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The evaluation of surface porosity of different glass ionomer cements

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Abstract
The purpose of this study is to investigate the evaluation of surface porosity of 5 different glass ionomer cements; EQUIA Forte Fil (GC, Tokyo, Japan, EQF), Fuji II LC Light-Cured Glass-Ionomer Cement for Restorative Filling (GC Corp, Tokyo, Japan, F2S), Fuji IX Conventional glass ionomer Cement for Restorative Filling (GC Corp, Tokyo, Japan, F9S),Glass carbomer (Glass Carbomer, GCP), Ionoseal (Glass ionomer cement, VOCO, Cuxhaven, IOS). They were filled in teflon molds (height: 4 mm, width: 6 mm) and stored in distilled water at 37 0C / 24 hours. The surface purosite of the materials was examined with a stereomicroscope (Olympus SZX-7) at 50x, 100X, 200X and 500X magnification. As a result of the obtained findings, it was determined that IOS has the least pore surface and F9S has the most porous surface.

Keywords: Glass ionomer cement, porosity, pore

1. Introduction
It was first discovered by Wilson and Kent in 1972; conventional glass ionomer cements (GCIS) developed by combining the advantages of silicate and polycarboxylate cements have limited use in areas exposed to intensive chewing forces due to their low resistance to abrasion and abrasion [1, 2].
Due to these problems observed in GCIC, "resin-modified glass ionomer cements" (RMCIS) have been developed in recent years, which are modified by dual-cure reactions of modified cements [3-5]. These are the normals for polymerizations of cements In addition to acid-base reactions, activation of a light device is also necessary. It has been reported that these cements have increased resistance to compressive and tensile forces, fracture toughness, modulus of elasticity and retention ratios due to polymerizations of the resinous monomers [3, 5-8].
Water absorption, which affects the physical, chemical and mechanical properties of all restorative materials, is one of the factors that can not be fully controlled and affects the clinical success of restorative materials [3, 9].
Water absorption; In GCIC and RMCIS materials where acid-base reactions occur, the diffusion matrix is mainly in the matrix and the diffusion coefficient decreases in a controlled process depending on the water concentration in the matrix. Thus, water absorption leads to degradation of cement masses over time due to hydrolysis of the cement matrix and causes surface properties, edge integrity, loss of aesthetic appearance, and therefore impairment of restorations [3, 4, 10]. So, the aim of this study is to evaluate the surface porosity of glass ionomer cements.

2. Materials and methods
Glass ionomer cements were used in five different brands in the study. These materials; EQUIA Forte Fil (GC, Tokyo, Japan, EQF), Fuji II LC Light-Cured Glass-Ionomer Cement for Restorative Filling (GC Corp, Tokyo, Japan, F2S), Fuji IX Conventional glass ionomer Cement for Restorative Filling (GC Corp, Tokyo, Japan, F9S),Glass carbomer (Glass Carbomer, GCP), Ionoseal (Glass ionomer cement, VOCO, Cuxhaven, IOS).
The study was conducted *in vitro*. After placing the restorative materials in the molds (4mm height, 4 mm width), strip bands were placed on the upper and lower surfaces of the molds and pressed to form a flat surface with glass slides and then with LED light device (Elipar Freelight II, 3M-ESPE, St. Paul, MN, USA) and manufacturer's instructions 20/40 sec

polymerized. Some materials were expected to be chemically polymerized. These cured materials were removed from the molds. As a result, a sample of 4 mm in diameter and 4 mm in height was obtained. Samples were stored in distilled deionized water at 37 ° C for 2 weeks.
The materials were examined for their pore size with a stereomicroscope (Olympus SZX-7) at 50X, 100X, 200X and 500X magnification. For each magnification, images were taken from two different regions of the sample (n = 10). In the images obtained, the tubules were counted with Adobe Photoshop CS5 and the averages were taken.

3. Results & Discussion

Surface roughness values of all materials are shown in Figure 1-5 and graph 1. When the surface roughness was examined at 50X magnification, the most porous structure was detected in the F9S material and the least porous in the IOS material. When looking at the magnification of 100X, the most porous structure F9S was found at least in X-tra Base material. At the 200x magnification, the least porous structure was seen in the X-tra Base and the most pyruzic structure was seen in the F9S. When the pseudo-structures of the groups were evaluated at 50X, 100X, 200X and 500X magnification, the IOS material was found to have at least a porous structure. Similar results were obtained between F2S and IOS filler materials.
Hydroscopic eclipse is seen when the water dip in the polymer network of the materials. This expansion separates the chains between the polymers causing the properties of the material to weaken. However, sometimes the absorbed water can remain free in the micro voids formed between the materials without changing the volume.
It is thought that the difference is due to the filler content of the materials when the results obtained from the working groups are examined. Clinically, IOS and F2S material may be preferred over other groups. The excess of surface purosis affects the long-term clinical success of the materials. can be met by coloring problems in materials with excess surface pores.

