groups were examined with SEM. XRD analysis was used to examine the crystal structure of the nanoparticles. The all test data were analyzed with Kruskal–Wallis test.
Results: The surface roughness of Group 3 was found to be statistically significant higher than the other groups ($p < 0.001$), but it was within the clinically acceptable limits. When the surface hardness test results were evaluated, Group 1 and 2 showed statistically significant higher values than Groups 3 and 4 ($p < 0.01$). Generally, the thermocycling did not showed statistically significant effect on the test parameters compared to water storage groups.
Conclusions: On the whole, the nano-ZrO_2 addition with various ratio into the heat-cured PMMA increased the surface roughness and hardness values.

FC090
Decision Making for Successful Restorations Begin with Right Treatment Planning
Asha Samant
Rutgers School of Dental Medicine, Newark New Jersey, USA

Introduction: Times are changing and so are needs and demands of patients. Society is media dominate. Social stigma plays a major role in how people learn to improve their appearance and self esteem. The partially edentulous patients are frequently the most challenging prosthodontic patients in the clinical practice. There is a myriad of treatment alternatives based upon such factors as number and location of remaining teeth, esthetics, function, comfort and vertical dimension of occlusion and limited interarch space. All too often the dentist will acknowledge what remains and attempt to restore patient's dentition while accepting the limitations inherent to this compromised dentition. On the other hand, a comprehensive diagnosis and astute treatment planning will provide the opportunity to deliver prosthesis of the highest quality and attain the goals of esthetics, function and comfort.
Case description: Two clinical cases will be presented where there was limited interarch spaces, financial was not available. One patient was older and did not want surgical management or extraction teeth or alveoplasty. There were missing teeth opposing arches and lost vertical dimension.
Discussion: In Patient presenting with limited interarch spaces an alternative treatment with removable modalities is possible care. Case based treatment planning is the best way to make patient comfortable and happy, which provides quality of life to patient and pleasant success to Dentist.
Conclusions/Clinical significance: Patient comfort and esthetic is the key to alternate treatment care which contribute Self esteem and Quality of life.

FC091
Translational Multidimensional Model Redefining Disability Functioning and Health In Dentistry
Oscar Suarez-Sanchez[1], Elebia Slayton[2], Paul Longo[1], Chester Douglass[3]
[1]*American College of Prosthodontists, Ramstein, USA,* [2]*University of Maryland, Ramstein, Germany,* [3]*Harvard School of Dental Medicine, Boston, USA*

Aim or purpose: To propose a meaningful model, operational definition and standardized diagnostic criteria, for clinical application

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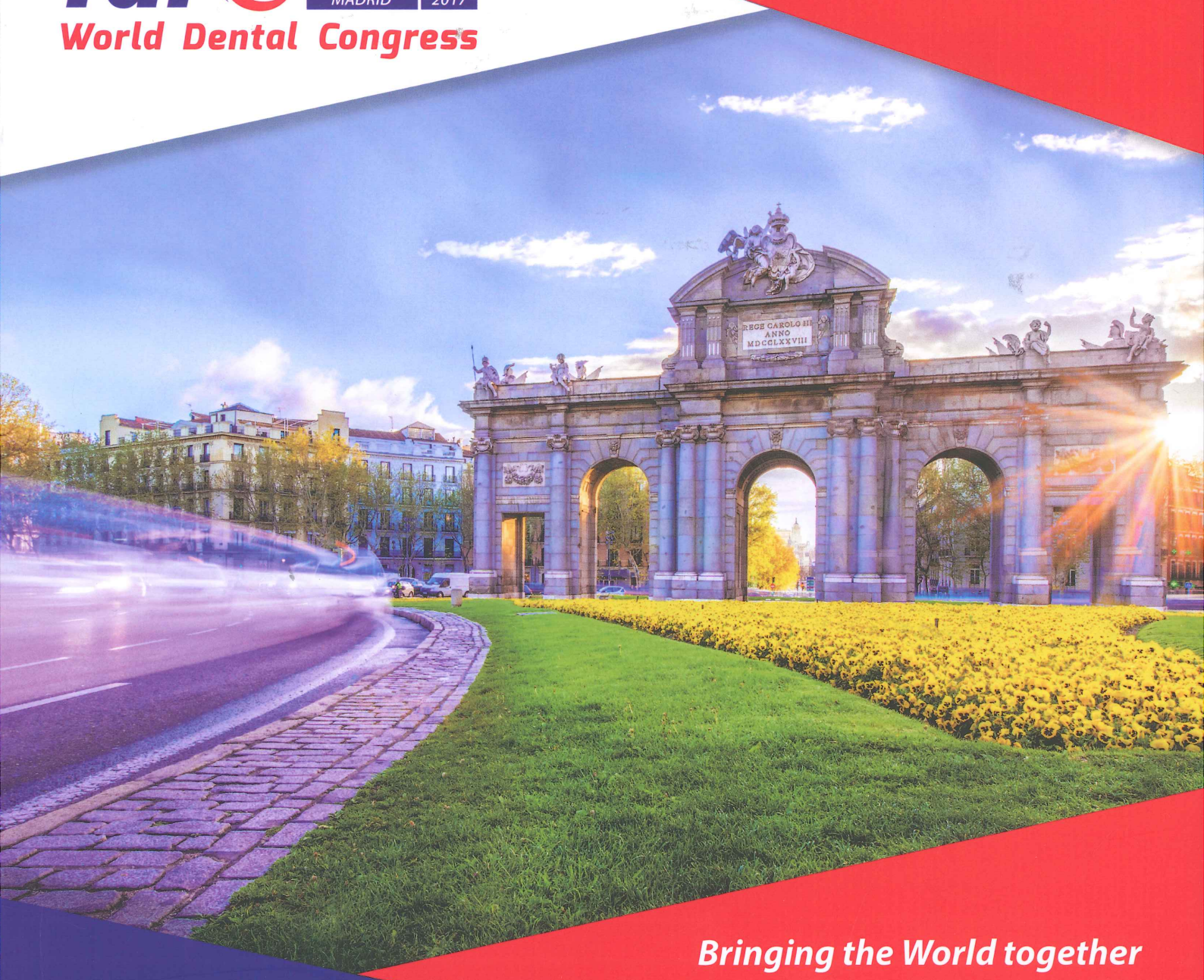
Madrid, Spain
29 August - 1 September 2017