3.1 Tables and Figures

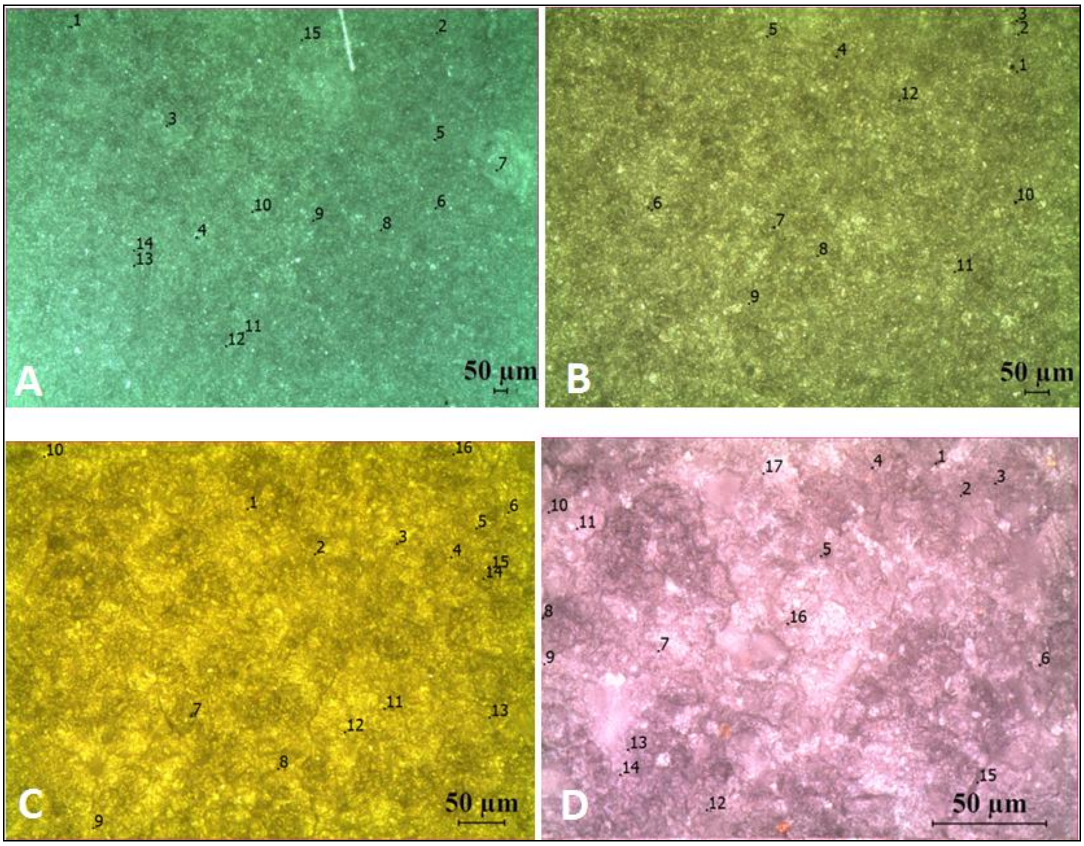
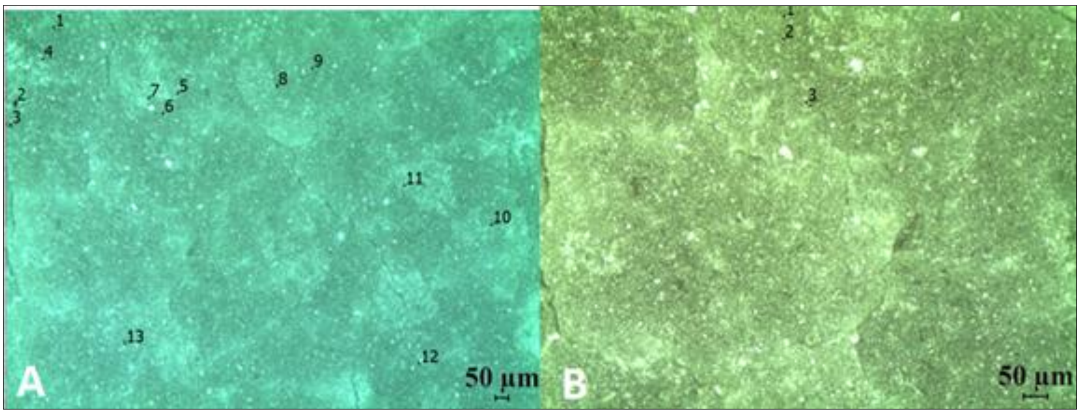


Fig 1A-D: The surface porosity structure of EQF at 50X, 100X, 200X and 500X magnification.



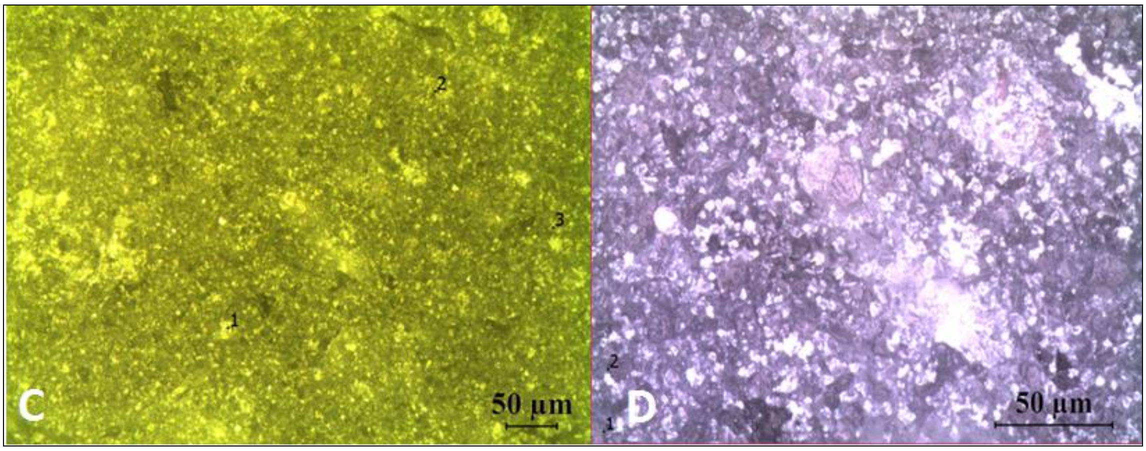


Fig 2A-D: The surface porosity structure of F2S at 50X, 100X, 200X and 500X magnification.