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Free Communication Session 20

29.08.2017, 15:15 - 16:15 | Room A9.13

Theme: Implantology

FC077 Protocol of immediate implant with Socket Shield using digital tools
Adela Díaz Daza

FC078 5 Year s follow up of new laser technique in second surgery in dental implants
Josep Arnabat-Dominguez

FC079 Alveolar preservation. Filling and sealing with saddle connective tissue graft
Marc Mascaró Pons

FC080 Full Mouth Reconstruction- From Simple to Complex
Forna Norina Consuela

Free Communication Session 21

29.08.2017, 16:30 - 17:30 | Room A9.9

Theme: Gerodontology

FC081 Alteration of Memory and Depression in Elderly with Full Overdenture
Bahruddin Thalib

FC082 The Influence of Taste on Swallowing Function in Elderly
Dewi Agustina

FC083 In vitro Evaluation of Inhibitory Activity of Thymoquinone against Candida Albicans for Denture Stomatitis Prevention
Khalifa Al-Khalifa

FC084 Concierge dental services for India's elderly: A unique model
Kadambari Rawal

Free Communication Session 22

29.08.2017, 16:30 - 17:30 | Room A9.10

Theme: Prevention and Periodontal diseases

FC085 Dental awareness affecting the periodontal health in Karachi, Pakistan
Hamza Syed Muhammad

FC087 Interactions between periodontal disease and chronic kidney disease
Maria Alexandra Martu-Stefanache

Free Communication Session 23

29.08.2017, 16:30 - 17:30 | Room A9.11

Theme: Prosthodontics

FC089 Surface roughness and hardness of PMMA with ZrO2 nanoparticles addition
Ayşe Seda Ataol

FC090 Decision Making for successful Restorations begin with right treatment Planing
Asha Samant

FC091 Translational Multidimensional Model Redefining Disability Functioning and Health in Dentistry
Oscar Suarez-Sanchez

FC092 Effect of different color CAD/CAM-ceramics and resin-cements on final color
Funda Ozen

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FC089

CERTIFICATE of PRESENTATION

THIS IS TO CERTIFY THAT

Ayşe Seda Ataol

has contributed with a **Free Communication** presentation titled:

Surface roughness and hardness of PMMA with ZrO_2 nanoparticles addition

Authors:

Gülfem Ergün, Zeynep Şahin, Ayşe Seda Ataol

in the **FDI World Dental Congress** in Madrid, Spain,
29 August-1 September 2017

Sally Hewett, DDS

Dr. Sally Hewett
FDI Educational Committee Chair

Dr. Oscar Castro
Local Organizing Committee President

Surface roughness and hardness of PMMA with ZrO2 nanoparticles addition

Gulfem ERGUN[1,2], DDS, PhD, Zeynep SAHIN[3], DClinDent, Ayse Seda ATAOL[2], DDS, PhD

[1] Gazi University, Faculty of Dentistry, Department of Prosthodontics, Ankara, Türkiye

[2] Mersin University, Faculty of Dentistry, Department of Prosthodontics, Mersin, Türkiye

[3] Balikesir Oral And Dental Health Center, Balıkesir, Türkiye

This work was supported by the Unit of Scientific Research Projects fund of Gazi University [grant number 03/2015-12].