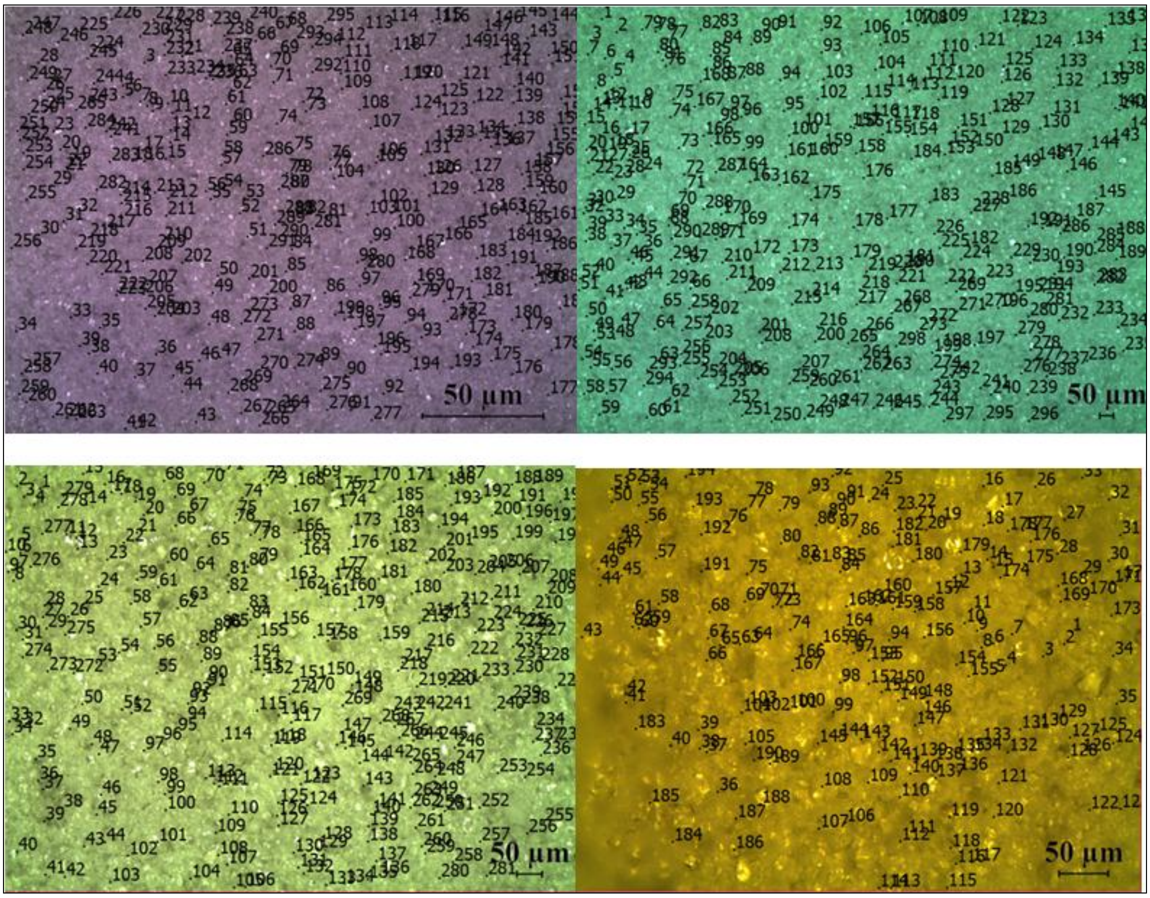
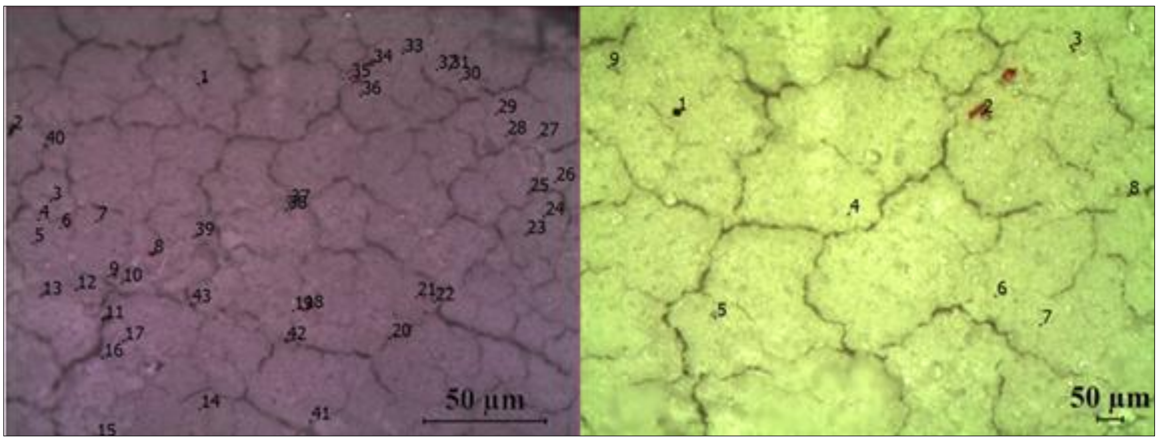


Fig 3A-D: The surface porosity structure of F9S at 50X, 100X, 200X and 500X magnification.



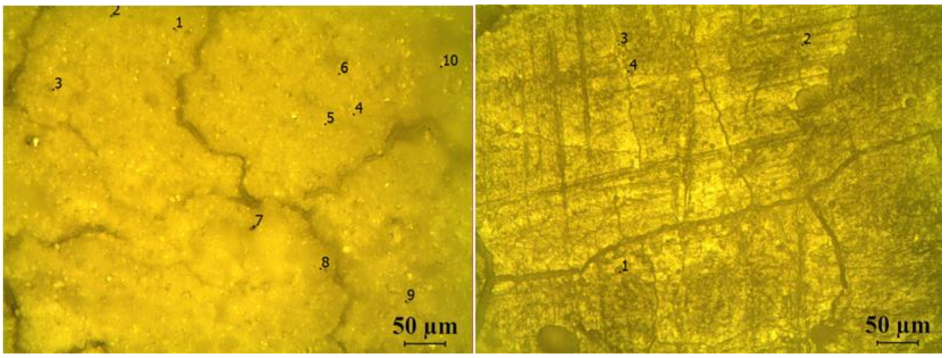


Fig 4A-D: The surface porosity structure of GCP at 50X, 100X, 200X and 500X magnification.