The aim of this study was to evaluate

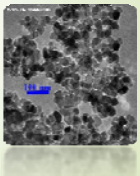
- **Surface roughness and hardness of PMMA reinforced with:**
  - **5% nano- ZrO_2** (Group 1)
  - **10% nano- ZrO_2** (Group 2)
  - **20% nano- ZrO_2** (Group 3)

after aging by thermocycle

The hardness (ease of finishing a material and surface roughness (surface irregularities) of PMMA

ZrO_2

- chemical inertness
- thermal stability
- high fracture strength
- high hardness and mechanical resistance
- abrasion resistance
- resistance to physical corrosion
- biocompatibility



The Chemical Modification of ZrO_2 Nanoparticles

- Silane coupling agent (APTES) was solved in toluene.
- The nano-ZrO_2 powder was mixed with this prepared solution.
- The mixture was kept in toluene for 5 min and in the ultrasonic mixer for 10 min.

TEST METHODS

Surface roughness	Profilometer
Hardness	Vickers Microhardness Tester

TEST METHODS

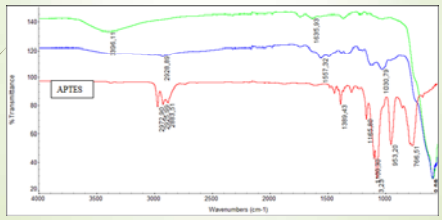
Chemical Analysis	FT-IR analysis
The microstructure of the specimens	SEM analysis
Crystalline phase and structure identification of the nano-ZrO2	X-ray diffractometer (XRD)

- All of the specimens were stored in distilled water at 37 °C for 50 ± 2 hours.
- The half of the test specimens were exposed to thermocycling (TC+)
  - 5°C and 55°C for 10 000 cycles with a 60 s dwell time and 6 s transfer time.
- The other half were stored in distilled water at 37°C in an incubator (TC-)

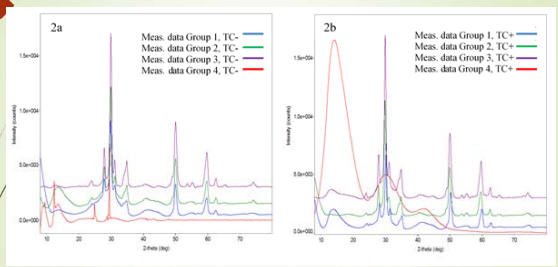
during TC+ specimens were in the thermocycler.

Results:

FTIR spectrum (red: silane coupling agent "APTES", blue: tetragonal nano-ZrO_2 modified with silane coupling agent, green: tetragonal nano-ZrO_2)



XRD patterns of the tested specimens



2a XRD analyses of the tested specimens (water storage, TC-) (Group 1, 2, 3 and 4)
2b XRD analyses of the tested specimens (thermocycle, TC+) (Group 1, 2, 3 and 4)

Surface roughness results of the tested specimens

	TC -	TC +	p-value †
Group 1 (%5)	0.19 (0.16-0.30)^{c}	0.21 (0.16-0.25)^{c}	0.971
Group 2 (%10)	0.40 (0.18-0.49)^{a,d}	0.24 (0.18-0.45)^{d}	0.393
Group 3 (%20)	1.06 (0.72-1.16)^{b,c,d}	0.94 (0.71-1.30)^{b,c,d}	0.912
Group 4	0.14 (0.13-0.17)^{a,b}	0.16 (0.15-0.26)^{b}	0.190
p-value ‡	<0.001	<0.001	

The data have been shown in median (interquartile range), † the comparisons among the groups according to the thermocycle, Mann Whitney U test, the results were accepted as statistically significant for p<0.0125 according to the Bonferroni Correction, ‡ the comparisons among the all test groups, Kruskal Wallis test, the results were accepted as statistically significant for p<0.025 according to the Bonferroni Correction. The same superscript letters indicate statistically significant differences between the stated groups; a: Group 2 and 4 (p<0.001), b: Group 3 and 4 (p<0.001), c: Group 1 and 3 (p<0.001), d: Group 2 and 3 (p<0.01).

The critical Ra value is 0.2 µm according to ISO 20795-1.
The roughness results of the present study were higher than the threshold value for Ra (except Group 1 and 4).

- The increase of surface roughness values of Group 1 (5%) was within the clinically acceptable limits.
- Nano-ZrO_2 particles had a very small size, and they were well dispersed especially in Group 1.

In agreement with a previous study, in the present study,

- The increase in surface roughness with the increased addition of nano fillers may be due to the different roughness of nano particles and acrylic denture base matrix.
- In addition, it was also probably related with the difference in micro structural characteristics of the materials and the form of the particles.

Aljafery AMA, Mah B (2015) Effect of addition ZrO_2-Al_2O_3 nanoparticles mixture on some properties and denture base adaptation of heat cured acrylic resin denture base material. J Bagh Coll Dent 27, 15-21.

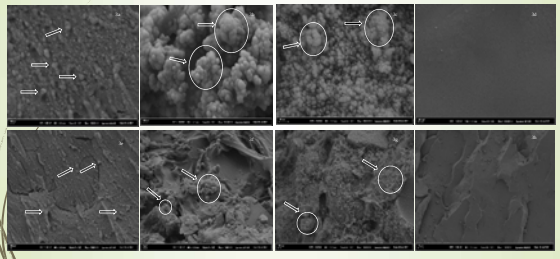
Hardness results of the tested specimens

	TC -	TC +	p-value †
Group 1 (%5)	36.8 (33.4-42.8)^{a,c}	35.2 (32.6-39.1)^{a,c,e}	0.529
Group 2 (%10)	36.2 (34.4-37.9)^{b,d}	31.3 (30.0-36.5)^{d,e}	0.029
Group 3 (%20)	33.3 (31.5-35.1)^{c,d}	28.1 (24.2-30.9)^{c,d}	0.009
Group 4	32.6 (30.8-34.8)^{a,b}	31.6 (29.3-32.9)^{a}	0.353
p-value ‡	<0.001	0.003	

The data have been shown in median (interquartile range), † the comparisons among the groups according to the thermocycle, Mann Whitney U test, the results were accepted as statistically significant for p<0.0125 according to the Bonferroni Correction, ‡ the comparisons among the all test groups, Kruskal Wallis test, the results were accepted as statistically significant for p<0.025 according to the Bonferroni Correction. The same superscript letters indicate statistically significant differences between the stated groups; a: Group 1 and 4 (p<0.01), b: Group 2 and 4(p<0.001), c: Group 1 and 3 (p<0.025), d: Group 2 and 3 (p<0.025), e: Group 1 and 2 (p=0.020).

SEM images of tested specimens

Group 1 | Group 2 | Group 3 | Group 4



Ahmed and Ebrahim, used nano-ZrO_2 at four different concentrations (1.5%, 3%, 5% and 7%) to improve mechanical and physical properties of heat-cured PMMA.

- Although, in the previous study, the nano filler addition ratio was lower than our study, they reported a significant increase in hardness as the percentage of nano-ZrO_2 fillers increased.
- In the present study, increase of the hardness in Group 1 and 2 could be related with the strength characteristics of nano-ZrO_2 (17). ZrO_2 has a strong ionic interatomic bonding that provides desirable material characteristic such as hardness.

Ahmed MA, Ebrahim MI (2014) Effect of zirconium oxide nano-fillers addition on the flexural strength , fracture toughness , and hardness of heat-polymerized acrylic resin. World J Nano Sci Eng 4, 50-57.

Asopa et al. reported that;

- 10% and 20% nano-ZrO_2 addition to PMMA resulted in a significant increase in flexural strength, but decrease in surface hardness.
- Therefore, the weak interfacial bond between the nanofiller and resin matrix could be the cause why there was no significant increase in hardness in the high ratio of nano-ZrO_2 addition groups of the present study (especially in Group 3).

Asopa V, Suresh S, Khandelwal M, Sharma V, Asopa SS, Laxman SK (2015) A comparative evaluation of properties of zirconia reinforced high impact acrylic resin with that of high impact acrylic resin. Saudi J Dent Res 6, 146-151.

Conclusion

It is important to investigate new applications which will **provide the homogenous distribution** and bonding of nano-ZrO_2 to heat-cured PMMA matrix.

- The addition of nano-ZrO_2 with various ratios had **an adverse effect on surface roughness** of heat-cured PMMA.
- On the other hand, the nano-ZrO_2 addition with various ratios into the heat-cured PMMA **increased hardness values**.
- To achieve maximum surface hardness of heat-cured PMMA, the optimum amount was **5% nano-ZrO_2 addition**.