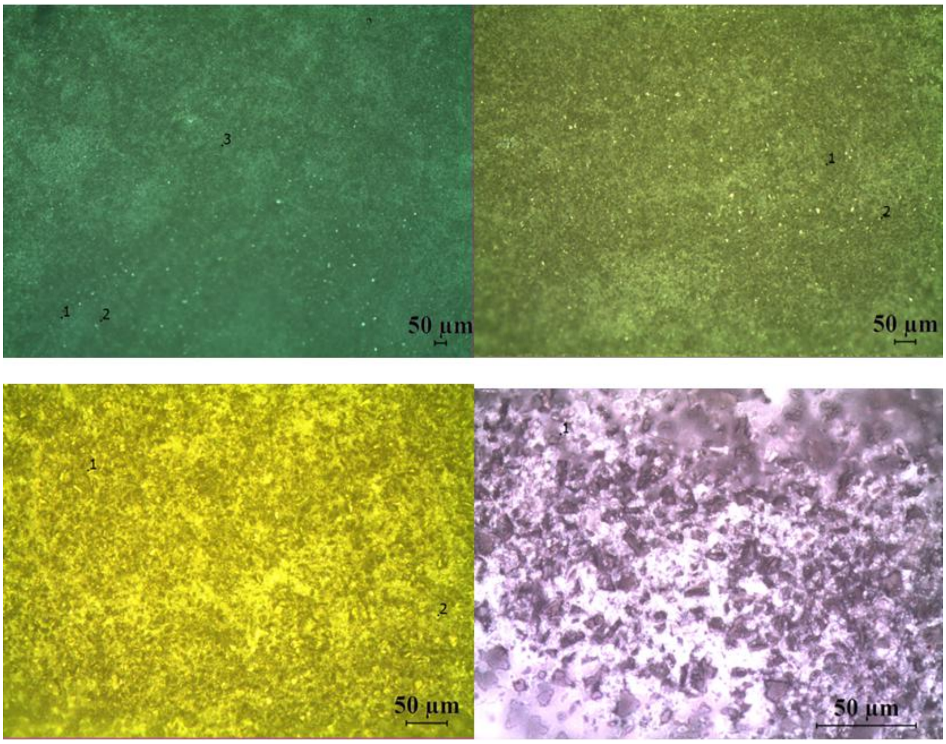
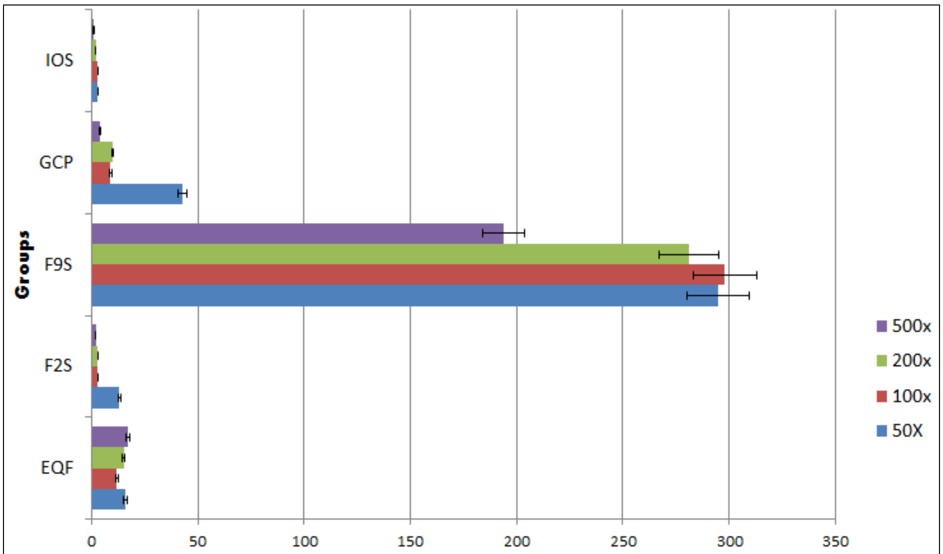


Fig 5A-D: The surface porosity structure of IOS at 50X, 100X, 200X and 500X magnification.



	EQF	F2S	F9S	GCP	IOS
500x	17	2	194	4	1
200x	15	3	281	10	2
100x	12	3	298	9	3
50X	16	13	295	43	3

The number of pores

Graph 1: The surface porosity values of the materials at different magnifications

4. Conclusions

The results of this study suggest that clinicians may prefer IOS, F2S, EQF, GCP and F9S, respectively.

5. References

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